Plastic Cows: Purity, Pollution, and Polymers

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Abstract

This thesis explores the intersection of animal welfare, human identity, and plastics through a case study of urban dairy cows in Mysore, Karnataka, India. Analyzing first how cows inform and reinforce human identities within a Hindu nationalist culture, the thesis next seeks to understand how socio-religious, political, and economic forces conspire to keep cows living in Indian cities. Then follows an investigation of urban cow welfare and management, and finally, concludes with research about the impacts of plastic pollution in cities to cow and human welfare. The thesis addresses the entangled relationships between animals, humans and plastics to illuminate the deleterious impacts to both animal and human wellbeing and our shared environment.

The concept of plasticity functions as a unifying theme in this multilayered analysis of dairy cows in Mysore. There are four expressions of plasticity that guide the study: (1) The *rhetorical plasticity* of animals' symbolic cultural meaning, which addresses the recognition that animals inform human identities, and that humans give animals diverse and sometimes conflicting meanings; (2) *genetic plasticity,* which addresses the ways humans make animal bodies plastic through direct and indirect means; (3) *behavioral plasticity,* which examines the ways a species (here, cows) can adapt their behaviors to a range of contexts; and (4) *material plasticity,* which, in the context of plastic pollution and its impact on urban dairy cattle, examines the force of plastics' pollutants on bodies that are connected by the food chain. This concept of plasticity contributes to scholarship in more-than-human geography, which addresses processes of social and material evolution and change.

Through an analysis of the history and lives of Indian urban dairy cows, this thesis contributes the following concepts to the discipline of geography. *Anthro-animal identities*, which proposes that some animals are used to internalize and reproduce human cultural identities, which can also inform competing ontologies about animals as well as reinforce social conflict between humans. The *urban-animal pastoral*, which postulates that some urban animals evoke sentiments of bucolic environments and lifestyles to urbanites, even if these animals are divorced from the landscapes they are seen to embody. The concept of the *urban-animal contact zone* suggests that the city is a site of both risk and opportunity for animals that inhabit urban environments. Finally, the thesis proposes that the ubiquitous polymer products known as plastics are *leaky materials* (Nading, 2017) which release chemicals back into the environment. Plastic petrochemicals travel in and through bodies through environmental exposure and via the food chain and should be viewed as both a solid and a fluid waste problem.

Through an analysis of human, animal, and material entanglements, this thesis explores: how animals co-constitute human social and political worlds; how cultural identity informs understandings of animal welfare, subjectivities, and placement on the landscape; and how beliefs about animals contribute to perceptions about pollution and purity, including how we understand and relate to plastic waste in the environment.

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Chapter One: Introduction

1.1 Introduction

This thesis originated from a desire to understand the ways culture informs perceptions of animal welfare. The scope of the inquiry widened as my research into the lives of urban dairy cows in Mysore, Karnataka India, exposed an entanglement between cow welfare, human identity politics, and environmental pollution. The study begins with an examination of the cow's role as a symbol of Hindu identity and ends with an exploration into the material nature of man-made plastics. A multifaceted concept of *plasticity* is proposed that operates as an organizing thematic framework which threads together these seemingly diverse topics. The research behind *Plastic Cows* reflects that the study of urban dairy cattle and their consumption of plastic pollution is an important topic of study, with implications for animal welfare and public and environmental health.

I first travelled to India in 2009 to research the role of cattle in Indian culture, returning again in 2010 and 2011. This research was part of an ongoing, non-academic project to write about how cultural values impact animal welfare through an examination of the lives of cattle in different parts of the world. My experiences and findings were presented on a blog called worldcowgirl.wordpress.com. Because of my commitment to report on animal welfare issues through a cultural lens, I re-entered academia in 2011 when I enrolled in an MSc program in Anthrozoology (Canisius College, 2013). I discovered that the social sciences, and Geography in particular, were disciplines that welcomed research on animals in society and offered tools of analysis that could enrich my understanding and ability to communicate about issues I had pursued personally. This included my interest in urban, feral, and 'pest' species through my work co-editing *Trash Animals* (Nagy & Johnson, 2013b). I brought these

interests and past research to Oxford so I could receive training as a social scientist and situate my research within the discipline of geography. Research on the lives, welfare, and plastic entanglements of urban cattle in Mysore, Karnataka India combines my interest in the social role of cattle, urban and feral animals, and animal habitats within waste and wastelands.

During my first trip to India, a travel agent hired a prominent Hindu social activist to be my guide in Varanasi, a place sacred to Hindus and whose residents accommodate a high density of street cows within the city. One afternoon, my guide had a brief errand to run at his solicitor's and took me with him. His solicitor was curious about who I was and struck up a conversation, asking me what I was doing. He felt it important to inform me that he had been born into a Hindu family, but now identified as a Buddhist because he was 'a man of science' and sceptical of religious dogma. After he summarized his point of view on the cow's role in contemporary Hindu politics, he made this statement, 'To me, the cow is no better than a pig. I have seen cows eat shit off the streets. For this reason I only drink buffalo milk. I never drink cow's milk'. Before I could respond, my guide interjected and they proceeded to argue quite loudly in Hindi. It was clear that my guide had taken great offence to this statement. He had already spent considerable time informing me about the pure and purifying properties of Indian cows and their products, and had taken me to two farms that researched dairy husbandry for the indigenous *Ganga Teeri* breed. He had also taken me to visit a Brahmin priest who had educated me about the *panchagauva* (5 cow product) elixir to help with all manner of human ailments. His solicitor's harsh assessment of the lives of urban cattle was more than he could bear. 'But she has eyes, she can see for herself'. The solicitor exclaimed, pointing at me. My guide was so enraged that the conversation ended swiftly, possibly for the sake of their friendship.

This argument brought up many questions for me at the time, such as why are cattle—animals viewed as sacred by many in India—allowed to eat trash? Why are cattle perceived of and managed differently than dairy buffalo in India? Why do cattle remain in India's cities? How could a disagreement over cattle cause two long-time friends to experience such dramatic discord? This initial curiosity persisted and the answers to some of these questions were brought into clearer focus by the end of my first trip, but the more I researched, the more complex and nuanced the topic became. These questions gradually evolved into this thesis. Tensions between Hindus and minority groups in India, especially Muslims, have only escalated after the election of Narendra Modi in 2014 and cattle remain on city streets and at the heart of political conflicts. While often overlooked in political discourse, this thesis will look at the lived realities of urban dairy cattle and how their lives and management are shaped by their multi-faceted function in society.

This thesis takes the concept of plasticity as its unifying theme. The philosopher Catherine Malabou has proposed plasticity is a paradigm for this era (Malabou, 2005b), much like Derrida introduced deconstruction as a paradigm for his time (Derrida, 1973). For Malabou, plastic is defined as a malleable substance, a force of change and evolution, as well as a force of destruction that may alter something permanently, as in a brain injury or an extinction. Touching on Malabou's theories of plasticity, I propose four meanings of plasticity that guide this exploration of urban cattle in Mysore, Karnataka, and their purpose, lives, and welfare. These four meanings of plasticity presented in this body of work are as follows: (1) The *rhetorical plasticity* of animal's symbolic cultural meaning, which addresses the recognition that animals inform human identities and humans give animals diverse and sometimes conflicting meanings; (2) *genetic plasticity,* which addresses the ways humans

make animal bodies plastic through direct and indirect means; (3) *behavioural plasticity,* which examines the ways a species (here, cows) can adapt their behaviours to a range of contexts; (4) *material plasticity,* which, in the context of plastic pollution and its impact on urban dairy cattle, examines the force of plastics' pollutants on bodies connected by the food chain. I propose that these concepts of plasticity are useful for scholarship in critical animal studies and more-than-human geography.

Having introduced the impetus for this study, the rest of the chapter will outline three main topics of study that guide this investigation into the social function of cattle in urban and nationalist settings, and their material entanglements with pollution. The theme of plasticity will weave together these diverse topics of the social, material, and embodied lives of cattle. Once these topics are briefly outlined, the focus of the chapter shifts to the contributions of this thesis and what the concept of plasticity, applied to more-than-human geographies, may offer to Human Geography. This is followed by a summary of three main research questions, and the chapter concludes with an outline of the remaining thesis chapters.

1.2 Urban Animals and Plasticity

A focus on urban animals helped motivate research about animals as social actors in geography during the mid-1990s beginning with a special issue of *Environmental Planning D: Society and Space* entitled 'Bringing the Animals Back In' (J. Wolch & Emel, 1995). Philo's (1995) contribution for the issue described the rationale behind the exodus of urban livestock from London. Wolch proceeded to publish further articles, introducing the concepts of *zoopolis* and *anima Urbis* (1998, 2002) into geography. The concept of *zoopolis* recognizes that cities are populated by animals which live largely subaltern lives, alongside human

development (Wolch, 1998). Complementary to the idea of zoopolis, *Anima Urbis* is a call for research about the animal world existing within the city, which is what Wolch refers to as the city's 'breath, life, spirit, and soul' (Wolch, 2002, p. 722). Acknowledging these issues in academia—referred to as 'animal turn'—is important not only for 'intellectual reasons', but for ecological and moral reasons as well (Wolch, 1998).

Two influential edited volumes, *Animal Geographies* (Wolch & Emel, 1998) and *Animal Spaces, Beastly Places* (Philo & Wilbert, 2000), included work on urban animals and helped to shape the field of animal geography in the years following, utilizing urban animals to think through the ways that humans represent, place, and manage animals. Urban animals were also used to challenge assumed binaries in more-than-human urban geography, crisscrossing the well-worn divides between nature/culture, wild/domestic, and rural/urban (Braun, 2005; 2003; 2005; Hinchliffe & Whatmore, 2006).

In 2008, Hovorka made the observation that urban livestock received very little attention in the field of cultural animal geography, despite the fact that the practice of rearing urban livestock persisted throughout the global south (Hovorka, 2008). In her paper on human-chicken relationships in Greater Gaborone, Botswana, Hovorka observes that urban animals are unrecognized members of urban political ecologies in the global south. Her research examines how chicken rearing plays a role in cultivating residents' cultural identity and dignity, and provides an important income stream. Importantly, recognizing chickens—and other urban animals—as a social group in cities challenges the perception of cities as the exclusive domain of humans. While there has been other scholarship in cultural geography on urban livestock (Blecha & Helga, 2014; Moore & Kosut, 2013), and urban animals in India (M. Barua & Sinha, 2017; Narayanan, 2016a; Srinivasan, 2013), there has yet to be an in

depth study of urban dairy cows with the breadth and scope of the research presented in this thesis, which seeks to better understand cattle as a social group in India's cities. Why have cattle experienced a different social trajectory in western cities than in the global south, where cattle remain in cities? Understanding the social and material forces that have contributed to the removal of livestock from metropolitan cities throughout western countries serves as a comparison to India, where cattle remain on the urban landscape.

The late 1800s and early 1900s was a time of social reform for human perceptions and care of animals in Europe and North America. The animal rights movement originated during this time, led by upper and middle class urbanites, who sought to make people more sensitive to the plight of livestock, animal baiting,[1] and stray animals (Ritvo, 1990). Due to advancements in the field of microbiology, made famous by Louis Pasteur (1993), livestock were identified as the source of zoonotic disease (Atkins, 2012b; Laxton, 2012). Urban livestock became less popular once they were viewed as sources of contagion to large populations of humans. Reforms brought about by animal rights reformers targeted lower class laborers who were often painted as having corruptible moral characters and often engaged in work that caused suffering to animals such as driving carriage horses, running gambling rings that baited animals, or working in the slaughter houses and offal and leather industries (Donald, 1999; Ritvo, 1990; Velten, 2013). Innovations in transport and refrigeration made it both possible and relatively efficient to raise and slaughter livestock outside of cities and transport meat and milk back to urban consumers (Atkins, 2012b; Cronon, 1992). These technological developments also coincided with a growing sensitivity

[1] Animal baiting refers to animal blood sports. Some examples of animal baiting include: bear baiting, cock fighting, dog fighting, and bull-baiting (Ritvo, 1990).

toward the politics of sight of the meat industry (Pachirat, 2011) and the realities and brutalities of meat and dairy industries (Philo, 1995). By the beginning of the 1900s conceptions of *rural* and *urban* had formed in the west, and livestock production became territorialized as a rural pursuit best conducted outside of urban centres and away from the purview of middle and upper-class city dwellers (Beers, 2006; Kean, 1998).

During this same era, India was under British rule and experienced similar innovations in transportation. A British influenced animal rights movement was also active in some parts of the country, but the historical trajectory of urban cattle took a different course (Davis, 2008; S. Mishra, 2011). The diverse meanings and roles cattle assume in human culture is the first concept of plasticity this thesis introduces. In India, cattle have a different physical place in society and on the city streets than in western cities. Their favoured status for high caste Hindus shaped the course of India's history and continues to create conflict between religious groups in the country. Alternately, what humans believe about cattle shapes how cattle are managed and the type of life they experience. Urban cattle exhibit different types of social relationships with humans and the city can provide opportunities for cattle to display different types of capabilities than in other management contexts. The ever-changing human built urban environment provides a landscape for cattle to exhibit behavioural plasticity—the third type of plasticity proposed in this body of research.

Cattle have been a rich topic of inquiry since the 'animal turn'. Cattle breeding and management, in particular, have been a focus of biopolitical inquiry, ethics, and discussions of non-human labour. Holloway and Morris (2005; 2012; 2009) explore the biopolitics of the use of genetic databases in dairy cattle breeding, where computational technologies construct cattle into what Haraway (1991) refers to as cyborgs. Grassini (2005) examines the tensions

cattle breeders feel when navigating these technologies along with the practical skills of breeding not fully captured by computations. Others' research focuses on cattle subjectivities, including: studying encounters with unfamiliar human herders (Roe & Greenhough, 2013); examining cow agencies in the context of mechanized dairies that utilize robotic milking machines to allow cows some small autonomy over milking time (Bear, Holloway, & Wilkinson, 2016; Holloway, 2007; Holloway, Bear, & Wilkinson, 2014); and finally, questioning whether an understanding of cows' subjectivities changes if cattle are understood as non-human labourers that assist or resist farmers during milking time (J. Porcher, 2014; Jocelyne Porcher & Schmitt, 2012). Many of these studies seek to deepen our understanding of cattle subjectivities in order to re-evaluate what is meant by cattle welfare and how it can be improved (Buller & Roe, 2018).

Merging an analysis of an ever-changing and rapidly growing-South Asian urban landscape with new understandings of cattle subjectivities is the focus of this thesis. Urban centres are sites of adaptation and are becoming recognized as drivers of evolutionary adaptations for some animals. Cattle are animals that have a long history as domesticates with humans and have adapted to a wide range of management contexts. The city presents a unique space in which to research cattle behaviour due to the autonomy of urban cows outside of architectures of confinement coupled with their confidence in the presence of unfamiliar humans. The city is also a place in which cattle must adapt to a human-built and purposed landscape. It is a place where cows navigate a high density of people, vehicles, stimuli and various food sources that include: roadsides, flower gardens, and food waste. The cow's place in the social and material assemblage of an Indian city is due, in part, to its cultural function in Hindu culture.

1.3 Nationalism and Plasticity

Narendra Modi became India's Prime Minister in 2014, after I began this research. As a Bharatiya Janta Party (BJP) member, he maintains a Hindu nationalist platform, which includes a cow protection platform and in the years following his election cow protection has become a catalyst for sectarian violence. This has revived the political and cultural divisions that cow protection politics helped create between Hindus and Muslims more than 100 years ago in the late 19th century and the years leading up to India's 1946 partition from Britain. The escalating violence disproportionately affects Muslims, and attacks are often overlooked by the police. In early 2019, CNN reported that 'between May 2015 and December 2018, 44 people suspected of killing or transporting cows for slaughter, or even just eating beef, were killed in vigilante attacks. That number included 36 Muslims' (Regan & Gupta, 2019). A 2019 Human Rights Watch report stated that in the majority of these cases, police turned a blind eye to vigilante violence over cow protection (Regan & Gupta, 2019). Yet cow protection politics still fail to secure the welfare of the majority of cattle in India. Tightening restrictions on cattle slaughter has led to the increased abandonment of cattle (Jadhav & Bhardwaj, 2019). State and federal governments have not devised a solution for how to support barren and non-income earning cattle, and the vast majority of farmers cannot pay to support non-income earning animals. This is not likely to change.

An understanding of the religious significance of the cow in Hindu culture and how beliefs about the cow assumed agency in the Hindu Nationalist Movement sheds light on significant ideological differences between Hindus, Muslims, and Euro-centred attitudes toward cattle. In the late 1800s the cow became a unifying symbol of Hindu identity as a

further means to separate Hindus and their customs from the British and from Muslims that had collectively occupied and controlled the country for centuries. Cow protection helped create a *Hindutva* mindset that seeks to reclaim India as the sole homeland of Hindus and has reinforced the cow's role in Hindu Nationalist discourse, which contributes to disciplining lower caste groups into adopting the customs of the political elite (Chigateri, 2008). By the late colonial period, cow protection already had a long history in India amongst Brahmins, Jains, and Sikhs (Korom, 2000; Lodrick, 2005) but it was the writings of Swami Dayananda Saraswati (1824-1883) that galvanized cow protection into a social and political movement. Saraswati was a Brahmin Vedic scholar and social reformer who founded the Hindu nationalist political party, the *Arya Samaj* (sankrit for 'Society of Nobles') and the Cow Protection Movement (Robb, 2008). His writings were instrumental in the development of other cow protection societies and encouraging diverse caste groups to adopt Brahmin practices—such as cow worship and a beef taboo—that set Hindu identity apart from British and Muslims and portrayed the butcher and consumption of cattle meat as barbaric (Gupta, 2001). Nationalist ideals through cow protection are perpetuated today through the Rashtriya Swayamsevak Sang (RSS) organisation. The RSS is considered the ideological arm of the BJP and since the organization's inception in 1925 it has sought to infuse the nation with strong Hindu values and economic prosperity. It has promoted a *Hindutva* attitude, which seeks to reclaim India as the true Hindu homeland *(Bharat)* by fostering a homogenous Hindu society (Bandhan, 1992). This sentiment has become a hallmark of Hindu nationalism which the cow has come to symbolize, and whose protection is promoted in RSS ideology and activism (Marvel, 2016).

The cow's current role in Hindu nationalism has gained increasing attention in the social sciences. Narayanan has critically examined several aspects of the cow's role in India through a lens that merges political ecology, sustainable urban development, and feminist-animal liberation perspectives. Narayanan argues Hindu myths about Krishna and the 'Ocean of Milk' legitimize the role of the cow as a mother to humans, who have a right to her milk (Narayanan, 2018a), yet subsequently cause conditions for her slaughter, as the milk industry is directly linked to the beef industry (Narayanan, 2015a, 2019b). The fact that the slaughter of cows is illegal throughout much of India also criminalizes the butchery and consumption of beef that is performed by Muslims and Dalits and delegitimizes the place of non-Hindus as a part of Hindu Nationalist projects (Narayanan, 2015a, 2018b, 2019b). She argues that *Gaushalas,* or cow shelters, are complicit in an 'anthro-patriarchal' mindset toward cows, on a continuum with the masculine project of Hindu nation building. *Gaushalas* subjugate non-native cow bodies in ways akin to how non-Hindus are treated under the Hindutva mindset (Narayanan, 2018b) placing cattle and humans on a continuum of violence.

In her ethnographic work on village dairy farmers in Uttarakhand, Govindrajan (2018) studies how bovine materiality has come to play an important part in shaping the nature and outcome of Hindu nationalist projects of cow protection in contemporary India. Her work illuminates how National identities are co-produced with native cows. Villagers relate to Jersey cows as bovines that have different natures than native cows and whose dairying capacity can offer more income than native cows. Native cows are preferred for ceremonial worship and their milk carry more spiritual significance than Jersey cattle, which are not native. My research departs from Narayanan's work with a focus on materiality and a multi-species methods focus on urban cattle. It builds on Govindrajan's work by providing an

additional perspective to materiality and nationalism by focusing on the perspectives of urban farmers in South India, but also differs from her work by focusing on urban cattle's interactions with pollution as it enters into their material entanglements with humans and ideas of purity and pollution.

The first research chapter, Chapter 4, proposes that the very meaning of a cow is political and—insofar as its meaning changes from context to context—plastic. Chapter 5 examines how these meanings become embodied and reproduced by urban farmers. While the meaning of cattle to humans can be socially constructed, there is also a living entity that exists for herself—beyond her social implications. This research recognizes that the meanings generated about animals and their representations have real impacts on the lives of animals, but also goes beyond this representation by offering an ethnography of one urban cow in Mysore, Karnataka. In chapter six I use ethnographic methods to look beyond the human and focus on the cow's lived experience, recognizing how cows adapt their behaviour to different management styles.

1.4 Materiality and Plasticity

Chapter 7 of this thesis concerns itself with theories of plasticity as well as the materiality of a group of polymers we have come to know as plastic. The lives of India's urban cows are entangled with plastic. In Mysore, and elsewhere in India, urban farmers supplement their cow's feed by turning them free during the day to forage for their own food and to enjoy movement and exercise. Urban cattle often forage for food in trash heaps and bins, where they encounter human food waste. Unlike other large mammals, like elephants, cattle cannot pass plastic through their rumen and studies conducted on these cattle suggest

that urban cattle have an average of 33kgs (72.6 lbs.) of plastic harboured in their bodies (Vohra, 2012). Because of their unique digestive system, cattle can live with a large amount of inorganic debris in their bodies, though it does impact their quality of life, weakening their immune systems and increasing the incidence of mortality from an intestinal blockage or puncture (Anwar et al., 2013). In addition to these immediate concerns for cattle welfare, I am also concerned about the flow of chemicals that leach from plastic into cow's bodies into their blood, milk, meat, and—because some of these chemicals are considered hormone disruptors—these chemicals have the potential to impact the development of their offspring as well as the humans who drink their milk (Gore et al., 2015; Teuten et al., 2009).

This focus on materiality recognizes that humans are not the sole source of agency in the world (Whatmore, 2006). Human-created products and technologies can and do escape the bounds of our control. Between 1950 and 2016 an estimated 8,300 million metric tons (Mt) of virgin plastics were produced globally. Close to half of this—3,900 million Mt—were produced in the last 13 years. 6,300 Mt of that plastic has been disposed of and has either been recycled (9%), incinerated (12%), or accumulated in landfills or the natural environment (79%) (Geyer, Jambeck, & Law, 2017). An unknown amount of plastic resides uncontained in the environment. An estimated 8 million Mt of plastic waste enters our oceans every year, (Jambeck et al., 2015) speaking to the enormity of the problem. Plastic pollution is a solid waste issue that has spun exponentially out of control. Additionally, plastics are made up of various chemical combinations, few of which have undergone safety testing before becoming consumer products. I will argue that polymer-cattle-milk-human entanglements reveal plastic as both a solid and a fluid waste issue. Through their entanglements with plastic, these dairy

cattle demonstrate how bodies are porous and that plastics' chemicals flow between fluid bodies (Alaimo, 2010; Liboiron, 2013).

As the risks of polymers and their production continue to be understood, Gabrys et. al. (2013) define plasticity in terms of the malleability of these materials' ever-changing threats. Plastics are products of social and political systems. Plastics can be viewed as a material that facilitates sanitary conditions for food and medical devices, while at the same time disseminating a chemical miasma. We have yet to fully grasp the consequences of its ubiquitous presence in our daily lives. These polymers are much like the synthetic sex hormones Sanabria (2016) studies through her theory of plasticity, which she describes as substances that '…circulate globally [as] they leak between official and unofficial prescription regimes, reconfiguring bodies and socialities by circulating, not only through blood, brain, and other body sites, but also through social settings' (Sanabria, 2016, p. 19). Plastics are perfect denizens of Malabou's theory of plasticity.

1.5 Potential Contributions

Cows are 'plastic' in the sense that humans imbue animals with multiple—and at times, contradictory—meanings that may have little to do with inherent biological or behavioural attributes, such as the contested meanings cattle assume in India as sacred animals to Hindus, sacrificial animals and sources of income to those Muslims that have relied on work in slaughter houses and leather tanneries (Anderson & Jaffrelot, 2018), beef for many non-Hindus, and a means of economic prosperity as milch animals for millions of farmers. 'Plastic cows' are plastic in their ability to display adaptable phenotypic and genotypic behaviours in a multitude of contexts, including cities. In regards to cattle

encounters with material plastic, I will expand on Malabou's theory of 'destructive plasticity', a concept used to describe a neurological event that leads to permanent irreversible change (Malabou, 2012), and apply this idea to genetic change in biology. The story of India's 'plastic cows' illustrates cattle's entanglements with plastic waste and makes clear the impact of plastic pollution and its harm to nonhuman animals, the bioaccumulation of polymers in the food chain, and their potential to harm animals as they accumulate and persist across the planet, including their contribution to the sixth great extinction (Kolbert, 2014). The concept of plasticity challenges the notion of eternal essence or form in an ontological and a biological sense. Plasticity also refers to an inherently creative force that acts as a catalyst for species adaptation, but may also harm or destroy what cannot evolve, change, or be re-formed.

This work seeks to contribute to literature on the biopolitics of urban farming in the global south. Free-roaming and 'feral' animals pose challenges to urban planning and development (Narayanan, 2016b), yet urban livestock are an important income stream and source of pride and personal identity for many farmers in the global south (Hovorka, 2008). The reasons cattle persist on the urban landscape—and are allowed to roam streets freely—is informed by the religious and political history of cattle in India which shapes particular philosophies of care toward animals that differ from those in the global north (Srinivasan, 2013). My research on India's urban dairy cows in Mysore shows that while these farmers typically own less than ten cows, they are managed through networks of sophisticated medical technologies, such as artificial insemination and vaccines (Basu, 2009), the result of ongoing science from research institutions in India and abroad. Fresh milk sales occur in the largely informal marketplace, yet require a high level of technological intervention and even government subsidies—revealing enmeshment of formal and informal markets. Hybrid cows

are normally bred through artificial insemination and typically produce more milk than native cows as well as possessing a higher resistance to heat, parasites and disease. In the sense that humans can manipulate some genetic and physical attributes of livestock, cattle become plastic. My research also points to farmers perceiving that urban cattle flourish better in the city than in the countryside, revealing that hybrid cattle might thrive in urban and peri-urban spaces.

This research will also contribute to the growing body of work on urban animals and their geographies through the concept of nonhuman plasticity. Instead of viewing cities as sites of human ownership and exceptionalism—in which only certain animals are viewed as having a place—nonhuman plasticity recognizes cities as 'beastly places' (Philo & Wilbert, 2000) that are habitats of ever-changing spaces of potentiality, where animals may display novel behaviours of evolution and adaptation. During the late 1990s-early 2000s the 'animal turn' in geography (Philo, 1998; Philo & Wilbert, 2000; Wolch, 1998, 2002) asked us to consider: *What would a zoopolis—an integrated human-animal city—look and act like? What political and ethical commitments would humans change in order to make cities into convivial (Hinchliffe & Whatmore, 2006), cosmopolitan (Hinchliffe, 2001), and storied (Van Dooren & Rose, 2012) multispecies spaces*? Overall, this literature focuses more on promoting positive human attitudes toward urban animals than striving to understand how animals inhabit the city and the harms and benefits to animals living in urban spaces. Notable exceptions to this include Hinchliffe et al.'s (2005) water vole study in Birmingham, Baynes-Rock (2015) urban hyena ethnography, and Barua and Sinha's (2017) research on rhesus macaques in New Delhi. Researchers in these studies observed novel animal behaviours for the first time, which illustrate that social scientists can contribute to advancing human understanding of animal

capabilities, intelligence, and adaptation. The multi-species cow ethnography chapter will contribute to animal geographies' insight into the welfare and behaviour of urban animals that display adaptable plastic behaviours. The following section will introduce the guiding research questions.

1.6 Research Questions

Q1. Although India has undergone rapid urbanization over the last century, there are nearly 6 million urban dairy cattle remain in India's cities[2] (Agriculture, 2012), which leads to the question: *Why do cattle persist in India's cities?* This research question will be addressed in my first and second chapters of research, which (1) discuss the role of cattle in Hindu religion and nationalism to provide information on cattle's unique cultural role in India, and (2) examine federal and state dairy development policies, to examine the biopolitics of cow management and breeding technologies in the city.

Q2. The lived experience of urban cattle has not yet been a topic of multispecies ethnography in geography, and India's free-roaming urban dairy cattle offer a unique research opportunity. *What is the urban experience of cattle in the city?* Unbound by the architecture of confinement, these cattle provide an opportunity for geographers who study cow agency in the dairy industry to closely observe how cattle make choices and become part of cattle and human social groups. The city emerges as a place of benefits and harms for cattle. They are

[2] It is likely the estimated number of urban cattle will be more than 6 million when the 2019 Indian Livestock Census is released (Sharma, 2019).

allowed to live alongside humans as urban citizens who make choices about where to go, what to eat, and who to socialize with that cattle in systems of confinement may never be allowed. But, they are also exposed to dangers unique to the urban environment, which include traffic and trash. When foraging for food in the city, encountering and consuming plastic is an inevitable part of urban-cattle life. While animal entanglements with waste is a rich topic in geography (Doherty, 2019; M. J. Hird, 2012; Mitchell, 2015; Zahara & Hird, 2015), geographers have yet to analyse how plastic waste impacts terrestrial animals and how plastics' associated chemicals move though the food chain. My research touches on both of these topics. I will answer this question in the second, third, and fourth chapters of research.

Q3. My research occurs at a moment of rapid change in India. Cities have grown quickly, overtaking villages, and cattle have become a contentious political topic, but policy has failed to address the lived reality and suffering of the cattle it appropriates. In addition, humans are just beginning to understand and grapple with the material realities of plastic as a promethean substance. A multi-faceted analysis of urban cattle that includes the perspective of urban dairy farmers—who have yet to be a topic of research in geography—in addition to observations about cattle's lived reality, can help address the final research question: *How might the health and wellbeing of cattle and humans be improved?* This question will be the focus of the thesis' conclusion that ties together the four chapters of original research and offers a discussion of policy changes that might improve the lives of urban cattle. It also asks us to rethink how we treat cattle in industrial farming systems elsewhere.

1.7 Thesis outline

The literature review in Chapter 2 outlines the theory of plasticity presented in this thesis, identifying and synthesizing diverse literatures influential to animal geography with regard to: the role cattle have played in nationalist representation; the lived realities of animals as a focus in geography and critical animal studies; and more-than-human plastic materialities. Chapter 3 provides a detailed analysis of the mixed-methods methodology used to investigate the historical, political, and economic function of urban dairy cattle in Mysore and the theories and methods used to conduct my fieldwork.

Chapter 4, 'The History of Cow Protection Discourse and Anthro-Animal Identities', introduces the concept of anthro-animal identities as a way to explain the importance of the cow as a unifying symbol of Hindu identity, as distinct from Muslim and British identities in the years leading up to partition. The cow's rhetorical plasticity is examined as a symbol of human identity, which inflamed cultural and political tension between Hindu, British, and Muslim inhabitants of India, and territorialized space. The focus then shifts to an analysis of how the cow's material properties functioned to promote her products in economic discourse and Hindu perceptions of the cow's role in human health and Ayurvedic medicine. Upper caste Hindu beliefs about a cow's purity inform social norms that have played a role in keeping cattle on the urban landscape today.

Chapter 5, 'Mysore's Dairy Farmers and the Urban Animal Pastoral', contributes to animal geographies and eco-criticism by identifying an expression of the urban pastoral that is unique to India. By seeking the point of view of farmers, insight is gained for why cattle persist in India's cities, why hybrid cows have become the most common urban cow, and how public and private forces serve to place cows on the urban landscape.

Chapter 6, 'Urbane Cows and Contested Spaces', utilizes multispecies ethnographic methods to better understand the realities of the life of an urban cow through my observations of one urban dairy cow named Shilpa, whom I followed in Mysore, Karnataka. By focusing on the day-to-day projects of one urban cow—observed over the course of nine days, staggered throughout eight months in 2015—I propose cows are plastic in the sense that they are adaptable to a wide variety of habitats and multispecies social interactions. The city is a contact zone (Pratt, 2008), providing a landscape of risk and opportunity for urban cows, who exhibit unique capabilities of adaption to the novel social relations and material landscape of the city, and are increasingly exposed to plastic waste at foraging sites.

Chapter 7, 'Plastic Cows', focuses on how cattle come to eat plastic—literally becoming plastic cows. Consumers of fresh milk from these cows almost certainly ingest contaminants associated with plastic waste. Through interviews with farmers, trash collectors, *Gaushala* directors, government officials, NGO directors, and data from an NGO's study that collected the stomach contents of cattle through live surgeries, this chapter focuses on the microbiopolitics (Paxson, 2013) of plastic pollution.

The conclusion will return to the concept of plasticity as the unifying theme, offering a final analysis of my research questions. The cow is one organism, but her body is multiple, imbued with various human generated meanings and forms of genetic manipulation and management techniques. It is a creature designed to digest a variety of fibrous low-calorie foods and thrive, but now her wellbeing is threatened because of the urban cow's constant exposure to plastic pollution at foraging sites. None-the-less, the cow remains a resourceful creature that lives as a companion animal (D. Haraway, 2003) and adapts to a wide range of contexts. Here I will return to my third and final research question, '*How can we improve*

human and urban cow welfare?' and give recommendations for policy, husbandry practices, and individual behaviours that may improve cattle and human lives in Mysore. To conclude, I will reflect on the limitations of the project, discuss potential contributions to the literature, and propose possible directions of future work.

2. Literature Review

2.1 Catherine Malabou and the Plasticity of 'Plastic Cows'

This thesis is an attempt to understand the multiple meanings, social relations, capabilities, and bodily materialities of the Indian cow. Catherine Malabou's multifaceted theory of plasticity will be used as a unifying thread, tying together diverse topics such as nationalism, animal behaviour, and plastic pollution into a unified body of work that seeks to answer the following questions:

Why do cows remain in India's cities?
How are these urban cows managed and what is their experience of the city?
How can we improve human and urban cow welfare?

Today, plastic most commonly refers to man-made polymer products, but before their invention, 'plastic' was used in art criticism to describe the sculptural style of moulded and solid form. In German, plastic (*Plastiche*) can mean 'both capable of shaping' and 'capable of being shaped' (P. Benson, 2006, p. 312). The philosopher Malabou argues that plasticity is the force of change and transformation for natural phenomena (Malabou, 2015b) and human identity (Malabou, 2005b, 2012). It speaks to the potential inherent in generative forces—as well as in destructive forces—to create change (Malabou, 2005b, 2012). Plasticity in this mode is, 'the grounds of a philosophical notion drawn from the French word *plasticité,* which bears at once the giving (like plastic surgery or sculpture), receiving (like clay), exploding (like a bomb, *plastiquage* in French) and regeneration (like stem cells) of form' (Shread,

2010, p. xxvii). Malabou views plasticity as a motor-scheme which is, 'more than a metaphor, more than a notion or a concept, it is one of the inescapable means through which we think, understand and mould the world' (Shread, 2011, p. 128). Malabou seeks to bridge Derrida's notion of writing as the locus of meaning with materiality. Plasticity is a force of deconstruction for both language and the material world that generates new social and theoretical meanings, scientific paradigms, and—through evolution and epigenesis—new biological entities.

The story of the urban dairy cow in India illustrates the tensions inherent in: an animal that embodies metaphysical purity, yet also feeds on human refuse; an animal that is both worshiped and is manipulated for human utility; and an animal whose management is a result of sophisticated genetic and medical technologies and age-old practices. Their lives have become impacted by the growing and ever changing urban landscape and by environmental pollution—especially by plastic harboured in trash heaps—which nearly all free-roaming urban cattle have ingested. To gain insight into the changing and contested political and material entanglements of India's urban cattle, Catherine Malabou's theories of *plastic* (as a material *and* an action) and *plasticity* (as a force of change) will provide the organizing framework for the thesis. For Malabou, plasticity is a potentiality inherent within form; she uses this creative and destructive force to critique theoretical commitments to an essential ontology of form in the fields of: philosophy (Malabou, 2005a), science (Malabou, 2012, 2015b), genetics (Malabou, 2016), and politics (Malabou, 2010). I will utilize and expand upon her use of plasticity to analyse cow protection politics, the breeding of hybrid cattle, and the behavioural adaptations of urban cows. I will also adapt her concept of destructive plasticity (Malabou, 2012) to apply to environmental entanglements between cattle and urban

plastic pollution. Focused on the lives, welfare, and perceptions of urban cattle in Mysore, Karnataka, this thesis is an investigation of the ways in which animals—like urban cattle—act as changing and changeable agents in history and society, become contested sights of human belief, and adapt, evolve and become affected by the human built environment.

As represented by the concept of the Anthropocene, relationships between humans, animals, and the environment are in a state of rapid change (Lorimer, 2015). The concept of plasticity can contribute to the field of more-than-human geography by helping us make sense of environmental destruction and resilience, animal genetic and behavioural innovation and adaptation, and human response and response-ability (Haraway, 2008, 2016; van Dooren & Rose, 2016) in a world in flux. The story of the urban cow—a charismatic (Lorimer, 2008) and convivial (Hinchliffe & Whatmore, 2006) creature whose ubiquity has made it a somewhat overlooked presence in India's rapidly growing and changing urban-centres—is an ideal creature to examine the plastic and shifting entanglements between society, place, pollution and animals.

This chapter will first examine the plasticity of the cow as a symbol, through an analysis of literature on cattle and Hindu Nationalism. The focus then shifts to plasticity of animal behaviour as represented by post-structuralist animal geographies that treat animals as subjects, with attention to the concept of shared suffering. These concepts disrupt ideas of animals as objects—with predictable cause-and-effect behaviours—and their pain as separate from humans who are often the cause of it. Not only does this research reveal new insights into animal behaviour, but challenges scientific and moral assumptions that humans have adopted in the past (Despret, 2016). The final body of literature addressed discusses the plasticity of material entanglements between humans, animals, and plastic waste. Plasticity

not only refers to a changing environment, but also to how our bodies are shaped by plastic pollutants that mimic hormones, potentially changing our genes and those of future generations.

Theories of Plasticity Discussed in Thesis and their Supporting Literatures	
Rhetorical Plasticity	The representation of animals is plastic in the sense that one animal, like a cow, can possess multiple meanings based on a person's historical time period, place, cultural and/or racial background, religious belief, political role, and individual feelings about a species. (Baker, 2000; Elder, Wolch, & Emel, 1998; Hribal, 2007; Philo & Wilbert, 2000; Rothfels, 2002)
Genetic Plasticity	Animal bodies are plastic when shaped by evolution, natural and artificial selection, and genetic engineering, within certain limits. (Grasseni, 2005; Holloway, 2005; Lewis Holloway, 2009; Malabou, 2015b; Mawani, 2015)
Behavioural Plasticity	Human and animal behaviour are not static or nor do they appear to originate from an eternal bounded 'self'. Malabou argues that a major neurologic event—an accident or stroke—can permanently alter a human's personality, challenging western philosophy's concept of a soul as an unchangeable 'form'. In a less catastrophic example, some animals—humans included—display a great degree of behavioural plasticity by adapting to a variety of habitats, others are less 'plastic'. (Bear et al., 2016; Holloway, 2007; Holloway et al., 2014; Malabou, 2005b, 2008, 2012)
Material Plasticity	Plastics (human-made polymers and their added synthetic chemicals) are 'plastic' in the sense that the number and type of materials used to make plastics is continually changing and our understanding of plastic products and their environmental entanglements constantly changes and with it our perception of its harms continues to change—including how plasticizers are altering the development and genetics of humans and animals. (Gabrys et al., 2013; Liboiron, 2013, 2015, 2017; Malabou, 2012)

Table 2.1 The Four Meanings of Plasticity

2.2 Symbolic Plastic Cows

The first two analytic research chapters of this thesis discuss the representation of cattle in Hindu culture. Chapter 4 looks at the symbolic role of the cow in the establishment of the Hindu nationalist movement, which occurred in the late 19th to early 20th century through the concept of anthro-animal identities. Chapter 5 then discusses ways in which their placement in the city combines pastoral ideals with urban lifestyles and spaces to represent a unique vision of a Hindu urban animal pastoral. This focus on the *symbolic* function of the cow in the history of Hindu culture differs from the current approach to animal and more-than-human geographies that focus on: encounters with more-than-human subjectivities and agency (Bear, 2011); biopower (Holloway & Morris, 2012; Lewis Holloway, 2009) and biopolitics (Lorimer & Driessen, 2013; Paxson, 2008); and embodied cross-species sociality with plants, animals, and microbiomes, (Haraway, 2008; D. Haraway, 2003). Plastic cows revisits earlier manifestations of cultural geography represented by the 'animal turn', in which Buller describes animals as exemplars of 'nature' that have been variously incorporated, represented, and defined as 'other presences and bearers of meaning within our own cultural spacings [and] placings…' (Buller, 2013a, p. 311).

Examining the cow's representation in Hindu culture helps explain why cattle persist upon the urban landscape in India and why the cow's symbolic function makes a difference in the collective social imaginary. The categories of 'animal places', as spaces where animals belong, and 'beastly spaces' in which animals encroach on perceived human territories (Philo & Wilbert, 2000), does more to describe western anxieties over defending cities as

exclusively human territory than to acknowledge the inherent place of animals in urban nature-cultures—common in India and throughout the global south.

Early in the disciplinary call to 'bring animals back in' to geography (J. Wolch & Emel, 1995) Wolch questioned what it would mean to take urban animal geographies seriously (Wolch, 1998, 2002). Animal geographers have since discussed historical reasons for the removal of livestock from cities in Europe (Atkins, 2012a; Philo, 1995), how 18th Century zoos shaped city-goers perceptions of zoology (K. Anderson, 1998), and perceptions of wild and feral urban animals (Griffiths, Poulter, & Sibley, 2000; J. Wolch, Bronlow, & Lassiter, 2000). But with a few exceptions, geographers have not researched animals' lived experience in cities (Hinchliffe et al., 2005; Lulka, 2013) and only recently has urban animal geography examined animal lives and human-animal relationships in the global south (M. Barua & Sinha, 2017; Hovorka, 2008; Narayanan, 2016c; Srinivasan, 2013). The divergent trajectory of urban animal lives, management (or lack-there-of), and human-animal relationships in other parts of the world, speaks to the plastic nature of human-animal relationships and representations that shape personal and national identities, co-produce space and place, and inform how humans perceive and relate to animals themselves.

2.2.1. Mother Cow and Hindu Nationalism

Understanding how cattle have shaped India's history and Hindu culture provides context for cattle's lives and human-cattle relationships today. Representations of cattle shape Hindu identity—from the economic function of cattle, to their religious role in ritual worship, and society's feelings and attitudes toward cattle. Cattle have a long history of representation in human culture and have been vital in shaping the material and cultural worlds of humans.

They were some of the earliest forms of known wealth; the Latin word for wealth, *picunia,* comes from the word for cattle, *pecus* (Velten, 2007*),* and the Sanskrit word for war, *gavisti,* means a desire for more cows (Jha, 2002). Cattle continue to play important religious roles in societies in Africa (Galaty, 2014) and elsewhere. They remain sources of material wealth and human identity. Their role in the history of colonial and post-colonial India is particularly rich because of the cow's function as a symbol of Hindu identity (Lodrick, 1981), which has played a role in the project of nation building (Yang, 1980), sectarian strife (Adcock, 2010), gastro-politics (Chigateri, 2008), and as income for millions of farmers, butchers, leather tanners and others who profit from their trade and products in informal markets (Narayanan, 2015a; Samanta, 2006).

Deryck Loderick's (1981) work, *Sacred Cows: Sacred Places* about Hindu and Jain cow sanctuaries, known as *Gaushalas,* describes the symbolic function of the cow for those Hindus who believe in her sanctity.

> She is the supreme symbol of femininity in all its aspects of fecundity, maternity, and life-giving sustenance. The cow is Earth; the cow is the mother of the gods; cows are rain clouds; cows are the cosmic waters from which the universe is created (Lodrick, 1981, pp. 51-52).

He observes the cow is the most mentioned animal in Vedic literature and has served ritual and symbolic functions for Hindu culture for over three thousand years. For Lodrick, *Gaushalas* are an element of the Indian cultural landscape that act as mirrors of society. He suggests:

> Not only do they embody a traditional set of beliefs and values, but the changes in the nature and function may be expected to reflect more general processes at work in Indian society. They become, to some degree, a signpost to the future as well as a record of the past (Lodrick, 1981, p. 12).

The fact that *Gaushalas* have increased in number since the late colonial period speaks to the growing concern for cow protection, reflecting Hindu anxieties about cattle slaughter—a topic fraught with political and nationalist overtones.

Other historians have noted how the symbol of the mother cow was used to project gender norms onto Hindu men and women, where men are called to protect the innocent, docile, and life-giving creature, while women are expected to emulate the same qualities embodied in the fundamental symbol of femininity and motherhood (S. Banerjee, 2019; Gupta, 2001). Cow protection has contributed to the territorialization of space between Hindus and Muslims within neighbourhoods and between borders. As the cow increasingly became a symbol of Hindu identity in the late 19th and early 20th century, the differences between Hindu and Muslim religious identity and practice became increasingly contentious. During Muslim religious festivals—where cattle may be sacrificed—discord was sown, sometimes leading to violence in areas where Hindus and Muslims had previously lived in relative peace (Gupta, 2001; Jones, 2007). Today the illegal smuggling of cattle to states or countries where it is legal to slaughter cattle, also causes friction and violence between sectarian groups (Jones, 2009). Taboos surrounding the consumption of beef have also contributed to heightened scrutiny of caste purity and food norms between high and low-caste Hindus (Appadurai, 1981; Chigateri, 2008; Simoons, 1974), as well as encouraging laws against the sale and consumption of beef that disproportionately impact minority groups including Muslims, Dalits, Christians and Indigenous groups (Ahmad, 2014; Robbins, 1998, 1999). With a revival in Hindu nationalist sentiment regarding cow protection, a historical understanding of the role of the cow in a religio-political and religio-economic function is

useful for understanding the cow's unique and contested social function and placement on the landscape.

The editors of a recent volume on historical animal geographies (S. Wilcox & Rutherford, 2018) see the benefit in animal geographies taking a 'spatial as well as temporal' approach and a deeper understanding for how spatially situated human-animal relations have changed through time. The rationale for providing the social, political, and religious context of the history of India's 'sacred cows' is to give a nuanced foundation for better understanding the ethnographic and material discussions of urban cattle in the later chapters of the thesis. This strategy hopefully avoids what Govindrajan (2018) critiques as the colonial and post-colonial arguments that rely on either purely political or religious rationales for the role of the sacred cow in Hindu society because the cow is 'sacred in itself'. Govindrajan identifies three simplifications that have arisen from scholarship on the symbol of the sacred cow: (1) they assume the cow is sacred to all Hindus equally, and this does not accurately reflect the state of affairs in India in a historical or contemporary context; (2) it does not adequately reflect on the conditions in which certain symbols become sacred to individuals; and (3) these overarching claims do not question what happens when the body of the cow herself is transformed, specifically, when 'sacred' or native cows become hybrid cows. These are all topics that will be addressed in the body of the thesis.

Analysing how cows inform human identities, and how beliefs about animals inform their treatment, will be an ongoing theme in this thesis. The theory of antho-animal identities will be proposed in Chapter 4 to discuss the ways in which animals co-constitute human identities, sometimes in contentious ways. Levi-Strauss' (1971) theory of totemism suggests that indigenous groups in North America used animals symbolically to represent kinship

groups, and totemic animals also served a spiritual function in their lives, suggesting that utilizing animals to form a construction of self may be a fundamental feature of human nature. Our perceptions about animals are situated within historical and cultural contexts (Noske, 1997; Rothfels, 2002). These belief about animals inform ordinary moral problems, as Haraway asks ‘who should eat who and who should cohabit?’ (Haraway, 2008). Representations of animals can inform how we relate to species in politico-economical, socio-cultural, ecological, and spatial ways relative to humans, as well as how animals are ranked hierarchically in relation to other animals (A. J. Hovorka, 2018). In this way, animals assume agency in human societies alongside their innate charisma (Lorimer, 2007) and subjective life-worlds. The theory of anthro-animal identities proposes that representations of animals still have real-world cache, even as the discipline of animal geographies seeks to move past anthropocentric and anthropomorphic accounts of animal lives. In this manner, the theory of anthro-animal identities is offered as a tool to analyse human beliefs and critique human behaviours towards animals.

As a domestic animal, the cow has been manipulated to fit human utility. As a symbol, she is an object upon which humans project meaning. In an Indian context, the cow has multiple and contested meanings that help define groups of humans. Analysing the plasticity of the symbol of the plastic cow shows how the animal is manipulated to serve social, religious, and political functions in human societies and how these symbols change according to historical time periods and cultural contexts. Examining the historical role of the cow in Hindu Nationalism will provide a context for the social importance of cows today in India, as well as offer insight into reasons they persist in cities across South Asia.

2.2.2. The Urban Pastoral and Re-evaluating the Rural-Urban Divide

During the 1990's, an interdisciplinary group of environmental historians, eco-critics, geographers, and others challenged the nature/culture divide regarding commitments to wilderness which had guided land and wildlife management policies since the late 1800s. *Uncommon Ground,* William Cronon's edited collection revealed that wilderness is a cultural construct that effectively erased the oppressive colonial structures of gender, class, and empire (Cronon, 1996). Subsequent inquiry into nature as a cultural construct led geographers to question binary spatial understandings of wild animals. Whatmore and Throne describe how the social informs our understanding of wildlife in this way: 'We seek to elaborate a notion of "wildlife" as a relational achievement spun between people and animals, plants and soils, documents and devices, in heterogeneous social networks that are performed in and through multiple places and fluid ecologies – what we call topologies of wildlife' (Whatmore & Thorne, 1998, p. 437).

As the deconstruction of the concepts of pristine and untouched 'nature' and 'wilderness' became more contested, questions concerning the nature of cities arose. An understanding of the more-than-human world at play in urban landscapes led to questions about how urban ecosystems were understood and defined (Harrison & Davies, 2002), including: how wild animals inhabit cities (Hinchliffe et al., 2005); how urban planning that ignores the presence of animals can contribute to violence toward them (Lulka, 2013); and how we can coexist with urban animals in beneficial ways (Francis & Lorimer, 2011; Hinchliffe & Whatmore, 2006). These questions have led to what Braun calls an 'unbounding' of the city (Braun, 2005). Overlooked were challenges to assumptions about the place of certain domestic animals in cities, for example, confronting the efficacy of the rural-

urban divide, especially regarding livestock rearing, with Hovorka's (2008) research on urban-chicken keepers in Greater Gabone, Botswana as a notable exception.

I propose the concept of the urban animal pastoral in Chapter 5 as another perspective on why cattle have persisted in cities, looking at ways the concepts of 'rural' and 'urban' speak more to rural or urban performative practices than to the spatial ordering of agricultural or metropolitan space. The idea of an urban animal pastoral evolved from interviews with rural and urban dairy farmers, who perceived the cow to have a place in the city and associated her with pastoral tropes that emerged from farmers' perceptions of the cow as an embodiment of Hindu cosmologies that idealize village life, and a connection to family heritage and industry.

These romantic notions speak to pastoral ideals that were unique to a Hindu context, but have parallels with the pastoral ideal familiar in western literature and eco-criticism. The pastoral thematic was identified in the *Idylls* of the Greek scholar Theocritus in 316-320 BCE. His stories of a shepherds' song competition from his Sicilian youth were read and performed to members of a royal court. The eco-critic Terry Gifford (2013) defines the classical pastoral that emerged at this early date, as a 'knowing paradox' that invokes several tropes, including: 'nature and place as a literary construct, the poetic rhetoric of the herdsmen, retreat in order to return, the apparent idealization that might reveal truths, fictions that examine realism, [and] the guise of simplicity that is a vehicle for complexity' (Gifford, 2012, p. 19). It also serves to bridge differences between the social classes (Empson, 1950). Inherent in the pastoral are tensions between the city and nature, art and reality, harmony and desire; these tropes have remained important to the mythic pastoral, despite ways the concept has changed over time.

The pastoral has continued to evolve as conceptions of the rural, urban, and nature have continued to change and the pastoral has conformed to different nature-cultures and contexts.

Hovorka (2016) urges the field of animal geographies to continue to globalize and decolonize its scope. This allows for different ontologies and forms of knowledge production to be taken seriously. This also speaks to the plasticity of categories and ontologies that animals are bound up in, even as critical animal scholarship gains a better understanding of the material assemblage and networks that constitute the more-than-human world.

2.3 Urban Animals as Geographic Actors that have Lived Worlds

Buller describes the most recent articulation of Animal Geographies as having the following three goals:

> First to…demonstrate impacts of the purposefulness and agency of animals on both our co-habitated worlds and in resistance to them; second, to thereby destabilize hitherto accepted dualistic approaches through a more fluid, turbulent and relational human/animal ontological reconfiguration of cultural practice, spatial formations and ultimately decentered (and exclusively human) subjectivities; and finally, to create a more radical politics that might accommodate all this complexity and the inherent variations within (Buller, 2013a, p. 312).

Re-examining pre-conceived beliefs about animals, recognizing animal agencies, and our ethics of engagement with them requires a new type of attentiveness and asks us to re-imagine foundational beliefs about our assumptions and relationships with non-human life in the natural world. In this vein, van Dooren, Kirksey, & Münster (2016) ask *'What does it mean to live with animals in entangled worlds of contingency and uncertainty?'*

Decentring the concept of the human as a singular agent has been an important role of more-than-human geographies and critical animal studies. Post-humanism challenges the notion of a human as a singular agent and seeks to understand the ways different forms of life

are entangled, rhizomatic, symbiotic, and fraught with life and death, in order to decentre human agency and exceptionalism (Haraway, 2008, 2016). As Anna Tsing (2012) notes, 'Human nature [in all its myriad forms] is an interspecies relation'(p. 144). In addition to multi-species relations and interdependencies, more-than-human geographies include materials, organisms, and technologies that have agency in co-creating hybrid geographies (Whatmore, 2002, 2006).

Cities are fertile places to examine animals and interspecies relationships because of the close proximity of humans and animals, and the rapidly changing geographies and technologies that shape the landscapes and architecture of cities. Cities are rapidly expanding landscapes that encroach on farmland and animal habitats, in turn creating different multi-species spaces. We are just now beginning to understand cities as forces of adaption, evolution, and extinction (Schilthuizen, 2018). Cities are plastic, both in the ways space and multi-species behaviours can rapidly transform, but also in the sense that they are sites of material accumulation, metabolisms, and flows of literal plastic.

Urban centres in the global south are especially rich places to examine human-animal relationships, frictions, and interdependencies, because animals can hold diverse conceptual, ecological, material, or economic roles in the city and the recognition of this can challenge the dualistic approaches toward animals and space mentioned in the previous passage by Buller (2013a). As Hovorka (2008) argues regarding urban livestock, Srinivasan (2013) for feral dogs, and Barua and Sinha (2017) for rhesus macaques, urban animals throughout much of the global south have never been out of place in the city and therefore the public often has different expectations for their management. Examining human-animal relations in these cities allows for a politics of engagement that recognizes animals' rights to exist in human

built and dominated environments. Urban animals offer us many opportunities to re-examine beliefs, relationships, and ethics of engagement with the more-than-human world and our place within it.

2.3.1. The 'Animal Turn' and the Urban

Thinking with domestic, wild, and feral urban animals was instrumental in ushering in the most recent animal turn in geography. Early on, Jennifer Wolch (1998) proposed a theory of *zoopolis* that envisions the city as a space for animals to live alongside humans. Enacting a real life *zoopolis* requires a new conceptual framework to bring together previously disparate attitudes of urban planning and human agency in cities to move us beyond previously held dichotomies of nature/culture, wild/domestic and rural/urban. Hinchliffe et al. (2005) propose an 'urban non-human cosmopolitics' that could address how we might move toward taking animal subjectivities seriously in the city. Cosmopolitics, a theory first proposed by Stegners (1997), is invoked to engage new types of encounter and conviviality with nonhumans—through the sciences—to give rise to new modes of relation and political practices between humans and the more-than-human world. The authors ask 'Are there nonhuman spaces? Are there spaces to be nonhuman? If so, what do they look like and what are the consequences for politics?' (Hinchliffe et al., 2005, p. 643). Whether human political systems acknowledge the existence of nonhuman spaces, cities are already peopled with animals, and recent scholarship in geography is working to better understand and theorize urban-animal geographies.

The city emerges from an organic fabric that is not eclipsed by a human lack of regard for its more-than-human inhabitants (Lulka, 2013; Narayanan, 2016c). Urban animals have a role in bringing new understandings about how animals live in, and sometimes thrive in,

novel human-built ecosystems. Urban animals also contribute to 'storied places', Van Dooren and Rose's (2012) term in recognition that no singular vision contributes to the social and material history of a place or city, including animal stories which contribute to sites of meaning. Taking multispecies storied places seriously is a moral endeavour. *'The city is not so much a material fact as it is a specific material mode of storytelling—a way of understanding, relating, and becoming'* (Van Dooren & Rose, 2012, p. 18). For vulnerable animals—such as urban penguins and fruit bats in Australia and New Zealand—connecting their stories to place may reveal new possibilities for convivial human-nonhuman city spaces. Additionally, this awareness may have favourable implications for the inclusion of nonhuman others in sustainable city planning, and help minimize conflicts between humans and urban animals. Other storied spaces may involve more mundane aspects of city life, such as animals' entanglements with waste.

The interplay between human attitudes toward animals and urban materialities can shape animal ethologies. Barua and Sinha (2017) examine how the multispecies social structure and urban metabolism of the city influence novel behaviours and cultures within rhesus macaques troops in New Delhi. These animals are emboldened by their habituated proximity to humans, which results in attacks on humans and in rare cases human mortality. Religious sentiment shapes human-macaque interactions and management strategies. Not only do macaques scavenge upon human food waste in rubbish heaps and bins, macaques also are more likely to be fed by Hindu temple goers, increasing the risk of conflict. Because of the favourable religious sentiment held by Hindus—who see macaques as manifestations of the god Hanuman—the public protests managing macaques through lethal methods and sometimes problem troops are transferred to wilder areas, where un-adapted to forest life, they

inevitably find human settlements and subsequently create problems for villagers. An interplay of human attitudes, behaviour toward, and material entanglements with animals, shape animal adaptations and survival strategies in the city and can alter behaviour toward humans. The city is a space of behavioural adaptation and evolution for some, but not all, animals.

Predators' ethologies are also shaped by the city and they adapt to living in close proximity to humans. A multi-species ethnography conducted with urban hyaenas in Harar, Ethiopia by Marcus Baynes-Rock (2015) offers a way to re-think human-predator relationships in cities. His study reveals it is possible for hyaenas to form bonds with humans and possibly even exercise a type of retaliative justice when humans break bonds of trust. The recognition that predators can adopt new behaviours in urban environments is also demonstrated by urban leopards in Mumbai. These leopards' territories overlap with a large population of humans living in mostly informal settlements next to Sanjay Gandhi National Park. Mumbai's peri-urban leopards avoid humans by hunting at night, and, as Braczkowski et al. (2018) propose, leopards benefit human health by reducing the number of people bitten by dogs, the risk of rabies transmission, and the costs associated with dog sterilization. 74,603 dog bites every year are reported in Mumbai, a city of 21 million people, compared to less than two attacks per year by leopards upon humans in recent years (Braczkowski et al., 2018). Instances of wild predators attuning themselves to the city's human and ecological rhythms stand out for their remarkable feats of adaptation and co-existence, but what might be there to learn from domestic animals, like livestock, that perhaps live more mundane lives in the city?

Livestock have been adapted to urban life far longer than the aforementioned predators for the simple fact that livestock have lived in cities throughout the world, once

agriculture allowed humans to settle in one place. It has only been in the last 100-150 years that livestock were moved out of cities throughout much of the global north because of convenience, cleanliness, and aesthetic concerns (Gaynor, 2007; Philo, 1995). But in places like India they have remained to live and adapt to increased human density and material and technological progression. Hovorka (2008) recognizes that urban farming remains an important occupation for many people in the global south, but there has yet to be a multispecies ethnography on urban livestock in India that attempts to understand the city from the stance of an animal, what Moore & Kosut (2013) call intra-species mindfulness. We also have yet to understand the biopolitics, agency, and labour of urban cattle that have been studied in so-called 'conventional' agricultural settings in Europe (Bear et al., 2016; Holloway et al., 2014; Lewis Holloway, 2009; Morris & Holloway, 2008; J. Porcher, 2014; Jocelyne Porcher & Schmitt, 2012). For example, many studies about cow agency on dairy farms have focused on free-choice robotic milkers (Bear et al., 2016; Holloway, 2007; Holloway et al., 2014) or when cows resist doing what is expected of them (Jocelyne Porcher & Schmitt, 2012). There are more opportunities to study an urban cow's freedom of choice because of the agency they have, relative to their counterparts in confinement.

Domestic, wild, or feral, many urban animals are plastic in the sense that they have become successful at living with humans in an everchanging human-built environments, with often rapidly changing technologies, material landscapes, and human behaviour. Animals such as pigeons (Jerolmack, 2013), cockroaches (Copeland, 2004), and rats (Sullivan, 2005), thrive in these landscapes, but so can wilder species, including primates (M. Barua & Sinha, 2017), predators (Baynes-Rock, 2015), songbirds (Marzluff, 2014), and even, under the right conditions, penguins (Van Dooren, 2014). Perhaps it is not surprising that a domestic

animal—one that has been vital to so many human cultures—should also inhabit the city and live alongside us with relative success. But there are limits to the well-being of urban cows and this is due, in large part, to a novel material that has become a ubiquitous and often uncontained presence in the city—plastic waste.

2.3.2 Animal Rights, Animal Welfare, and Shared Suffering

This project is undertaken with an eye toward examining the welfare of urban dairy cattle in the city and therefore it touches upon animal rights—of which there are many theories. To summarize relevant animal rights' theories in very broad strokes: abolitionists (Regan, 2004) argue that because animals have intrinsic value—their lives matter in and of themselves—humans do not have the right to use them for instrumental gains. Utilitarians (Singer, 2009) argue that even though animals have moral worth—because they are beings that can suffer—in some circumstances an animal's life can be sacrificed to serve the greater good. Others argue that as long as humans provide an animal with a 'good' life, one aligned with its biological needs and behavioural nature, then killing an animal for human utility can be justified (Rollin, 2006). For some this means that utilizing an animal's products—such as milk from a cow or eggs from a chicken—can be justified, even in a rights context, as long as an animal is allowed to live out its natural life (Cochrane, 2012). I propose this is the rationale that is often proposed to justify the use of dairy cattle for milk in a Hindu ethos in cow protection discourse (Burgat, 2004) and in interviews for this research (Interview, 27 October, 2015). At the same time this justification ignores or hides other motivations for supporting cattle protection (Narayanan, 2019b). In reality feeding a cow until the end of her life, as well as caring for male calves that become oxen or bulls until the end of life, becomes complicated

in the face of practical realities considering a cow can live as long as twenty years. The welfare of humans and cattle are also interlinked, especially in a country such as India, which houses the largest population of bovines of any country alongside the second largest population of humans on earth.

Geographers also have an interest in critiquing the ethics of human-animal interactions and food-animal production systems (Srinivasan, 2016). Political ecology is one approach implemented by animal geographers. Political ecology attempts to provide critiques—as well as alternatives—in the interplay between the environment and political, economic, and social factors. Robbins asserts that the discipline has a 'normative understanding that there are likely better, less coercive, less exploitative, and more sustainable ways of doing things' (Robbins, 2004, p. 20). Merging post-human geographies with political ecologies situates animals within broader political processes (Margulies & Karanth, 2018), moving geography away from the view that ethical attitudes towards animals are personal matters, to one of understanding them as political actors which are part of economic and social assemblages (Margulies & Bersaglio, 2018; Srinivasan, 2016; Srinivasan & Kasturirangan, 2016). In this regard, my work is located within the theoretical commitments of political ecology. In addition to political ecology in animal geographies, feminist and abolitionist approaches to human-animal studies (Adams, 1990) also focus on the exploitation of livestock, within frameworks of capitalism, anthropocentrism, and patriarchy (Gillespe, 2014; Narayanan, 2018a, 2018b, 2019a).

I acknowledge and laude abolitionist approaches and their goal to permanently end the abuse, exploitation, and suffering of animals, but this is not the approach that I have taken in this thesis. Understanding that the lives of marginalized humans and their livestock are

often entangled and tied to larger political systems and economic exploitation, I take a shared suffering approach.

Navigating the rights and welfare of cattle and humans in a context specific manner lends itself to a further type of ethical analyses proposed by Donna Haraway (2008) who introduced the concept of shared suffering. Haraway's notion of shared suffering is less an ethical principal than an acknowledgement that we are part of a state of affairs in which bodies live in and through other bodies (Haraway, 2008, p. 6). With this recognition comes a responsibility to minimize the human role in wilfully ignoring or perpetuating injustices and harm to entities and environments that we are inextricably bound. This includes scientific and ethical justifications that make life killable, even when the killing of individuals inevitably occurs. Of the open-ended nature of this ethical guideline, Haraway states:

> I don't think we will ever have a general principal for what sharing suffering means, but it has to be material, practical, and consequential, the sort of engagement that keeps the inequality from becoming commonsensical or taken as obviously okay (Haraway, 2008, p. 77).

Shared suffering can be an intimate individual experience of 'copresensing' (Greenhough & Roe, 2010) with another entity, or can involve broader intellectual recognitions of shared suffering on multiscalar, multispecies, and multi-material levels (Haraway, 2008). Food animal production is a rich topic of inquiry for human-animal-material entanglements addressed by the concept of shared suffering (Govindrajan, 2018; Porcher, 2010), from the abuses that industrial farm animal workers endure, alongside 'food' animals, to questioning the definition of animal welfare itself.

Shared suffering is a concept that aligns with Malabou's theory of plasticity. Instead of using rigid rule-based ethical systems, shared suffering examines injustices on a case-by-case basis, acknowledges the complexities of the world, and adjusts the response in light of

new information and facts. It is an ethics of attunement in the face of a growing awareness of multitudinous subjectivities in the world we share. Shared suffering also acknowledges that the scale of harm toward entities in a more-than-human world may have multiple entanglements—such as global warming and plastic pollution—which impact ecosystems and individuals in numerous ways and leaves room for predictable and unpredictable interactions and outcomes.

Shared suffering is a concept that weaves itself through the various entry points into plasticity that this thesis addresses. It is useful in tracing the connections between human and animal suffering discussed in both theory and practice, the shared lives of farmers and cattle, and the material entanglements of plastic pollution.

My ethical position in this thesis is more closely aligned with Haraway's concept of shared suffering, even though I am sympathetic to an abolitionist's goal to cease suffering in the dairy industry by ending milk production altogether. There are many human-animal-material and cultural entanglements involved with India's dairy industry and human-animal issues with the growing urbanization of India. I considered the issue of cattle rights and welfare from many angles while conducting fieldwork including interviews with top government and NGO officials and *Gaushala* directors working on cattle rights and welfare issues. I too would like a world where the exploitation and suffering of animals referred to as 'livestock' has ended, but I found the issue of urban cattle in Mysore to be complex when considering the topic from diverse stakeholders—most importantly from the perspective of urban dairy farmers.

The farmers I met in Mysore influenced my decision to approach the issue from a shared suffering perspective rather than a strict abolitionist perspective, especially those who

were economically vulnerable or illiterate and expressed dignity in their work. I met people that showed genuine affection and care for their cattle. These lived not unlike dogs which could roam freely and return to the same house daily and exhibited a bond with people in their household. Some urban cattle experienced better welfare and far more autonomy than anonymous industrial dairy, feedlot cattle, and many village cattle I encountered. The sentiment of affection expressed for cattle and enjoyment of working and living alongside them, instilled an empathy for those farmers who are not dissimilar to myself in how they expressed their genuine love of living with animals.

How do we address the exploitation and abuse that occurs in the dairy industry, while also being attuned to the emotions that arise from farmers with whom cattle form a deep part of personal identity and who see cattle as a form of spiritual as well as monetary abundance? The issue is multifaceted and this influenced my decision to approach the topic from multiple viewpoints. This is why there are diverse approaches in each chapter, including multiple theories illuminating different facets of human-cow relationships in Mysore. I hope that a better understanding of urban cattle and their welfare will lead to ideas that effectively improve their welfare. I will return to a pointed discussion about urban cow welfare in the thesis' conclusion in Chapter 8, which focuses on my third research question: *How can we improve human and urban cow welfare?*

2.4 Plastic as a Lively Material

Sarah Whatmore (2006) introduced the phrase *more-than-human* geographies to speak broadly to a material turn in geography in which 'materials are understood to be animated by their own dynamism and spatio-temporalities, which are processurally configured through

relations with other materialities' (Richardson-Ngwenya, 2014, p. 294). This literature recognizes that human bodies are enmeshed in, rather than apart from, the liveliness of the world which operates 'in excess of humans' (Whatmore, 2006). Whatmore's *more-than-human* geography highlights the connection between the material world, the nonhuman, and the political. This allows geographers to rethink the human in human geography, while recognizing that knowledge claims of technology have become key controversies in the public realm (Whatmore, 2011).

Whatmore identifies four areas the material turn helped to innovate: 1) a shift from discourse to practice; 2) a shift from onus on meaning to an onus on affect; 3) a shift toward the more-than-human modes of inquiry; and 4) a shift from focusing on the politics of identity to the politics of knowledge production (Whatmore, 2006). While the early part of this thesis attends to the symbolic nature of the cow as a 'sacred' entity and as a denizen of an urban pastoral, the later chapters focus on a *more-than-human* experience of an Indian city and plastic waste's material entanglements—via the cow—through the food chain.

This research engages with other work that examines the 'thing power' (Bennett, 2010b) of polluted or polluting objects and environments. Bennett defines thing power as an attentiveness to the agency of bodies and objects—regardless of their awareness—to exert force upon the world. Attending to material vitality requires an attentiveness toward 'encounters between ontologically diverse actants, some human, some not, though all thoroughly material' (Bennett, 2010b, p. xiv). If we attend to assemblages of materials, biological processes, and collectives of individuals—all of whom contribute to the success of societies—we can begin to understand materials as political actors. Objects like plastic, therefore, have agency in political ecologies that are comprised of resource extraction,

polymer technologies and innovation, industry, economics, policy, consumer habits, waste practices, waste management, and the natural world when they leach into the environment.

The material turn moves conversations about waste beyond scholarship that examines the concept of waste as a subjective category. Categorizing objects as 'trash' has been influenced by historical context, cultural norms that define perceptions of use value and pollution, and individual proclivities. Yet 'waste' objects are actors in the environment regardless of when and how they became discarded items. Faeces—as a disease vector—has influenced public health, shaped urban infrastructures (W. Anderson, 1995; Gandy, 1999) and bodily practices like handwashing and waste management, which then shaped economies and labour practices (Gidwani & Reddy, 2011). Landfill chemicals have the potential to shape the biosphere (M. J. Hird, 2015), and in the ocean plastic waste in its macro and micro states has become a 'miasma' that entangles, strangles, and poisons sea life (Liboiron, 2013).

Plastic pollutants are particularly lively types of pollution, as there are more than 10,000 types of plastic that have been produced—each with its own unique chemical structure and ability to bring a new chemical thingness into the world (Gabrys et al., 2013). Plastic pollutants' propensity to mimic hormones make it a unique type of toxin that we have yet to fully understand in regard to when and in what quantities plastic pollutants alter or harm bodies. Its ubiquitous presence in our lives and upon the planet means that it has become nearly impossible for organisms and environments to escape exposure to plastic pollutants. Its feral nature as an unpredictable and harmful presence in environmental and molecular intimacy with bodies is a state of affairs we are only beginning to comprehend.

The fact that the category of plastic is multifaceted and has many technological, economic, ecological, and social entanglements, make it difficult to comprehend the entirety

of how polymers impact our lives and world. For this reason, Gabrys et al. (2013) theorizes the 'plasticity of plastics' in which *plasticity* refers to the material politics that emerge through the processural materialities of plastics. This gives rise to questions about the ontological status of plastics, the new relationalities these materials generate, and how these relationalities become sites of responsibility (Gabrys et al., 2013). For example: attending to the affective politics of plastic bags in different contexts allows us to compose new sensibilities toward them (Hawkins, 2010). Liberion (2013) states that in light of new understandings of plastic pollutants in oceans, we need better metaphors to comprehend the pervasiveness of plastic pollutants and therefore describing ocean plastic pollution as a miasma is better than 'floating island' or 'gyre'. We are not always able to understand how or why plastic pollutants become toxic (Liboiron, 2017), disrupt hormones (Liboiron, 2015), or cause chemical sensitivities (Alaimo, 2010), leaving our bodies and intellect open to the world wide experiment of plastic production. Hird (2012) calls for a more-than-human understanding of 'knowing waste', because we cannot predict the volatile forms waste takes and we are as vulnerable to inhospitable outcomes as other forms of life.

As India's economy and consumer habits increasingly mirror those in the global north, it will continue to generate a growing amount of plastic pollution to its benefit and detriment. As much as half the waste in India is handled by the informal market (Gadwani, 2014; Gill, 2010), but little attention has been paid to the ways that animal waste workers,—such as dogs, cattle, and raptors—interact with and help manage parts of the waste stream. My study seeks to add to the literature on material natures and the politics of urban cattle in Mysore, as well as contributing to the literature on how trash has become a lively material in the urban ecosystem in India—one that impacts human health via the food chain.

Gabrys' theory of *plasticity* is focused on plastic's material and political agency, while Malabou's concept of plasticity has been developed to address wider philosophical issues in neuroscience, evolution, and philosophy, to the point of becoming a paradigm for our time. For the purposes of my analysis of urban dairy cattle as cultural agents, urban subjects, and organisms enmeshed in hormone disrupting plastic ecologies, Malabou's concept of plasticity offers a unique depth of application for my research.

Malabou's concept of plasticity advances Derrida's concept of deconstruction by moving the focus from strictly the realm of language—speech and writing—to the physical processes of destruction, renewal, and change in the material world. Like deconstruction, plasticity can refer to the process of destruction, which becomes the generative force for new creation. As mentioned previously, for Malabou this is illustrated by neuroscience (Malabou, 2008, 2012). Research on brain damage has challenged the concept of the 'eternal' self, which, as Malabou points out, reveals the plasticity of the brain. As a material, the brain is vulnerable and when physically harmed can alter or erase a person's perceived identity. At the same time, Malabou views plasticity as the driving force of evolution. In this instance, plasticity is a creative force, affirmed by new research in epigenetics which illustrates that genes have the capacity to evolve more quickly in response to environmental pressures than was previously thought possible (Malabou, 2016). Plastic pollutants directly impact corporeal plasticity of humans and animals—on biological and genetic levels. Plastics present new types of toxins that challenge our ability to conceive of their harms because of plastics' ubiquitous presence in our lives, the vagueness of when and in what amount it can harm, and the difficulty in comprehending the temporal nature of its impact on future generations. For all

these reasons, we need new types of concepts that allow us to better relate to its presence in our lives.

2.5 Potential Contributions

My thesis seeks to add a new concept of nonhuman social, behavioural, and material plasticity to animal geography and posthumanism. Regarding cattle's encounters with material plastic, I will expand on Malabou's theory of destructive plasticity—a concept she uses to describe a neurological event that leads to permanent irreversible change—and apply this idea to biological and geological processes. The story of India's 'plastic cows' illustrates cattle's entanglements with plastic waste and makes clear the impact of plastic pollution and its harm to nonhuman animals, the bioaccumulation of polymers in the food chain, and its potentiality to harm animals as it accumulates and persists across the planet—including its contribution to the sixth great extinction (Kolbert, 2014). The concept of plasticity challenges the notion of eternal essence or form in an ontological and biological sense. Plasticity also refers to an inherently creative force that acts as a catalyst for species adaptation, but may also harm or destroy what will not evolve, change, or be re-formed.

This research intends to contribute to the growing body of work on urban animals and their geographies, through the concept of nonhuman plasticity. Instead of viewing cities as sites of human ownership and exceptionalism—in which animals are out of place—nonhuman plasticity recognizes cities as a habitats of ever-changing spaces of potentiality, where animals display novel behaviours of evolution and adaptation. Overall, the existing literature focuses more on promoting positive human attitudes toward urban animals than striving to understand how animals inhabit the city and the harms and benefits to animals living in urban spaces.

Notable exceptions include Hinchliffe et al.'s (2005) water vole study in Birmingham and Baynes-Rock (2015) urban hyena ethnography. Researchers in both studies observed novel animal behaviours for the first time, which illustrates that social scientists can contribute to advancing human understanding of animal capabilities, intelligence, and adaptation. Chapter 6, presenting multi-species ethnographic methods, will contribute to animal geographies' insight into the welfare and behaviour of urban animals who display adaptable plastic behaviours.

By examining the reasons urban cattle are exposed to and ingest plastic, this research can also add to waste studies scholarship on more-than-human understandings of refuse. Introducing the concept of destructive plasticity draws out the tension between plastic as a material that cannot be trans-formed through digestion or decomposition and the concept of plasticity to characterize a potentiality to change. Ironically, as a material hyperobject (Morton, 2013), it is the inability of plastic waste to change form that is the source of its destruction. This new synthetic material has yet to be effectively contained by human waste practices, especially in developing nations that lack waste management infrastructures (Jambeck et al., 2015) or have yet to create cultural habits to contain this new and rapidly growing waste product (Chakrabarty, 1991). In addition to vast numbers of marine life killed by plastic waste (Gall & Thompson, 2015), a growing list of terrestrial animals are also impacted by plastic pollution, including cows, camels (Landais, 2008), and elephants (Agency, 2016). Striving to appreciate waste from a more-than-human perspective (M. J. Hird, 2012) can help us recognize how human consumption and waste habits impact the more-than-human world, and challenge human exceptionalism on the planet. The growing understanding of plastic wastes' 'thing-power' (Bennet, 2010) and its destructive afterlives

also asks us to adopt a new ethos toward our waste practices: 'How, for example, would patterns of consumption change if we faced not litter, rubbish, trash, and the recycling, but an accumulating pile of lively and potentially dangerous matter?' (Bennett, 2010b, p. viii).

2.6 Concluding Thoughts on Plasticity

The diverse ways that plasticity threads its way through these theories signifies the plastic nature of the concept itself. This may lead to questions about its efficacy as a theory and its usefulness as a concept in critical animal studies and animal geographies. Malabou argues that plasticity may not always be necessarily useful as a specific theory, but rather a paradigm for a post-modern, post-deconstruction era (Shread, 2011). It brings me back to a question that was originally the catalyst for my research on cattle nearly 15 years ago: *Why do humans treat one animal—a cow—in so many different ways?* A question that I still find both fascinating and perplexing and one that plasticity speaks to the heart of.

The field of animal geography no longer recognizes animals as inert beings upon which humans project beliefs, without acknowledging animals as agents in their own right. Yet, as the Indian cow illustrates, the projection of human values onto animals continues to occur and has consequences for animals, as well as humans. In the context of human representation of animals, plasticity speaks to disparate ways that animals are represented for human means. Critical analysis of genealogies of meaning can aid in understanding where animals are placed in cultural contexts and upon the landscape (Philo & Wilbert, 2000; Wolch

& Emel, 1998). These diverse, and sometimes desperate, or plastic, meanings of an animal, do not inform an inherent or correct *telos*—form or purpose—of an animal. Deconstructing meaning can also assist in calling assumptions into question, inviting new ways of seeing an animal and challenging the efficacy of dichotomies (Whatmore, 2002)—perhaps imagining new ethics of engagement with the species in question (Nagy & Johnson, 2013a).

Cultural meanings also inform material concerns, such as: how farm animal breeds develop and change; different ways livestock are managed; and how people relate to cattle and their material goods. Whether a person chooses to eat meat and/or milk, use cowhide leather, or rejects one, part, or all cow products are tied to assumptions about human relationships with cattle. The diverse treatment of cattle and uses of their products the world over reflects the plastic nature of cultural-material entanglements with cattle. The fact that cows are allowed to freely forage for food in Indian cities—where they encounter trash—reflects both economic considerations as well as cultural customs and beliefs farmers project upon their cattle.

Cattle are also plastic in the sense that they display a great ability to adapt to a variety of circumstances. Their ruminant bodies allow them to thrive by eating a wide variety of plant materials, surviving in many different management styles, including the arid plains of American ranch lands and African savannas, lush British pastures, the cramped conditions of intensive dairy or feedlot systems, and in crowded cities. Not every animal can adapt like cattle to such a wide range of environments and human-derived conditions. While plasticity may be a theoretical paradigm, there are limits to the ability of organisms to adapt and plastic waste may be one of these instances for India's urban cattle. It remains to be seen if public

concern about plastic pollution will end the practice of free-roaming cattle in India, a question I return to in the conclusion of this thesis.

Chapter 3: Methodology

3.1 Introduction

My initial interest in cattle centred upon the question: *why do humans treat cattle differently in diverse cultural contexts*? Then a specific interest in urban dairy cattle arose, which led to a complementary question, *how do animals respond to human behaviour?* In terms of a concept of *plasticity,* how do cattle respond to human behaviour that is inconsistent, for example, when the treatment of cattle differs depending on the perceived utility of the cow (meat, dairy or 'entertainment'), and husbandry systems vary from industrial to pastoral to urban. These broad questions have been narrowed into the thesis' guiding research questions, but the interest in understanding both the *animal spaces*—reasons that humans continue to invite cattle into Indian cities—and *beastly places*—the cow's experience of the city—requires a qualitative, transdisciplinary and multi-methods approach to consider the many facets that constitute the Indian urban dairy cow and her social and material worlds.

A mixed methods approach facilitates the analysis of data collected from multiple sources, which provides for a holistic approach to a complex topic. Data collection and analysis was implemented utilizing a constructivist grounded theory approach, that: (1) assumes a relational epistemology; (2) acknowledges the researcher's and research participants' multiple standpoints, roles, and realities; (3) adopts a reflexive stance toward background, values, actions, situations, relationships with research participants, and representations of them; and (4) situates the research in the historical, social, and situational conditions of its production (Charmaz, 2016).

Examining the 'why' of an urban dairy cow and an attempt to understand the 'how' of the urban dairy cow involved historical research and archival literature, as well as interviews

with urban and village farmers. Key members of cattle protection and welfare NGOs, *Gaushala* directors, and relevant policy makers were also interviewed to give insight into the cow as a source of Hindu cultural identity and as an accepted resident of an Indian city. This research also includes experimental multi-species methods, where one urban cow was observed and her movements-mapped over the course of several days, interspersed throughout eight months of fieldwork in Mysore. Finally, analysis of literature on plastics biochemistry research was conducted to understand the material impact of plastic pollution on cattle and human health.

In this chapter I will provide a rationale for the relevance of research on urban dairy cattle in India and why Mysore, Karnataka was an appropriate field site. Then follows an outline of research design, outlining rationales for seeking out historical and archival materials, sampling methods for interviews conducted, and my approach to conducting a multispecies ethnography using innovative methods. The synopsis of the research design is followed by a discussion of how data was analysed, followed by a brief conclusion that summarizes key points.

3.2 Research Rationale

I decided to research urban dairy cows in India out of concern for their welfare. Urban cattle's tendency to forage upon open refuse in cities, ingesting plastic and other debris, is a central concern and possibly also a public health risk. Public health risks posed by cow's consumption of trash have been largely overlooked by public health officials. There is also no oversight of the informal fresh milk market in cities, which is further justified by the colloquial belief amongst many Hindus that cattle are pure and purifying agents.

Mysore is located in Karnataka, in Southern India, roughly 150 km southwest of Bangalore. It is a city with a 73 percent Hindu population (MMC, 2011) and a consumer base that is willing to buy fresh milk from the city's abundant urban farmers, many of whom allow their cows to roam free. Cattle remain an accepted part of the economic workings of the city. Their breeding remains subsidized by dairy development schemes and city government veterinary centres that provide low cost breeding and veterinary care for urban cattle. There are no plans to ban cattle from the city, as has happened in Delhi (Baviskar, 2011).

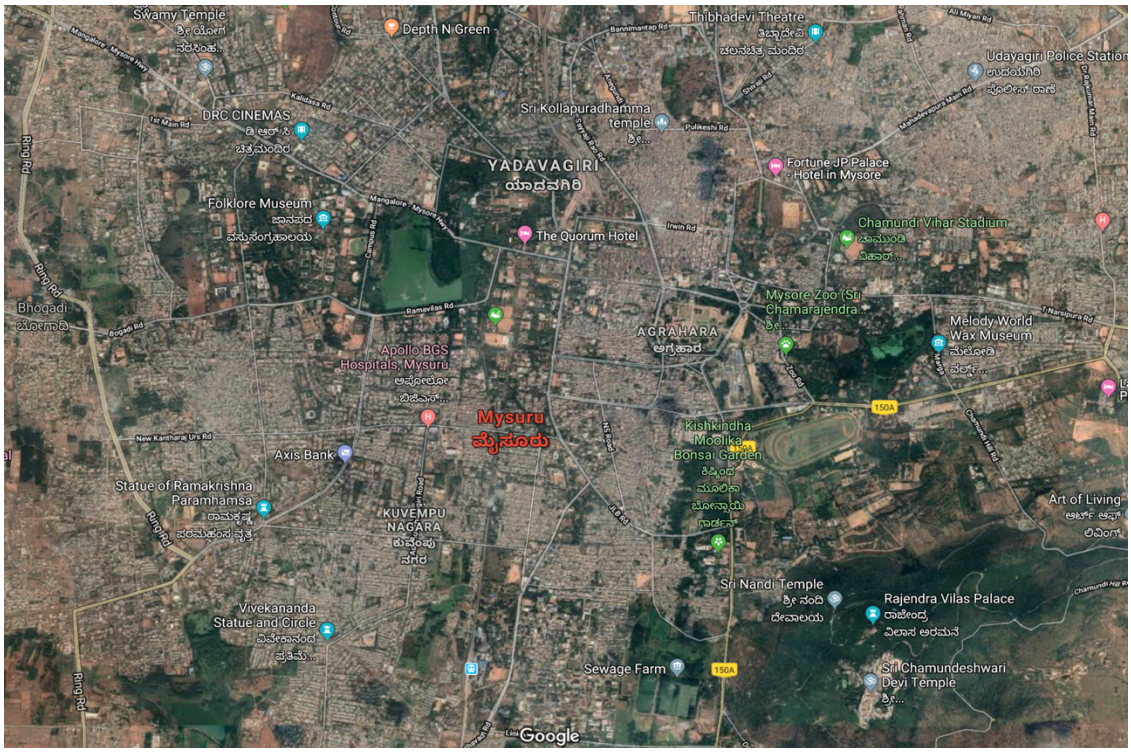

Figure 3. a. A satellite map of Mysore. Fieldwork with Shilpa took place at the top middle left of the map between 'Depth N Green' and 'Kalidasa Road'. Another point of interest, The Sewage Farm, is located on the bottom middle right.

Figure 3. b. Location of the state Karnataka

Figure 3. c. Location of Mysuru (Mysore)—the site of my fieldwork.

Dairy farming is also a common occupation for farmers in nearby villages, which, for the purposes of my study, provided means for comparison between rural and urban cattle keeping practices. In other parts of India, particularly in northern India, buffalo are also commonly kept in cities for dairy farming because they produce more milk with a typically higher fat content than cattle. Animal husbandry differs slightly for buffalo as these bovines are rarely set free to exercise. In contrast, while the dairy buffalo population is generally increasing in India, in Mysore and the state of Karnataka, dairy buffalo are on the decline, and dairy farming with hybrid cattle is on the rise (NDDB, 2015). Therefore, Mysore does not serve as a field site that encompasses the entirety of urban cattle-keeping practices, but offers an in-depth study of one city that has a large population of middle-class Hindu residents and their cattle.

Mysore also served as a site to study cattle plasticity in India. Although it is a city with less sectarian violence than other parts of India, cow politics play a factor in local and state-wide politics. Cow slaughter is restricted and transport of cattle between Karnataka and Kerala is illegal. The largest *Gaushala* in Karnataka is located in Mysore and houses many cows, bulls, and calves that have been rescued from cattle transport trucks, intercepted while smuggling cattle across the border. The ferment of cow politics and the multiple meanings of cows and their association with identity politics was active and observable in Mysore's news publications and in fieldwork interviews. Mysore also has an abundant number of free-roaming cattle that are active on streets throughout the day.

These cattle are acclimated to living alongside people and present a unique research opportunity. Because they are acclimated to strangers, I could observe their behaviour without causing cows undue stress and to behave differently than normally might. Other social

scientists that have conducted research on dairy cattle have had to account for their presence as strangers and the potential impact on cattle behaviour they observe, because cattle can be wary of unfamiliar people. Observing urban cow behaviour in this study did not require that I spent time acclimating myself with the herd (Jocelyne Porcher & Schmitt, 2012; Young, 2003) or hiding myself from the cow's field of vision (Bear et al., 2016), to be able to observe cattle from close range—even as I remained aware of my role as an experimental partner that had influence on the cow's behaviour (Roe & Greenhough, 2013). The recognition of the difference in cattle behaviour and attitude toward humans reveals the plasticity of cow behaviour, not only to recognize humans as friend or foe, but also to exist in the city with far more noise, activity, and unique and changing topography than other cattle husbandry contexts.

Figure 3 d. Gokulam's Main Street. The dumpster Shilpa visited in the mornings is located just to the left of the red street sign and outside of the frame.

Figure 3 e Shilpa in an alleyway in Mysore's Gokulam neighbourhood, the site of multispecies ethnographic research.

Mysore's urban cattle are often seen foraging in rubbish heaps and bins. The familiarity of cattle with humans proved especially useful for close observation of the types of food that cattle seek out in the effluvium of human waste. Because cattle and humans come into close proximity with one another every day at these sites, my presence was unremarkable and cattle appeared to carry out their business undisturbed by my presence. This provided a unique opportunity to observe how cattle approached foraging for food amidst the plastic materiality of waste, which is a phenomenon that has only become a significant part of the waste stream in Mysore over the past twenty years. Plastics' prolific presence on the landscape has made containment of its disposal a challenge throughout the country.

Mysore also served as a site to better understand plastic's role in urban ethologies. In 2015, the Government of India Ministry of Housing & Urban Affairs, awarded Mysore the

Cleanest City in India award (PIB, 2015). This award is part of the *Swachh Bharat* (Clean India Mission), implemented by the Modi government to improve sanitation practices in India, including sewage infrastructure to end open defecation, improve waste disposal practices, and increase clean energy practices across India (G. o. India, 2017). Even with this prestigious distinction, plastic pollution remained visibly present throughout the city. Plastic pollution continues to provide significant waste challenges for humans and animals, even in a city that is recognized as having one of the most progressive waste management systems the country. This speaks to the magnitude of the problem—not only in India, but everywhere plastic use is on the rise—and its wide-ranging impacts for humans and the more-than-human world alike.

3.3 Research Design

This research encompasses various perspectives on the cow, including the representation of the cow in a Hindu context, as well as an attempt to engage with the subjective experience of the urban cow, and how the cow interacts with and is impacted by the urban material environment. This study also includes interviews with Mysore's urban dairy farmers—a group that sells their milk in largely informal markets and is a group often overlooked in dairy development data and political controversies over cattle—and importantly, the cows themselves.

The rise in research on human-animal relationships and the experience of animals themselves in social science research has become a catalyst for novel methodologies that attend to the consideration of non-human animals and organisms as social actors. These emerging methodologies—multi-species ethnography (Kirskey & Helmreich, 2010; Smart,

2014), (Kirskey & Helmreich, 2010; Smart, 2014), more-than-human ethnography (Barua, 2014b), beyond-human anthropology (Ingold, 2013), and multi-species methods, human-animal ethnography, or posthuman methods (Hamilton & Taylor, 2017)—are employed to attune to and empathize with nonhumans. Multi-species ethnography seeks to understand a topic from a more-than-human point of view through observation (Baynes-Rock, 2015; Bear et al., 2016) and ethology—which reveals information about animals' cultures (Hodgetts & Lorimer, 2014; van Dooren & Rose, 2016)—and interviews from human stakeholders familiar with the object of inquiry (Fuentes, 2010). Multi-species methods build on the past history of ethnography as a tool to bring to light the lived experiences of the subaltern, with a political aim to improve social justice inequities (Hamilton & Taylor, 2017). These methods recognize that animals and organisms are agents that co-constitute societies and many involved in this new type of research seek to expose human harms to animals, with a political aim to call into question human abuses to animals and the more-than-human world.

Utilizing ethnographic methods to represent non-human others raises question as to whether their representation can capture anything meaningful about the experience of organisms so distinctly different from humans, or whether researchers can escape types of representation that privilege hegemonic humanist aims (Hamilton & Taylor, 2017). Regarding whether humans can understand animals, Wittgenstein (2009) speculated, 'If a lion could speak, we would not be able to understand him' (pg. 223). In other words, even if we could break down the language barriers between humans and animals, a lion's world-view would be so alien from our own that language would not bridge the divide between worlds for us to make intelligible sense of a lion's point-of-view. Other theories in philosophy also propose that we cannot know the minds of other humans (Candea, 2013; Paulson, Chalmers,

Kahneman, Santos, & Schiff, 2013), but this has not prevented an array of social scientists from attempting to communicate and theorize about the diverse experiences and feelings of human others, however challenging. Both human and more-than-human ethnographic inquiry must proceed with various levels of uncertainty and vigilant reflexivity to the power dynamics of researcher to research subject(s), and while I cannot claim to understand all reasons for why cows are motivated to make decisions, I believe they do make decisions about themselves and their wellbeing beyond mere conditioned-response reactions. In addition to this, multi-species ethnographers must utilize innovative methods of inquiry, to account for differences in biological, neurological, and social structures and behaviours between humans and animals, which provide glimpses into otherness—even if these remain imperfect—with constant attention to corporeal, phenomenological, and expressive differences between human and non-human others.

Buller (2014) identifies three areas that social science and animal geographies must address to establish multi-species methods: (1) a focus on animals as embodied beings living entangled lives with humans; (2) an attempt to understand animals on their own terms apart from human motivations and utility; and (3) moving beyond animal studies '…outdated…separation of the social and natural sciences to create a set of concepts and methodologies that address what matters for both human and animal subjects in their various relational combinations and spaces' (Buller, 2014, p. 3). To fulfil these aims requires innovative methods. Traditional ethnographic methods have relied on participant observation and interviews that depend on humans having a shared umwelt and self-expression through verbal communication. Human perspectives about animals remain useful in multi-species methodology, such as Fuentes' (2002, 2010) study of human-monkey interactions at temples

in Indonesia. Social scientists that employ multi-species methods are introducing new methods from ethology, the arts and technosciences, and genetic sciences to better understand animal places and spaces (Hodgetts & Lorimer, 2014). Multi-species ethnography can employ different approaches including directly tracking animals, singular (Bear, 2011; Hinchliffe et al., 2005) or multi-site fieldwork (Barua, 2014a; Lorimer, 2008), participatory observation (also called 'experimental partnering') (Haraway, 2008; Roe & Greenhough, 2013) and film or visual studies (Bear et al., 2016; Lorimer, 2010).

While multi-species methods are utilized, they are not the only methods used to understand why cattle remain in cities and how they live. Chapters Four and Five utilize representational analysis to understand Hindu belief systems that inform the perspective that cows are sacred, and their bodies and products are pure and purifying, and how the cow became a symbol of Hindu identity—all of which contribute to the persistence of cattle on the urban landscape in India today.

3.3.2 Historical and Archival Data

Research into historical archives on cattle protection in Southern India during the late colonial period was conducted at Oxford University and at the British Library. This research was conducted to better understand the role of cow protection in the history of Hindu Nationalism, which informs today's politics surrounding cattle, pollution, and purity. Archives examined included British Indian Government reports on the cattle of southern India that discuss the economic importance of cattle and husbandry practices of the time—as observed from a British point of view. Other archival literatures that addressed the religious and political importance of the cow in India in the years leading up to partition included: the

writings of Dayananda Saraswati, considered the founder of the cow protection movement; M.K. Gandhi's archived publications and speeches; publications from the Bombay Humanitarian League, an animal welfare organization that championed the cause of cow protection throughout southern India; and newspaper publications that discuss cow protection between 1880 and 1946.

These archived works were contextualized with other historical research via books, journal papers on the history of cow protection, dairy development, urban design, Ayurveda, and subaltern studies literature that address tensions between Hindus and Muslims in colonial and post-colonial India. The information gathered from these diverse sources informs Chapters 4 and 5.

Historical research concerning urban development and the aesthetic, cultural, and economic functions of the cow in India also inform Chapter 5. This required another set of data collection that resulted in a new concept of an 'animal urban pastoral'. This required research into interdisciplinary literary sources that included: urban design, religious studies, literary criticism, and British and Indian government reports on dairy development in India.

3.3.2 Interviews Conducted

Over 100 interviews were conducted for this research. Key stakeholders were selected through 'purposeful sampling' and 'theoretical sampling' techniques (Cresswell & Poth, 2018). These individuals possessed vital insights about urban cows and their social and material nature-cultures. Semi-structured interviews were conducted with various stakeholders involved with urban dairy farming, cattle protection, and waste disposal to gain an understanding of the reasons cows live in cities and how they come to encounter waste and

ingest plastic refuse. Over seventy-five farmers were interviewed—divided between village and urban settings—as well as trash collectors, politicians, policy makers, *Gaushala* directors and those working in the NGO sector on cattle protection (detailed in Table 3.1). Interviews with dairy farmers and trash collectors were conducted with the assistance of interpreters that translated between Kannada and English. Interviews with government officials, *Gaushala* directors and NGO directors were conducted without the aid of translators. All interviews were recorded via note taking and with a cell phone audio recorder application and later transcribed.

Interviews

Urban farmers	44
Rural Farmers	33
Trash Workers	9
NGO Directors/Workers	6
Gaushala Directors	2
Academics	5
Milkmen/Dairy Delivery Drivers	4
Animal Welfare Officers	2
Member of Parliament	1
Animal Welfare Board of India Members	2
Mysore City Officials	2
Milk Cooperative Officials	3

Table 3. 1

A number of individuals provided help, advice, and introductions to find appropriate stakeholders to interview. Interviews with farmers were facilitated mainly with the help of interpreters. For both urban and village interviews, we identified areas with high concentrations of dairy farming families and we met farmers randomly without prior notice of interviews. One interpreter had grown up on farm located between Gurur and Kallidasa—two villages outside of Mysore—and these two villages comprised the majority of village interviews. These interviews occurred when farmers brought their cows back from the fields and cows were being fed and milked. Urban dairy interviews were conducted by similar methods. It was easy to locate urban dairies and introduce ourselves to farmers, who often recommended other farmers to interview. This allowed us to interview some farmers who kept cows off the streets, tied in sheds or even in a room in their house. After we had become well acquainted with interviewing farmers, we discovered the easiest way to find our first interviewee would be to follow a street cow to her cowshed. There would always be someone at home waiting to feed and milk her. From there we were given instructions on where to find the next farmer to interview.

Interviews with trash collectors began during cow ethnography fieldwork. While observing cows at dumpsters, I inevitably met formal and informal waste workers who had daily interactions with cattle and had insights about them.

Introductions to NGO directors with insight into urban cattle were made through various means. I met a handful of NGO directors and staff, including Clementein A. Paws-Koenegras—the director of Karuna Society for Animals and Nature and staff—from People for the Ethical Treatment of Animals (PETA) India, at Minding Animals 3, a conference

which took place in Delhi in January of 2015. The Karuna Society had performed a number of surgeries to extract accumulated plastic from cattle rumens. By invitation, I visited their animal sanctuary in Andhra Pradesh in November of 2015 and the organization shared their data collection on the amount of plastic and inorganic material extracted from these surgeries.

Interviews with *Gaushala* directors also informed this study. The family I lived with in Mysore introduced me to Ramesh Jain, the director of the *Gaushala* in Mysore, whom I met with several times during my fieldwork. He introduced me to some NGO directors, including Meneka Gandhi, a Member of Parliament and director of People for Animals, with whom I met in November 2015. Introductions to other key interviews with NGO directors and policy makers happened through similar networks of individuals putting me in contact with other individuals, including help from interpreters. In some instances, I was able to make my own introductions by procuring contact information from a web site and writing emails. This data informs Chapters Five, Six, and Seven.

3.3.4 Multi-species Ethnography

Experimental methods were used to collect data for the multi-species ethnography on one urban cow in Mysore. The methods used to collect data for the multi-species ethnography (the focus of Chapter Seven) is the result of nine days of observing a free-roaming urban dairy cow over the course of eight months in 2015 with the aid of an interpreter. This research was also informed by observations gleaned from living with a family that kept eight cows, which I was able to observe on a daily basis. My personal observations were supplemented with information about cattle from the cows' owners, interviews with people that observed or interacted with cows on the street, and interviews with *Gaushala* staff, who cared for stray

cattle, in addition to literature on cow welfare (Moran & Doyle, 2015; Phillips, 2002; Young, 2003).

My understanding of cow behaviour and welfare comes largely from reading cow welfare literature, written from a western (Grandin & Johnson, 2005; Phillips, 2002; Young, 2003) and south Asian perspective (Moran & Doyle, 2015), from past experience working on a dairy farm, and close observation of the behaviour and herd dynamics of the small herd of cows kept by the family I lived with during my fieldwork. This family kept a herd comprised of five adult cows and three calves (one cow died and another calf was born, another calf sold, and another donated to a *Gaushala* during this time). I interviewed the sole cow-herd hired to keep charge of the cows and learned each cow's personal history from the family, kept a daily record of the cows' schedule and spent some time observing them when they were turned out to forage and exercise in the peri-urban neighbourhood where they lived. I came to know their personalities and habits so well that I could recognize when the herd was content or distressed.[3] These experiences informed my observation of the multi-species ethnography focused on one urban cow.

To gain insight into the experience of the life of an urban cow I chose to map a cow's path through the city, supplement the map with photos, and collect data on how she spent her time and whom she encountered throughout her daily activities. These methodological approaches were implemented to experiment with less anthropocentric approaches for researching human non-human relations (Bear et al., 2016) and to provide 'image external

[3] One evening as I returned home on a scooter, I saw Davi (a Holstein-Friesian cow and the herd's leader) marching through the neighborhood mooing, apparently trying to find a herd-mate. I then noticed the herd had separated, which was not unusual, but each cow quickly walking through the neighborhood mooing *was* unusual. At the house the family told me they had sold one of their male calves (a Hallikar, a breed native to the area) to a farmer who would train him to become a working bullock.

contexts' to enrich other textual and human interview based methodologies. Maps and photographs provided additional ways of perceiving how cows interacted with urban spaces, material resources, and multispecies landscapes to offer comparison for cattle in other management contexts.

I conducted an exploratory cow mapping session in mid-February—early on in my fieldwork—to set the criteria that would help me determine which cow to choose for my ethnography. This was conducted in the Dattagalli neighbourhood where I resided. Dattagalli is a rapidly growing neighbourhood on the edge of the city, which I would classify as a peri-urban environment. My interpreter and I found a group of cows eating at dumpsters near a traffic circle of a small highway. This initial four-hour observation period helped me understand that cow mapping required physical and mental preparation in order to spend the day exposed to the heat and weather of Mysore, often far away from a toilet, and spending long stretches of time in one place watching cows eat out of rubbish bins or while reclining stationary, chewing their cud. I also noted that as interested in a cow as I might be, my interpreter might not share my enthusiasm. In fact, persuading my interpreters to join me on cow mapping forays became the main challenge of this project. I also needed to find a cow whose owner allowed his cows autonomous freedom during the day—as opposed to tying them up to a tree or post to graze, who would give me permission to observe his cow for my research, and who was willing to be interviewed several times.

Before I chose a cow to follow, I decided upon a neighbourhood that would serve as a landscape of the urban pastoral; a neighbourhood where cows roamed freely, and had a mix of rubbish bins and grassy areas along roadsides and in vacant lots. This allowed me to observe whether urban cows would still prefer to eat out of rubbish heaps and bins if other resources

were available. For these reasons, I chose the middle-class neighbourhood of Gokulam in Mysore. This area had many cattle, which were kept to supply milk to residents and local restaurants. This neighbourhood was established predominately in the late 1950's and 60's and the roadsides hosted large shade trees and grass. Many people had small gardens in front of their homes, which cows sometimes grazed upon to housewives' lament. A mix of shops and residences were also found in the neighbourhood, which was adjacent to an 'urban village', where cattle, goats, and chickens were easily viewed on the streets. The neighbourhood also housed internationally famous *yogashallas*—attracting many westerners for yoga tourism—and residents in the area were used to seeing foreign men and women walking through and living in the neighbourhood. It felt like a relatively safe place to conduct fieldwork and allowed me the freedom to focus on my research subject.

On our first day out in Gokulam, we found a lively looking dark brown cow with small curved horns walking down the main commercial street of the neighbourhood and started tracking. This was the first day we followed the cow we came to know as Shilpa. That day she had just finished foraging at her late morning rubbish bin and was in the process of crossing the main road to look for kitchen scraps in the neighbourhood in front of the trash collectors' colony of subsidized housing. She visited another rubbish bin, rested, grazed along the grassy residential roadsides for over an hour and then returned to what I came to call 'rubbish bin number 4'. At 4 p.m. her owner came to collect her. I interviewed her owner with the help of my interpreter and he was amenable to my research project, gave me his contact details and permission to use Shilpa as a subject for my research. Shilpa was an ideal representation of an urban cow in Mysore. She was a hybrid cow kept in a shed attached to the residence of her owner. She was part of a small herd of two other adult dairy cows and 1-3

young calves (two were born over the course of my research). Shilpa and her herd were allowed to spend a large part of their day wandering the city unattended, which allowed me to observe where cows go and what activities they prefer when given autonomy to forage for themselves. Because they were a small herd, I was able to better observe herd dynamics that could shed light on my questions. *Would an urban cow prefer company? Or would she keep to herself, to minimize competition for resources?*

To keep a record of Shilpa's path through the city, her activities and behaviours, I kept handwritten field notes, supplemented by journal entries written in the evenings to record in depth my observations about the day, and I used a phone app called LiveTrekker™. The app had a mapmaking feature where I could also pin photos, videos, audio recordings, and text to the map. This allowed much of my data to be stored in once place and made it possible for me to blend in as much as possible as just another Westerner using their smart phone instead of a camera. Early in the cow tracking process I severely upset a man that wrongly assumed I was taking camera photos of him urinating in the vacant lot beside Shilpa's preferred rubbish bin. After this unpleasant interaction, I conducted myself more discreetly. While I chose these methods to best capture the experience of an urban street cow, there were limits to accurately representing the experience of an animal through field notes, photos and video. Even with the best data we can never entirely comprehend an animal's thoughts or umwelt. As Bear et. al. states,

> …[A] problem in more-than-human research is of interpreting the nonhuman; we cannot access the thoughts or feelings of nonhumans through their words, and reliance on field notes can reduce scope for alternative interpretations of nonhuman practice. Including video research can offer the opportunity for nonhumans to 'speak' for themselves (Bear et al., 2016, p. 28).

While photos and video have the potential to create less anthropocentric data

collection—which may be open to more interpretation than field notes—these mediums are still framed by the human eye. Because of my phone's finite battery life there were constraints on how often I could record Shilpa. I often chose to record her behaviour in moments of activity. What a cow is thinking or feeling in 'dull' moments of rest, chewing cud, or standing in the shade may be meaningful to a cow yet remain enigmatic from a human perspective.

I followed Shilpa for a total of nine days over the course of eight months—from February-March and July-December. Other days were spent in informal observation when I would check in on the cow without an interpreter as I was often in her neighbourhood. Three different interpreters assisted me on cow tracking days throughout the course of this study, and their schedules largely determined the course of this project. One friend who I employed to be an interpreter found the project too tiring to do on weekends with his own family obligations and a full-time job. Another interpreter accepted an internship during her time working with me, which limited her availability. My third interpreter was a postgrad student with other obligations. While they expressed excitement about interviews with farmers or trash collectors, less enthusiasm was expressed for the cow ethnography project. I was quite keen to experience the city from a cow's point-of-view, but I sympathized with my interpreters who were less invested in spending hours outside, often standing near dumpsters for hours on end. There were long stretches of time when no obvious activity took place.

This reluctance to inhabit the life of a cow spoke to larger issues of the human-animal divide. The attention required to inhabit a cow's point of view and temporality, requires setting aside human desires for the comfort of the indoors, the distractions of books, television, or social media for most of the day. Setting our schedule to the pace of cow life did not always allow convenient times to eat or use the toilet. For my well-educated interpreters,

following a cow may also have seemed like a farmer's occupation that lacked the use of their education and skills. The job also exposed us to unsavoury environments, such drainage ditches, roadsides, and rubbish bins. One bin in particular was located near to two bars, and close to a vacant lot where men often came to urinate. This was Shilpa's preferred rubbish bin. The work was largely passive and other than the occasional interview the work required a lot of meditative time merely spent watching without much excitement, which I tried to alleviate with frequent conversation. Because my interpreters all lived busy lives, if they had other work to do, cow tracking lacked appeal. Their companionship and language skills were vital to the project and it was frustrating to lack their support for this phase of the project.

This reality set constraints on the amount of data collected for the cow ethnography, a weakness of the study that I tried to supplement with observations of the herd of cows at the house of the family I stayed with, and from data collected in interviews with Mysore's rural and urban farmers. The family's cow herder kept a watchful eye on the cows when they were turned out for exercise in the family's neighbourhood, making sure they were not visiting the neighbourhood's always over-flowing rubbish bin. Shilpa had the autonomy these cows did not and lived in a more densely populated neighbourhood with a mix of shops and houses, representative of a typical urban neighbourhood in Mysore. My cow-tracking days were spaced out over the course of most of a year. I observed the transition from the hot 'summer' months in February and March through the monsoon months of July-September and into the winter months of November and December. During the hot season, Shilpa was allowed fewer hours outdoors, and during the cool and lush monsoon season she was allowed a longer time to graze on the abundant grass.

Another gap in my ethnography happened during the months of April-June, when I returned to the UK. During that time Shilpa delivered a calf, and thus I was unable to observe her behaviour during this important event in a dairy cow's life. Additionally, even though her owner was friendly and open in interviews, some of his observations about his cows were overly optimistic or unreliable, such as claiming his cows wouldn't eat out of the rubbish bin because it 'smelt bad' (Interview, 1 August, 2015), which I discovered to be untrue. The lack of a continuous body of research opens some of my observations up to speculation. I also can't claim to have been adopted as part of the herd as Marcus Baynes-Rock (Baynes-Rock, 2015) became adopted into a pack of hyenas in Harar. I did have the advantage of easily viewing and tracking a cow largely indifferent to my presence, a luxury not always afforded to animal ethnographers such as Hinchliffe et al. (Hinchliffe et al., 2005) in their ethnographic water-vole experiment (where they did not have the good fortune to see a water vole) or Barua's (2014b) observations of human-elephant conflict in Assam.

I approached observing Shilpa with an open and curious mind, aware of the limits of my biped, omnivore, monovision, to fully grasp her experience as a quadruped, herbivore with the binocular vision of a prey animal. Because India's urban cows have a high tolerance for human strangers, I was able to follow her relatively closely without noticeably disturbing her. This was advantageous as other people who have undertaken the task of representing bovine subjectivities have looked for experimental film and video methods to observe cows on their own terms without disturbing them (Chris Bear, 2016) or have spent years as farmers living alongside the cows whose lives they chronicle (Young, 2003). I experienced one notable exception to this on a hot sunny afternoon early in the project, when I opened an umbrella for shade after which Shilpa raised her head, looked at me, and issued a sharp snort,

which I registered as a sign of agitation. I retreated and closed the umbrella. After this I became acutely aware of my positionality as a primate and predator and her innate wariness and vulnerabilities as a prey species. Because following is the basis of hunting I tried not to focus my gaze too intently upon her, made sure I followed and observed her from a distance, and assumed a nonchalant body posture of a pedestrian on the street. For my efforts, I appeared to be ignored. From this imperfect but sincere human perspective I conducted my multi-species ethnography.

3.4 Positionality

Multi-species ethnography has many challenges. As with other ethnographic research, it is important to examine power differentials between researcher and research subject, but these are even more extreme between human and animal subjects. As 'livestock', cattle are bred and managed for human utility. This language of human 'utility' covers up a multitude of abuses that exist between humans and cattle. It would be rare for an ethnographer to have eaten the flesh, worn the skin, and drank the non-familial mammary secretions of her human research subjects, but that is sadly my position in studying cattle, even if I have lived as a vegetarian for over 20 years. The fact that social science research is conducted on livestock who already live in unethical systems of human exploitation elicits moral questions the researcher is left to navigate. Gillespe (2018) raised concerns over the lack of a research ethics protocol that applied to social science investigations of livestock subjects when she embarked on her multispecies ethnography on dairy cattle in the United States. The ethics and safety forms I filled out pertained to protecting human subjects from ethics violations and did not give guidance on how to investigate a topic that involves the study of suffering for animal

subjects. I did observe cattle suffering in various contexts while conducting this research at farms, on streets, and in cow sanctuaries. This research bears some witness to the moral complexity of human-cattle power relations and shared suffering of humans and cattle. I cannot say that I am outside the power systems that create this suffering for cattle even if I work to improve awareness of the challenges cattle face and solutions for their better future, nor can I 'speak' for cattle, even if I have spent time attempting to gain insight into their worlds.

I cannot claim to 'see through [a cow's] eyes' (Haraway, 2008, p. 176), to understand the cow's phenomenological or bodily experience of the city—the way it smells, how comfortable the cow is in the heat of the day, or how much anxiety she experiences leaving her calf in the cow-shed as she looks for more food, and so on—but I can speculate upon some of these situations through a range of interdisciplinary information and an empathic attitude toward intra-species mindfulness (Moore & Kosut, 2013). Although she did not consent to being the subject of this study, it was conducted in the spirit of partnership. I did catch glimpses of a more-than-human experience of the city, as Hodgetts (Hodgetts & Hester, 2017) was given a different perspective of the forest on a search for pine martin scat with his research companion, Hester the dog, and her heightened olfactory sense. The maps and visual images made while following Shilpa were created without her consent. Photographic visual images are subjective insofar as they are informed by my cultural positionality, aesthetic proclivities, and framing—what was left in and what was excluded from images. A cow cannot react to or correct my account of her visual imagery, as a human subject might. For the prosaic reason of not drawing more attention to myself than necessary, I did not use video methods, even if this may have provided a richer type of data to explore the lived experiences

of a non-human subjects as others (Bear et al., 2016; Lorimer, 2010) have suggested. Photographs also lack the auditory richness of urban life in Mysore, to which the cow is also adjusted, nor can a photograph provide detailed information of everything a cow encounters and eats at a rubbish bin.

Figure 3. f Shilpa at the rubbish bin, eating unidentified food scraps with her horn hooked in a plastic bag filled with trash.

Observing cattle at the rubbish heap or bin became one dilemma I faced during research. I spent hours watching cows eating at rubbish sites and ingesting plastic bags and other inorganic debris. Plastic is a material that cannot be passed from the cow's rumen and all manner of sharp and dangerous objects reside in the mix of household waste that cow's encounter at the trash heap. These inorganic objects lead to degraded cow welfare and can be a cause of mortality. Additionally, milk from these cows likely harbours unknown quantity of chemicals and heavy metals that will pass onto humans with uncertain consequences. The ingestion of a foreign body had caused the death of a cow of my host family, even though they were careful about her grazing habits. So, I felt concern for a cow I spent many hours

watching over several days. As Candea (2010, p. 254) asks, 'Does the production of attachment not also produce responsibility?' Ultimately, I chose to observe cow behaviour at rubbish site with 'rational detachment' (Candea, 2010) to try to better understand their motivations for choosing this food source over other types of food, but remained aware of the uneasy and helpless feelings that arose in choosing not to intervene while watching this dangerous—albeit common—behaviour. Attempting to better understand the cow's role in pollution and purity in Hindu society had ecological and political implications as well, which made me cognizant of my responsibility to raise awareness about plastic pollution and its chemical pollutants for animal and human public health; in this context and everywhere we encounter plastic.

This research was conducted against a backdrop of contemporary Hindu Nationalist politics, in which the states of Madhya Pradesh and Haryana had recently passed laws banning the sale and possession of beef. This created heightened tensions between Hindus that observe beef taboos and Muslims and Dalits, to terrifying ends. Several mob lynchings over suspicion of cattle slaughter and beef consumption occurred in Northern India during the period of my fieldwork in 2015. While Karnataka has not passed a beef ban—nor experienced recent sectarian violence incited over cattle protection—my research remained sensitive.

The Modi government's support of increased cattle protection and anti-slaughter policies has increased antagonism towards minority groups in India who eat beef or sacrifice cattle during religious festivals. All the while overlooking other Hindu group's involvement in the suffering and death of cattle via the government subsidized dairy industry, or the fact that the consumption of meat—including beef—is on the rise amongst wealthy Hindus. In 2015, the Modi government also targeted many NGOs they perceived were influenced by 'foreign

ideologies'. This included banning certain NGOs from receiving foreign funds and freezing Greenpeace India's bank accounts—a directive that was later overturned by the Delhi High Court but has not been entirely resolved (Reuters, 2019). Because of this antagonism toward social and environmental rights groups, one of my interpreters who had engaged in social activism requested that I not associate his name with this project.

Another incident (that involved a different interpreter), also highlighted the precariousness of my position as an outsider researching this topic. As mentioned previously, I inadvertently upset a man who thought I had taken photographs of him urinating. He aggressively confronted my interpreter and accused him (in his native Kannada) of helping me make his country 'look bad'. He was perhaps embarrassed by his actions because he expressed concern that his image would appear on a newspaper cover, but this encounter highlighted the fraught nature of my position as an outsider examining pollution, purity, and cattle politics at the trash heap, and that my western perspective about India may not be welcomed.

There was also underlying tension over cattle theft in Mysore, which was left unreported by the media. A cow sanctuary director I interviewed in Mysore carried a pistol with him at all times because his facility had been made a target of a cattle theft. Cattle from Mysore were routinely trafficked to the neighbouring state of Kerala, where it is legal to slaughter cattle. Some urban farmers also informed me that dairy cattle theft was a common problem and the police would not pursue these cases. The potential for the issue of cattle theft to spark sectarian unrest during the course of my fieldwork made me aware of the sensitive nature of this research for my interviewees, my interpreters, and myself. In addition to securing permissions for interviews from all people that participated in this research,

agreements were made with some to read and approve of any chapters in which they were mentioned.

I depended on interpreters to conduct and transcribe interviews because I lack fluency in the local language of Kannada. During interviews, I took detailed notes, recorded interviews, and had interviews translated by my interpreters and one other outside individual. Although I lamented not having immediate fluency when conducting interviews, working closely with my interpreters—all of which worked in areas of social justice or journalism in India—became an important aspect of my research. We had many discussions about my positionality in addition to their experience as interpreters. Interviews with the vast majority of NGO officials, policy makers, and veterinarians were all conducted in English. Interviews conducted in Kannada were transcribed from the recording and translated into English by three individuals fluent in both languages. I transcribed interviews conducted in English.

Interviews with dairy farmers were not always straightforward. At the beginning of an interview my interpreter always introduced my project and me as we asked for verbal permission to conduct an interview. Yet, some people had an impression that I had been sent from the government to conduct a survey. This idea made some people optimistic that I might somehow influence dairy subsidies. For this same reason, two others viewed me with suspicion and in this case denied me permission to use their interview in my study, although one of these people still spoke with me for over a half-hour. How people perceived me influenced the information they provided, and it was, at times, difficult to discern if what I was being told was accurate. I tried to mitigate this with a large sample number of farmers and by seeking advice from interpreters or expert advice when I encountered these situations. There were also cultural disparities in meaning—pointed out to me by interpreters. When I

wanted to know what presented the largest challenge to being an urban dairy farmer, I was told that it was difficult to translate the concept of 'challenge' or 'obstacle' into Kannada in this type of context. The meaning of 'dumpster', 'rubbish bin', or 'trash' also missed the meaning of waste receptacles, which were better translated as 'dust bin', which had a somewhat less negative connotation. I also had to be mindful to avoid asking leading questions, which people easily agreed with and to gain certain information about a person's identity before asking further questions. For example, instead of asking 'Do you think cows are sacred?', I would ask the farmer if he or she conducted any cow puja ceremonies. This gave me information into the type of rituals the farmer performed. All farmers observed at least one cow-blessing or cow-thanksgiving ceremony. From there the question of a whether or not they perceived the cow as sacred followed more naturally from the person's ritual customs and reasons they performed them, and this potentially yielded a richer analysis as to why these rituals were performed—whether for the cow or to ensure a farmer's economic gain.

I am not a native of India and I cannot claim to understand or to represent every complex aspect of the cultural and political nuances within pre- and post-colonial cow protection politics and India's dairy industry, even with careful attention and many, many conversations with nationals about these topics. This research is written with the awareness that all knowledge is a work in progress—incomplete and positioned (Pauwels, 2015). With further transparency toward research design, the following section describes mixed-methods data analysis.

3.5 Data Analysis

3.5.1 Historical and Archival Analysis

A structural coding approach was implemented in each chapter to analyse and organize data from which themes emerged. 'Structural coding generally results in the identification of large segments of text on broad topics; these segments can then form the basis for an in-depth analysis within or across topics' (MacQueen, McLellan-Lemal, Bartholow, & Milstein, 2008, p. 125) . Further coding was conducted after initial themes were identified to focus content and new rounds of coding were required after second and third drafts.

Data analysis began with the historical and archival literature that formed the data set used in Chapter 4 and these resources were coded to better understand: *cow politics, cow welfare, social injustice, conflict, riots, Gaushala, sacred, Ayurveda, pure, purifying, pollution, economic benefit, territory, urban cattle, cow management, and unique British, Muslim, and Hindu attitudes toward cattle.* From this, larger themes emerged regarding the cow as an object that helped caste groups unify into a broader group now known as Hindu; the cow's role in the territorialization of space that began to divide Hindu and Muslim social practices; and the Hindu belief in the cow as a spiritually and materially pure and purifying entity promoted in some cow protection literature, which became the organizing structure of Chapter 4.

Historical and archival literature from which data was generated from Chapter 5 was coded for *urban dairy development, Mysore's dairy development, Mysore urban development, green urban design, urban pastoralism, the pastoral, pastoral animals, Krishna, Chamundi, Mahishasura, dairy buffalo, hybrid, sacred, and urban cow management.* Some research done for this chapter, including the history of Mysore's mythic origin story—a battle between a buffalo-headed demon *Mahishasura* (that may have represented the native buffalo herding tribes) and *Chamundi* a goddess brought to the area by Hindu invaders) and an analysis of the decline in dairy buffalo and the rise of cattle in the region—did not make it into the thesis. From my first and secondary data analysis, themes emerged regarding the pastoral and urban pastoral applied to an Indian context that became the foundation for the concept of an 'animal urban pastoral' proposed in Chapter 5. This chapter also includes another data set of interviews discussed in the following section.

3.5.2 Interviews

I created a chart to keep track of all research subjects interviewed that I updated at the end of every day of fieldwork. In this chart I attempted to pre-code adding 'analytic memos' (Saldaña, 2016)—comments and observations to help me reflect upon potentially important data until the time transcripts were coded. Coding 'grounds' the data in grounded methodology (Glaser & Strauss, 1967, 2017) and analytic coding gives initial insight into the data collected and sets the groundwork for further coding. This chart also contained quantitative data as to the number and type of cattle each farmer owned (which I later put into a spread sheet) and where the interviews occurred. This informed the data regarding herd size and comparisons between village and urban cattle management practices.

Transcripts were typed out, either by myself or by a paid transcriber and checked against handwritten notes I captured during interviews. I attended a course at the University of Oxford IT Centre to learn how to operate NVivo software and had planned to analyse transcripts using key word searches with this program, but after consulting with other DPhil students about their experiences with the program—which they found frustrating and unreliable—I chose to code manually in Word documents adding colour coded highlights in the document and annotated comments in the margins. Key themes coded for emphasis from a descriptive coding cycle were: *plastic, pollution, trash, rubbish, purity, the sacred, welfare, management, hybrid, native, urban, village, countryside, economic benefits, family heritage, tradition, wealth, cow intelligence, and rituals*. This initial coding cycle was used to generate data from which themes emerged. Once themes were identified, a further theoretical coding cycle was conducted from which overarching theme of plasticity was identified. Then further categories emerged related to plasticity as a unifying theme, such as the aesthetic and spiritual role of cattle in cities and the benefits of cattle for human health, which informs Chapter Four. Cultural perceptions of plastic held by research subjects—versus concerns about the material toxicity of plastic in environmental health literature—informs Chapter 7. Farmers' observations about cattle as members of households and cattle intelligence inform parts of the multi-species ethnography in Chapter 6.

3.5.3 Analysis of multi-species methods

Some experimental methods conducted for multispecies ethnographic methods—such as a cow's path through the city—did not have clear methodological precedence for analysis, nor can such a small sample size in one city be considered a proper representation of all cow's

urban experience. Analysis was conducted in the spirit of what (Hinchliffe et al., 2005) describe as 'writing "around"' an animal subject. Their description of this approach is as follows:

> Learning water vole writing involves rapid movements between texts, descriptions, field signs, conversations, comparisons, finding similarities, explaining differences, and so on, to be a good reader [of a more-than-human subject] requires of form of expertise that can combine multiple indications of presence, a looser kind of sense, a knowing around water voles, a diagnostics, and a diagramming (Hinchliffe et al., 2005, p. 648).

I also employed descriptive coding for journal entries and photos, and an ethological type chart to compile data from my field notes and Live Trekker™ app. This tracked the amount of time a cow spent grazing for grass and foraging at the trash heap, time spent alone, in the company of other cows in her herd, and the rare instance of cow conflict.

3.6 In Conclusion

This chapter outlined the methodological approach to research conducted on plasticity and urban dairy cows in Mysore, Karnataka. This topic is analysed in this thesis through various approaches that include: representational analysis of cattle and their symbolic function in India (Chapters 4 & 5), ethnographic and multi-species methodological approaches to urban farmers and dairy cattle (Chapters 5 & 6), and a biogeographical and political ecology approach to better understand cattle-plastic entanglements on the urban landscape. To facilitate this multi-faceted analysis of the urban cow, this study implements a qualitative multi-methods methodology.

The rationale given for this study explains why urban dairy cattle and their consumption of plastic pollution are an important topic of study, not only for cattle welfare

concerns, but also for wider public health implications, and why Mysore proved a fitting location for this research. An overview of methods used included historical and archival research, interviews, and multi-species methods, with a discussion of the benefits and challenges of more-than-human methodologies. Then followed a discussion of my positionality and reflexivity as a developer and writer of a human and more-than-human study. Finally, a summary of data analysis was presented.

The following chapter focuses on the research question: *Why do cattle persist in India's cities?* In it, I examine the plasticity of the cow a symbol of cultural identity that informs her role in contemporary Hindu culture and her 'place' in society and space.

Chapter 4: The History of Cow Protection Discourse and Anthro-Animal Identities

Man through the cow is enjoined to realize his identity with all that lives.

-M.K. Gandhi

4.1 Introduction

This chapter examines how cattle in India have come to inform Hindu identities in ways that shaped India's colonial and post-colonial histories. The concept of anthro-animal identities will be proposed as a theory that describes how cattle—as one example—help construct human identities. It works to explain differing expectations of livestock and why they inhabit different places—rural, urban, and industrial—in different cultures. The cow's role in India's history, in which Hindus, Muslims, and British all conceived the cow as having different meanings, also touches on the concept of plasticity in which anthro-animal identities differ due to context, individual positionality, and historical time period. The identities humans form with and through animals reveal insight into human values toward animals, as well as how animal agencies shape human culture. In this sense the cow can be understood as 'plastic'.

I propose anthro-animal identities as a concept that defines how beliefs about an animal are used to internalize and reproduce human cultural identities and facilitate human inclusion into a group. Antho-animal identities separates locating agency within animals themselves and places the agency in the force of individual or collective human beliefs about animals. The qualities or attributes of animals used to create human identities can inform competing ontologies about an animal. These beliefs may be based on an animal's charisma, a

mix of human instinct and understanding about an animal, and the animal's ontological relationship with humans (Lorimer, 2007, p. 108). Anthro-animal identities may, in turn, inform perceptions about other human social groups and their treatment of animals. This plastic nature of anthro-animal identities is one way 'political animals' (Hobson, 2007) assume roles in human societies. Beliefs about certain animals can also hold more relative power in networks of human or animal social groups. Hovorka (2018) calls this 'animal power' and states, '[a]nimal lives are shaped by their power relative to other animals, as enmeshed with human relations and orderings in hierarchical networks (p. 5). These hierarchical multi-species networks—through which animal power exerts force—include human social groups. While humans retain asymmetrical power over animals, at times human groups associated with certain animals are bound up in inequitable relationships with other humans, as is the case with how beliefs about the sacredness of cows contributed to the marginalization of Muslims in late colonial and post-colonial India, which inform current attitudes toward cows as emblems of Hindu Nationalism.

The cow is an emblematic example of anthro-animal identity in the case of Hindu nationalism. Beliefs about cows—specifically referring to female Bos taurus and Bos Indicus species—have more social 'power' than bulls, oxen or dairy buffalo in this context, and these beliefs about cows assume a religo-political agency in helping to define and create frictions between social groups in India. The plasticity of competing interpretations of cows that inform anthro-animal identities will be explored through their role in both the Hindu Nationalist movement and Ayurveda, the traditional system of Hindu medicine.

Before discussing the historical role of cattle in the late colonial period in India, I will briefly outline contemporary perceptions of cows that are held by some, but not all, Hindus.

These beliefs about cattle inform the country's politics, and inflame tensions between Hindus and Muslims.

In a religious sense, the cow is viewed as a cosmic mother, a source of nourishment, spiritual and material abundance and care for humans, as well as an entity that bestows blessings upon humanity. In this manifestation, she is known as *Gomata* or *Kamadhenu*—the wish-fulfilling cow that remains a source of iconography in popular culture, such as business names or figurines sold in giftshops and airport duty-frees. For some Hindus, actual cows are the embodiment of the divine mother cow and when a devotee makes some small offering of food or even just touches the cow's head or tail, it is enough to receive a cow's blessing. The cow is also associated with the popular god Krishna and other followers of Vishnu including Hare Krishnas. Importantly, cow protection is championed by high-caste Hindus, who are also influential in India's economic and political decision-making.

The cow is a source of religio-political identity for many Hindus (Narayanan, 2018b). She is a symbol of a Hindu homeland and Hindutva (Hinduness) (Noronha, 1994) that initially helped to define a unified Hindu identity and has become a post-colonial symbol of Hindu Nationalism in today's political landscape—which has taken a nationalist turn of late. High caste Hindus promote the belief that the cow is inviolable, or un-killable, and recent legislation has strengthened anti-slaughter laws in some states, as well as increased sectarian conflict.

The cow is also promoted as a pure and purifying entity in Ayurvedic medicine, an indigenous system of ancient medicine from South Asia that has been part of Hindu tradition. 'The five cow products' (milk, curd, ghee, manure, urine) are promoted as having medicinal properties for humans and also applications in agriculture. Cow's milk products are promoted

as vital sources of vegetarian nutrition that provide protein but also are especially nourishing for the young, weak, or elderly. Advancements in dairy science have helped to increase the number of milk cows in India, and its dairy industry has become the largest in the world, which has highlighted the cow's importance in the economy.

While the cow has been important to the agrarian cultures of South Asia and worshiped by many groups, it has only since the mid-1850s that she has become a prominent symbol of Hindu identity. Tracing the recent historical trajectory of the cow's significance in Indian culture is the main purpose of this chapter. This provides an analysis for how animals factor into the construction of individual and cultural identities, and also serves to shed light on why the cow remains a prominent fixture on so many of the nation's city streets.

The body of the chapter focuses on the role of cattle in India's history from the mid-1850s to the years leading up to partition. During this time, the cow became a pivotal figure whose protection was promoted by three prominent social reformers in the Hindu Nationalist movement: Dayananda Saraswati, Mahatma Gandhi, and the organizers of the Bombay Humanitarian League, who helped shape a Hindu identity distinct from Muslim and British identities and values. Then follows a discussion of how this led to the cow's use as a catalyst to territorialize India as a Hindu homeland and to unite rural and urban, high and low caste Hindus around a common cause. The focus then shifts to how the belief in the cow as a pure and purifying entity may have played a part in perceptions of sanitation that differed from Anglo nations around the turn of the 19th century, which has helped to keep the practice of urban dairy farming alive in India. The conclusion returns the discussion to anthro-animal identities and their plastic nature.

4.2 Hindu Cow Protection Discourse in India's Late Colonial Period

Three social reformers—Dayananda Saraswati, Mohandas Gandhi, and the organizers of the Bombay Humanitarian League—were important during the late colonial period for elevating the cow and her protection as a central cause for the Hindu Nationalist movement. During this period, cow identities were constructed in contrast to Muslims and Anglo beliefs and uses for cattle. These irreconcilable contrasts illustrate the personal and social power anthro-animal identities potentially embody. These social reformers are introduced and discussed in chronological order. By the late colonial period, cow protection already had a long history in India amongst Brahmins, Jains, and Sikhs (Korom, 2000; Lodrick, 2005) but it was the writings of Swami Dayananda Saraswati (1824-1883) that first galvanized cow protection into a social and political movement. Saraswati was a Brahmin Vedic scholar and social reformer who founded the Hindu nationalist political party, the *Arya Samaj* (sankrit for 'Society of Nobles') and the Cow Protection Movement (Robb, 2008).

4.2.1 Dayananda Saraswati

Dayananda Saraswati's philosophic writings advocated for Indians to revive their commitment to Hinduism by returning to Vedic law, reclaiming their culture from outside influences. Written by Aryan nomadic herders and agrarians roughly between 1500-1000 BCE, the Vedas are considered foundational to Hindu belief. Saraswati's interpretation of Vedic Law appeared in his popular works, *Light of Truth* (Bhawan, 1975) a widely distributed

interpretation of Vedic Law, and *Ocean of Mercy (Dayananda & Prasad, 1889),* a plea for cow protection, and over 60 other works. Dayananda Saraswati is credited with the creation of the Hindutva ('Hinduness') mindset, which sought to establish India as the true homeland for Hindus—the 'true' descendants of India—the Vedic inhabitants who preceded Buddhist, Muslim, and British occupation and rule of India. His philosophic elucidation of the Vedas included a progressive interpretation of the caste system that was based on merit rather than birth, opposition to child marriage, and an 'orthodox' or conservative belief in the sacredness and inviolability of the cow (Bhawan, 1975).

The *Arya Samaj* was founded in Punjab in 1877. It was supported mainly by professionals who were educated in English and attempted to reformulate their indigenous traditions to withstand western criticism (Freitag, 1980b).[4] The Cow Protection Movement, founded in 1882, encouraged all Hindus to adopt the Brahman vegetarian diet, to prevent the slaughter of cattle by buying cattle otherwise destined for slaughter, to establish *Gaushalas* (cow sanctuaries) where cattle could live out their lives free from harm, and to advocate for policies that protected cattle (Freitag, 1980b; Parel, 1969). The pressure to adopt the practices of the Cow Protection Movement forced individuals of Hindu castes to align with the emergent and politically powerful liberation group (Freitag, 1980b) and created a growing intolerance amongst culturally diverse communities that had once coexisted peacefully (Jones, 2007). In the process, The Cow Protection Movement helped unite high and low castes and rural and urban communities under a unified Hindu identity (Freitag, 1980b; Yang, 1980).

[4] Though the *Ayra Samaj* was not the only Hindu liberation organization during this time it was the most notable and highly successful across northern India.

Saraswati's influential writings and advocacy established the cow as a symbol of Hindu identity in late 19th century India, and subsequently, the cow's role in Hindu identity politics was used to fuel communal tensions in the defining years leading up to partition. Historian Anthony Parel (1969) claims the Cow Protection Movement was initially more important than the birth of the Congress Party and thus the historical significance of the Cow Protection Movement during the late 1800s cannot be underestimated (Veer, 1994).[5] The Cow Protection Party's ideology remained significant throughout the early twentieth century and influenced the writings of Gandhi and the Humanitarian League, both secular reformers that continued the work of cow protection in their own manner.

Dayananda Saraswati was instrumental in elevating the social status of cattle during this time. He argued that beef eating and cattle sacrifice—practiced by those portrayed as invaders, both Muslims and British—was particularly troubling. The innate goodness of a cow and her devotion to humans were emphasized to remind Hindus of their duty to protect cows from harm and to abstain from eating cattle flesh. In his book *The Ocean of Mercy* (1889), a plea for cattle protection, he provides 'rational proof' for the sanctity of the cow:

> Rational proof – They regard and love us like our children and friends … They come to us at our mere look or call when they perceive danger … On their death their skin protects us from thorns … They sacrifice their body and soul for the defences of their master. Everything of theirs is for the happiness of both the king and the subject. Now, who can be more treacherous, more afflictive, and more criminal than the people who with knives cut the throat of the beneficent animals, the source of terrestrial human happiness, in order to stuff their stomach with their carcass to the irretrievable loss of the world (Dayananda & Prasad, 1889, p. 24)

Here Saraswati explains how the cow's social agency—largely symbolic in political rhetoric—arises from attributes the cow inherently possesses. He commends the cow for her

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[5] This legacy of cow protection continues today with the revival of the Hindu Nationalism, expressed through the BJP party and recent beef bans in the states of Marahastra and Haryana.

intelligence, love, devotion, and honour, which is seen to be communicated through her innate generosity to humans, both in spirit and material goods.

This passage goes beyond the rhetoric of animal protection in Europe and North America, which was grounded largely in utilitarian sentiment. Though vegetarianism was preached by some bourgeois animal rights activists and Christian missionaries in Europe and North America (Davis, 2008), it did not have the social cache or appeal that it did in India, where the philosophy of *ahimsa* (nonviolence toward sentient life) had been cultivated for centuries by elite castes. Because of the cow's inherent 'benevolent and sacrificing' qualities, Dayananda painted Muslims and Europeans that butchered cattle and ate their flesh as particularly barbaric, a rhetorical turn that placed Hindus as a more civilized culture in respect to their purportedly modern and sophisticated British colonizers. In this way the Cow Protection Movement gave Hindus—whose customs the British portrayed as primitive—the freedom to feel morally superior to their colonizers and entitled to reclaim their homeland.

The Cattle Protection Movement was successful in spotlighting the British and Muslim disregard for the sanctity of the cow to illustrate the manner in which these groups attacked the central tenants of Hinduism and the ability of native cattle to abundantly provide for Hindu farmers. The fervour over cow slaughter wrought by the Cow Protection Movement sparked riots between Hindus and Muslims, which occurred around the festival of Bakr Id[6]

[6] According to (Z. H. Khan, Chen, & Watson, 2015) 'The Bakr Id festival (also known as Eid-ul-Adha and Id-ul-Zaha) is the 'feast of sacrifice' that marks the end of Hajj. The Hajj is one of the Five Pillars of Islam and involves a pilgrimage to the Ka'bdh in Mecca. Muslims should make this pilgrimage at least once in their life if they are able to do so. The Ka'bah is a cube-shaped shine where the Islamic tradition says that, among other things, the prophet Ibrahim demonstrated his faithfulness to God by willingness to sacrifice his son Isma'il. God instead had Ibrahim sacrifice a ram as a substitute. Eid-ul-Adha commemorates this earlier event with the sacrifice of a sheep, goat, or other animal, and the meat is then eaten as part of a communal celebration. Not just the Hajjis, or those who make a pilgrimage to Mecca, are required to participate in Eid-ul-Adha. All Muslims should mark the end of the Hajj with the sacrifice of an animal. The meat of the sacrificed animal is then shared

nearly every year from the movement's inception until partition, amplifying tensions between Hindus and the British Indian government, which had difficulty managing the communal conflicts while navigating the growing sentiment for independence (Robb, 2008).

4.2.2 Mohandas Gandhi

At the turn of the century, amidst growing communal tension, Mohandas Gandhi advocated for cow protection because he believed the cow was central to agriculture and village life—both essential to the perpetuation of Hindu culture in his philosophy. Only ten percent of India's population lived in cities at the start of the twentieth century (Chandramouli, 2011) and agriculture was the main source of livelihood for more than two-thirds of the economically active population in South Asia under British rule (Roy, 2000). Gandhi believed that protecting cattle would preserve Hindu culture, prevent famine, and create a flourishing economy in a country where many people relied on cattle as part of their livelihoods (Burgat, 2004). The importance of the cow as the source of Hindu culture, the practice of *ahimsa,* and salvation of agriculture is alluded to in the following passage from Gandhi's 'Address to Villagers' delivered in 1940:

> The central fact of Hinduism is cow protection. Cow protection… takes the human being beyond his species. The cow to me means the entire subhuman world. Man through the cow is enjoined to realize his identity with all that lives…Not only did she give milk, she made agriculture possible. The cow is a poem of pity. One reads pity in the gentle animal. She is the mother to millions of Indian mankind. Protection of the cow means protection of the whole dumb creation of God… Cow protection is the gift of Hinduism to the world and Hinduism will live so long as there are Hindus to protect the cow (Gandhi, 1940, p. 36).

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with others—the poor, friends, and members of the family—in an event that should ideally strengthen communal solidarity.' (Z. H. Khan et al., 2015, p. 38)

Although the cow is central to Hinduism, according to Gandhi, he did not advocate for the cow to be used to oppress Muslims, yet the fundamental differences in attitudes toward cattle remain an unresolved tension in his philosophy. He held fast to the belief that cattle were the salvation of India (Parel, 1969).

India's farmers were encouraged to perpetuate a centuries old occupation that could provide an abundance of food for humans and replenish fields and forests with valuable cattle-dung fertilizer. This discourse elevated the status of cattle in Indian society, and I would argue, made more space for cattle in the social imaginary as well as on the landscape, whether rural or urban. Insight into the religious agency of the cow in the Hindu Nationalist movement aids in understanding the function of the cow in political and sanitation discourses in India. The following sections of this chapter show important contrasts to attitudes toward urban cattle during the Victorian and Industrial era in the west.

As an indigenous animal and a central part of the farming community, Gandhi saw the cow as an economic resource that could improve the lives of millions of farmers if they utilized all the cow products—milk, dung, and urine—and labour while alive, and after a natural death, farmers could capitalize on income raised from selling leather, gut, and fat biproducts (Burgat, 2004).[7] Gandhi's vision was based on the belief that villages and farming communities were the future of India. He did not foresee the rapid urbanization that would occur during the later half of the twenty-first century. The material importance of cattle encapsulated by Gandhi's philosophy remains important to the cattle protection movement today.

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[7] To conduct research on his vision for the future of cattle, he established his own model farms with experimental cow sanctuaries in which his vision for cattle wealth was practiced (Lodrick, 1981).

4.2.3 The Bombay Humanitarian League

Contemporary to and compatible with Gandhi's view on *ahimsa,* was the 'humanitarian movement', which sought the betterment of lives for vulnerable populations—such as women, children, minorities, and animals in the United States and Europe—and had a presence in India where the organization focused mainly on promoting cattle protection and the adoption of a vegetarian diet (Chakrabarti, 2010). The Bombay Humanitarian League was founded in 1910 by *Dayalankar Sri Lillubhai Deepchand Jhaveri* (friend of animals) and *Prir Mitra* (person whose ornament is mercy) and *Shri Jayantibhai Naradlal Mankar*. In their *Silver Jubilee Compendium,* The Bombay Humanitarian League described the manner in which they spread their message through 'propagandists' that gave lantern lectures in communities, sometimes attracting as many as 5-6,000 people per lecture, visiting cattle markets and, *Yatras* (places where large numbers of animals are sacrificed) to prevail upon the people not to sell the animals for slaughter and refrain from animal sacrifice (Horniman, Modi, Vartman, Khadilkar, & Mitra, 1934). As reported in the League's *Silver Jubilee Compendium,* by 1934 they were focused heavily upon animal sacrifice and cruelties to animals, the advantages of vegetarian diet, better treatment of animals, and cattle improvement (Horniman et al., 1934). The League also produced many publications including educational pamphlets and an annual book contest. A number of winning books focused on the importance of cattle and cattle protection. These titles include: *Romance of the Cow* (Jani, 1938) and *India's Cattle Problem* (Barad, 1937); these writings include references to both Gandhi and Dayananda Saraswati regarding their attitudes toward cattle and benefits of cattle products.

All three reformers aided in promoting a vision of the cow that informed human identities in powerful ways. Gandhi and the Humanitarian League both sought to end the abuse of animals, but held two contradictory positions about cow protection: (1) cows had utility as dairy, but not beef animals, and (2) the aim to end the sacrifice or slaughter of cattle, which they claimed could be a-political and support cow welfare. Claim one has created a condition where cows continue to be bred for dairy production indefinitely, without solutions for how male cattle and retired dairy cattle will be cared for until the end of life. It is both financially and ecologically impossible for the nation to breed cows and care for them until the end of life. This situation remains problematic today and has resulted in a formal dairy market and a largely informal beef market (Narayanan, 2019b). The second claim overlooks the force of identity politics that surround the cow. It is impossible to honour the religious and economic freedoms of Muslims and work to end the sacrifice and slaughter of cattle in India while remaining apolitical. The symbol of the cow moved beyond the visions promoted by social reformers, led to sectarian conflict, and played a role in divisions between Hindus, Muslims, and the British that ultimately led to the partition of India. The following section discusses the ways in which Cow Protection rhetoric led to the territorializing of identity and space in the late colonial era.

4.3 The Cow and the Territorialization of Religious Practice

Gandhi had hoped his argument for *ahimsa* via cattle protection would serve as the basis for a universal ethic embraced by people of all religions, and lead to the unification of India. The Bombay Humanitarian League also promoted this idyllic vision of India's future, but the vision of an India unified by cattle protection was an unrealistic aim. The cow's power

as symbol strengthened differences between groups that had internalized disparate anthro-animal identities, further polarizing cultural groups that had growing discontents with one another.

This passage from *Romance of the Cow* (Jani, 1938) summarizes the idealized sentiment that cow protection could unify disparate groups across India. This articulates the basis for a universal ethic toward cattle sanctity that might be realized through the recognition of cattle's indigenous connection with the landscape:

> India, with its so many nationalities and communities cannot have one religion. It has several of them. But viewed in the above light, one can see that besides having one's personal and communal religion, the land must have one common religion—that is the National Religion respecting the Geo-Economic condition of the land. If this one National religion *Samashti Dharma*[8] comes into operation it may crystalize the colloidal and amorphous mass of dissent sects, casts and creeds. Awakening of National consciousness in the land, becomes the clearing of the ground for the National Religion—all embracing and all-pervading Ecoreligion (Jani, 1938, p. 12).

The belief in cow sanctity as a practice that could unify various religious communities mirrored Gandhi's vision for the future of India and shows how intimately tied cow protection is with socio-ecological constructions of territory and space. Played out in the politics of The Hindu Nationalist movement, the acknowledgement of the cow as a progenitor of a true eco-religion could easily be used to privilege the right of cow-worshippers over those who failed to acknowledge the sanctity of the cow.

While cow protection failed to unify Hindus, Christians, Muslims, and other groups, cow protection did, at times, succeed in unifying groups of Hindus. The cow's ability to unify low and high castes and rural and urban communities in late colonial India was contrary to the division of lower and upper class and rural and urban territory that occurred in Europe and

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[8] Truth for the entire creation

North America (Philo, 1995) during the same time period. The Cow Protection Movement had a significant impact in defining cultural identity and territorializing religious practice based on a person's relationship to cattle. Before this time period, individuals were identified by the community or caste group they belonged to—rather than the broad categories of *Hindu* or *Muslim* (Robb, 2008). The tension over cow protection created conditions in which communities began to identify themselves more strongly with religious identity than with caste—as either for or against cow protection. Historian Sandra Freitag makes the argument that The Cow Protection Movement was uncommonly successful in uniting Hindus, because cow protection was a platform that appealed alike to traditional, orthodox, and reformist Hindus and the movement's focus on rural outreach united urban centres and their rural surroundings (Freitag, 1980b).

One strategy the Cow Protection Movement used to appeal to Hindus across various castes was the symbol of the cow as mother. Kamadehnu, mother cow of all cows, with eighty-four Hindu gods illustrated on her body, was a common image depicted in cow protection propaganda. Various versions of the image were printed by propagandists during this time. 'The Cow with 84 Dieties' (Figure 4.1) image was distributed by preachers in pamphlets and displayed at Cow Protection Meetings (Freitag, 1980a). The image is described by Christopher Pinney (2004) in *Photos of the Gods* as such:

> The figure with drawn sword is clearly labelled in the image as representative of the *kaliyung,* presumably the demon *Kali.* The caption above his head reads *he manusyaho! Kaliyugi mansahari jivom ko dekho* ('mankind, look at the meat-eating soul of the kaliyug'), and the figure in yellow (labeled as *dharmaraj*[9]) beseeches him with the words *mat marogay sarv kajivan hai* ('don't kill the cow, everyone is dependent on it') (Pinney, 2004, p. 108).

[9] 'King of truth'

Below the cow a milkman serves milk to men representative of Hindu, Christian Parsi, and Muslim faiths, with the slogan 'drink milk and protect the cow' (Freitag, 1980a), which could be interpreted as conveying a communalist message. But this particular image invoked controversy. The Ravi Press' 1912 image 'Cow with 84 Deities' was described in detail in more than one British memo and credited with fostering tension between Hindus and Muslims. The demon that threatened the cow with his sword was widely interpreted as portraying the Muslim community by the British, who noted Muslims took offence to even the rumour of the image (Pinney, 2004).[10] Another version of the image was printed vertically and edited out the *Kaliyug,* but retained the cow's Hindu protector.

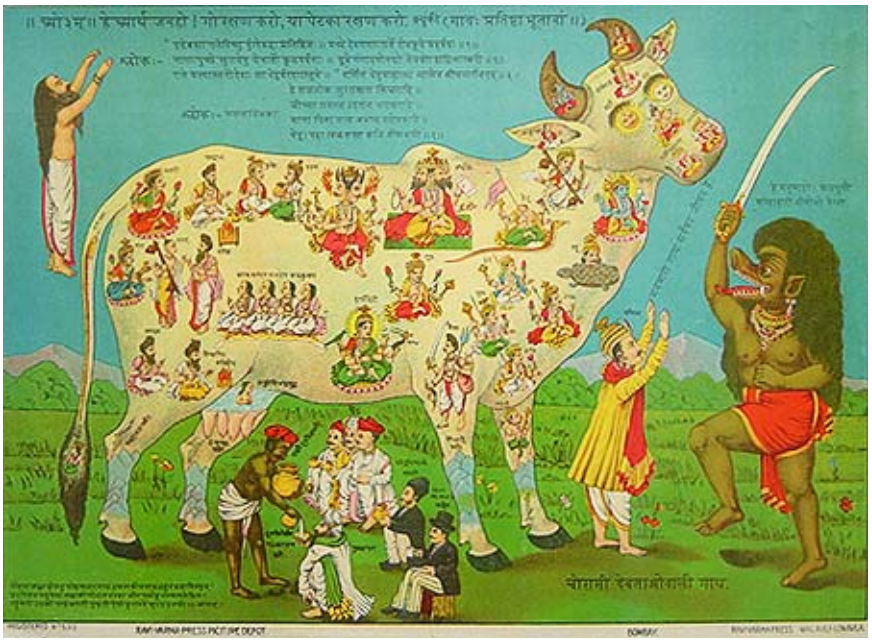

Figure 4 a. Chaurasi Devata Auvali Gav (the Cow with 84 Deities) c. 1912, Ravi Varma Press.

[10] As part of a response to the Earl of Kimberley's question as to why disturbances were becoming more frequent than in previous years, the Marquess of Lasdowne described the image of Kamandehnu depicted in Figure 1: 'Another [image] exhibits a cow, in every part of whose body groups of Hindu deities and holy persons are shown, being assailed by a monster with a drawn sword entitled the Kali Yug but which has been largely understood as typifying the Muhammadan community' (Pinney, 2004)

The image of the divine mother cow deity in danger of having her throat cut played on powerful tropes of the time. The cow is the symbol of abundance and connects the metaphysical world of the gods to the landscape through the physical embodiment of a cow. The cow provided so much to agrarian livelihoods she became a surrogate mother to all. As Freitag (1980a) states 'As every man drinks cow's milk just as he as an infant has drawn milk from his mother, the cow must be regarded as the universal mother, and so is called 'Goa Mata'. It is matricide to kill a cow. Nay more, as all the gods dwell in the cow, to kill a cow is an insult to every Hindu' (p. 609). The mountains represented on the legs of 'The Cow with 84 Deities' mirror the mountains might be interpreted as representing India as the Vedic homeland.

Historian Charu Gupta claims the invocation of *Gomata* 'mother cow' quickly became associated with *Bharat Mata,* mother India, in Hindu Nationalist rhetoric and he states the following:

> Cow imagery was also important because of the cow's association with domesticity. She was seen as a foster mother, and an integral part of India's family life. Like the woman at home, the cow was a 'domestic animal,' and both the woman at home and the domestic cow proved potent mothers. Like the women's breasts, cows' udders were a metonym for nourishment and livelihood. Milk flowed from both and both signified a domestic space where no outside invasion or penetration could be tolerated (Gupta, 2001, p. 4297).

As a mute and pliant female creature, the cow could take on a number of meanings in different contexts. She was a source of purity because of her association as a home of the gods and also as a creature of innocence that relied on humans for care. Her association with both domestic space and with 'mother India' in Hindutva rhetoric made the thought of harm to a cow an affront to Hinduness itself. Of course, the reality of a farm cow's life was far less idyllic. In reality, cows were very much like human mothers, but in the sense that they gave

much, while receiving little in return.[11] Regardless, the symbol of the cow was successful in bringing together previously diverse groups of Hindus, while deepening divisions between Hindus and the British and Muslims. The discord sewed between Hindus and Muslims over cow protection resulted in rioting at times and even the loss of human life. In the extreme instance when Hindus and Muslims resorted to violence in riots over cow protection, the rights of Hindu beliefs about cattle were defended above even the right to life of other humans. In a less idealized interpretation, riots over cow protection were motivated by xenophobic sentiment and cow protection merely became a trigger for already contentious relations between two groups. Even so, the symbolic importance the cow assumed to Hindus during this era remains nearly unfathomable from a western point of view, and the unique importance of cattle to Hindus in religious, political, and economic contexts continues to this day.

The symbol of the cow as linked to *Bharat Mata* or Mother India had two unique outcomes that differ significantly from attitudes toward cattle in Europe and North America at the time. The cow was promoted as indigenous to India along with her Hindu caretakers, and her presence upon the landscape was depicted as that of a creature that provided fertility, nourishment, and abundance to both the environment and humans. This perception of cattle gave them a special right to exist on the land as native and sacred entities. During the late colonial era cities were under a process of rapid urbanization. In 1911 it was estimated eleven percent of the population lived in cities. But after the 1920s, the urban population grew at a much faster rate: it increased by 19 percent (or double the growth rate of the rural population)

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[11] I first heard this statement from an Indian scholar and guide in Varanasi when I travelled to India to study cows in 2009.

in the decade between 1921 and 1931; by 32 percent between 1931 and 1941; and by 41 percent between 1941 and 1951 (Haynes & Rao, 2013). If today's urban growth patterns are used as a frame of reference, outlying villages would have been consumed by rapidly growing urbanization, and village practices, like cattle keeping, would not have immediately changed. This is the case today in India's cities like Delhi, where 'urban villages' exist within the rapidly expanding infrastructure of modern cities (Mehra, 2005). These villages maintain local *panchayat* governance and are allowed to continue village industries, such as dairy farming (Mehra, 2005), which makes distinctions like 'urban' and 'rural' less about territory—in or outside of the city—and more about practice. Urban cattle in late colonial India became part of the modern and hybrid twentieth-century city.

I would argue that the sentiment of the right of a cow to exist on the landscape in India, especially as a dairy cow, informs the practice of keeping urban cattle in India today. For example, in an interview with the Animal Welfare Officer for the city of Mysore, he expressed his feeling that keeping cows in the city might not be best for their welfare 'But you cannot tell anyone here [in the city] they can't keep cattle' (28 September, 2015). And even in India's largest cities, like Delhi, where cattle create significant traffic jams and laws have been made to ban cattle, farmers bribe police to turn a blind eye so they can continue keeping dairy cattle (Baviskar, 2011). The tolerance for cattle to inhabit India's cities where they slow or impede traffic when they cross roads, defecating on public sidewalks, may well be informed by sentiments toward cattle cultivated during the late colonial era. A tolerance for urban cows may also be informed by the perception of the cow as a pure and purifying entity as promoted in Hindu worship and Ayurvedic medicine in the late colonial period, which may also have altered sanitation discourse and policy in India—the focus of the next section.

4.4 Sanitation Discourse and the 'Five Cow Products'

During the late colonial period, Ayurveda, a traditional system of Hindu medicine, experienced a revival. The *panchagavya* is a branch of Ayurvedic medicine that translates to mean: the five cow products—milk, yogurt, ghee (clarified butter), dung, and urine. The following section will discuss how the *panchagavya* created conceptions of pollution and purity in regard to cattle that differed significantly from Anglo concepts of animal feces as sources of filth and contagion. As part of Ayurveda, the *panchagavya* is included in this system of indigenous Hindu medicine that witnessed a revival in India in the late nineteenth century, in no small part due to the Hindu Nationalist Movement. Using the writings of Dayananda Saraswati and the Bombay Humanitarian League, I will argue the Hindu belief in the cow as spiritually and materially pure, expressed in literature that addresses the *panchagavya,* may inform a more tolerant attitude toward cattle 'filth' generally, but especially in cities, particularly amongst some Hindus. To provide a context for the discussion, I will compare the state of urban sanitation practices in EuroAmerica and India.

The late nineteenth century and early twentieth century was a time of medical discovery and innovation regarding filth, microbes, and the nature of contagion. This shaped perceptions and behaviours toward individual and public sanitation across the world, especially in cities where large populations of humans and waste were concentrated. Reports in Britain and America reveal that animal manure added considerable amounts of waste to cities, which, before public sewers, added to problems encountered by the disposal of human rubbish and faeces. At the time, livestock manure was considered a valuable fertilizer in EuroAmerica (Atkins, 2012c) and India (Prashad, 2001), but logistical problems with storage and transport meant that livestock manure added considerably to the unpleasant odour created

by concentrated amounts of animal waste, pools of sewage, animal carcasses, decaying vegetation, and poor ventilation that existed in cities. Animal faeces were also recognized as a notable vector for contagious disease (Atkins, 2012b; McFarlane, 2008; Prashad, 2001), and urban livestock came to be viewed as a risk to public health during this era. For instance, New York City outlawed pigs because of cholera outbreaks and by 1860 they had been removed from the city (Mizelle, 2010). The city of London also created regulations for urban dairies that required dairies to offer more space and fresh air for cattle (Atkins, 2012b) until eventually phasing out dairies entirely. Cities in Europe and America installed sewage systems to manage human waste and the idea of the city as a faeces free and hygienic landscape became a defining feature of the modern western city (Gandy, 1999; McFarlane, 2008).

In India, British officials were aware of the problems encountered by the lack of sanitation in 'contaminated cities', where the poor bore the highest risk of disease (McFarlane, 2008). Because the majority of the British Indian government's budget was spent on the military, little money was left to address sanitation problems in India's numerous and growing cities. British city planners created 'island spaces' for Europeans and the wealthy to live in—sectioned off areas of the city where infrastructure and space minimized the risk of exposure to contagious disease (Haynes & Rao, 2013; Kidambi, 2007; McFarlane, 2008; Prashad, 2001). Meager sanitation budgets were spent on educating urban residents, who often times were blamed for being 'unwilling to learn', despite the fact they lacked access to the infrastructure of sanitary facilities and therefore the means to change their behaviours (McFarlane, 2008). In the midst of these sanitation struggles, the cow remained a spiritual and materially pure creature for those Hindus that believed in her sanctity. The literature that

addressed the *panchagavya* during the late colonial period may add an additional perspective to the role of the cow in the modern Indian city, one in which manure is a hygienic, medicinal, and pure substance, making it of less consequence for native citizens who faced many other challenges in the city.

Ayurveda, which means 'the knowledge or science for longevity' (Wujastyk, 2003) is the indigenous Hindu medical system. Evidence from Sanskrit texts suggests that Ayurveda originated before the reign of the Buddhist Emperor Ashok, giving evidence that it originated during the Vedic period (Wujastyk, 2003), a point Dayandanda Saraswati evoked to encourage Hindus to revive their native systems of medical wisdom from that time (Bhawan, 1975). Ayurveda utilizes preventative and prescriptive practices to balance the body's systems or *doshas* with the use of medicine made from parts of animals and plants and all manner of therapies. Historically, Ayurvedic medicines were made locally using local ingredients, medical knowledge was passed down from master to apprentice (Islam, 2012), and it was practiced at the local level of village or family and had little to do with state structures (Berger, 2013). Early in British rule, the practice of Ayurveda was discouraged and the British established their own hospitals and medical colleges of Anglicized medicine.

During the late colonial-period Hindu Nationalists advocated for the revival of Ayurvedic medicine with some success. At the same time, the British Indian Government began to embrace Ayurveda as an affordable form of health care for native-born government employees, which led to the establishment of Ayurvedic medical colleges and hospitals (Bala, 2015). Courses in Ayurveda even appeared in British medical colleges (Berger, 2013). Initially, the nationalist movement popularized Ayurveda as a healing system that reclaimed the right to Hindu identity as a form of resistance to British medical institutions, but the

adoption of Ayurveda by the Congress party also led to its institutionalization and many Ayurvedic practices were standardized and legitimized using Anglican scientific idiom (Berger, 2013). Yet, there remains a part of the *panchagavya* that cannot be captured solely by the empirical terminology of western medicine.

The *panchagavya* utilizes the five cow products individually or in mixtures with minerals and herbs to treat all manner of human ailments. Milk was renowned for its metaphoric purity 'an ability to ward off sin,' as well as 'its other functions, reflected in nature in its physical purity' (Zimmerman, 1999, p. 221). Milk, butter, and ghee have been routinely used in ritual worship and often poured over statues and deities in purification rites (Simoons, 1974). Viewed from a medical perspective in Ayurveda, milk is a source of nourishment, vitality, and fertility (Bhawan, 1975). A similar mix of metaphysical and empirical purity applies to cow dung and urine. Jani, the author of *Romance of the Cow*, uses lofty language to describe the purifactory role of cow urine and dung as follows:

> Every part of [the cow's] body is inhabited by some deity or other. Every hair on its body is Inviolable. All its excreta is hallowed; not a particle might be thrown away as impure. On the contrary, the water it ejects out to be preserved as the best of holy waters—a semi-destroying liquid—which sanctified everything it touched, while nothing purifies like the cow-dung (Jani, 1938, p. 24).

Dung and urine are viewed as both spiritually and materially pure in this context. For example, native *zebu Bos Indicus* cattle urine has been promoted as a cure for a variety of conditions and ailments including: gastric troubles, wounds, asthma, psoriasis, eczema, heart attack, blockage in arteries, fits, piles, prostrate, arthritis, migraine, thyroid, ulcer, acidity, constipation, and gynaecology problems (Choudhary & Goyal, 2015). To a western audience, the ingestion of cattle manure and urine by humans may appear particularly detestable, but for high caste Hindus, such as Brahmins, the cow and her secretions were pure in every respect.

The cow assumed significance in a caste system with a myriad of rules governing pollution and purity, even regarding who people could interact with and what they could eat to remain spiritually pure (Simoons, 1974). By the 1930s, there was interest in understanding the purifying function of dung and urine using the methodology and language of Anglican science.

The hygienic properties of cow urine and manure were noted early on in an 1895 British report, *The Cattle of Mysore* (Kristnasamiengar & Pease), in which the authors remarked that cow dung was believed to have antiseptic properties and was used for treating wounds. Forty years later in the Bombay Humanitarian League's book, *Romance of the Cow (1938),* Jani devotes a chapter to the health benefits of cow dung and urine. Manure is described to have antiseptic properties that heal wounds and absorb tuberculosis microbes if spread upon walls and floors of village houses. This explanation expands at times upon a Pasteurian understanding of harmful microbes. Cow urine and dung are extolled for their antiseptic properties that can overcome unclean or pathogenic conditions. Medical research (from Northern Ireland and the United States) is presented to describe the anti-bacterial and medical properties of urea, which are reported to inhibit the growth of bacteria and stave off advanced heart failure from its diuretic effects (Jani, 1938). He also noted that Dayananda Saraswati instructed the readers of *Light on Truth (Bhawan, 1975)* to keep their kitchens clean by routinely applying a thin layer of cow dung. Jani's dexterity in describing the antiseptic properties of cow dung from studies conducted in Europe and North America, go a long way to bridge cultural understandings regarding cow excrement which a western reader of *Light on Truth* may have felt.

In this manner western science was appropriated to promote the cow as an agent of purity rather than pollution, one that promoted 'good' microbes over bad. In this manner manure may be likened to Paxson's post-Pasteurian theory in which beneficial bacteria are not only helpful microbes, they are essential to the process of cheese making (Paxson, 2008). It also may explain why many Indians freely touch manure with their hands when cleaning cow manure from stables, and mixing it into building materials, cooking fuel, and compost—all activities known as 'dung work' (Jeffery, Jeffery, & Lyon, 1989)—or using it in ritual worship (Simoons, 1974).

The relationship to cattle manure and urine described in these texts radically differs from the discourse on manure in Europe and North America during the same historical period. Despite the fact that cow manure was a valuable source of fertilizer for farms that encircled large cities like London (Atkins, 2012c), cow manure was largely viewed as a nuisance. Its noxious odours contributed to the unpleasant olfactory experience of the urban landscape in pre-sewer cities, and after Pasteur revealed microbes could pass diseases between livestock and humans, cow and pig manure became increasingly viewed as a serious public health threat. Advances in transportation made it more practical for cattle and other livestock to be moved out of cities with their meat and milk products shipped back to consumers on train cars. It is important to point out that India also had an extensive train system—contemporary to those in Europe and North America—yet agriculture did not undergo the same process of industrialization, nor were livestock moved out of cities.

Cow urine and manure were promoted as pure fonts of human health in the literature of *panchagavya*, but concerns about manure as a source of sanitation and public health problems certainly existed in India at the time. Outbreaks of cholera, malaria, and even the

plague occurred in India during this time period, and medical institutes in India conducted cutting-edge research on vaccines using the practice of vivisection more freely than in Europe or the United States, where the inhumane practice incited much controversy (Chakrabarti, 2010). One report by the Bombay Humanitarian League entitled 'What Causes the Epidemics? Conditions in the Bombay Milch Stables' identified poorly managed buffalo dairy farms for contributing to the malaria outbreak in Bombay (League, 1922). But overall, the conversation around cattle manure took a different tone in India than it did in Europe or North America. Cow manure may have posed less of a nuisance in India than it did in the west because it was widely used for many purposes. In one *Times of India* op-ed from 1938, the author points out that soil quality remained poor in India because much of the cow manure was used as fuel and there was little left for fertilizer (T. T. o. India, 1936). In addition to cooking fuel and fertilizer, cow manure and urine were also promoted for use as medicine, cleaning products, and pesticides (Jani, 1938).

Today in India, certain groups continue to promote the antimicrobial and antifungal properties of cattle manure and urine, which, alone or in mixture with herbs and minerals, are purported to improve the presence of beneficial bacteria (Girija, Deepa, Xavier, Anthony, & Shidhi, 2013). Cow manure and urine continue to be used in house cleaning products, agricultural preparations—that increase soil fertility or to repel pests--(Joseph & Sankarganesh, 2011; Vallimayil & Sekar, 2012), and in numerous human health products. Recent scientific trials have been conducted on cow urine's ability to aid chemotherapy patients (Randhawa & Sharma, 2015) and another study documents a *panchagayva* mixture's ability to remediate pharmaceutical, pesticide, and petrochemical wastes (Randhawa & Kullar, 2011). Some of these products are manufactured at *Gaushalas* where they are used as

an income stream to support the care of cattle to the end of life. Dung from cattle is also important to biodynamic and zero-budget farms that utilize native cow dung as a prized fertilizer (Münster, 2017b) and cow dung continues to be made into cooking fuel and fertilizer by hand as 'dung work', which in certain communities is gendered labour (Jeffery et al., 1989). While it may be the work of poor laborers, I discovered evidence that cow dung still has significance for upper class Hindus. I was told by an affluent man of the Brahmin cast that food cooked in a cow dung fire remained the best and purest way to cook food, followed by a gas stove, and then the microwave. Dried cow dung continues to be burned as purifying incense in Hindu rituals and one retired army brigadier—who runs a prominent *Gaushala* outside of Delhi—believes in the restorative power of cow dung. He has even positioned himself under a specific cow so that her manure would fall upon him, which gave him a unique 'vitality'.

The role of the cow in Hindu Nationalism and Ayurvedic medicine elevated the status of cows in society and, I would argue, upon the landscape. Certainly, in contrast to attitudes toward cattle and their manure in anglicized societies, the *panchagavya* may have created more goodwill—or at minimum a tolerance—for cattle and their excreta in cities, especially amongst high caste Hindus that have held more power over city planning and policy decisions governing urban space.

4.5 Plastic Cows and Anthro-animal identities

This chapter closely examines the manner in which a cow assumes multiple meanings and the ways that humans construct identities with and through animals. The first meaning of

‘plastic cow’ proposed through this research illustrates the ways in which humans project ontological beliefs, meanings, and epistemological inquiry upon animals. Our understanding and treatment of animals is deeply tied to human beliefs about our relationship with the natural world, human identities, and relationships of power between human and non-human. Anthro-animal identities also inform the creation and reproduction of social-spatial relations of animals and humans. In this sense, cows are illustrative of Hovorka’s (2018) concept of animal power in which power is co-constituted between human and animals in multiple ways. These relationships and identities are plastic in the sense that they differ between social groups and, as social constructs, can change.

For the social reformers of late colonial India, the cow became a vehicle to convey a message about cultural values, identity, and place—not only regarding cattle, but regarding custom, health, and power between different cultural groups of the time. With the revival of the Hindu Nationalist Movement in India over the last decade, the ‘plastic cow’ remains an important feature of India’s political and spatial landscape. The Arya Samaj has evolved into today’s Rashtriya Swayamsevak Sangh (RSS) organization (Sarkar & Sarkar, 2016). The RSS is considered to be the ideological arm of the Bharatiys Janta Party (BJP), which is the current ruling party. Prime Minister Narendra Modi, espouses a cow protection platform and since his re-election cow protection has renewed violence between Hindus and Muslims. It is important to understand that India’s urban cows are not archaic vestiges of a culture. Instead India’s urban cattle are part of the fabric of ‘ordinary’ and modern cities (Robinson, 2006) in which practices of urban livestock keeping are informed by many factors including financial, technological, political, and health concerns (Adcock, 2010) and can constitute important networks and human identities (Hovorka, 2008).

The concept of anthro-animal identities proposed here describes how cows informed identity politics in the late colonial era. Differing beliefs about cows and their material utility and spiritual benefactions created deep cultural and political divides, separating colonizer and colonized, Hindu and Muslim. In turn, these identities contributed to the territorialization of space in South Asia. The plastic nature of beliefs about cows reveal that anthro-animal identities often inform human identities more than they provide definitive statements about the ontological or material nature of an animal.

The concept of anthro-animal identities adds to other scholarship on animals' roles in constructing nationalist identities. Related to understanding of anthro-identities in Hindu nationalism, Pandian's (2008) study of the Kallar caste in post-colonial Tamil Nadu analyses the biopolitical history of human and animal governance in the region. The Kallars were considered a 'thieving' caste by the British and were governed through various methods of pastoral power that Pandian compares to the human treatment of animals. While animal characteristics were projected onto humans, the Kallar herders—the focus of his anthropological study—describe their cattle in ways comparable to the discourse applied to 'animalizing' the Kallars themselves—as thievish and lazy. The herders implemented a pastoral means of governance over their water buffalo or oxen in ways that echo human forms of pastoral governance. Like Pandian's study, this research also seeks to place flows of power between human social groups and animals into an historical context, in which anthro-animal identities sometimes factor into ways human behaviours are formally and informally disciplined.

Narayanan's theory of 'casteized speciesism' is another concept deeply aligned with anthro-animal identities. Narayanan asks 'what does the politicization of the bovine body

mean for the cow?' and argues that contemporary cow protection discourse 'renders bovines vulnerable because it reinforces two compatible comparable oppressions "casteism" and "speciesism"' (Narayanan, 2018b, p. 1). Specifically, native breeds of Indian zebu cattle are burdened with representing Hindu purity and are the main focus of cow protection discourse and activism. Cross-bred cows and dairy buffalo—that make up the bulk of the dairy industry—suffer the exploitation and oppression comparable to the situation faced by Dalits. As discussed earlier in this chapter, if the cow is the representation of *Bharat,* (the original Sanskrit word for India) which Hindu Nationalism advocates is the Hindu homeland, it follows that native cows would be the main focus of religious protectionists, Hindu priests, and BJP politicians. Native or *Desi* cattle are victims to the same exploitations of other cattle in the dairy industry, but they hold more power as a political symbol than cross-breeds. The following chapter will look at the manner in which urban cows complicate the ways that Hindu Nationalist views are embodied and reproduced via the perspectives of urban dairy farmers and their affective and material relationships with hybrid cattle.

The material agency of cow products also contributes to ways cows informed anthro-animal identities in India. As Atkins writes 'We all have to eat, and though we don't have to drink milk or consume butter and cheese, their presence or absence in a diet tell us a great deal about the individual consumer and her place in society' (Atkins, 2017, p. xvii). This is especially true in India, where milk is viewed as a nutritious and sanctified food.

This work provides historical context for current geographic work on bovine nationalism in India by scholars like Narayanan, who analyse the ways cow protection discourse and policies directly contribute to the exploitation and suffering of bovines in India. Understanding the forces that informed the creation of the cow as a symbol of Hindu identity,

provides a background for why the cow is sanctified over male cattle and buffalo that do not have the religious function or legal protections that Narayanan's addresses with her concept of casteized-speciesism. Understanding the political history of the 'mother cow' in India also informs understandings of the sustained force of this religious trope, and how it contributes to rationalizations of the exploitation of 'sacred cows' (Narayanan, 2018a, 2019a). The paradox created by early reformers who promoted cows as a source of material wealth for Indians, without accounting for how an exponential number of dairy cattle would be sustained until the end of life, also has created conditions for todays 'sacred' cows to become beef cows (Narayanan, 2019b). Finally, an analysis of the *panchagavya* contributes to understanding how materiality, religious sentiment, and nationalism are bound up in human-cow relationships in ways that shape the dairy farmer identities that Govindrajan (2018) explores amongst villagers in Uttarakhand.

The following chapter changes the focus to the present day and considers reasons why dairy cattle persist in present day cities in India. Using data gained through interviews with urban dairy farmers the next chapter develops the concept of the urban animal pastoral to explain the economic, cultural and material reasons why cattle remain in Mysore.

Chapter 5: Mysore's Dairy Farmers and the Urban Animal Pastoral

Figure 5 a. A statue of Krishna as a cow herd stands atop a temple in Mysore's city centre near Deveraja Market.

5.1 Introduction

The previous chapter focused on how the cow has been used as a political tool to promote Hindu nationalist aims. There has been a resurgence in both Hindu Nationalism and cow protection rhetoric in recent years. This perspective offers one rationale for why cows have remained in cities. Missing from media and scholarship on cow protection is the perspective of urban dairy farmers, who are participants in formal and informal systems of cow breeding, management, and death. Research on this demographic may have been overlooked because it comprises a relatively small sector of the dairy economy, and the milk is sold largely in informal markets and does not contribute to India's GDP. The 2012

livestock census reported there were approximately 183 million rural cattle in India compared to roughly 7 million cattle living in cities (G. o. India, 2012, p. 16). The majority of urban farmers in Mysore are small-scale farmers with 2-10 cattle per herd, who keep dairy cattle as a sole or supplemental source of income.

The government subsidized breeding of hybrid dairy cattle (a cross between native zebu female cattle with western dairy bulls) has changed the demographics of cattle in India, with hybrid cattle on the rise and a decline in native cattle populations. Hybrid cows have also brought about changes for how village dairy farmers perceive narratives of Hindu Nationalism, the sacred cow, and bovine materiality (Govindrajan, 2018; Münster, 2017a). This research on Mysore's urban farmers provides increased understanding of how hybrid cows and their products factor into the function of urban cows in Nationalist discourse and embodied religious practice of farmers. In this sense, the plasticity of cow bodies has led both to a new type of cow in India as well as a new set of relations between farmers, cattle, and their products.

Dairy farming in India, as an industry, is a risky investment that operates on slim margins. Research conducted by economists has revealed that dairy farming is, in fact, a low yield investment for farmers, at least in the short term (Anagol, Etang, & Karlan, 2013; Economist, 2013). A study on rural farmers discovered that when labour was accounted for, a cow yielded a -64% on investment (Anagol et al., 2013) and according to farmers I interviewed, dairy farming in the city is more costly than rural dairy farming because of higher food and housing costs. Bearing these challenges in mind, what motivates people to be dairy farmers? And why do cows persist in cities with the added challenges and expenses of urban dairy farming and where landscapes that have sustained cattle for centuries are absent?

In response to these questions, I propose the urban animal pastoral as a concept that describes a set of socio-ecological relations between farmers and livestock in the city, which helps to better clarify the cow's affective, economic, and material roles on the urban landscape and in the lives of urban farmers. This chapter also introduces a concept of an urban animal anti-pastoral to discuss the cow's contested role in the city. The urban animal anti-pastoral examines instances in which some urban residents view cows in a negative light.

The pastoral is a multi-faceted concept that has evolved throughout history. The pastoral represents a rural and bucolic landscape, a set of ecological relations, and forms of livelihood and community that accompany rural occupations. The pastoral is also an imagined ideal—of a better 'Golden Age' in the past (Gifford, 2012)—and pastoral concepts inform idealized relationships between human, animals, and nature. For example, today's industrial farms and confined animal feeding operations (CAFOs) stand in opposition to idealized notions of a family farm and the type of intimate and caring relationships a farmer might experience with his or her land or livestock, representing the sensibility of the pastoral trope. Since the industrial revolution, the pastoral has become complicated and contested by modified versions of the theory, including an anti-pastoral, and a post-pastoral, in which the pastoral is reimagined to synthesize pastoral ideals with features of modern technology or landscape (Paxson, 2013). The concept of the pastoral that emerged from this study is not a European concept that is superimposed onto an Indian context, but is a version of the pastoral unique to India.

India also observes a long held literary tradition of the pastoral from religious texts and poetry. Although the pastoral trope has had small recognition in literary scholarship thus far (Mishra, 1998), it has still played an important role in cultural identity and nationalist

political ideals. The Vedas (1500-1000 BCE), written by pastoral herders, and additional poetry written about Krishna (Bryant, 2003; Mishra, 1998) are texts that invoke classical pastoral topes, which continue to inform people's perceptions about cattle and their importance in society today. For example, Gandhi promoted village life and industry as the salvation of India in the years leading up to partition, and it could be argued promoted a pastoral ideal—one that was contested by B.R. Ambedkar who was himself raised as a low caste man in a village, unlike Gandhi, and asserted an unromantic image of village life, which he accused of fostering localism, ignorance, and narrow-minded communalism (Nath, 2016). Through interviews with urban farmers, this chapter discusses ways the cow continues to play an affective role in reproducing certain forms of Hindu nationalist and religious sentiment in the lives of lower and middle-class dairy farmers in Mysore. These theories of the urban animal pastoral and urban animal post-pastoral give insight into economic and affective motivations for dairy farmers to continue with their professions despite its high risks, and give insight as to why dairy farming continues in the city.

The urban animal anti-pastoral challenges some of the premises of the animal urban pastoral described above. It first questions the suitability of the city as a habitat for cattle from an animal welfare position. The idea that the city is a space where cattle can freely chose food is challenged by the fact that cattle often consume unsuitable food when foraging in rubbish heaps. Cattle also block traffic and contribute unsavoury smells and flies to cities, and their place in the city is contested by a bourgeois environmentalist position (Baviskar, 2011). It also examines instances in which a narrative of the pastoral excludes other groups—especially Muslims—that do not participate in or benefit from the ideals promoted by a classical interpretation of the Hindu pastoral.

The chapter proceeds as follows. First, there is a discussion of the pastoral as a literary trope that emerged in ancient Greece, undergoing several formulations in the west, including the urban pastoral, post-pastoral, and anti-pastoral. I then discuss the pastoral in an Indian context and why animals are important to an Indian concept of the urban pastoral. In the third section, I focus on data collected through interviews with urban farmers to propose the five features of an urban animal pastoral, which describe attitudes toward urban dairy cattle in both its classical and post-pastoral expressions. The fourth section presents the anti-pastoral as a critique to some of the information that arose from this data, which questions the efficacy of raising cattle in the city and the Hindu narrative of the pastoral that helps to place cows in the city. The conclusion offers further thoughts and uses of the theory.

5.2 Introducing the urban animal pastoral in India: A post-pastoral concept

To arrive at an concept of an animal urban pastoral, it is useful to understand the evolution of the pastoral to see how it is configured in the present day—both to examine how animals may fit into the urban pastoral and the unique contribution an Indian context adds to a contemporary reading of the pastoral.

The pastoral thematic was identified in the *Idylls* of the Greek scholar Theocritus (316-320 BCE). His stories about a shepherds' song competition held during his youth in Sicily were read and performed to members of a royal court. The eco-critic Terry Gifford (2013) defines the classical pastoral that emerged at this early date, as a 'knowing paradox' that invokes several tropes. He describes them as 'nature and place as a literary construct, the poetic rhetoric of the herdsmen, retreat in order to return, the apparent idealization that might reveal truths, fictions that examine realism, [and] the guise of simplicity that is a vehicle for

complexity' (Gifford, 2012, p. 19). The pastoral also bridges differences between the social classes (Empson, 1950). Inherent in the pastoral are tensions between the city and nature, art and reality, and harmony and desire. These tropes have remained important to the mythic pastoral, despite the ways the concept evolved over time, as conceptions of rural, urban, and nature change.

The concept of the pastoral has been reconfigured many times since its inception in ancient Greece. In Europe and North America, the pastoral evolved different themes during the Renaissance, Romantic and Industrial periods that reflected different perspectives on the relationship between humans and nature, especially as technologies allowed humans and their industries to become increasingly invasive in natural landscapes (Gifford, 2013). During the industrial era, Leo Marx and Gifford argue, an anti-pastoral emerged. Anti-pastoral literature is defined by unidealized literature with an emphasis on realism that is often corrective of pastoral myths. Anti-pastoral literatures often focus on the exploitation of rural workers by powerful landowners. For example, in the novel *Grapes of Wrath,* Steinbeck describes the unidyllic work conditions on California's industrializing farms, experienced by laborers lured to California by the hope of a better life in an Arcadia-like promised land. As India undergoes rapid urbanization—and cattle live alongside humans in crowded concrete landscapes—there is some appeal to describing their lives as anti-pastoral, but the information that emerged from my interviews led me to consider the post-pastoral as a more appropriate theory to describe their persistence in the city – at least from a human perspective.

Gifford describes the post-pastoral, from an Anglo-centric reading, as a complex interpretation of pastoral tropes, especially those that question culturally loaded language about the country. Features of Gifford's post-pastoral include: awe leading to humility in the

face of the creative destructive forces of nature; a recognition that we are part of nature's creative and destructive forces; contemplation about our inner natures as a reflection of outer nature; questioning the nature/culture dichotomy; and the recognition of the exploitation of the less powerful people who labour on landscapes that are often romanticized (Gifford, 2012). Paxson (2013) applied a concept of the post-pastoral to North American artisanal cheese-makers trying to cultivate a cottage industry in a competitive industrialized and capitalist market. They live in the country, but use technology to extend the reach of their hands in crafting their products. As livestock farmers as well as cheesemakers, they view themselves as stewards of animals and the land and the cheese as a product of the environment, while at the same time they manipulate animals and natural processes to create a product for human consumption. These farmers do not view their occupation as a return to a past time, but rather as a way for humans to move into a future living with, rather than against the environment. Urban dairy farming in India involves different landscapes, cultural tropes, and socio-ecological relations than craft cheesemaking in North America, but I propose that my concept of an urban animal pastoral fits within many of Gifford's parameters of the post-pastoral. Before discussing the urban animal pastoral I will first introduce the concept of the urban pastoral.

The idea of an urban pastoral seems oxymoronic, but there is a history of literature about the urban pastoral that shows it to be another type of post-pastoral literature and relevant to India today. The urban pastoral movement arose in response to the rapid urbanization that occurred in North American cities at the turn of the 19th century and became a movement in both literature and urban design. The urban pastoral recognized the aesthetic and psychological benefits of access to natural spaces for city-dwellers (McNamera & Gray,

2014). Proponents of the urban pastoral sought to bring the elements of nature into the city with equitable access for all residents, regardless of race or income (Schwartz, 1991); Central Park is arguably the most famous example of urban pastoral design from this era (Gandy, 2002). But the concept of the urban pastoral has not yet been used as a theory to give insight into urban farming practices in either the global north or south. As India continues to undergo a process of rapid urbanization, the concept of an urban pastoral and post-pastoral seem especially important.

The pastoral is also an important, albeit overlooked, trope in Indian literature (Mishra, 1998). Pastoral tropes occur in Indian religious mythology and poetry and the story of the popular cowherd god, Krishna, invokes many tropes of the classical pastoral outlined above. Krishna is the embodiment of Vishnu, the preserver god in the Hindu trinity, who rules over the universe and its minor gods. As Vishnu's earthly embodiment, Krishna came to earth to banish evil. A prophecy claimed that Krishna would one day overthrow the ruling tyrant and as an infant he was hidden in a village amongst a family of cowherds. During his late adolescence, Krishna herds cows in bucolic landscapes, plays the flute, and enjoys the company of women, while also performing feats of heroics by vanquishing demons that plague the countryside. Eventually, Krishna's identity is revealed, he returns to his royal family and fulfills the prophecy by overthrowing the ruling tyrant in epic battles. While Krishna's story is multifaceted, he is most often depicted in contemporary popular iconography as a cowherd, described in the *Bagavata Purana*[12] and the *Gitagovinda.*[13]

[12] The purana (one of Hinduisms 18 great histories).
[13] Composed by Jayadeva in the 12th century.

Mishra identifies two important tropes of the pastoral fulfilled by Krishna: making the complex into the simple, and reconciling divergent social classes. Krishna's seeming solidarity with cowherds signals the status of the humble caste undergoing a radical revaluation (Mishra, 1998). Social classes are also seemingly unified at the temple when they chant the *Gitagovinda's* texts in unison, and the text's function may have been to use the simple tropes of the pastoral to unite a community in turmoil. Mishra suggests that the *Gitagovinda* was written during the 12th century, at a time of social unrest in Northern India when Muslims were beginning to assume rule. According to Mishra, 'This elaborate pastoral of a lost golden age (of Krishna and Radha cavorting in pastoral serenity) speaks to a world order on the brink of collapse' (Mishra, 1998, p. 122). Today's resurgence of Hindu Nationalism has renewed sectarian anxiety between Hindus and Muslims. Cattle remain important symbols of religious-identity politics (Narayanan, 2018b), but how cows inform personal identities of farmers is less understood.

Cows became important in India as symbols of Hindu identity politics and a sector of the livestock industry that contributes to the GDP. Whether cow protection narratives matter to farmers, why they enter into the profession, and how they feel about their work and their cattle is less understood. From interviews with urban and rural dairy farmers in and around Mysore, it appears that Hindu concepts of the cow are internalized by many farmers in that region and do inform perceptions of cows and the work of dairy farming. This includes pastoral ideals promoted by cattle's ancient role in India and by Krishna's story, as well as local deities that assume his function.

The following excerpt from my fieldnotes is taken from an interview with two *Gaushala* workers at the largest cow sanctuary in Mysore, and provides insight for the

importance the pastoral has on the perception of dairy cattle for some Indian individuals. Before accepting a job at the *Gaushala,* these two men had travelled throughout Karnataka learning best dairy management practices. When asked how to facilitate the best cow welfare, the workers answered first with a discussion of the benefits of cattle keeping on human well-being, which centred on the theme of the pastoral:

> They said, 'It has been proven since ancient times, you know. A person who is having chronic disease, if he travels with the shepherd, automatically he will be cured.' This led them to reflect on a movie *Bangurada Panjana* (Golden Cage) about a man who was born into wealth in the city but was sickly. His family brought him to a village to be raised. He returns to the city as a young man, but despite his riches 'feels suffocated' and in the end returns to the village where he feels free. (Interview with two *Gaushala* workers: Fieldnotes, Mysore City, August 24th, 2015)

This conversation revealed important insights into beliefs that village life and work with livestock contributed to a person's health, vitality, and wellbeing that are lacking in the city, despite its material abundance. This story is antithetical to a typical 'rags to riches' story in which a poor person overcomes hardship to experience his or her dreams of monetary wealth and its subsequent comforts.

This conversation provides one instance where a notion of the pastoral emerged in interviews with urban farmers in Mysore, and from which a concept of the urban animal pastoral began to take shape—including the way animals can invoke idealized notions of a rural heritage and a sense of wellbeing. Their methodical pursuit to learn the latest scientific advances in dairy cow management before settling in Mysore, also speaks to a post-pastoral approach in which technological advancements in dairy cow management co-exist with personal and classical pastoral narratives of cattle and dairy farming. The features of an urban animal pastoral will be outlined in the following section.

5.3 Urban dairy cattle and an urban animal pastoral

Urban cows are divorced from the pastoral landscape. They graze on roadsides, vacant lots, and in trash heaps. This interruption of pastoral landscapes including modern realities that threaten the features of the pastoral is what Marx called the 'machine in the garden' (Marx, 1964, 2000). Speaking about the evolution of the pastoral in the United States, Marx stated that the pastoral is 'incorporated into powerful metaphors of contradictions,' (Marx, 1964, 2000, p. 4). About the contradictory nature of the post-pastoral, Paxson states, 'Marx calls attention to the paradox at the heart of American industrialism that nature is simultaneously reduced to raw material for technological transformation and in its purportedly pristine form, upheld as an object of reverence and means of contemplative self-realization' (Paxson, 2013, p. 16). As pastoral objects, dairy cattle in India also play a contrary role in society. Urban cows embody a paradoxical function of a post-pastoral in which they are both objects of reverence and resources—symbol and sustenance (Lodrick, 2005), both 'sacred nature' and 'sacred resource' (Albanese, 1990). This section outlines five features of an urban animal pastoral that mixes traditional and modern attitudes toward cattle in the city: 1) 'rural' animals have a place in the city; 2) animals invoke a nostalgia for rural places or pasts; 3) animals can benefit city life; 4) urban livestock are managed with various technologies; and 5) the rural becomes a practice rather than a place.

5.3.1 'Rural' animals have a place in the city

A densely populated human built environment may not be the ideal habitat for cattle but the residents of Mysore I interviewed viewed the city as an environment that provided resources for cattle to live. The persistence of livestock on the urban landscape in India's

cities, I would argue, is predicated on a widely held belief that animals have a right to the urban commons. Gidwani and Baviskar (2011) define urban commons as spaces that are not privatized and are comprised of both ecological commons and civic commons. Urban commons include public parks, schools and transport, but they also refer to less obvious spaces, including municipal garbage, roadsides and riverbeds, and local bazaars (Gidwani & Baviskar, 2011).

Animals also inhabit India's urban commons. Vacant lots, roadsides and road medians, alleyways, rubbish heaps, and public markets are all places that cows and other animals carry out their lives in cities. In many cities, including Mysore, animals are also given right of way on city streets. Street cows and dogs that cross roads at leisure help to moderate the driver's speeds so they are safer for humans and animals alike. Even animals that are problematic for humans because they may cause bodily harm and spread disease—like monkeys and street dogs—are viewed by the general public and policy makers as having rights to the urban commons (M. Barua & Sinha, 2017; Srinivasan, 2013).

Srinivasan (2013) argues that culture informs perception of animal autonomy and welfare in the city. 'Street' dogs live without owners in India where trap, neuter, and release programs are viewed as the humane way to regulate populations of feral dogs, while in British society, ownerless 'stray' dogs are commonly euthanized because of concern that they experience poor welfare without an owner. The language used to describe these dogs gives insight into the way different cultures view dogs' rights to inhabit the city. The perception that animals have a right to the human-built urban environment in India includes cows, with the exception of major centres of commerce like Delhi, which has banned cattle throughout much of the city (Baviskar, 2011). Not all welcomed urban animals are denizens of an urban animal

pastoral, but a widespread public acceptance of animals that invoke favourable sentiments of rural landscapes and occupations is a condition for inclusion in the category.

The farmers I spoke with acknowledged the city held risks from traffic, trash, and theft but they also viewed cattle as intelligent enough to navigate the city and its harms. It was taken for granted that cows would stay in familiar territory, close to their cowshed, and sometimes made their own way home. I also heard anecdotes from other residents of Mysore, such as an apartment complex security guard who assured me that cows were well adapted to the city because of their innate intelligence (Interview, 1 August, 2015), and a businessman who several times had observed one specific cow obey traffic signals when needing to cross a street (Interview, October 3, 2019). Urban dairy cows are not considered pets by farmers, but they are given liberties that some dogs and cats have—to explore their environment and return home. Despite its risks, the city afforded cows room to exercise, rest, find shade, and socialize at liberty with other cows. Most importantly, it allowed cows the ability to forage for food that supplemented their often-meagre rations in the cowshed.

Large concentrations of urban trash in Mysore provide opportunities for animals to scavenge from and even thrive off human food waste. Barua and Sinha (2017) argue that animals are an unrecognized component of an 'urban metabolism'. Cattle both manage waste and turn what previously had no value into dairy products, which are desired for their perceived health benefits and used in Hindu ritual ceremony and temple foods. Cattle have a long history of eating kitchen scraps and biproducts of agriculture—such as rice stalks, chick pea husks, the cake left after oil is pressed from seeds, and wheat bran—which I observed are still the most common foods fed to dairy cattle today. Food waste is an accepted source of food for cattle, even if it is procured from the rubbish heap or bin.

Many urban dairy farmers viewed the city as a landscape of resources for cattle. Grass that grew on vacant land or roadsides, tree branches, shrubs, household food waste left out intentionally for cattle, and rubbish-heaps and bins, all provided food sources for cattle. This maximized the food-growing potential of the city. Some Hindu residents presented cows with food scraps as one way to receive the cow's blessing and to bestow good-fortune on themselves or their family. Some housewives would wait for a cow to walk down their street and deliver them food-scraps or leave food waste in a bucket, bag, or simply deposit it on a sidewalk. Others would seek out a cow to feed a piece of flat bread or banana peel to directly. The symbolic associations and social function of the cow as symbol of a Hindu pastoral and agrarian past fulfils the next feature of the urban animal pastoral.

5.3.2 Animals fulfil a nostalgia for a real or imagined past

India has been in a phase of rapid urbanization although many people still have memories of growing up in villages or have relatives that remain there. Keeping dairy cattle was an occupation that had been handed down from parents and grandparents for the majority of the farmers in my survey, while a handful of farmers were drawn to take up the occupation on their own. Cattle invoked a nostalgia for a real or imagined past and often a connection to family and spiritual traditions. In keeping with the pastoral trope, the propensity to idealize cows as well as a historical past, became apparent when urban farmers were interviewed about their motivations for keeping cattle.

One Brahmin grandfather of means kept a herd of six to eight cattle at his joint family home and employed a man to take care of them. He was motivated to keep his own cattle in order to know where his milk came from and for his family's enjoyment. His three grandsons

were able to grow up with cattle as he had. He reminisced about sleeping in the cowshed with a calf he befriended, 'as Krishna had', and the time spent with his calf friend as some of the happiest in his childhood (Interview 14 October, 2015). His son-in-law had also grown up with dairy cows as part of a high caste family on the outskirts of Mysore. He was pleased his sons were growing up with cattle, 'Just like real cowboys!' he said, making a pun that invoked the iconic image of the American cowboy, but also conveyed the fact his boys were learning how to handle and form bonds with the cattle they grew up with (14 October, 2014). They were their own kind of 'cow boys' with their own rich history.

Another man who worked as a librarian adopted the occupation of dairy farming fifty years ago and at one time had a herd of 100 cows. At the encouragement of his children, he reduced his present herd to fifteen Holstein Friesian cows, which was still sizeable for the city, yet he was adamant that as long as the work was going well he should continue it because there was value in 'old things' and because looking after cows kept him healthy (Interview, 30 October, 2015). His brother, who kept a herd of seven cows in the same neighbourhood and ran a cable company, had stopped keeping cattle for a time, but went back to keeping a herd of dairy cows because he missed it too much (Interview, 29 October, 2015). Their fondness for the work was echoed by another man who had lost his farmland when the city overtook his property. He sold his farm for an apartment complex. He and his mother resided on the top floor but kept a herd of four cows in a small storage room on the ground level. When asked why he had not given up dairy farming he said 'if you don't keep cows your mind is always wondering about them' (Interview, 3 November, 2015).

A fourteen-year-old boy who worked at his father's tea stand, kept a herd of four cows and remarked in a similar fashion 'I like this work. The cows give us milk and it is our

livelihood. We are maintaining cows from fore-father days. In the future also, I will keep cows and look after them' (Interview, 2 November, 2015). More than one farmer discussed memories of fathers or grandfathers that had been exceptional cattlemen, as well as memories of spending time going to cattle fairs or training oxen with their elders. In these conversations, past times or past cattle were remembered as being better than the present day. The general attitude toward keeping cattle was positive, in part, because of memories tied to cattle keeping, and a connection to a rural past. Cattle were also viewed favourably because of their economic importance, which is discussed in the following section on cattle as a benefit to city life.

5.3.3 Animals perceived as a benefit to city life

While cattle provide a source of income, research has shown that dairy farming does not provide a *stable* source of income (Anagol et al., 2013) and their upkeep is more expensive in the city than the countryside. Therefore, it is likely cattle provide other emotional or health benefits to farmers and these intangible attributes may be an important reason that cattle remain in the city. These sentiments are analogous with a classical pastoral interpretation of the cow whose embodied presence can alleviate the inherent difficulties of urban dairy farming. Interviews revealed that cattle played a spiritual role in farmers' lives and the spiritual aspect of a cow was an expressed belief about a reciprocal relationship between farmer and cow, and the cow's association with the goddess of wealth, Lakshmi. Several farmers expressed the sentiment, 'that if you take care of a cow, then she will care for you'. Sometimes cows were viewed as creatures that showed a person how to live an

exemplary life, such as in the following interview with a man who was in charge of caring for the dairy cows of a wealthy family in a peri-urban neighbourhood:

> Cows are pure and cows are god-like because they are very innocent animals. So they are pure and sacred. So if we serve the cow, then it will do good for us … So how much we serve them, the better for us. It is such an innocent animal, if we serve them, it is like getting rid of all the sins. (Interview, 16 November, 2015)

Some farmers expressed an attitude of contentment with their work that allayed larger financial concerns and had a prosaic perspective about the financial ups and downs. They praised cows as providers of wealth, while at the same time not expecting a guarantee of abundant wealth. For example, one older man expressed gratitude for the financial security his cows provided, while also hinting at the times of abundance or hardship that came with the profession. He said 'See madam, for our life, looking after cows is going along smoothly. We get this much or that much into the hand and are happy with what we get. So life is going because of them, the cows. So we have made our daughter educated from the earnings of the cow' (Interview 30, October). The man had a positive outlook when he looked back on the ups and downs of dairy farming, perhaps because his daughter's success in life made him more secure about his future.

Many people also expressed frustration about the rising cost of keeping cattle in the city, such as one woman who stated: 'Back then, all the feed [costs] were less, now everything is expensive. Now we do not know anything apart from that. So we have to do it right? So even if it becomes less expensive we have to do it and even if it becomes more expensive we have to do it. Isn't it? [sic]' (Interview, 3 November, 2015).

Urban dairy farmers who kept cattle as their sole source of income reflected this type of ambivalence towards their work. The overall attitude toward dairy farming reflected a

frustration with the increasing cost of feeding cattle in the city, tempered by feelings of gratitude for a livelihood and often a genuine affection for cows and the work.

Several farmers also commented on the health benefits they experienced by keeping cattle. One farmer was convinced that he had escaped his family's propensity for diabetes because he worked with cows (Interview, 1 August, 2015). Another *Gaushala* director described feeling cured from pain after he broke his back as soon as he stepped foot inside the cow sanctuary (Interview, 21 January, 2015). A handful of other farmers remarked on the health benefits of cow products including cow's urine, which is made into an Ayurvedic tonic. These attitudes are based in Hindu beliefs—discussed in the previous chapter—that cows are pure and purifying entities and that attending to cattle and using their products has healing effects.

Dairy farming is not a secure livelihood and individuals interested in choosing an occupation that provides a sound financial future might look for less risky work. Cattle may act as a long term savings account for families that can make a larger sum of money by selling a cow (Attanasio & Augsburg, 2014; Economist, 2013). Yet, the labour intensive nature of dairy farming and the minimal, yet mostly consistent, and sometimes precarious profit, suggests that there are affective motivations for cattle keeping beyond the meagre monetary rewards. Incentives such as companionship with cows and the belief in spiritual and health benefits the work bestows upon farmers—which fostered idealistic feelings toward their work—were types of compensations beyond the mere benefits of financial security.

5.3.4 Technological management of urban livestock and bovine materialities of the sacred

Cows are kept in cities through various breeding and vaccination technologies that complicate the vision of urban livestock farming as a relic of a bygone era. Hybrid cows have been introduced to increase milk production throughout Southern India in both rural and urban areas as part of dairy development programs. Dairy buffalo are the original native dairy bovines of the region (Kathiravan et al., 2011).[14] They are more efficient dairy animals than cattle, due to the high milkfat content. During this study, dairy buffalo milk sold for a full 10 rs/liter (0.12p) more than the average price of fresh cow's milk, yet their milk is not considered as healthy or as spiritually significant as cow's milk to many Hindu consumers despite its economic advantages (Wiley, 2017). The 2015 livestock census reports that in Karnataka dairy buffalo husbandry has been on the decline and the state's population of hybrid cattle continues to increase (NDDB, 2015).

Reports from second or third generation urban dairy farmers interviewed[15] give evidence that Mysore had introduced hybrid breeding initiatives to the area in the 1960s, when the federal government introduced systematized subsidized breeding of hybrid cattle as part of the dairy development program known as the 'White Revolution' or 'Great Flood' (Scholten, 2010). Subsidized initially by the European Union,[16] it has become the most successful food aid program in the world (Verghese, 2005) and it has changed the distribution

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[14] The native breeds of cows in the area—Hallikar and Amrit Mahal (R, 1909)–are known for their draft abilities but low milk production.

[15] Interviews with some dairy farmers revealed that the tradition of dairy farming began with their grandfathers who kept hybrid cows. Around this same time, Mysore's then king, Srikantadatta Wadiyar, also promoted the breeding of dairy cattle and held an annual cattle fair at the Mysore palace grounds. A handful of those interviewed told me stories of their families' prize winning cattle and one woman had saved a medal won by her father's cow at one of these fairs.

[16] Then the European Economic Community.

of cattle breeds throughout India's rural and urban landscapes. I would argue these programs are responsible for increasing the number of urban dairy cattle and decreasing the number of water buffalo in cities within Karnataka.

Some farmers interviewed also kept purebred Holstein Friesian (HF) cattle, which many referred to as Ooty cattle. These cattle were brought to the high mountain tea stations around Ooty by the British, who had experimented with European and hybrid dairy breeding in the region before partition (Guha, 1980). Pure-bred HF cattle are now the most expensive dairy cattle in India, at 40,000-50,000 rs (£450-550), and one urban cow I met had an ear tag that identified her as a cow that was part of a local government micro-loan program—a program of which village farmers I met were unaware.

Government programs continue to subsidize the breeding of hybrid cattle in Mysore, which help to keep cattle on the urban landscape. There are 29 government veterinary centres in Mysore (Karnataka, 2017) and farmers reported that artificial insemination (AI) services cost between 15rs-150rs (£0.16-£1.65), depending on the breed of bull. Semen is collected in urban breeding centres, like one in Bangalore that houses only bulls for this specific purpose (Narayanan, 2015b). Without the widespread technology of artificial insemination, it is unlikely that cattle would be the main dairy animal in Mysore, because native cattle produce 1-2 litters of milk per day. A hybrid or HF cow can produce ten times more, giving 10-20 litters of milk per day.

For urban dairy farmers, the ability to earn an income from dairy farming is more important than the type of cattle they own. Milk from native cattle is perceived as having more nutritional and health benefits by some Hindus and can be sold for a higher price than hybrid cow's milk. I was also told by urban farmers that native cows' milk was considered to

have a higher nutritional and medicinal content than hybrid cows' milk, but it was viewed as less practical to keep native cows, akin to something a person would do as a hobby. In this post-pastoral, native cows remained idealized, where hybrid cows were different than native cows in desirable ways: because they earned farmers more money. Although the recognition that hybrid cows' milk did not have the same perceived health or spiritual benefits of native cows' milk to these urban farmers, hybrid cows were still viewed as embodiments of the sacred.

Native cows also are the most prominent type of cattle at many *Gaushalas*. Narayanan argues that this is due to Hindu identity politics and 'casteised speciesism' that venerate native cattle as more sacred animals than hybrid cattle (Narayanan, 2018b). Yet in my interviews with Mysore's farmers, they expressed no difference in their fondness for hybrid versus native cattle. Hybrid cattle were still perceived as Laxmi, the embodiment of a god, bestowing the same spiritual value, but perhaps bringing more economic benefit to dairy farmers. The vast majority of urban farmers interviewed performed a cow *pooja* or a ritual blessing of thanksgiving upon their hybrid cows one or more times a year and more than half of the farmers interviewed blessed their cows weekly. Hybrid cows embodied similar if not the same pastoral sentiments for urban dairy cattle, even if farmers acknowledged the material differences between hybrid and native cow's milk.

This differs from the role hybrid cattle play in the 'nativist biopolitics' Govindrajan (2018) and Münster (2017a) observed amongst village dairy farmers in Uttrakhand and Kerala respectively, who had only recently started to keep hybrid dairy cows. Govindrajan reports some Uttrakhand villagers thought jersey cows were not 'ritually powerful enough to be part of everyday regenerative religious and social practice in the same way that [native] cows

were' (Govindrajan, 2018, p. 79). Most important to the villagers in Govindrajan's study were the embodied history of cows and this was not static, but open to change over time. In Kerala, zero-budget farmers viewed native, *desi,* cows and their microbe rich dung and urine as facilitators of what Münster (2017) describes as 'Nature, Nation, and Autonomy' in the project of natural small-scale farming. These same farmers claim cross-bred cows are 'not real' cows (Münster, 2017a, p. 31). Therefore, the perspective of dairy farmers depends on many factors, including their perception of cattle in relation to individual perceptions of the cow's function in spiritual, financial, and political matters.

There was also a perception amongst the majority of urban and village farmers that hybrid cattle were better adapted to the city than they were to the countryside, where they were ill adapted to heat, rough terrain, disease, and predators. Village farmers also kept hybrid dairy cattle, but they were considered 'delicate' and watched by herders, where urban cattle were often left unattended in the city to seek out food and shade. Veterinary care also appeared easier to access in the city, where a government veterinary hospital was often within walking distance, than in villages where veterinarians would have to be called on a case-by-case basis. Technologies of hybrid cow management intentionally placed cattle in the city and perpetuate their breeding and care, blurring lines between rural and urban industries.

5.3.5 Rural as practice rather than place

When villages are overtaken or flattened by cities, social structures are reconfigured and villagers find themselves as urbanites. For some of the farmers interviewed, urban dairy farming became a transitional occupation in which their farming skills could be used in the city, while their children could become educated in school and to the ways of city life. The

Indian government recognizes that when cities overtake villages, it places villagers in a difficult position. Their land-based livelihood has been taken away from them, yet they may not have the skills to transition easily to city life (Mehra, 2005). Therefore, urban villages exist, in which rural industries like dairy farming are allowed within city limits, even when they are banned elsewhere in the city. Urban villages show that rural practices are not necessarily tied to landscape.

Urban villages are recognized in policy and nomenclature as villages that have been overtaken by a rapidly growing city. When a city overtakes a village its residents' land is often sold or seized, but if recognized as an urban village, the inhabitants retain village councils, some village industry, and have special tax and policy codes (Glover, 2012). This has created a population of agrarians who find themselves unable to grow crops but can tend cattle; these landless farmers are able to continue agricultural work while adjusting to city life (Mehra, 2005). Urban villages represent one example of the mixing of rural and urban attitudes and spaces. Many people also migrate to urban areas from villages and may prefer to continue a rural occupation rather than learning new skills in order to get a job in the city. Urban dairy farming exemplifies the fluid nature between the rural and urban that I encountered in Mysore's neighbouring villages, peri-urban areas, urban villages, and the city proper.

Cattle management was similar in many ways between village and city cattle, but the breed distribution differed slightly. Cattle herd sizes were similar between farmers in Mysore city to nearby villages, with an average of six cows per family. Village farmers often had two native oxen, in addition to their hybrid dairy cattle. Herd sizes in the city and villages were reported to have diminished in size over the past 30 years. One woman said that farmers used

to keep around 20 cows and now people kept fewer cows but they could look after them better (Interview, 2 November, 2015). The relatively small size of village herds may be due to the fact that village farmers had multiple income streams, and didn't depend solely on dairy farming and the subsidized price of milk from the dairy cooperatives—the main consumers of village milk. A few industrious farmers retained large herds of cattle in villages. One dairy kept twenty cows and made value-added organic products, like cheese and ghee, that were sold in organic shops in Mysore. The largest dairy I visited was located in Mysore and had sixty cattle—twenty of which were being milked—and supplied milk to a boy's boarding school. Therefore, 'village' and 'city' weren't determining factors of how many cattle the farmers might own. Ultimately, 'rural' became more about practice than about a geographic location.

Interviews with urban dairy farmers in Mysore revealed a post-pastoral style of farming that occurred in the city—orchestrated by modern technology. This was combined with attitudes that expressed familiar features of the pastoral, including: ties to family heritage and to rural lifestyles; humble work that provided a sense of satisfaction; and idyllic attitudes and rhetoric toward cattle that overlooked some of the problematic truths of the human-animal relationship and the politics associated with cattle in India. The following section will discuss tensions that complicate these narratives of an urban animal pastoral, introducing an urban animal anti-pastoral.

5.4 Politics and paradox of urban dairy cattle in the post-pastoral

This idea of an animal urban pastoral applied to cattle may appear odd when considering the often harsh realities facing urban dairy cattle. Dairy cows are kept in cities to

provide milk, which is already problematic, given that cows are expected to provide milk for humans, often to the detriment of their calf. In addition, urban cows often forage on human trash, and in the process consume plastic bags and other debris mixed in with food waste, and they are exposed to the general air and environmental pollution of an Indian city. When roaming the streets they can be harmed in traffic or train incidents. When they are tied in the cowshed, they often experience cramped and hot conditions, and are made to stand and lie on concrete or stone floors without the benefit of straw or sawdust bedding. Some cows are injected with oxytocin (Kaul, 2017), which makes them produce more milk, but are not often fed enough calories to produce a higher volume of milk without taking a toll on their body (though I did not witness evidence of this in my impromptu interviews with farmers in the Mysore region). When cows are no longer able to earn an income for a farmer, they will be sold, given away to be slaughtered, or turned free to encounter their own, often harsh, fate. Cows that are sold into the illegal and/or unregulated slaughter industry experience extreme suffering when transported—tied in cramped trucks and starved of food and water (B. Sharma & Sharma, 2013). Even some, perhaps many, cow sanctuaries perpetuate the abuses of the dairy industry and some are complicit in profiting from the sale of male calves to butchers (Narayanan, 2016a). These are points made by animal rights scholars and activists who point to the hypocrisy of the very notion of 'the sacred cow' (Narayanan, 2018a, 2018b, 2019a; B. Sharma & Sharma, 2013).

This information may appear antithetical to the notion of the pastoral—as a landscape and a type of nostalgia—as well as in the other use of pastoral as a type of protection offered for the weak and innocent. But within the concept of the pastoral lies a tension between real and imagined worlds, and many of the farmers I interviewed exist within this paradox. To re-

iterate Gifford's (2013) analysis of the paradoxical nature of the pastoral: '[T]here is a mixture that is often in tension, between realism of close encounters with nature, a simplified life, real transferable learning about inner nature from dealing with and observing outer nature, and the acceptance of a degree of artifice about the discourse' (Gifford, 2013, p. 18). I would argue that the information farmers provided about their enjoyment working with cattle, their spiritual satisfaction, the sense of reciprocity with which they approached the work, and the financial rewards from dairy farming, are all real motivations for keeping cattle. Farmers are either also aware of the harsher realities that cows experience and/or try to make the cow's trials appear less problematic or harsh than they actually are. This acceptance, or artifice of the discourse, is consistent with the pastoral trope.

Cattle's status as both a spiritual and monetary resource is perhaps the largest paradox in dairy farming, in or outside the city. Hindu tradition dictates that cows should not be killed, but this is often a luxury for the rich and not subsistence farmers, who cannot afford to keep their cattle until the end of life. The tension between sacred animal and financial resource has become an internal paradox for the vast majority of Hindu farmers who cannot afford to keep their cows until they die a natural death. It is important for many Hindus to avoid participating in the killing of an animal, especially a cow. It is also impossible for most farmers to continue to feed an animal that does not bring in some form of income, and so cattle are sold at cattle fairs to cattle traders that I came to think of as middlemen. In this case, it is somewhat ambiguous whether the cow will be resold to another farmer or taken to the butchers, and this allows farmers to keep their karma clean by not directly contributing to the death of their cows, while at the same time selling them (the majority of the time) for slaughter. I briefly interviewed some of these middlemen at a weekly cattle fair outside of Mysore. It is common

knowledge that cattle traders earn money by taking cattle to the slaughterhouse. A handful of farmers admitted that they sold cattle directly to the butchers. Others claimed they gave their barren cows to the *Gaushala*, but when I asked the director of Mysore's largest *Gaushala*, he claimed that farmers almost never brought in cattle (Interview 27 October, 2015). They received the majority of their cattle from the police that confiscated truckloads of cattle headed to Kerala, where it was legal to slaughter cows, but illegal for them to be transported from Karnataka to Kerala. Wealthy, high caste Hindus also donate a handful of ailing cattle to the *Gaushala* where the *Gaushala* serves as a hospice centre in exchange for a substantial donation.

Karma is a system of retributive cause and effect in which good thoughts, words, and deeds are rewarded and bad thoughts, words, and deeds, are punished in this life or the next (Flood, 1996). Harming cows creates particularly bad karma because cows are viewed as a home for the gods; the saying goes that three-million and three gods reside on a cow, which is depicted in the image of the wish-fulfilling cow*, Kamadhenu.* As stated in Chapter One, the cows' gentle, patient, and generous natures makes harming them seem especially cruel (Dayananda & Prasad, 1889). One hypothesis about why cattle became sacred, suggests this custom is based on an economic law of return, which claims that cows became sacred when it was recognized they were more valuable alive than dead (Harris et al., 1966). For Vedic pastoralists and agrarians, cows provided manure and urine, which were valuable products for medicinal, household, and farming projects, long after they had stopped giving milk (Sridhar & Bilimoria, 2007). This concept was further promoted by the anthropologist Marvin Harris in his theory of cultural ecology or cultural materialism, which states, 'Human social life is a response to practical problems of earthly existence' (Harris, 1979, p. xv). Urban farmers are

often landless farmers, meaning they don't have property to farm. They have limited space and resources to feed cattle until the end of their lives, and selling barren dairy cattle is a sad financial reality for the vast majority of India's farmers. Only wealthy Hindus who have an interest in keeping their own dairy cattle have the means and interest in donating their cows to *Gaushalas*.

High caste Hindus, who also comprise the majority of politicians that enact cow protection laws, are able to carry out cattle husbandry in a way that exemplifies the classical pastoral tropes promoted by Hindutva ideology. Missing from much of the Hindu Nationalist cow protection propaganda that bans cow slaughter, are real solutions for providing care to cows until their natural death—a problem that Gandhi identified and worked, unsuccessfully, to solve (Burgat, 2004). The majority of urban farmers who rely on dairy cows for some or all of their income, not as a kind of hobby, exemplify a post-pastoral approach to cattle rearing in which they care for their cattle, but cannot ensure a perfect end to their lives. The sad fate of the majority of India's dairy cattle remains an open secret, while the government continues to subsidize the breeding of cattle through artificial insemination programs at government hospitals. The formal and informal, political and economic networks that maintain this fraught system is what Narayanan (2019b) refers to as *Jugaad*—a complex Indian social innovation of corruption and innovation.

The fact that India's dairy industry is directly linked to India's beef industry is another often overlooked topic in Hindu Nationalist discourse about cow protection (Narayanan, 2015a). India is the world's largest dairy producer and is also the world's largest exporter of beef. The slaughter of cattle for beef has become politically controversial, but not the raising of dairy cattle or the consumption of cow's milk and its products. Narayanan (2018a) argues

that this is partially due to the role of milk in Hindu scripture, including stories of the infant Krishna and his passion for butter and curd, as well as the significance of the mythic ocean of milk, which perpetuates norms of milk consumption. Whatever the reasons, the welfare of cattle is effectively overlooked. This exemplifies how anthro-animal identities suffuse a narrative that privileges Hindu mythology over other castes or cultures (Narayanan, 2018b). Pastoral narratives such as this simplify complicated human-animal relationships and, as Narayanan argues, Hindu norms also often gloss over how cows suffer differently based on their gender (Narayanan, 2018a).

The gender of a cow is important to note here because male calves, bulls, and oxen do not receive the same spiritual consideration from many farmers. This is reflected in Karnataka's laws that regulate cow slaughter. It is illegal to slaughter female cows until age 12, unless they are mortally sick or wounded. It is legal to slaughter a male calve, bull, or ox at any age (Mittal, 2012). Some farmers claimed outright that they gave their male calves 'to the Muslims', which meant that they gave or sold them to a Muslim butcher. Some male calves are set free, often without receiving the colostrum, or first milk, from their mothers. These orphan calves were often collected by police and given to a *Gaushala,* where they most often died, despite receiving medical care. The largest *Gaushala* in Mysore was a Jain-led organization and took in both male and female cattle until the end of life, although the majority of cattle on the property were female, and many were used as dairy cattle from which the *Gaushala* earned an income. Not all *Gaushalas* across India keep male cattle and some even sell male calves to butchers (Narayanan, 2016a). The perception of cattle as sacred entities allowed to roam the streets of Mysore glosses over these troubling realities of dairy farming in the city and disrupt a rarefied version of the cow as a representative of the pastoral.

Despite the fact that, with some restrictions, the slaughter of cows is legal in Karnataka, tensions between Hindus and Muslims were revealed during the course of this study. A handful of Hindu dairy farmers reported that their cows had been stolen in the night—reportedly by Muslims—although this was difficult to know for certain. These reports occurred in two neighbourhoods with dense populations of dairy cows. Farmers reported that once a cow is butchered and its skin and horns are removed, it is impossible to distinguish from dairy buffalo, which have no restrictions on their slaughter. They had reported the thefts to the police, but the police were reluctant to offer help. Without evidence, the farmers had no recourse to find a suspect or recoup compensation for their missing cattle. The sectarian conflict between Hindus and Muslims is minimal compared to the violence experienced in other parts of India, where lynchings of Muslims have occurred under the mere suspicion of cattle slaughter. Nor are the anti-slaughter laws as restrictive as they are in Maharashtra, where the slaughter of all cows has been banned (Northam, 2015). It is clear the animal urban pastoral narrative about cows exists for many Hindus, who revere cows and their milk, and perhaps is challenging for Muslims, who may or may not eat cattle meat, and are the unwitting recipients of the hypocrisy inherent in this aspect of dairy farming.

5.5. Conclusion

The power that cows have to evoke pastoral sentiments and ideals is captured in this *New York Times* headline: 'Parks give Cambridge a Rural Vibe, "but Cows Do it Better"' (Kirkpatrick, 2018) This article highlights the popularity that urban cattle have in Cambridge, UK, to residents and visitors, especially to those who express a fondness for the countryside or lifestyle and industries of times past. Like the article's headline, this chapter proposes that

animals can invoke favourable sentiments for rural landscapes and lifestyles, even when they are divorced from bucolic settings in Indian city.

The concept of the urban animal pastoral can be applied to rural animals in other cities, such as squirrels that were introduced from rural areas into US cities in the late 1800s (E. Benson, 2013), or the resurgence of urban chicken coops in North America (Blecha & Helga, 2014). The urban animal pastoral may add to other theories that place animals in cities, such as Horovak's (2008) trans-species urban theory and Wolch's (1998) zoopolis.

This chapter also examined how cow bodies are plastic in the ways they are manipulated for human utility. Native cows are generally low milk producers. Crossing them with western dairy breeds has produced a cow that can better withstand the climate, diseases, and parasites of South Asia and produce significantly more milk than most indigenous breeds. The manipulation of cow bodies has also created a range of attitudes about the half-foreign cows and their products. Urban dairy farmers have come to accept hybrid cows as sacred, while at the same time pointing out that their milk is different, perceiving native cow milk as containing more health benefits than hybrid cow's milk. Hybrid cattle have been used for decades by urban farmers in Mysore and their attitudes about the spiritual value of their cattle differed from some villagers whom other researchers have interviewed about the spiritual and material properties of cattle and their products (Govindrajan, 2018; Münster, 2017a). This study adds to a fuller understanding of the different ways farmers perceive the sacredness of cows, and cattle's role in their spiritual lives, and how this informs their relationship with larger formal and informal political and economic networks of milk and beef industries—in which they are participants.

As a post-pastoral concept, the urban animal pastoral situates ways urban cows are depicted positively by farmers within their socio-spatial and material function in the city. It does not, though, avoid the recognition that keeping cows in cities is problematic for both humans and animals, nor that dairy farming is inherently a system that exploits cows for human profit. Despite the fact that cattle are accepted as members of an urban landscape in Mysore, they are still exploited for their products and are not living autonomous or ideal lives. Animal rights and vegan activist scholars that condemn livestock farming as enslavement of sentient beings, calling for a ban on production of animal products, may benefit from understanding the deep emotional connection that some farmers have for their work and for the affective power that, in this instance, cattle hold in a culture. How does one approach changing the profession of someone that has fond family memories of dairy farming and perceives cattle to embody special metaphysical properties and positive values? Addressing the psychological and emotional aspect that livestock farming holds for individuals is something that is largely missing from abolitionist discourse, and an area where animal rights scholars and activists may find common ground with farmers. The following chapter will shift from a human-centred perspective to the experience of the cow in the urban landscape.

Chapter 6: Urbane Cows and Contested Spaces: Nonhuman plasticity in the urban contact zone

6.1 Introduction

I have argued that the Indian cow is plastic in the manner in which she is represented by humans for various socio-religious or political ends (Chapter 1), and in the ways humans have genetically manipulated her body to serve human utility (Chapter 2). Now—shifting to the cow's point of view—I will argue the cow is plastic in how she can adapt to a variety of situations, including living with humans in cities. Through multispecies ethnographic methods, I will examine cow agencies, conflicts, and entanglements with trash in the contact zone of the city.

Mary Louise Pratt proposed the 'contact zone' to describe how the colonized and the colonizer might come to understand one another, and the language that arises from these encounters. Contact zones are defined by Pratt as 'spaces where cultures meet, clash, grapple, with each other, often in contexts of highly asymmetrical relations of power, such as colonialism, slavery or their aftermaths lived out in the world today' (Pratt, 2008, p. 179). For Pratt, contact zones are revealed through written texts and spoken language—both in the past and present (Pratt, 1991). In so doing, she renders power relations in colonial and post-colonial frameworks 'available to reflection and transformation' (Pratt, 2008, p. xiii). Transculturaltion—how marginalized groups select and represent themselves in the discourse of the dominant culture—are zones of contact and give some insight into how subaltern groups, absorb, appropriate, and 'talk back' in asymmetrical structures of power (Pratt, 2008). The notion of the contact zone explores multiple ways that meaning is made in the world, inclusive of subaltern groups in fraught power relations. This is compatible with recent work

in critical animal studies, animal geographies, and multi-species ethnographies that examine uneven power dynamics between humans and animals, often invoking new methodologies (Hodgetts & Lorimer, 2014) to decentre humans as sole agents of world-making.

To this end, Donna Haraway (2008) proposed the concept of more-than-human contact zones. Haraway's multispecies contact zones challenge human exceptionalism and autonomy and are informed by feminist theory, science fiction, ethology, biology, and lived experience (Haraway, 2008). One way Haraway expands on Pratt's notion of the contact zone is with her concept of 'tentactular thinking' (Haraway, 2016) which invites investigations into the multiplicities and entanglements of the human and more-than-human worlds—relationships that are always steeped in power. Tentacular thinking requires weaving diverse threads of meaning together to show how lives are co-constituted and always 'becoming with' (Haraway, 2008). Like Haraway's dogs in *When Species Meet* (2008), the cow is a rich subject considered through tentactular thinking. The lives, histories, and materialities of humans and cows are deeply interwoven over time and hold uneven power relations. Cows are also charismatic animals (Lorimer, 2007) in many cultures, but uniquely so in India. India's urban cows are therefore situated to provide a lens to examine many threads of co-constituted meaning-making, including religio-political, economic, material, and urban.

Cattle and urban animals are increasingly becoming subjects that reveal how animals unwittingly become participants in hegemonic systems in South Asia. Govindrajan (2018) explores interspecies relatedness between humans and cows in villages in Uttarakhand where hybrid dairy cows were recently introduced. Her nuanced analysis of 'nativist biopolitics' in relation to cow materialities and identities, and how these are expressed and embodied through villagers' relationships with cattle, gives keen insight into ways nationalist identities

are infused in farmers' daily attitudes toward and interactions with their cattle. Baviskar (2011) analyses how efforts to remove New Delhi's streets cows reflect middleclass bourgeois environmental values that shape the city and overlook environmentalisms of the poor.

Barua and Sinah's (2017) intra-disciplinary research on rhesus macaques in Delhi focuses on human tolerance of rurban hesus macaque and humane management when they do cause conflicts. Srinivasan (2013) also argues that street dogs have a place in the city and Trap, Neuter, Release (TNR) programs respect dogs rights to live autonomous lives regardless of whether they are 'owned' by a human. While attitudes of tolerance for street animals exists in India, Narayanan (2016c) critiques urban planning in cities that create 'states-of-exception' where animal rights are excluded from formal urban governance and contribute to animal suffering. Recognizing animals as subaltern, she seeks to radically redefine 'human' and 'animal' in urban spaces, with a focus on animal rights in the city.

To this body of literature, I will add the perspective of the city as a contact zone for the Indian urban dairy cow. Cities are human built and privileged spaces in which animals must live against the grain of human design and adapt their lives to human behaviours, architecture, and technology. Yet, the lives of humans and cows are also co-constituted in the city. For animals, cities are full of danger and pollution, but cities are also spaces of opportunity and adaptation, where subalterns may find instances in which to create new opportunities and to exert their influence within systems of hegemony. Occasions when the subaltern finds opportunities to prosper in systems of oppression are key features of the contact zone. Through a focus on an urban cow, I will argue both risk and opportunity are features of an urban multispecies contact-zone.

Using multi-species methods, the experience of one urban dairy cow is the focus of this chapter. Multi-species ethnographic methods attempt to bring experiences of animals into our purview, often involving encounters between humans and non-humans. Encounters, for Barua (2015), 'move geographers toward *animal's* geographies, the manner in which *they* apprehend and sense the world' (M. Barua, 2015, p. 268). Barua also sees value in the contact zone as a means to engage with more-than-human encounters which have 'equally vital histories and world-making'(M. Barua, 2015, p. 269). A contact zone perspective can shift the focus from cattle as *objects* to *subjects*. Their ethology can be analysed from a welfare perspective that is not based on maximizing utility and economic benefit for humans—an underlying and often unspoken context for livestock ethology research (Rollin, 2003).

As a site of contact, the city is both a contact zone and a site of plasticity. In so far as power dynamics usher in change, the contact zone can foster plasticity. What has yet to be fully explored by this concept is the role of materiality in contact zones. Haraway's (2016) investigation of the entanglements between dogs-horses-humans and synthetic oestrogen is a striking example of the role of materiality can play in more-than-human contact zones as a tool of analysis. The city is a rapidly changing and growing human built landscape. Species that co-exist and sometimes even thrive in cities must exhibit a propensity to adapt to these spaces and circumstances. Engaging with ethnographic methods and observing animal lives in the city, we may come to better understand aspects of their adaptation, as well as appreciate how cities are co-constituted by humans and the more-than-human world. For example, animals can complicate the human desire for urban spaces to be hygienic and free of zoonotic disease. Likewise, human waste and air and water pollution can negatively impact animals.

The chapter proceeds as follows: The following section defines the term 'urbane' cows and outlines the positive aspects of the life of free roaming urban dairy cows in the city, where potentially novel behaviours were observed. The next section describes the city as a site of contact in which cattle are perceived as polluting animals and urban nuisances. Then follows a discussion of pollution as a site of contact that provides risk and opportunity in the urban multispecies commons. The conclusion returns to the notion of urbane cows and reflects on the city as a multi-species and material contact zone.

6.2 Cow agency in a multispecies city

This section will discuss the agency of cows in a multispecies city. Cows endure oppression, bodily manipulation, and pollution, yet these facts do not capture everything about the experience of an urban cow. As a contact-zone, the city is a human dominated space within which a cow encounters both freedom and danger. Moments of agency that allow a cow to exercise her intelligence and curiosity are occasions when cows encounter positive aspects of city life. The ability of cows to adapt to cities and live with humans in convivial ways invites a critique of other systems of management—namely industrialized agriculture—that negate a cow's individuality and expression. I use the word *urbane* to mean civil and attuned to existence and peaceable interspecies relationships in the city, and I use it purposefully, to define a type of convivial nature cows express in the city. Convivial means friendly, lively, and with enjoyment, and invites an understanding of animals as companionable, genial, and sociable neighbours for which humans can make space in our urban planning and political ecologies (Hinchliffe & Whatmore, 2006). It also illustrates the cow's ability to adapt its behaviour to the densely populated multispecies city. Not all people

welcome cows in cities as will be discussed later, but 'urbane' will be used here as a means of addressing the unique, albeit limited, agencies cows may experience in cities.

This research is partially informed by multi-species ethnographic work focused on a cow named 'Shilpa', and living with and observing a herd of dairy cows owned by the family I lived with in Mysore. Shilpa was an 8-year-old hybrid cow that lived with two other dairy cows and two calves. She had borne several calves, including a set of twins, considered to be auspicious by her owner, which was a reason he gave her the pet name Shilpa, which means 'beautiful ornament' in Hindi. His other two cows remained unnamed. She also bore a calf during the time this fieldwork was conducted. The other cows I observed were a mixed herd of hybrid cows, pure-bred Holstein-Friesian dairy cows, and native *Hallakar* cows.

This research was conducted in neighbourhoods where urban cattle were kept to provide milk to those who paid a premium for fresh unpasteurized milk—valued for its taste and health benefits.[17] Some urban farmers allow their dairy cows to roam freely during the day for exercise and to forage for food. These cattle may be unattended for most of the day, which gives them a different experience of multispecies interactions and stimulus, often without human intervention. Compared to their counterparts in villages that I observed during my fieldwork (who were followed by a herder to prevent them from raiding crops and protect them from predation by leopards or thieves) or their counterparts in intensive dairy systems in Europe and North America, urban cows experienced a unique type of freedom and a life full of stimuli.

[17] If Muslim dairies existed in the city, I did not encounter them. I only met one Muslim dairy farmer at a cattle fair during my 8 months of fieldwork in and around Mysore.

The city provides a habitat where traffic and the consumption of inorganic debris in dumpsters and heaps of garbage present dangers to cattle, but the city is also a landscape of unique autonomy. There are opportunities in the city for cows to freely express curiosity and companionship with humans and animals that are markedly absent from other management contexts. I will focus on the following three ways the city offers a unique landscape to view cows: 1) the city as a site of behavioural adaption and agency, 2) notable independent behaviours displayed by urban cattle, and 3) cows and multispecies relationships in the city.

Literature on dairy cow behaviour (Phillips, 2002), welfare science (Grandin, 1997; Grandin & Johnson, 2005), and stockmanship (Moran & Doyle, 2015) appeared to contradict much about cattle behaviour that I observed in the field. This literature focuses on helping cattle display confident and relaxed behaviours living in and moving through the cowshed. One manual written for south Asian dairy farmers lists several stimuli in the cowshed that may cause cattle to baulk out of fear including 'steep declines, a grate over a drain, a water puddle, change in floor texture, a flapping piece of cloth, clanging metal or a change of lighting along the laneway' (Moran & Doyle, 2015, p. 66). Yet urban cattle moved through the city with no noticeable reaction to the bombardment of all manner of stimuli, noise, colour, and chaos. Cattle walked calmly in the middle of a street next to busses, trucks, and scooters. Quieter—but still active—streets became a place where cattle felt confident enough to lay down for a rest and chew their cud. I rarely observed a shadow, curb, flag, or car horn that caused an urban cow to pause for concern. Shilpa even ignored children igniting strings of fireworks behind her.

Urban cattle's ability to adapt to city life must involve early conditioning to stimuli, observing the behaviour of other cows, and daily handling by humans at the cow shed, but

breeding may also play a role. Cattle behaviour studies (conducted in Europe) that compare aggression and flight in Bos taurus cows (European) and Bos Indicus (zebu) have found Bos taurus cows (European dairy breeds in particular) to exhibit calmer behaviours than Bos Indicus cattle (Haskell, Simm, & Turner, 2014).[18] There were a mix of hybrid and native cattle on city streets in Mysore. While some people interviewed considered native breeds to be more difficult to handle and wary of strangers, both types of cows wandered city streets in relative peace. As urban cows are commonly hybrid—a mix of the two cattle types—they are not often the focus of cattle behaviour research. Therefore, it is difficult to determine the extent genetics play a role in the behaviour of hybrid cows, even if genetics influence cow temperament (Haskell et al., 2014).

One hypothesis about urban cattle's calm nature in the city is based on research that finds when cows are allowed the freedom to make their own autonomous choices about how to react to perceived danger, they are better adapted to novel stimuli. In cattle, fear and curiosity are closely linked (Grandin & Johnson, 2005) and animal behaviour researchers Schütz et al. (2012) state that the 'close link between fearfulness and the ability to explore may have significant implications for [their] welfare' (Schütz et al., 2012, p. 20). Much of the architecture of confinement in industrial agriculture is designed to keep cattle safe while maximizing their material productivity. Concentrated animal feeding operations (CAFOs) are not often built to cultivate important aspects of animals' mental and emotional lives, or to

[18] I observed individuals of the bos Indicus, *Hallikar cow,* a cattle breed native to Mysore, as more nervous or even aggressive around strangers than cross-bred cattle. According to farmers I interviewed, these cows prefer to be handled by only well-known persons,which I also observed. This perspective was also expressed in Govindrajan's ethnography (2018). Recent literature on dairy cattle behavior from research institutions in India was difficult to find. The National Dairy Research Institute (NDRI) does not study cow behavior as one of their main research areas.

help them respond to new situations. A significant factor that diminishes the wellbeing of cattle in confinement is boredom. Research on dairy calves that display repetitive behaviours (stereotypies) that signal boredom, reveals that their brains form differently than calves that do not engage in repetitive behaviours (Redbo, 1998). This indicates that allowing the brain to learn and grow may be an important aspect of cow welfare—whether this means exploring a field full of grass or a city's roadsides. Perhaps being allowed to make decisions about when and how to interact with unknown humans are also a reason urban dairy cows, like Shilpa, have adapted to the presence of human strangers and novel stimuli.

In addition to cattle calmly navigating a city full of stimuli, urban cattle may exhibit more independence than dairy or beef cattle in other husbandry contexts. In both herds of urban cows I observed, cattle would separate from the herd and sometimes reunite again during the day. Being part of a herd is important to cattle welfare, so much so that standard tests used to measure stress or aggression in cattle intentionally isolate cattle from their herd to measure stress behaviours (Haskell et al., 2014). On the days I observed Shilpa, she would spend half her time or more away from her herd-mates. Likewise, I would encounter her herd-mates on their own. One afternoon, her herd-mate, a black cow, saw Shilpa from the top of a small hill and mooed to her from half-a-block's distance. Shilpa looked up, then went back to grazing. The black cow then walked away in the opposite direction. I observed Shilpa lying down to chew her cud on her own as well as with her herd-mates. Perhaps moving through the city independently is a strategy for urban cows to find the most abundant or preferred foods. This topic would need further research to make substantiated claims, but remains a notable behaviour.

Cows also interacted in a variety of multi-species relationships in the city. Humans sometimes approach cows and offer them food or touch them in ritual gesture. Traffic also provides any number of obstacles for cows to navigate through—yet because of the genial behaviour of both humans and cows, all parties usually remain safe.[19] Cows also interact with dogs and birds. My observations between cows and dogs happened almost exclusively at trash heaps and dumpsters where both animals would forage. Shilpa had no tolerance for dogs and would shake her horns aggressively to drive them off. Other cows seemed ambivalent about dogs, and both species foraged together. Interactions with birds, on the other hand, appeared welcomed by cows. Crows, jackdaws, and cattle egrets were all observed perched on Shilpa and her herd mates, where they picked off ticks and flies. These interactions between birds and cows in the city were a friendly, daily occurrence. Crows also routinely visited the other herd of cows I observed in their cowshed.

[19] In my limited time in India, I never saw a cow-human interaction end in harm, although cows are hit by cars and cattle do injure and kill humans.

Figure 6 a. A cattle egret and crow groom Shilpa.

One last notable type of agency I observed in the field regards cow mobility. When farmers allow their cows to roam freely in the city, the cows are allowed to exhibit a unique form of agency that many dairy cows do not experience. Even village cattle were looked after by a cowherd, to protect them from leopards, cattle thieves, or to keep them from eating crops. Many urban cows could move through the city unattended and this provides a unique opportunity to observe cow choices and movements. I made eight maps of Shilpa's movements through the city and found that before and after her calf was born she appeared to stay within approximately one kilometre of her cowshed. This may indicate an affinity to her owner, cowshed, herd, and/or calf, or may simply mean a cow is ready to be milked. Dairy cow owners state this behaviour distinguishes cattle from dairy buffalo, who are reported not to return to the cowshed on their own, needing to be looked after by a herder. As a relatively

more valuable meat and dairy animal, there may also have been additional reasons for the confinement of dairy buffalo. To reiterate, some farmers claimed the cow's voluntary return to the cowshed was proof of the cow's intelligence, a trait that made them easier to manage, and (to some farmers) proof of the cow's superiority to buffalo. Further investigation is needed to better understand cow movements and herd territories in the city—and how lactation impacts this range—but initial impressions indicate that Shilpa did not range beyond a certain distance from the cowshed.

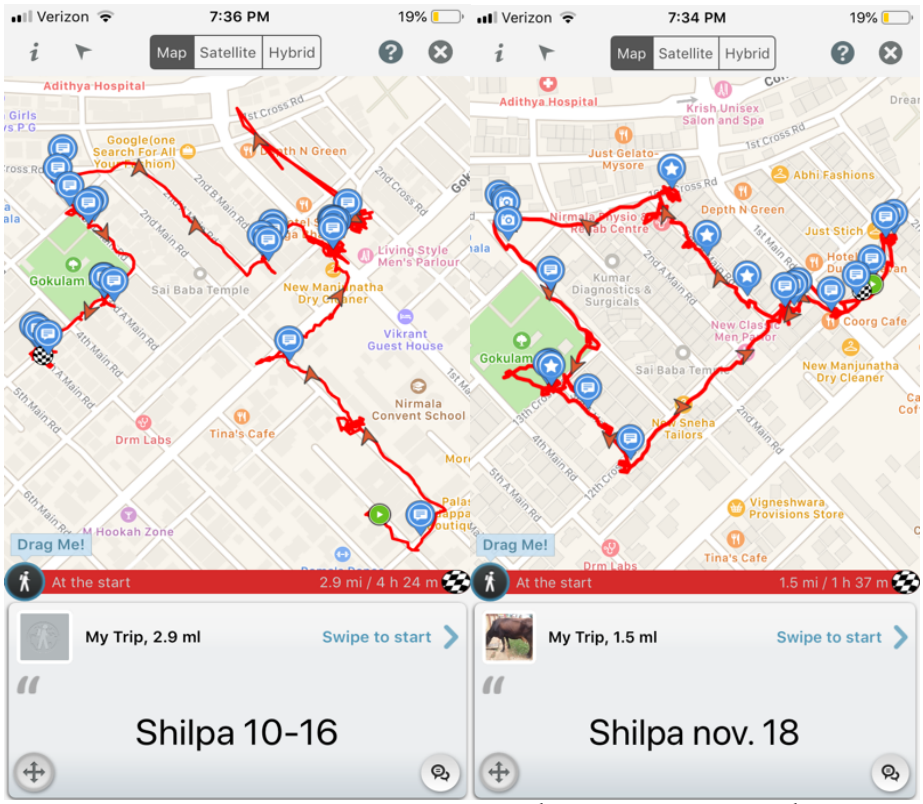

Figure 6 b. & Figure 6 c. Cow tracking maps October 15th and November 18th. The red line is my path as I followed Shilpa. The blue dots indicate where I wrote a note or took a photo with the Live Trekker™ App.

In the late afternoons, between 3:30-5 p.m., there was a general movement of cows back to the cowshed. Farmers would either find and herd their cows home for milking, or the cows would voluntarily make their own way back to their cowshed. So many cows made their

own way home that following became a successful strategy to find urban farmers to interview. Although I observed many cows return to their cowsheds by themselves, I did not see Shilpa return to her cowshed on her own. On the limited number of days I observed her, she continued to forage in the late afternoons and would be in different parts of her neighbourhood between 4-5 p.m. when her farmer would come collect her for milking time. This continued even in the months after her calf was born, when it would seem natural for her to seek out her calf. Her owner claimed that his cows would return to the cowshed around 4 p.m., but I observed him rounding up his cattle in the evenings. Shilpa did display other independent behaviours though, such as spending time alone and defending water and food resources from other cattle and dogs. Perhaps she enjoyed more time away from the cowshed than other cows. My study is too limited to make conclusions from one cow followed over a handful of days and the topic of cow mobilities in the city invites further research.

The city is a unique setting to observe cow behaviour. Cows have adapted to a wide range of stimuli and unfamiliar humans, which speaks to the plasticity of cow behaviour. Cows inhabit a multispecies landscape unprotected from vehicles, construction sites, trash, and varying types of terrain. Their behaviour indicates that they experience low levels of stress in situations that would arguably cause significant stress to cows raised in other management contexts—and I would argue these behaviours cannot be fully accounted for by their breeding. The city as a more-than-human contact zone is a place where cows exhibit a level of behavioural plasticity—accustomed to a cow shed system at night, and adapting to the city during the day along with the noise, crowds, topography, and technologies of this environment. Cows often live in close proximity with their human caretakers—sometimes living inside or directly adjacent to their homes—and their owners treat them more as

individuals than as anonymous units of production. The erasure of affective relationality in industrial agriculture is a notable welfare concern (Buller, 2013b) absent in this setting. The quality of human-animal bonds between livestock and humans for animal welfare and productivity has been well established (Croney, 2014). The ability to live as individuals—expressing unique subjectivities, and adapting to novel stimuli on their own terms—may contribute to the mental wellbeing of cows in cities. In addition, the possibility of convivial relationships with humans—including strangers—offers situations in which they are both urban and urbane cows.

There may be benefits to freely roaming the city for cattle, but there are obvious welfare concerns to keeping cattle in cities. World Animal Protection's welfare recommendations, in India, advise against keeping cattle in cities (WAP, 2019)(Interview with WPA cow welfare spokesperson, 25 November, 2015). Cowsheds are often cramped spaces with poor ventilation and cows are often tied up with only enough room to lie down. They may stand upon concrete for indefinite periods of time. Hygiene is an issue for both humans and animals, as zoonotic diseases can spread between cows and humans. Not all cities in India have as many trees and grassy roadsides as Mysore, which were positive aspects of city life for Shilpa. My observations of urban cattle seek to: 1) point to instances where cattle make use of the city as a contact zone for opportunities to express small moments of agency, such as choosing where to go and who to spend time with; 2) indicate areas where animal husbandry systems might look to improve cattle welfare, such as providing stimuli that invites curiosity on cow's own terms, instead of expecting cows to endure dull predictable environments; and 3) highlight the cow's ability to behave in 'urbane' ways as an intelligent and companionable resident in a high density multispecies cities. The following sections

discuss the city as a contact-zone for urban cows and specifically, their encounters with plastic waste.

6.3 Cows in contested contact zones of the city

This section returns to Haraway's idea of tentacular thinking through the concept of the 'multispecies commons', a term used by Marcus Baynes-Rock (2013) to describe the biological, social, historical, and ecological entanglements, often in cities, between species that require intra-disciplinary explanations. Baynes-Rock's research focuses on the urban interactions of humans and hyenas in Harar, Ethiopia, where the predators coexist with humans—defying preconceived categories and displaying unique multispecies socialities. Like India's urban cattle, many factors contribute to the existence of hyenas in the city, including: a tolerance for their presence facilitated by their role in religion and folklore of the area; modifications to human and hyena behaviour to allow for this unique relationship between the two species; and a small economic function fulfilled by hyenas as a tourist attraction (Baynes-Rock, 2013, 2015). Weaving together a multispecies commons is what Baynes-Rock describes as, 'a zone of entanglement in which historical, political, economic, social, and religious threads…come together in ways that defy singular explanations and challenge disciplinary boundaries' (Baynes-Rock, 2013, p. 223). The city, already a multispecies landscape, is a contact zone where many factors contribute to the success or suffering of urban animals and their affective relationships with humans.

Regarding urban cows in Mysore and elsewhere in India, the next two sections will focus on entanglements between cows and pollution—a material contact zone—in the urban multi-species commons. Both the perception of Indian urban cattle as polluting animals and

their consumption of plastic pollution in the city will be discussed. A focus on urban cows and pollution will add the material as a zone of contact to Baynes-Rock's (2013) notion of the multi-species commons.

As argued in Chapter 4, one reason cows have remained in cities is the perception of cows in Hindu culture as pure and purifying entities, whose material products are highly valued in certain contexts. While the cow's presence is welcomed by some people in the city, it is contested by others—even upper caste Hindus. Street cows block traffic and fowl streets and sidewalks with their manure—increasing the potential for flies and pathogens to spread. Cow's consume and scatter trash. It is therefore questionable whether milk from street cows is fit for human consumption (Baviskar, 2008). In rare cases, urban cows injure or kill people. In 2002, New Delhi judges ordered cows cleared from streets because of a public outcry due to the aforementioned reasons, yet the effort to ban cattle had limited success. Today, cows are still a visible presence in some parts of New Delhi. Urban dairy farmers who manage to retain their cows pay a bribe to police or 'cow catchers', hired to remove cattle from the city (J. Khan, 2008).

Baviskar (2011) proposes that efforts to ban cattle from New Delhi come from middleclass residents that have brought bourgeois environmental attitudes to the city and lack an understanding of the environmentalism of the poor. Bourgeois environmentalism in the city seeks urban order, hygiene safety, and environmental order. Urban cow keeping is an occupation of the lower classes or castes, who may have moved to the city from a village, or whose village may have been overtaken by the city. Cows remain in cities for social and economic reasons, even as they create frictions between socio-economic classes and formal

and informal spaces and governance. Cows occupied a similar space of ambivalence in Mysore.

Mysore city's Chief Veterinarian's duties included management of animal 'menaces', animal slaughter, and disposal of animal waste—including cow manure (Interview, 29 September, 2015). He stated that even though it is not ideal for cows to live in the city, it was difficult to enforce policies that would keep them off the street. Nuisance cattle could be detained and taken to a municipal holding pen and farmers could recover their cows from 'cow jail' after paying a 500 Rs. fine (£5.84). These policies were mainly enforced during Dasara, a ten-day festival that brought thousands of people to the city. Farmers interviewed speculated that police captured and detained cows to generate extra revenue. At the time of this study, Mysore's municipal government had no plans to ban them from the streets. Rather, the city employed government veterinarians to provide subsidized Artificial Insemination (AI) breeding, free vaccinations, and general care at a reduced cost to urban farmers—although some farmers preferred to pay private veterinarians rather than accept the services of government veterinarians.

Many farmers were aware their cattle were unpopular with their neighbours, mainly because of the smell of manure piles and the flies they attracted. Shilpa's owner admitted that he let his cows free in the city during the daytime so he didn't have to manage as much manure at home, although he stated other reasons too, such as allowing his cows freedom to exercise and forage for their own food. Shilpa's owner perceived of his neighbours' attitudes in this way:

> The public doesn't cooperate with us. Some people say they are smelly, they poo everywhere. If they walk on the road, people complain they are blocking the traffic, if they walk on the pavement people complain they are putting dung in front of the gates … Man is very selfish. They invite me to bring the cows to the housewarming (*Griha*

> *Prapesh*).[20] They ask for the cow to enter the house, but after the ceremony, if they see cows passing the house, then they scold, 'why is this cow passing the house?!' (1 August, 2015)

When pressed about how many of his neighbours complained about cattle, he responded:

> The households and families usually don't have a problem with cows. Shopkeepers, hotels, and tire puncture shops do. [Tire shops] because they keep a big tub of water (to find the punctures) outside their shops and they get really upset [when the cows drink their water] (1 August, 2015).

Drinking out of the mechanic's bucket was, in fact, a behaviour I had observed Shilpa perform and she was sometimes shooed away from a water bucket, or scolded by a housewife angry at a cow eating her flowers and shrubbery. I also observed manure being sought out by residents during the Govardhan puja, in which figures are made out of manure to celebrate Krishna's life and the mountain Govardhan that is considered the embodiment of Krishna (Notermans, 2019). The cow exists somewhere between the sacred and mundane in the city.

The management of cow manure in cities does pose a challenge for urban farmers. The city has a green waste program and a compost facility at its solid waste disposal site to help manage the 402 tons the city generates a day (Aravind, 2014). The city's head veterinarian stated that Mysore City Corporation also had dedicated trucks to dispose of cattle manure, which it sent around the city (September 29, 2015). None of the farmers I interviewed used this service. Some farmers made their manure into dried cakes for cooking fuel, but the majority would sell it to someone in their neighbourhood who would collect cow dung and sell it to nearby farms. Farmers could earn between 500-2000 Rs. ($7.50 or £5.84--$30.00-£25.30) per truckload. Some farmers that only had one or two cows admitted to washing cow

[20] *Griha Prapesh pooja* is a blessing ceremony performed for a house warming. There are several rituals that are performed during this ceremony, but having a cow and her calf enter the house before the homeowners is seen as especially auspicious.

manure down the drain in the cowshed or on the roadside, and did not worry about dumping it or collecting it to sell. One urban dairy in Vidyaranyapura that kept 9-10 Holstein-Friesian cows informed me that managing their cow manure was the biggest challenge they faced keeping cattle in the city (Interview, 2 December, 2015).

Cow waste is a source of contention in the multispecies common. As mentioned in the previous chapters, cattle are viewed as nuisances by some city officials that detain cattle for blocking traffic during busy festival seasons or by neighbours who understandably detest the smell of cow manure or flies. At the same time, the local government subsidizes the breeding of cattle, their veterinary care and the removal of their waste, which tacitly sanctions the existence of cattle in the city. While there may be some elements of Baviskar's bourgeois environmentalism at play in Mysore, the place of cattle is less contested in Mysore than it is in Delhi. As Mysore grows, this may change. At present, some city dwellers enjoy the access to fresh milk or having cows available for Hindu ceremonial functions, but some are unhappy with other bothersome aspects of sharing streets with urban cows.

6.4 Waste as a site of contact

Trash is another site of contact in the urban multi-species commons that provides both dangers and opportunities for formal and informal waste workers—human and animal. Informal waste workers are an essential part of trash collection in India's cities (Gidwani & Reddy, 2011) and some animals' role in urban metabolisms of waste are becoming recognized as part of informal waste streams and urban metabolisms (M. Barua, 2016; Doherty, 2019). Cows, dogs, kites (Datta et al., 2010), pigs, and monkeys are found at rubbish heaps and bins in Indian cities next to human trash collectors. Plastic pollution has increased in India as

plastic food packaging becomes more common, often for reasons of hygiene, food preservation, and convenience—values promoted by the middle class. As inorganic waste has increased in the city, the street has become a site for disposing trash—either in dumpsters or in piles on the side of the road—and this is where cows, who consume food waste from trash but lack the dexterity to avoid plastic, encounter problems.

Doherty (2019) suggests that trash is a 'para-site' off of which cranes, who, like cows, consume food at waste sites, take part as participants in informal waste work infrastructures. Building on Michael Serres (2007) theory of the *para-site,* Doherty's theory proposes waste constitutes 'sites' that as he describes are 'also often spatially diffuse practices, rather than stable locations' and where '"para" refers to "proximity, or being beside"' (Doherty, 2019, p. S232). Doherty asserts, 'Parasites are contact zones that exist with and alongside mainstreams, although hardly on equal terms, facilitating flows while diverting materials toward unanticipated ends' (Doherty, 2019, p. S323). His relational approach offers a new understanding of the connections between so-called formal and informal urban infrastructures.

Figure 6 d. Cows, dogs, and a cattle egret gathered at the trash bin. Shilpa far right. Two cows from another herd and two dogs were driven off by Shilpa, who was territorial over food and water resources.

Urban cows in India encounter and consume waste every day. They have become unwitting participants in informal 'waste work' (Doherty, 2019) by removing discarded food from trash and turning it into capital for farmers who sell milk. Along with trash, cows are consuming plastic that is entangled in food waste, usually in the form of plastic bags, as well as other inorganic debris. According to a study conducted on live cows by the Karuna Society and highlighted in the documentary, *The Plastic Cow* (Vohra, 2012), street cattle studied had an average of 33 kg (72.6 lbs) of plastic contained in their rumens. Because of the shape and size of their digestive system, they are unable to pass plastic and it collects in their rumen. Due to this study's small sample size, its findings may not be definitive, but it is widely agreed that every street cow has consumed some amount of plastic (Withnall, 2019).

Encountering waste presents cattle opportunities to gain a further source of calories, but also presents the risk of consuming plastic entangled with food stuffs.

Why, then, do farmers' allow their cattle to forage on trash? This happens for two reasons. First, letting cows forage for food in the city allows farmers to provide additional food for their cows at no additional cost to themselves. In order to make milk, a cow must have enough food and water to produce the substance itself. This requires an increase in calories and ample available water source. Many farmers expressed that the main challenge of keeping a cow in the city was the rising cost of feed and for many letting cows find their own food is viewed as a benefit to their cows' welfare. Unlike in the villages, where some farmers interviewed only fed their cattle on pasture, all farmers I interviewed in Mysore bought feed for their cattle and the rising cost of feed was mentioned as a significant challenge to cattle keeping in the city. Letting the cows find their own food outside of the cowshed was the main reasons stated for allowing cows to roam freely during the day. Giving cows the opportunity to exercise was a second reason. When Shilpa's owner was asked why turned he his cows free during the day he responded, 'When you leave the cows outside they are healthy' (1 August, 2015). When asked what would happen if he kept them indoors, he said:

> They will not be healthy. When you leave them outside they will walk independently. Their health will be in a good state. If they get any sickness like fever they will be able to fight it. If you keep them tied indoors all day they will feel trapped. Any animal should be free. It might be a dog or a bird or a cow. Sometimes the public objects and questions why we leave them outside, but that is the wrong sentiment (1 August, 2015).

When asked if he was worried about his cows eating trash he claimed they would not eat trash because of the bad smell. I knew this to be false because I had spent several hours observing his cow eating trash, but he did not spend all day observing his cow like I had. Perhaps he participated in a wilful ignorance because on balance it was better for his cows to spend time

outside of the cowshed. Lack of comprehension about the enormity of the problem of plastic pollution is therefore the second reason that cows are allowed access to trash. Some owners, though, were aware of the dangers trash posed to cows. The family I lived with employed a cowherd to care for their cows and in addition to feeding, bathing, and milking the cows, he was expected to make sure they did not graze on roadside waste or neighbourhood dumpsters; this was as much for the family's health as for the cows'.

Not all farmers allowed their cows to roam freely in the city, especially if they had lost several cattle to accidents, like one farmer who had lost two cows to train collisions. He personally walked his cows to another neighbourhood where he tied them to shady trees every day. Other farmers, especially those with valuable purebred Holsteins, only exercised their cows when they walked them to the dairy to be milked, morning and evening. When I asked farmers who turned their cows free during the day if they were concerned their cows would meet with an accident or ingest something harmful in the rubbish heap, answers varied. A few farmers credited their cows with being too intelligent to eat harmful things out of the rubbish. The majority of farmers stated that 'there is a risk, but we have no choice'. I was also told that cows 'vomited out the plastic' and if a cow ingested plastic and fell sick a veterinarian would administer medicine that fixed the problem. I never witnessed either event personally, nor was given a clear example in interviews with veterinarians. While plastic was a nuisance, more farmers were worried about their cows finding a large bag of raw rice in the trash. A belly full of raw rice could be lethal to a cow.

After May, when the dry season gave way to the monsoon's pregnant clouds and rain bursts, I was able to address my question of whether Shilpa would continue to forage in the rubbish heap when given a choice of ample fresh grass. I was also able to observe Shilpa for

longer periods of time, because her farmer allowed his cows more hours to exercise and forage during the cooler weather with more available fresh grass. I found Shilpa's routine remarkably similar to her dry season foraging, but her path through the city was somewhat different. Instead of grazing near or on the way to a trash heap, she would seek out grass and weed-filled alleys made to accommodate power lines. Her time at the trash heap remained relatively unaltered, even with the abundant availability of fresh forage. The vigour with which Shilpa sniffed through the trash may also have indicated her preference for certain types of food. Her sense of smell was the best way to find edible and perhaps tasty food in the trash bin or heap. Cattle have a highly attuned olfactory sense and can recognize a smell as far as six miles away (Scanes, 2011) and they can also identify salt by smell (Bell & Sly, 1980). Shilpa may have preferred certain tastes of fruits and vegetable trimmings and bits of cooked food. During the course of my fieldwork she had either been pregnant or lactating and finding food at the trash heap may have provided more calories in a short time than grazing on filling and fibrous low-calorie cellulose stalks of grass and shrubs.

With a limited number of calories available at the cowshed, and the work of producing milk for both calf and human consumption, the importance of procuring extra calories while foraging during the day must matter greatly to an urban dairy cow like Shilpa. In the contact-zone of the city, a cow needs to know where resources are readily available and how to best avoid foods that cause illness or death. As environments and sources of food change, it becomes vital to possess the ability to adapt and problem solve. Yet plastic pollution is one material that is complicating a cow's welfare because it is often so entangled in food waste it is impossible to avoid.

Figure 6 e. Shilpa tearing open a tied trash bag.

I observed Shilpa avoiding eating plastic waste when she could. One day I watched her encounter a plastic shopping bag that was filled with trash and tied shut. She smelled something she wanted in the bag and she picked it up with her mouth and shook the bag until it ripped apart, like a dog shaking a toy (pictured above). Once the bag was ripped open, she was able to access the contents inside. This points to the development of new behaviours cattle have devised to adapt to a non-food material at a food source. Displaying new behaviours in order to procure food is also evident in their ability to adapt to other novel environments, such as the robotic milking machines that 'reward' cattle with food for their cooperation (Bear et al., 2016; Holloway et al., 2014). The ever-evolving environment of the city and its materials provides a platform to observe the adaptable and plastic nature of cattle. To extend Malabou's theory of plasticity to animals, Mawani (2015) writes, 'plasticity as creative life force is imminent to the vitality of human and nonhuman life, emerging in part

through their interconnections and interrelationality' (Mawani, 2015). Cattle are domesticates that live closely with humans who inhabit various landscapes and express numerous cultural practices. Whether in a system of confinement—or on open rangeland—cattle are continually problem-solving in order to procure food and navigate various multispecies relationships. Plastic pollution is a growing problem across the planet, impacting far more species than cows. The question has become: *can cows, humans and other animals adapt quickly enough to plastic and its harms?*

6.5 Conclusion

The urban cow illustrates how trash becomes a contact zone in the multispecies commons. The cow is both a welcomed and contested member of the city, who is viewed as a source of pollution by some and purity to others, yet is also affected by human generated pollution. At the para-site of the trash pile, dumpster, or landfill, waste presents opportunities for humans and animals to benefit in ways that support their livelihoods. At the same time, the toxic ways plastic pollution accumulates on urban landscapes and in bodies illustrates the human impact and power on the planet and our negative influence on the more-than-human world.

Urban cows have adjusted to a wide range of stimuli and socio-spatial relationships in the city. These adaptions have made them 'urbane' in the sense they display a high degree of conviviality with human residents. This is contrasted with the fact that cattle are statistically one of the most dangerous animals in the US and Great Britain—affirming that *the ways* we socialize cattle into human communities has important consequences for both species. In the United States, sharks and bears average one fatality a year, while it is estimated that cows

alone cause twenty deaths a year. A fifteen-year study in Britain (Evans, 2015) revealed cattle killed 74 people during that time and confirmed that they are officially the most dangerous animal to humans in Britain. In this study, bulls and newly calved cows were responsible for 87.5 percent of deaths and eighteen people were killed on footpaths or commonly used rights of way. The remaining 54 were farm workers. People over the age of fifty were more vulnerable to cow-related deaths in both groups. The perception that cattle are dangerous to the public has led officials to forgo trying to capture escaped cattle. Many escapees have been shot, even if they were not directly threatening people in both Britian (Ledwith, 2015; Martin, 2015) and the United States (Farberou, 2014). This open act of violence toward cattle would be unacceptable in India, where it is not uncommon to encounter bulls on the streets and all manner of cows. The ways in which humans and cattle are socialized to one another determine whether they find each other's presence largely normal or benign. The different ways in which cows react to humans should lead us to reflect more closely on why cattle in Britain and the US are fearful of or aggressive to humans, but not in India.

The belief that domestic animals, like cattle, cannot adequately adapt to the social interactions and infrastructure of the city serves to make us comfortable constraining animals in architectures of confinement, where it is easier to ignore the emotional and cognitive intelligence of livestock. The free-roaming Indian urban dairy cow, embodied by Shilpa, is an intriguing research subject through which we can begin to understand the ways cattle display plasticity, including: their convivial behaviour with strange humans. Street cows display potentially novel behaviours, such as choosing to spend time independent of their herd, navigating a landscape full of unpredictable stimuli, traveling within a 1 kilometre territory, and returning to their cowshed of own accord.

The city is a multispecies contact zone where cows can adapt and find ways in which to thrive, but there are limits to their ability to adapt. The cow's consumption of plastic pollution from human trash represents one of these limits. The following chapter expands on the material entanglements between cattle and trash and discusses larger socio-cultural reasons cattle are allowed to eat trash, the toxic properties of plastic pollution, and how—beyond being an issue for cow welfare—flows of plastic pollutants between cows and their milk is a larger public and environmental health issue.

Chapter 7: Plastic Cows: Polymer, cow, milk entanglements

Plastic, by its very nature, complicates efforts to think about it.

-Jeffrey L. Meikle, American Plastic: A Cultural History

7.1 Introduction

This last chapter of research will propose the final expression of plasticity by focusing upon the cultural and material agency of plastic itself, as it is entangled in human and more-than-human lives. The concept of plasticity in this thesis has evolved from: the *symbolic plasticity* of animals that serve as vessels upon which humans project political and cultural identities; to the *genetic plasticity* of cattle, including how artificial insemination technologies have contributed to hybrid cows; to the ways in which cattle display *behavioural plasticity*, evidenced through different social, spatial, and material encounters in the city. Finally, this chapter will focus on cattle-plastic entanglements and how plastic and its pollutants are understood as both significant *solid and fluid* waste issues. 'Plastic cows' are both real animals and parables for the era of the Plasticene, which may challenge previous biopolitical notions of risk, containment, and harm.

In 2011, The Karuna Society—an NGO dedicated to improving the life of street animals in India—performed live surgeries on cattle to extract plastic and other debris, in an effort to study the severity of plastic pollution for urban cattle.[21] The data they collected from 34 cattle taken from the streets of cities in Andhra Pradesh and Karnataka, suggests that 100

[21] Video footage of these surgeries can be seen on the documentary 'The Plastic Cow' (Vohra, 2012 #1037).

percent of urban cattle allowed to roam freely will have consumed plastic, and that plastic bags make up the majority of this undigested inorganic debris. An average of 32.2 kg. (71 lb.) of plastic and debris were removed from the cattle's rumens. One seven-year old cow harboured a maximum of 48 kilograms (105.6 lb.) of plastic and 15 kg (32.2 lb.) was the minimum amount removed from a 10-month old cow. Cattle can live with plastic in their rumens for years, but it increases their risk of dying from an impacted intestinal tract, or from traumatic reticuloperitonitis (TRP)—the medical term that describes laceration of the GI tract—which impacts their overall quality of life. As stated previously, a government veterinarian estimated that 10 percent of cattle in Mysore die from plastic pollution annually (interview 25 September, 2015).

NGO's like the Karuna Society, World Animal Protection (WAP), and cattle sanctuary directors, are concerned about cattle welfare issues. The milk from plastic cows is a potential public health issue, but concern about public health problems from cows consuming food in trash was largely absent from both my interviews and the general discourse of urban dairy cow management. This signals a lack of general understanding about plastic's properties as a chemical pollutant, the ease in which plastic pollutants may travel from a cow's rumen into her milk, and the potential human exposure to these chemicals via the consumption of milk. Research on plastic pollution reveals that chemicals leached from plastic do not break down or decompose easily, can act as carcinogens, disrupt hormone functions, and have multi-generational effects. Also, plastic pollutants do not follow past definitions of 'poison', which challenges our basic understanding of what a toxin is and how it behaves. This chapter will examine the agency of plastic as a consumer and waste object, the material properties that

make it a unique and troubling waste material, and the problems that arise with the governance of its novel and unpredictable material harms.

Advancements in molecular chemistry that occurred during the late 19th and early 20th centuries gave scientists the knowledge to deliberately alter the structure of carbon-based molecules derived from biproducts of coal and oil production. Polymers that mimicked rare, natural substances—like ivory, tortoise-shell and lacquer—could be produced en masse for a large consumer market (Freinkel, 2011, p. 239) and man-made synthetic chemicals could stand in for difficult to procure dyes, medicinal compounds, fertilizer and food additives (Altman, 2017). These compounds would transform human material culture and economics with the promise of human mastery over nature. But the way plastic would revolutionize material culture and the impact synthetic chemicals would have on environmental and public health were impossible to predict at the time (Altman, 2017).

The ability of the more-than-human world of organisms and materials to diverge from—and at times transcend—human understandings and expectations is part of their agency or 'thing-power' (Bennett, 2010a, 2010b). The history of plastics and their pollutants reveals that humans and their societies are not separate from nature. Rather, human bodies are enmeshed in, rather than apart from, the liveliness of the world which operates in excess of humans (Whatmore, 2006). Plastic is a material that has exceeded human abilities to contain and control the vast amount of plastics produced and discarded, and has material, social, and political agency (Braun & Whatmore, 2010; Hawkins, Potter, & Race, 2015). As more is learned about plastic ontologies, its material properties—composition density, size, strength of molecular bonds—become central to its agency (Liboiron, 2015). Research increasingly reveals alarming information about plastic pollutants' longevity, its molecular and genetic

impacts on organisms, and its ability to pass through environments and bodies. Plastic complicates the material turn in critical theory because it alters our understanding of objects and the shifting properties of their materials. (Gabrys et al., 2013).

Plastic and its ever-accumulating waste are intimately tied to industries and economies (Hawkins, 2013). Plastic production is a biproduct of petroleum refinement, which makes it cost effective, malleable, robust, and lightweight—all properties that have facilitated a new material and cultural democracy, as well as the rise of material capitalism during the last half of the 20th century (Freinkel, 2011). Plastics utilize only 4% of fossil fuel's raw materials and their manufacture use another 3-4 % in energy resources. Plastics save more energy than they use in building applications and in packaging. They also reduce food wastage and afford protection from spoilage. Plastics have also created innovations in healthcare, while providing savings (Andrady, 2015). Single use plastics, like plastic bags consumed by cattle, also have a lower energy cost and carbon footprint than paper bags made from timber (Yeow, Dean, & Tucker, 2013). The low cost, durability, and convenience of plastic shopping bags are part and parcel of capitalism as instruments of consumerism, which are commodities that are not consumed directly, but facilitate consumption (Harvey, 1978). These objects include items as diverse as cutlery and kitchen utensils, refrigerators, television sets, washing machines, houses (Harvey, 1999, 2007), and water bottles (Hawkins et al., 2015).

This chapter seeks to bring plastic bags and their materialities into the discourse of the political economies of plastic. Water bottles have received attention as political actants that become players in the water-oil-capital assemblages (Hawkins, 2006, 2010, 2011, 2013; Hawkins et al., 2015) and as components in embodied practices of health (Pacheco-Vega, 2019; Race, Michael, & Rosengarten, 2012). But analysis on the material agency of plastic

bags has received less attention. Plastic bags have been viewed mainly as a solid waste issue (Njeru, 2006), as materials that have fluidity as recycled and re-purposed materials (Klocker, Mbenna, & Gibson, 2017), and sometimes plastic bags serve only as metaphors for anxiety about the plastic age (Hawkins, 2006). The unique cultural and economic agency of plastic shopping bags as consumer and waste products in India will be discussed in this chapter, as well as a deep analysis of the specific molecular structure of these bags, which informs the entanglement of plastic, cattle, and milk. Because plastics leach associated chemicals, plastics are also a fluid waste concern on par with other synthetic chemicals, like pesticides, that benefit humans but also have troubling public health implications—substances that Nading (2017) refers to as 'leaky materials'. Plastic bags have the unique ability to absorb other organic petrochemicals and exhibit transcorporeal properties (Alaimo, 2010), as these long-lived chemicals travel through environments, including oceans (Alaimo, 2016; Liboiron, 2015) and landfills (M. Hird, 2017; M. J. Hird, 2013), with unintended and unexpected consequences.

As India's economy and consumption habits increasingly model those in the global north, the nation will continue to generate a growing amount of plastic pollution. Sociality shapes our relationships with waste (Hawkins, 2006), and the cultural norms that govern who and when people handle waste in India, remain influenced partly by the caste system (Chakrabarty, 1991) that evolved long before plastics. Government reports from British India recount that major cities, like Delhi and Bombay, had waste management and sanitation problems (McFarlane, 2008) before plastic was part of the consumer waste stream. New formal and informal economies have been created by plastic recycling in India, which lessens anxiety about its presence on the landscape. As much as half the waste in India is handled by

the informal market (Gadwani, 2014; Gill, 2010), but less attention has been paid to the ways that animal waste workers, such as dogs, cattle, and raptors, interact with and help manage parts of the waste stream (Doherty, 2019). The focus on cattle-waste in Mysore will attend to this gap in the literature.

Myra Hird argues that knowing how waste impacts the more-than-human world helps us recognize that our waste can have far reaching impacts on other organisms and ecosystems (M. J. Hird, 2012, 2015; Zahara & Hird, 2015), and challenges waste as a realm of human exceptionalism. In some cases, animals benefit from waste. Scavenging is an ecologically efficient behaviour and many animals find food and habitat in waste (Cormen, 2011; Jerolmack, 2008; Nagy & Johnson, 2013b). The excess of human food waste has even been responsible for the resurgence of species formerly threatened or endangered, such as the ring-billed gull in Toronto (Watson, 2013) or the black kite in Delhi (Kumar, Mohan, Jhala, Qureshi, & Sergio, 2014).

While a benefit to some animals, it appears far more likely that our waste—especially the accumulation of unmanaged plastic pollution on land and sea—is a growing threat to animals. This is especially true in the ocean, where plastic pollution now impacts the ocean's entire food chain from zooplankton (Setala, Fleming-Lehtinen, & Lehtiniemi, 2014) to sea birds (C. Wilcox, Van Sebille, & Hardesty, 2015), and cetaceans (de Stephanis, Gimenez, Carpinelli, Gutierrez-Exposito, & Canadas, 2013). Plastic's impact on marine animals has received some attention in geography (Mitchell, 2015), but terrestrial animal-plastic entanglements by urban livestock have yet to be explored by the field. My research on plastic-cattle entanglements in Mysore presented in this chapter attends to this.

Plastics have escaped our physical barriers and boundaries, and animals frequently encounter plastics in their habitats and foraging sites. Plastics also can elude personal, social, and political understandings of what it is as a material and what its public and environmental harms might be. Plastic is not one thing, but a group of materials that evolved as biproducts from the refining of crude oil. Different plastics require different chemical processes that change their physical properties. We don't yet understand all the health implications from exposure to these plastics and their associated chemicals but we all operate with assumptions about plastics' safety, hygiene, efficiency, and convenience. These assumptions inform our personal day-to-day encounters and relationship with this relatively new, but increasingly pervasive and omnipresent material. Our understanding of plastic as a material, its role in our lives, and its potential harms is ever evolving. As Gay Hawkins writes about plastic water bottles, 'plastic is plastic' (Hawkins et al., 2015). It has an ontological plasticity that will be explored in this chapter through its entanglement with urban cattle, the milk they produce, and the people who consume it. As we arrive at a better understanding of plastic pollution and the manner in which plastic chemicals travel throughout environments and bodies, we might ask: *as a material and waste product, where is plastic's place?*

The following sections will examine: (1) How plastic became pervasive on the urban landscape in Mysore and cities like it; (2) How urban dairy cows come to encounter trash and the bioaccumulation of plastics' associated chemicals in cattle bodies and milk; and (3) The idea of plastic as a leaky material (Nading, 2017), difficult or impossible to contain.

7.2 Indian Waste-Cultures and Cattle

Figure 7 a. Two cows and a dog search for food amidst the plastic debris in the Kanakadasana Nagar district of Mysore. The municipality only provided one dumpster for this area outside the city limits. The growing neighbourhood routinely maximized the single bin's capacity.

This section will describe the history of plastic pollution in Indian cities, like Mysore, to explain why cattle come into contact and consume plastic. There is a general ambivalence toward this problem. Plastic is a novel material that does not decompose and its production increases globally every year. Throughout India's history, waste collection has depended on complex social networks created by the caste system (Chakrabarty, 1991). The growing prevalence of plastic occurs at a time when India's population grows beyond 1 billion people. The nation is also grappling with the problems of a relatively new democratic government that is expected to provide more public services to an expanding middle class, while the benefits and harms of a growing capitalist economy shake up previous social and economic

structures. The story of the plastic cow reveals both the unintended harms that plastic pollution causes to the more-than-human world, and is illustrative of the lack of understanding about plastics material harms that are not unique to India, but serve as a cautionary tale about the growing prevalence of plastic chemicals in food and in environments the world over.

During the first decade of the 21st Century, plastic production in India grew 890%. Per capita consumption increased 340%. Plastic recycling industries have mushroomed autonomously and account for 47% of annual recycling. Unsystematic and informal collection, transportation, and uncontrolled disposal of plastic waste, have grave environmental implications (T. Banerjee & Srivastava, 2012). According to estimates from India's Ministry of the Environment—with data from 60 cities—over 15,000 tons of plastic waste is generated every day. 9,205 tons is collected and recycled, and 6,137 tons remain uncollected and littered (PTI, 2015). A visit to Mysore's municipal solid waste facility revealed that plastic bags were a ubiquitous part of the waste stream. Plastic bags were even a ubiquitous presence in the city's compost facility where they were intermingled in the compost mix and sifted out at the end of the composting process. Despite Mysore's designation as 'The Cleanest City in India' in 2015—the year I conducted fieldwork—plastic's feral presence in the city was apparent. Discarded plastic bags were visible on the side of city streets and piled in impromptu trash heaps, cascading out of city dumpsters.

'Waste' remains an ever subjective and evolving term, and defining waste and pollution reveals India's social history of ordering pollution and purity through social rules defined by the caste system (Chakrabarty, 1991). Chakrabarty (1991) argues that western anxiety about unmanaged waste fails to take into consideration the cultural norms of waste

management practices and their function in India's society. 'Purity/pollution' and 'inside/outside' are two indigenous ordering systems that guided societal and material relationships and do not directly map onto western notions of these same terms. Kaviraj states:

> The Brahmanical concept of cleanliness and purity was quite different than the emergent Western idea of hygiene. There are not successful and unsuccessful attempts to think about the problem of cleanliness, but two different mappings of concepts related to the material world, based on different cosmologies. In some ways this was also an illustration of the dichotomy between what was one's own and what was not *ghare/baire* (inside/outside) (Kaviraj, 1997, p. 98).

These concepts dictated temporal and spatial waste management practices for different castes. The timing of cleaning house would be dictated by the schedule of poojas, which ensured that prayer happened in a pure space. Kaviraj (1997) explains why concepts of inside and outside privileged conceptual purity over geographic purity:

> Yet the garbage collected from this obsessive house cleaning would be dumped on a mound right in front of the house. This owed not to a material-geographic but a conceptual distinction. When the garbage is dumped, it is not placed at a point where it cannot causally affect the realm of the household and its hygienic well-being. It is thrown over a conceptual boundary. The street was outside, the space for which one did not have responsibility, or which was not one's own, and it therefore lacked any association with obligation, because it did not symbolize any significant principle, did not express any values. It was merely a conceptually insignificant negative of the inside, which was prized and invested with affectionate decoration (Kaviraj, 1997, p. 98).

This was a sentiment echoed in an interview with a city municipal waste manager from the Dattagalli district of Mysore. 'If it isn't someone's personal property, then they feel free to dump waste there, even if it is on the other side of their wall' (February 13, 2015).

Chakrabarty (1991) states that the street was a public space which harboured elements of chaos and danger, in opposition to the way households could be purified—echoing Mary Douglas' (1966) dichotomy of purity and danger. Low caste groups were responsible for

keeping public places like markets and sidewalks clean, and modern commerce schedules have created discordance with the timing of when waste is deposited or cleared. The materiality of waste discarded in these public places has changed also with the introduction of plastic as a cheap packaging material that does not decompose and continues to accumulate on the landscape. This new waste stream has created opportunity for those in formal and informal waste management streams that have created a new economic stream through plastic recycling (Gidwani & Reddy, 2011; Gill, 2010). But not all plastic holds the same value in the recycling market. On my visit to a zero-waste facility in the Kumbarakoppal district, objects were hand sorted into recyclable or compostible piles by men and women wearing latex gloves and masks. Different types of plastics have different recyclable value. Clean milk and oil packets were more valuable than other types of plastic. When I asked the director if he saw a problem with growing waste due to increased consumerism, he replied that it wasn't a problem because 'more waste would only generate more revenue' (November 20, 2015)—a state of affairs informal waste workers also desire.

Unrecognized as waste workers, some animals sort through waste to consume food. Cattle, dogs (Narayanan, 2016b), and raptors, such as vultures (Markandya et al., 2008) and black kites (Kumar et al., 2014), and monkeys (Beisner et al., 2015) all seek food in human waste. Animals have also provided important ecological services by removing waste that has benefited human societies. Vultures, for instance, could consume and dispose of a large animal carcass in less than an hour. Vulture populations experienced a steep decline over the past two decades because of the prevalence of the anti-inflammatory drug diclofenac, that vultures consume when feeding from a medicated cattle carcasses. Exposure to diclofenac is a substance vultures' kidneys cannot process and acts as a poison to them. Since the early 1990s

their population has decreased by 99% (Prakash et al., 2003). Without flocks of vultures to clean rotting carcasses, street dog have a new source of food, which has helped to boost their population. Increased numbers of feral dogs have been linked with increased incidence of human dog bites due to rabies (Markandya et al., 2008).

Cattle also have a long history of utilizing waste in ways that have benefited human society. Since their domestication, cattle have turned roughages inedible to humans into useful materials and labour. Cows convert grasses, shrubs, leaves, and seedpods, into milk, leather, bone, horn, meat, and power to pull carts and plows. They have been a benefit to the nomadic tribes of the fertile crescent (Lodrick, 2005) and remain important to many today. With the development of agriculture, cattle could consume the fibrous biproducts of crop production and produce fertilizer, and labour for traction and transport, as well as the above list of materials. As mentioned in earlier chapters, the Vedic people that settled northern India valued the cow above all other animals for these reasons (Korom, 2000; Lodrick, 1981).

It is clear to me that cattle do not regard plastic as food, nor seek it out to eat. My ethnographic observations of Shilpa at the rubbish bin revealed that she would avoid eating plastic when possible, but there were instances when plastic-food entanglements were apparently unavoidable. For instance, desirable food contained in a small thin plastic packet—such as a sealed bag of rice—were consumed. State and city governments have tried to regulate the micron thickness of plastic shopping bags for this reason. The state of Karnataka implemented a ban on plastic bags of less than 40 microns thick in 2011, but there was little enforcement of the law (Shree, 2014). This prompted animal welfare organizations, including the Karuna Society, to advocate for better enforcement of plastic bag bans. In 2014, the online news source *Citizen Matters* reported, 'The Supreme Court summoned officials from

Bangalore responsible for plastic management, while hearing the PIL (WC 154/2012) filed by Karuna Society for Animals and Nature, after they recovered 70 kg of plastic from a dead cow's stomach in a surgery' (Shree, 2014). This prompted a new law to come into effect that banned all plastic carry bags and other types of single use plastic in Mysore and elsewhere in Karnataka (Bennur, 2016). Though I noticed high-end shops had stopped providing flimsy plastic shopping bags, there was little evidence that market vendors or roadside fruit and vegetable stalls had stopped using plastic bags when I returned to my field site in the summer of 2017.

Plastic pollution is a growing concern for urban cattle welfare in India's cities. All urban cattle that consume plastic will experience a poorer quality of life because of it. The rhetoric of plastic bans focuses on improving cattle welfare and preventing their deaths. When I inquired about concerns that plastic pollutants would be transferred to milk, little if any anxiety was expressed about this issue, even from veterinarians. At first, I thought the lack of concern about plastics' associated chemicals leaching into the milk stemmed from the perception that cattle are pure and purifying agents, and thus milk is seen as a pure substance, such as those who believe the waters of the Ganges are purifying despite the fact that chemical analysis shows the river contains a myriad of toxins (Mallet, 2017). But some people I spoke with stated concern over feeding cattle fruit and vegetable scraps because of concentrated pesticides in the peels. This shows that environmental pollution and cows are a concern for some people. Many people view plastic bags as an inert material and not likely to leach chemicals. Store bought milk is sold in plastic packaging, which signals to many that plastic is benign. A better understanding of the material properties of plastics reveals we have

cause for concern and more research is need to understand plastics potential harms to urban cattle and public health.

7.3 The plastic bag in a cow's rumen

To recognize the unique nature of plastic pollution, an understanding of plastic biochemistry is necessary. This section will focus on the biochemistry of plastic bags, which make up the majority of plastic ingested by cattle, with Mysore's urban cattle offering only one instance of exposure to plastic pollutants. An exploration into the biochemistry of the common plastic bag will deepen the understanding of plastic from a solid waste issue to an additional fluid waste problem as well. Other theorists have called for new metaphors to be used to describe plastic pollution, such as the marine debris 'miasma' (Liboiron, 2013) or 'toxic smog' (Liboiron, 2015), to this list I will add the concept of plastic as a 'leaky material' (Nading, 2017). In the chemical infrastructure of global health, Nading proposes a leaky material is a substance that crosses the perceived barrier of the body, which is porous to inorganic chemicals and toxins, often used to provide benefits to public health. For instance, pesticides are used to mitigate the spread of malaria, and bleach to manage microbes, yet each present synthetic substances that can harm bodies. Plastic is also used as a barrier to microbes, *and* also leaches chemicals that enter bodies and environments, causing various incalculable harms.

'Plastic' refers to a broad class of synthetic materials made from various chemicals, largely derived from non-renewable crude oil and natural gas. An early industry definition settled on the term 'plastic' to describe a 'commercial…class of substances… worked into shape for use by moulding or pressing when in a plastic condition' (Meikle, 1997, p. 239).

The various types of plastic made from cellulose acetate, polystyrene, phenolics, urea and other materials are as different from each other as are iron, steel, copper and lead. (Meikle, 1997). Plastic polymers are made by polymerizing monomers to link them into large, firmly bonded macro molecular chains (Lithner, Larsson, & Dave, 2011). These polymer chains are considered inert and not a hazard to human or environmental health on their own—because of their large molecular size—however, plastics' multiple characteristics are created by adding different chemical additives known broadly as monomers. These plasticizers, texturizers, and dyes are added to the strong carbon polymer bonds to make plastics light weight, durable, and flexible. This chapter focuses on high- and low-density polyethylene (HDPE and LDPE, respectively), which create the type of common grocery bags that are used often by those in Mysore to dispose of all manner of household waste, and that cows encounter and occasionally eat at the trash heap.

Figure 7 b. A standard polyethylene T-Shirt shopping bag a cow might encounter in the trash.

The plastic shopping bag we are familiar with today was invented in 1962. It is also known as the 'T-shirt bag' because when laid flat it resembles a sleeveless scoop-neck T-shirt. The revolutionary polyethylene film was waterproof, durable, featherweight and capable of

holding more than a thousand times its weight (Freinkel, 2011). These ingenious properties were made even more attractive by the fact it could be produced and sold far cheaper than paper shopping bags. Plastic bags were promoted as a green alternative to paper because their manufacture put less pressure on forests to provide materials for millions of shopping bags. Once consumers were trained to use T-shirt bags, they became one of the most mass-produced items on earth. By the year 2000, more than a million bags were used *per minute*, which made the T-shirt bag one of the most common consumer items on the planet (Freinkel, 2011). If the T-shirt bag was a highly successful instrument of consumption, it was also an equally successful solid waste problem, both in the industrialized west and the global south (Njeru, 2006).

HDPE has many characteristics that make it highly useful to humans who want a convenient and lightweight bag to carry home purchases or a watertight barrier to contain soggy rubbish to be carried to the waste heap. These same characteristics that make plastic bags a sturdy and convenient object, also make it a unique and troubling pollutant. Chemicals—such as phthalates, which make plastic film flexible—reside in the amorphous regions of the crystalline polymer structure that make up polyethylene. Phthalates are not firmly bonded to the segments of crystalline polymer structure and can easily exit or leach from the material under the right conditions, such as the heat and acidity that landfills provide (Teuten, et. al, 2009).

Polyethylene films leach phthalates when exposed to a range of fluids—including water, acid, and landfill leachate—and have a half-life as short as 2-6 days (Teuten et al., 2009). In addition to leaching plasticizers, polyethylene can also absorb hydrophobic organic chemicals (HOCs) when submerged in a water solution. Hydrophobic organic chemicals

(HOCs) are derived from crude oil and some have become widely known to be carcinogens, endocrine disruptors, and toxins. Well-known HOCs include: dichlorodiphenyltrichloroethane (DDT) [a pesticide], polychlorinated biphenyl (PCB) [which has a wide range of uses, including flame-retardants], phenanthrene (PHe) [a derivative of coal tar], and bis-2-ethylphthalate (DEHP) [a plasticizer]. HOC molecules persist for decades in the environment (Nam & Kim, 2002) and do not dissolve in water. True to their hydrophobic nature, they are attracted to organic polymers (Teuten et al., 2009) and lipids (Endo, Escher, & Goss, 2011; O'Connor, Huijbregts, Ragas, & Hendriks, 2013)—properties that have allowed them to bioaccumulate through the food chain. Studies with marine debris reveal that HDPE absorbs more HOCs than many other types of plastic, although researchers are still coming to an understanding of the health impacts to organisms, ranging from transmission to animals and impact to humans that consume these organisms.

Understanding plastic as a leaky material shifts the focus to plastic's fluid waste properties, which pose their own risks to cattle and potentially the humans that consume their milk. When a cow consumes a plastic bag, it is also consuming whatever chemicals have leeched out of the waste's slurry and have been absorbed by plastic. When plastic becomes lodged in the cow's rumen, the acidic environment of a cow's stomach may expedite the leaching of phthalates and other HOCs from the plastic film and into her system. Some plasticizers are eliminated through urine, other HOCs can reattach to other fatty molecules in the body or be excreted through her milk, to be consumed by a calf or a human. Although phthalates are excreted in urine, humans are constantly exposed to these chemicals that are nearly always present in our bodies (Coa, 2010). Phthalate exposure has also been linked to decreased sperm count (Pan et al., 2015), and a myriad of other abnormal reproductive

development issues (Bergman, Heindel, Jobbling, Kidd, & Thomas, 2013). HOC's can remain in the body for far longer as they bioaccumulate in body fat (Teuten, et. al, 2009). Research on trophic-level mammals, including orcas (Pedro et al., 2017) and humans, show that these chemicals are found in small amounts in amniotic fluid and in large amounts during lactation—when toxins stored in fat are released into breast milk (Solomon & Weiss, 2002; Williams, 2012). This means that infants are exposed to a larger percent of estrogenic hormones than other groups (Serrano, Braun, Trasande, Dills, & Sathyanarayana, 2014). In the global north, meat, oil, and fatty milk products contain some of the highest levels of HOC contaminants, and in addition, fluid milk also contains phthalates via the flexible tubing in automated milking machines (Coa, 2010) and contact with plastic packaging (Lin, Chen, Zhu, & Wang, 2015).

These biochemical entanglements reveal why milk is a perfect vehicle to move these toxins through food chains. These fat-loving molecules are released into mammal's milk and thus young offspring are exposed to higher concentrations of HOCs than most adult mammals. The petrochemical load in orcas, whom, like humans, are mammals and predators at the top of the ocean's food chain, has been studied to reveal the impact of these pollutants on reproduction and offspring (Pedro et al., 2017). Alaimo's trans-corporeal theory (Alaimo, 2010) is a useful theory to understand that the subject cannot be separated from networks of intra-active material agencies. The pervasiveness of plastic in the food system and waste stream, means that we are all exposed to risks, although the nature and severity of these risks is not yet entirely clear.

We are still coming to an understanding about what exposure to estrogenic chemicals will mean for the health of organisms exposed to phthalate esters. The authors of the second

assessment on endocrine disrupting chemicals (Gore et al., 2015) state 'EDCs interfere with the actions of hormones, disrupt homeostasis, and may alter physiology during the whole life span of the individual from development to adulthood.' (p. E7) Because these chemicals are structurally similar to hormones, they can influence growth and reproduction. Their ability to enhance, dampen, or block hormones involves many variables, including the developmental window of exposure, the individual's metabolism and his or her genetic background. (Gore et al., 2015) This challenges the temporality with which we perceive and react to threats to life, like air (Braun, 2008) (Hinchliffe, 2012; Hinchliffe, Allen, Lavau, Bingham, & Carter, 2013) and food borne diseases that harm quickly.

Plastics and their chemicals are challenging regulatory models of pollution, research methods, and modes of action because of their ubiquity, longevity, and scale of production. First, these pollutants challenge our previous understanding of a poison. A poison was once considered a qualitative concept that any substance could be harmful at some dose and, at the same time, is harmless at a low dose (Hodgeson, 2010). Effectively, the dose makes the poison (Freinkel, 2011). Endocrine disruptors change the perception of what constitutes a toxin. The poison is no longer solely in the dose—it can also be in the timing of exposure. Exposure to a small amount of an ECD at the right time may have an impact that exposure to a large dose won't have at a later time. Research reveals that pregnant women and young children may be the most impacted, and research also shows that exposure to some phthalates during foetal development could lead to multigenerational impacts (Gore et al., 2015). Studies conducted with bisphenol A (BPA) show that exposure to a EDC may not appear until the third generation shows abnormal development (Gore et al., 2015) Because of the unique nature of these chemicals, Liboiron (2017) argues that synthetic chemicals should be

classified as a separate class of substances from toxins. Toxins should be understood as poisons produced within the living cells or organs of plants, animals, and bacteria. The phrase *toxicant* should be used to distinguish synthetic, human-made, toxic chemicals because they have a unique agency, which is different in 'kind rather than degree' (Liboiron, 2017).

How we represent the materiality of waste has a crucial influence on the effectiveness of any actions proposed to solve or mitigate the problem (Liboiron, 2015). Plastic pollution in India and elsewhere is a *solid* waste issue, but an understanding of the biochemistry of plastic illuminates its agency as a *fluid* waste that migrates from plastic through environments and bodies with unintended and (as of now) unknown consequences. Various factors—which include plastic film's chemical structure, low cost of manufacture, consumer preferences and waste habits, municipal infrastructure, informal waste practices, and cattle behaviour—inform plastic-food waste entanglements and its material liveliness as a consumer product and pollutant. The research on sea-life points to plastic pollution creating impacts on individual organisms and their offspring (Engler, 2012). These chemicals persist in the environment and bioaccumulate through the food chain. The research indicates that free-roaming cattle will be exposed to plasticizers and HOCs in varying amounts, and that through milk these toxicants will be passed on to humans that consume their dairy products and/or meat. Our understanding of plastic remains plastic (Gabrys et al., 2013). As new scientific research helps us to better understand plastic's material force, *how do we now relate to its presence and management in the environment?*

7.4 The Sewage Farm

After seven months of fieldwork on this topic of cattle and plastic pollution, the virulent force of plastic pollution's agency in the environment struck me with an almost guttural force during my visit to the 'sewage farm'. When I interviewed urban dairy farmers, I was often told that they bought fresh grass for their cattle at the sewage farm. I went to investigate this oddly named farm during the last few weeks of fieldwork. I quickly realized the sewage farm was a name for the grass farm next to the sewage treatment plant and municipal city dump. At one time, the entire property had been a prosperous coconut farm owned by Mysore's royal family. The royal family donated the property to the city for housing the municipal solid waste facility and water waste treatment plant. The city later built a compost facility for green waste. The rest of the property has remained a coconut farm that grows the tall tropical grass used as fresh fodder for cattle in the region. The landscape was a juxtaposition of the dystopian and pastoral. A long sizeable mountain of trash paralleled the city's nearby iconic Chamundi Hill and was uniformly studded with countless numbers of plastic bags. In the opposite direction stretched a lush grass farm shaded by straight rows of towering coconut palms. The water waste treatment plant divided the disparate landscapes down the middle. The compost facility resided down a further road—also peppered with plastic bags and a flock of increasingly rare Egyptian vultures. At the sewage farm entanglements between plastic pollutants and cattle fodder reached a meta level.

Figure 7 c. Mysore's municipal solid and fluid waste facility. The water waste treatment facility pictured in the foreground. The sewage farm is pictured on the far left (grass growing under coconut palms) and the solid waste facility is visible on the far right partially hidden behind trees.

Figure 7 d. The municipal compost facility.


Figure 7 e. The Sewage Farm.

I've already described the fluid properties of plastic pollution and their impacts on mammals, but new research reveals that plants also absorb phthalates (Sun, Wu, & Gan, 2015). Even if urban farmers in Mysore kept their cattle confined to the cow shed—safe from plastic consumption at the trash heap—cattle could still be exposed to phthalates from this urban farm. This underlined my growing awareness that there are no barriers between plastic pollutants and the environment. Plastic is becoming so ubiquitous in daily environments that separating plastic petrochemicals from our lives has become impossible. In the past decade, every human and animal body tested contained chemicals that leach from plastics (Bergman et al., 2013). This presents a challenge to the traditional scientific method. If we lack a control group to compare what a plastic chemical-free organism would develop or behave like (Liboiron, 2015), our science of causation is muddled. Furthermore, these chemicals mimic hormones and can insinuate themselves inside the very genetic material we understand as the blue print of life. We have to re-evaluate binaries of pollution and purity in life's new plastic naturecultures, as we comprehend that petrochemicals in various types and amounts are a permanent part of the assemblages of life.

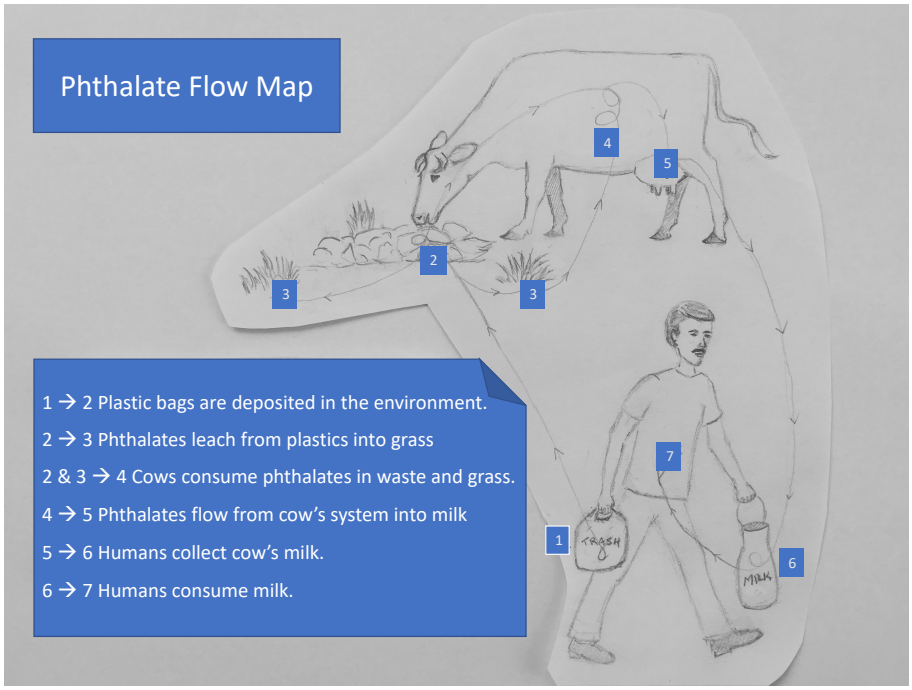

Figure 7 f. Pthalate flow map

The *plasticity* of plastic's material agency is that of the man-made chemical to alter the biological. Understanding plastic bags (and other flexible plastics) as vectors that both release and absorb endocrine disruptors—and can transport these substances across oceans or land masses into contact with bodies and environments—brings to light biopolitical and environmental justice questions. *Who is made most vulnerable to these substances? How can we minimize exposure or harms to these substances? Who is responsible for the governance of plastic pollutants?* My case study subverts traditional environmental justice narratives that the most vulnerable or poor populations will be exposed to the most pollutants. Residents who were able to afford the more expensive fresh milk from urban cows were not spared from exposure to these pollutants. Although packet milk will also contain some percentage of phthalates, because of the manner in which it is processed and packaged, unprocessed fresh

milk has the potential to harbour more HOCs because of the way plastic bags absorb these chemicals.

This scenario echoes plastic pollutant exposure in the more affluent global north. Lack of oversight and regulations may allow for more dangerous types of plastic to be produced in developing nations, but more people are exposed to plastic pollutants in North American and European countries, because of the sheer amount of plastic produced and used by their citizens (Serrano et al., 2014). Microplastics have been found in sea salt (Karami et al., 2017), and they have ferried PCB to organisms living in the depths of the Mariana Trench (Jamieson, Malkocs, Piertney, Fujii, & Zhang, 2017); microplastics can even elude the filtration systems of freshwater treatment plants (Karami et al., 2017).

The scale, novel properties, and unknown risks of plastic and its pollutants gives rise to a theory of plasticity that takes a two-fold approach in this chapter. The first speaks to the unique natures of plastic pollutants and their potential to alter, harm, or destroy life, and the second refers to our evolving understanding and response to these harms. As Gabrys et al. (2013) states: our understanding of and response must also be 'plastic', as our understanding of its properties and pollutants continues to change.

Plastic pollutants join other non-living materials that can alter life, blurring the line between vital and non-vital matter (De Wolff, 2017; Rose, 2007). Plastic pollutants have also become 'hyperobjects' (Morton, 2013). A hyperobject is a material that is ubiquitous and spills over the human agency to control it. Examples include radiation, mercury, DDT, and global warming. We cannot always view hyperobjects with the naked eye, but they are 'viscous' in that we are unable to prevent their molecules or phenomena from 'sticking' or flowing inescapably through us. They operate on temporalities that 'undulate' from readily

apparent, to slow released harms. Their omnipresence in the environment means that we no longer have an uncontaminated baseline from which to compare the contaminated. Exposures to plastic pollutants are unpredictable, and because these pollutants can alter the expression of genes, the temporality that determines when harms might emerge remains uncertain. They are real, but it is hard for individuals or societies to grasp their nature in order to respond to it, especially because they don't fit into cultural norms that have previously mitigated our response to toxicity and waste.

To return to Mysore and urban cattle, plastic and its pollutants have emerged recently in a culture that has previously had elaborate boundaries governing purity and pollution. As Liboiron states (2015) plastic pollutants are materials that challenge the cultural relativist position Mary Douglas proposed regarding pollution. To this I would add that biocitizenship (Langston, 2008; Rose, 2007) regarding plastic pollutants may take different forms depending on place, culture, a citizen's positionality, and an individual's knowledge of harm regarding the pollutant. For example, in my interviews, more than one person mentioned their concern about cattle exposed to pesticides from consuming vegetable scraps from the rubbish heap, which suggests that cattle aren't viewed as entities that can purify all substances. The perception amongst the majority of stakeholders interviewed recognized plastic pollution as a problem for cow welfare, but not necessarily a public health issue. This speaks to a lack of understanding about plastic, the potential harm of its pollutants, and possibly an underlying belief in the social imagery about the capability of the cow to purify some aspects of trash. Anxiety about other toxins, like pesticides, may be due to the way pesticides behave like normal toxins in high doses, and the visibility of pesticide events—like the Bopal disaster or farmer suicides. Plastic's harm as a leaky material may be made opaque by its benign status,

convenience, ubiquity, and utility for products that also aid human flourishing, for instance, the way it has revolutionized medical care (Roberts, 2013). Recognizing the harms of one type of plastic would raise questions about exposure to other plastic pollutants.

It is arguably easier to lock up cattle than change human attitudes and habits toward waste. In interviews, animal welfare champions—such as World Animal Protection (WPA), and a Hindu *Gaushala* director and author of a *Gaushala* best practices guide for India's Animal Welfare Board—advise that cattle should live outside cities in conditions that are more suited to their flourishing. Increased urban development and rising cost of feed in Mysore has already prompted some farmers to reduce their herds or to keep dairy cattle as a hobby that provides a small side income. As long as urban dairy farming continues, keeping cattle from plastic would likely mean that cattle are locked up in cramped, stuffy, hot cowsheds for much of the day, or tied outside without exercise—unless taken on walks with their farmer—a management style that a handful of farmers I interviewed already observe.

A sole focus on managing urban cattle's access to plastic also overlooks the agency of milk in cow-milk-human assemblages. Milk and its products are a vehicle to transport plastic pollutants to human bodies, whether it is through plastic cows or through industrial milk collection and processing machinery (Lin et al., 2015). If all of India's urban cattle were moved to villages today—where dairy cooperatives and collectives pay subsidized prices for milk and offer access to veterinarians—then this milk would still be exposed to plastic pollutants via the phthalate laden tubing in milk processing machinery and packaging, although levels of exposure remain speculative without appropriate research. Urban farmers interviewed expressed scepticism over the health benefits of processed 'packet' milk. It was viewed as a substandard product that could easily be adulterated before or during processing,

which included: its pasteurization (to kill microbes); homogenization (to cut fats into pieces so they remain suspended); and toning (adding skim milk and milk powder to standardize fat contents). Some were also concerned that these procedures denatured the beneficial properties of milk that made it healthy, and these anxieties prompted people to seek out fresh milk. Therefore, attuning our response to plastic pollutants in milk requires us to weigh its potential harms alongside many layers of meanings, anxieties, and assumptions about the health benefits of milk for humans (Atkins, 2010). It is also important to recognize that cattle and their milk are not the sole vector that expose us to these substances, but are one example amongst many types of foods and materials that expose us to plastic and its associated chemicals (Bergman et al., 2013; Serrano et al., 2014).

7.5 Conclusion

Plastic cows are plastic in the sense that they consume plastic and plastic pollutants flow through their bodies and their milk. But plastic cows also serve as symbols for this era of plastic waste and its consequences. Gandhi stated that 'The cow symbolizes all of dumb creation' (Gandhi, 1869-1948, p. 246). For Gandhi, how people treated cattle represented their compassion toward a beast of burden, but also larger attitudes toward the human relationship with nature and its inhabitants (F. Burgat, 2004). The story of India's modern day plastic cows reveal plastic as a material that escapes both human containment and foresight of plastics' environmental entanglements, as humans struggle to understand how to relate to its novel materialities. Its sturdy polymer chains do not decompose to renew its materials into new life, but its associated chemicals—some of which resemble hormones—interact with and potentially alter life. A theory of plasticity captures both plastic pollutants' capacity to modify

life, and the need to alter our understanding and behaviours toward plastic in response to its agency in the world. When cattle consume plastic waste there is the potential for plastic pollutants to travel into and through their bodies. This connects cattle health and welfare with public health, and leads us to the concluding question*: what can be done to improve the health of humans and cattle in the city?*

Chapter 8: Conclusions

8.1 Introduction

From the inception of the new wave of animal geographies in the late 1990s, urban animals have played an important role in establishing animal geography as a prominent subdiscipline. Wolch, Emel (1998; 1995), and Philo (1995; 2000) contributed to understandings of human representations of animals in human cultures and spaces, challenging presupposed binaries used to order the environment, and impelling a richer more equitable ethics of engagement with urban animals. Hinchliffe and Whatmore (2003; 2005; 2006) called for cities to be more convivial political spaces for the more-than-human world, and called on geographers to situate the ecological within the political. Expanding further upon these ideas, Hovorka (2008) asserted animals should be viewed as important actors that shape sociocultural, political-economic, and spatial landscapes in cities in Africa and elsewhere in the global south. Her aim was to make urban livestock visible and, 'to explore concretely the ways in which animals are drivers in urban processes, structures, and dynamics' (Hovorka, 2008, p. 110). This thesis addresses a research gap identified by Hovorka, who called for further research on urban livestock in the global south.

As the field of animal geographies continues to evolve, urban animals in South Asia are becoming an increasingly rich topic of study for animal geographers working to contribute post-colonial and more-than-human analysis to theoretical areas of inquiry in: biopolitics (Jerolmack, 2013; Srinivasan, 2013); cosmopolitics (Srinivasan, 2019); political ecology (M. Barua & Sinha, 2017); urban development (Narayanan, 2016c); and feminist and animal ethics (Narayanan, 2016b, 2016c). Through a multi-faceted analysis of the life and function of urban dairy cows in Mysore, Karnataka—organized around the theme of plasticity—this

thesis contributes to critical animal geographies, political ecology, multi-species ethnography, and more-than-human material geography.

This final chapter will summarize the thesis' aims and methodologies, and provide a brief overview of the chapters. This will be followed by a discussion of 'plasticity' and how this concept may be of use for future scholarship in animal geographies and critical animal studies. Then, the focus will shift to addressing the last research question: *How can we create conditions for better human and cattle welfare in Indian cities?* The thesis concludes with a discussion of further research that might follow from this study.

8.2 Thesis Overview

Chapter One introduced the scope of the paper, the topic of urban dairy cows, their role in Hindu Nationalism, their placement in the city and entanglements with plastic. The guiding research questions of this thesis were then presented.

Chapter Two reviewed the historical role of the cow, including: scholarship on the material and socio-political function of sacred cows; the literature on urban animal geographies; and literatures on the more-than-human material agency of plastics.

Chapter Three outlined the mixed methods methodology utilized in this study, inclusive of representational analysis of texts, and an account of the multi-species ethnographic research conducted during fieldwork.

Chapter 4 gave an overview of the history of the cow as a symbol of Hindu identity, and proposed the concept of anthro-animal identities to explain the influence of beliefs about cows in the creation and reproduction of socio-cultural identities. It also discussed how disputes over the use of cows played a role in the territorialization of India as a Hindu

homeland. The function of the cow in religion, politics, and Ayurvedic medicine reveals the ways perceptions about cows informed and helped to define unique Hindu socio-political identities. These beliefs, in turn, informed differing ontological beliefs and empirical inquiry about cows and their spiritual and material functions between influential social groups in India. The Hindu perception of the cow as a source of material wealth, corporeal health, and spiritual salvation for humans, also contributed to the cow's prominence and utility in a dairy industry that situates cows in the city.

Chapter 5 also discussed motivations for the persistence of dairy cattle in Mysore city and introduced the concept of the urban animal pastoral to describe affective and economic rationales for the presence of cows in Mysore. Interviews with 44 urban dairy farmers and 33 village farmers inform the empirical and theoretical contributions of this chapter, which proposes that cows embody a unique post-pastoral ideal in Mysore. This section outlines five features of an urban animal pastoral that mix traditional and modern attitudes towards cattle in the city. Mysore's urban dairy farmers have a 70-year history of keeping hybrid dairy cows. These cows represent the genetic plasticity of cattle, in which indigenous cattle are crossed with western dairy breeds to improve the hardiness of western dairy breeds to withstand the environmental conditions in India, while producing more milk than their native counterparts (Rajapurohit, 1979; Scholten, 2010). Even though this is a different animal in biology and temperament, many farmers stated that hybrid cows provide material and health benefits and embody the sacred. The chapter concludes by examining ways cows also embody an anti-pastoral in which mundane aspects of urban cow management and conflicts with humans complicate the notion of an urban animal pastoral; negative aspects of keeping cattle in the city are discussed further in the following chapter.

Chapter 6 utilized multispecies methods to better understand how an urban dairy cow in Mysore experiences the city. This chapter proposed that urban dairy cows exist in a more-than-human urban contact zone—zones of fraught power relations where animals are subject to exploitation by humans and to the dangers of the human built and privileged urban landscape. The chapter also speaks to cities as spaces of opportunity and adaptation, with possibilities for subaltern creatures to discover spaces to thrive within systems of hegemony. Urbane cows adapt to human built spaces and may experience small moments of freedom and wellbeing, which serve as a critique for cattle raised in industrial contexts. There are circumstances when cows reach the limits of their ability to adapt, and their encounters with and consumption of plastic pollution is evidence of this.

Chapter 7 examines the material entanglements between cows, milk, human, and plastic pollution. One study estimates that on average, each street cow harbours 32 kilos (70.4 pounds) of plastic bags and other debris in her rumen, which accumulate the gastro-intestinal tract (Nature, 2017). An estimated 10 percent of cattle die from intestinal impaction or laceration caused by plastic or other debris, which highlights the problems plastic pollution causes to animals that forage in human rubbish (Government Veterinarian, September 25, 2015). While plastic pollution remains a solid waste issue, it is also a troubling fluid waste issue because of plastic's propensity to leach chemical pollutants. This chapter examined: (1) why these urban cattle encountered and consumed plastic; (2) the biochemistry of plastic, and its unique agency as a pollutant and its potential harms to organisms; and (3) the concept of molecular plasticity, specifically the agency of plastic pollutants as chemicals that mimic hormones. Endocrine disruptors have the potential to interfere with the normal development of organisms and potentially alter the genomes of plants, animals, and humans. The story of

urban cattle in Mysore reveals plastic's unique agency as a waste material whose pollutants travel through environments and bodies in ways that challenge previous biopolitical understandings and capabilities.

8.3 Plasticity and its importance to the field

Four meanings of plasticity were introduced in this body of work: (1) *rhetorical plasticity,* where animals assume multiple and sometimes contradictory meanings; (2) *genetic plasticity,* noting ways organisms are shaped by evolution, natural and artificial selection, and genetic engineering; (3) *behavioural plasticity,* referring to changes in behaviour shaped by biological and/or environmental conditions; and (4) *material plasticity,* which traces how plastics and their pollutants continue to change, challenging us to find new ways to relate to and live with plastic products. The following section will discuss these four theories of plasticity in more detail.

Malabou introduced the notion of plasticity, to replace deconstruction as a paradigm for our time. Like deconstruction, plasticity reveals that representation is not static and the alteration and discrepancies in meaning continue to inform the ways we view our world. This includes animals and the way animals carry and support our identities as embodiments of symbols, or through food practices and customs, all of which inform human inclusion in socio-cultural groups. Human generated representations of animals can be plastic in the sense that they are fluid to the point of contention, as when different social groups project different meanings onto one animal. These are especially contentious when beliefs about animals form fundamental parts of human identity. When these beliefs differ within communities and societies they can help to create and reinforce powerful divisions between human social

groups, as evidenced by the cow's role in late colonial India and how it shaped conflicts between Hindus, Muslims, and the British. These beliefs about animals also inform how animals are perceived and treated. When discussing the social agency of animals it is important to locate the agency in the belief about the animal and not in the behaviours or properties of the animals themselves.

The rhetorical plasticity of cows discussed in Chapters Four and Five does not argue that cattle should be, or should not be, used to represent or reinforce conflicting cultural identities. The focus on representation is meant to reinforce that representations of animals are also entangled with the material and biological. Human representation of animals continues to inform the use, placement, and political ecologies of animals in important and sometimes troubling ways. Commenting on ways Malabou uses plasticity to deconstruct the biopower, Bhandar and Goldberg-Hiller (2015) write:

> Malabou observes that many juridical and political formations, such as the nation, rely on this kinship between the symbolic and the biological. Consider, for instance, the nationalist politics of 'blood and belonging' that fuse an ethnoracist discourse of biological unity with the transcendent and abstract concept of the nation (pg. 23).

Insofar as the dairy industry plays a role in nation building, this is where plasticity resides in the intersection of the representational and biological, as discussed in Chapter Five.

In today's post-colonial India, the cross-breeding of cows illustrates how corporeal plasticity shapes cow bodies, which serve several functions including: human economic utility for increasing milk production, informing identities, and promoting the cow as a favoured milk animal. Genetic plasticity is evidenced by crossbred cows, which are now a preferred source of urban milk production alongside dairy buffalo; the existence of hybrid cows has been shaped by bodily, technological, and socio-economic and cultural forces.

Urban cattle also exhibit behavioural plasticity in the manner in which they adapt to the unique social and material naturecultures of the city. Life in the city provides opportunities for cows to express unique behaviours, such as: moving independently through the city without a herd for part of a day; living with large number of human strangers without displaying stress and fear; and navigating human-built spaces and traffic. These behaviours are different than cattle's lives in other management systems. Their inability to avoid consumption of plastic waste reflects one instance of a cow's limits to adaptation in an urban landscape.

Plasticity also refers to material plasticity that comes from the flow of synthetic chemicals through bodies, having the power to shape genetic outcomes. This is illustrated by urban cattle, which often are allowed to forage for themselves in the city and eat plastic entangled in food waste. Plastic chemicals are known to travel through food chains and it is likely humans consume plastic pollutants by drinking milk from urban cows. Some of these chemicals are known endocrine disruptors. The flow of plastic pollutants between the environment and organisms in a hyper-relational material entanglement and toxicity, dissolves boundaries between bodies and environments (Mitchell, 2015). Plastic pollution is a global environmental problem we can no longer control or escape. Plasticity refers to how inert materials have the ability to shape bodies and their genetic material. Plastics' transmission of endocrine disruptors through organisms can not only alter the health of an individual organism, but in some mammals can alter the genetic inheritance of the organism, effects of which may not be seen until the f3 generation. The plasticity of plastics introduces uncertain temporalities of harm (Gray-Cosgrove, Liboiron, & Lepawsky, 2015; Hawkins, 2018).

These plastic cows are real cows, but they also symbolize any animal or human that comes into contact with plastic on a daily basis, and through plastic's entanglements with food, ingest plastic. One study suggests the average westerner consumes up to 5 grams—a credit card's worth of plastic—a week. Sources of microplastics listed include water bottles, beer, shellfish and salt (de Wit & Bigaud, 2019). Another recent study found that a tea bag made out of plastic mesh releases 11.6 million microplastics and 3.1 billion nanoplastics into a cup of water (Hernandez et al., 2019). My research focused on the problem of plastic waste in Mysore, Karnataka India, but as United States citizen, I am part of the largest demographic of single-use plastic consumers in the world. This research has made me re-evaluate my relationship with plastics in profound ways. In the past five years, plastic pollution in the ocean has gained a great deal of public attention, but plastic is also becoming an increasing problem amongst terrestrial animals. As more plastics are made, organisms and environments will be exposed to more pollutants. In tandem with the Anthropocene, we are living in the age of the *Plasticene*, and more scholarship is needed from the social sciences about how we conceptualize and live in relation to plastics.

8.4 Additional Contributions to the field

In addition to plasticity, several new concepts introduced in this thesis may contribute to the field of animal geography and critical animal studies. These have been discussed throughout the thesis and are now briefly highlighted.

Anthro-animal identities is a concept I have used to describe the role animals play in shaping human social identities. As Thomas Nagel (1974) makes clear in, 'What is it Like to be a Bat?' we cannot understand the phenomenological experience of other creatures solely

based on an understanding of their physiology and behaviour. We are always representing animals, and there are times when what we believe about animals says more about ourselves than bringing a truer understanding. This is one way animals assume agency in our lives—through our constructions of self, larger relationships with the natural world, and as political actors. The concept of anthro-animal identities can be used in other nationalist contexts where animals and their food products inform socio-political constructions of self, such as bull-fighting in Spain (Dopico Black, 2010) or the neo-colonial encroachment of cattle farming in the Brazilian Amazon (Hoelle, 2014). This concept could also be applied outside a nationalist context to inform instances when beliefs about animals and their relation to an individual help to define inclusion into a social group, such as beef consumption and masculinity (DeLessio-Parson, 2017). Anthro-animal identities could be used to discuss further how animals play into personal food taboos and choices (Fischer, 2016). The concept might also be useful in discussions about how pet keeping informs personal identity, such as ways people identify as 'dog' or 'cat people' and how this shapes pet-keeping practices (R. W. Mitchell & Ellis, 2013).

My analysis of *the urban animal pastoral* identified the pastoral as a common trope in Hindu culture that has yet to be recognized in the social sciences. The theory describes the appeal that the encounter with, or care of, rural animals has to some residents of the city. The concept of an urban animal pastoral could be useful in describing the affect that other animal representatives of bucolic-settings have in urban settings, such as other farm animals or wild animals associated with rural life and lifestyles (E. Benson, 2013). Inquiry into county fairs (Stokowski, 1998), urban farms (Blecha & Helga, 2014), garden animals (Chhabra, Siddique,

& Randhawa, 2012), and urban and suburban songbird territories and bird feeders (Marzluff, 2014), might all be topics that could be explored using an urban animal pastoral theory.

Multispecies urban contact zones identify growing urban landscapes as places that reconfigure ever changing socio-spatial relationships between humans and animals. Some animals will not benefit from the encroachment of human-built landscapes, while others will find opportunities to adapt and perhaps thrive in these novel spaces. As the concept of multispecies contact zones becomes a tool of analysis for how the more-than-human world responds, the concept of more-than-human urban contact zones recognizes the city as a human privileged space in which animals must live in response to human development.

This multi-species ethnography of an urban cow provides new understanding of an urban cow's freedoms and challenges in the city, answering Hovorka's (2008) call for further scholarship on urban livestock in the global south. This multispecies ethnography identifies potential novel behaviours displayed by urban cows, such as spending time independent from a herd, leaving a calf behind for much of the day, and navigating chaotic stimuli in the city. Despite the limited nature of the study, this ethnographic work signals further areas of ethnographic and behavioural research on urban dairy cattle.

8.5 How can we create better conditions for human and cattle welfare in Indian cities?

Chapters Four and Five addressed the first research question, *Why do cattle persist in cities in India?* by proposing that cows serve a politio-religious function as symbols that helped unify a Hindu identity and territorializing India as a Hindu space. Cows also serve as a source of economic abundance, and material and spiritual purity. These are all factors that

have contributed to people's tolerance for urban cattle and their purpose as diary animals in the city.

Chapters Five, Six, and Seven addressed the second research question, *How are urban cattle managed?* Most urban cattle in Mysore are crossbred, or hybrid cattle, a mix of native zebu and western dairy breeds that are bred using government subsidized artificial insemination technology and veterinary services. Urban farmers feed their dairy cattle a mix of bran, oil cakes, and fresh grass and rice-stalk hay but many choose to turn their cows free in the city to exercise and supplement their feed with foraged food. In the process, cows are exposed to plastic pollution entangled in food waste. Because plastics are both a solid and a fluid waste, consumption of plastics by dairy cows is becoming an increasing concern for cattle welfare and public health.

This leads to the last research question: *How can we create conditions for better human and cattle welfare?* I propose three main solutions which could be implemented to address better human and cattle welfare in Indian cities: (1) improving waste management in India to keep urban cattle from encountering and consuming plastic pollution; (2) banning urban dairy cows or banning cows from streets; and (3) reducing or stopping the demand for milk. The feasibility of each of these options will be discussed further here.

8.5.1 Improving waste management in India

The consumption of plastic by cattle is a troubling aspect of cattle welfare in the city and steps should be made to prevent cattle from exposure to trash. Separating food and other compostable green waste from solid waste and keeping waste contained in sealed trashcans, dumpsters, and gated solid waste facilities, would improve the welfare of existing street cattle

considerably. But tackling solid waste in India is incredibly difficult because of the scale of plastic use in the country, the difficulty of coordinating formal and informal waste collection networks to secure all waste, and the socio-cultural attitudes—often instilled by caste beliefs about purity and pollution—that inform personal waste disposal habits. The magnitude of the solid waste issue is partially summarized by the following statistics from journalist, Anthony Paraiz:

> While India is not a top consumer of plastics—24 pounds of plastic are consumed per capita compared with 240 pounds in the US—it has a poor rate of waste management. Much of the country's recycling sector is informal and unregulated, operating without government oversight. Everyday India generates 33.1 million pounds of plastic waste of which only 19.8 million pounds are collected and recycled… (Parvaiz, 2018).

Making true inroads to improve the welfare of dairy cattle in India is a complicated and daunting task because of the uneasy role of the cow as the embodiment of the sacred and pure, as well as a source of material wealth and prosperity for humans. As discussed throughout the thesis, idealistic visions of the cow often overshadow the mundane and harsh life of dairy cattle in cities. Ideally, information about the ways cows suffer from plastic pollution would inspire citizens, politicians, and dairy farmers to immediately address the problem. Despite more media and government attention directed to the issue of plastic pollution in India, I found many urban farmers had a laissez-faire attitude, and veterinarians were unaware of the dangers to cattle and humans from pollutants.

The improvement of solid waste disposal and recycling in India is currently being addressed on a national level as part of *Swachh Bhar*at or 'Clean India': a federal mandate introduced during Modi's first term as prime minister to improve India's public sanitation in rural and urban areas (G. o. India, 2017). At a state and city level, several plastic bag bans

have been passed across India,[22] including Mysore, and a federal ban on all single-use plastic is expected to go into effect in 2022 (Parvaiz, 2018). But are these bans enough to help cattle? Up to this point, they have not been. Plastic bag bans implemented in cities like Mysore often ban bags that are below a certain micron of thickness—bags that cattle most commonly consume. But this does not reduce plastic from entering the waste stream, nor does it prevent cattle from coming into contact with these bags. The state of Maharashtra passed India's strictest single use plastics ban to date, but the problems that have arisen in the aftermath of the ban illustrate how difficult it may be to stop the use of single use plastics in India. Evidence suggests implementation and enforcement of the bans are lacking. Business and industry have also been successful in weakening and rolling back these policies. The lack of agreement for a unified definition concerning items that fit into the 'single use plastics' category is a larger societal problem that impedes awareness of the hazards of single use plastics and the appropriate disposal of them (Parvaiz, 2018).

Educating people about the potential harm of plastic's toxic chemical contaminants may help to change people's attitudes towards plastics and the link between cow welfare and public health. When I asked stakeholders 'What are the harms of cattle consuming trash?' the majority of respondents did not express undue concern for the chemical toxicity of plastic and the potential for humans to be exposed to these chemicals through milk. Providing the public with more information about the material nature of plastic could be key to motivating people to see plastic pollution as a public health issue, in addition to a cow welfare issue. Three

[22] A ban on single use plastic went into effect across the state of Maharashtra in June 2018 (Correspondent, 2018).

people did express concern that pesticides from vegetable scraps found in trash would be harmful to cattle—and thus their milk—and one woman who owned a restaurant stated she had stopped putting her vegetable scraps out for cattle to eat for this reason. Plastics and pesticides are both products of modern chemical manufacturing and have important parallels in that they are both chemicals that can mimic hormones, and they both play a role in the global food economy. It is more difficult to understand the harms from plastic pollutants, and this remains challenging, as we do not yet fully understand the costs. We are continually exposed to plastic pollutants in small doses, and in contexts that are considered 'food safe' and hygienic. Perhaps, in time, plastic pollutants will become a larger part of the public's awareness about plastics and its environmental harms.

The story of plastic cows can serve as a catalyst to spark reflections on our social, environmental, and personal relationships with plastics and food. Microplastics have also been found in air, tap water, and sea salt—substances that sustain the basic processes of life. Our bodies are changed and compromised by plastics, even if the impact is not as extreme as the example of the Indian urban cow. In this sense, we are all plastic humans, alongside and in relation to plastic cows.

8.5.2 Ban cows from cities

Arguably, the easiest solution to keep cows from plastic will be to ban cows from cities or to ban free-roaming cows in cities. In 2014, the NGO World Animal Protection International introduced dairy cow welfare guidelines, in response to the often 'barren and unsanitary conditions [of urban dairies], [where cattle are] often tied up their whole lives, and deprived of basic needs such as access to clean food and water' (WPA, 2016). These

guidelines were supported by the central government and in 2017 the state of Karnataka's dairy cooperative, the Karnataka Milk Federation (KMF), adopted their guidelines, which included the vow of not knowingly sourcing milk from urban and peri-urban dairies. This does not impact the sale of milk on the informal market, but signals the fact that the State of Karnataka is willing to write a policy that addresses the welfare of urban cattle and public health. I did not come across any urban farmers selling their milk to Karnataka's Milk Federation, because they sold their milk directly to consumers or to smaller dairies that sold raw milk for up to double the price they would have received from KMF. KMF did have milk collection centres in places like the village Gurur, which will soon become a peri-urban area, as the city of Mysore grows in its direction.

These policies would protect people from being exposed to toxins consumed by cows in trash, but would they improve cow welfare? Unless cities ban cows entirely, the practice of urban dairy farming will likely continue, as it has in Delhi. And if cows were unable to exercise, their quality of life would be greatly diminished; this is already the reality for many urban dairy cows. But for those that are allowed to walk freely in the city, they have a unique life in which they are allowed some small autonomy and are exposed to stimuli that engages their curiosity—an important aspect of cow welfare that should be a larger part of the discussion in other husbandry and industrial settings. This situates understandings of animal welfare within a cultural perspective (Srinivasan, 2013), where urban farmers value cow autonomy and ability to navigate risk in the city over the safety of their cattle. Moving cows out of the city and allowing them to roam in paddocks or in pastures with a herder would be preferable to urban cows confined to life in a cowshed.

One solution for managing street cows comes from stray cows in the north Indian state of Uttar Pradesh, where a recent law has made it is illegal to slaughter cattle, which has created a stray cow crisis. Karnataka bans the slaughter of cows until age twelve, unless mortally ill or wounded. But in some places in Uttar Pradesh, the number of stray cattle is beginning to interfere with people's livelihoods. This happens when cows eat crops, eat food from an unattended fruit or vegetable vendors' stalls, or when a stray bull impregnates a cow against her owner's wishes. Uttar Pradesh is a state with a strong support for BJP politicians. Instead of reversing the ban on slaughter, the state administrators are requesting that ear tags with bar codes or GPS technology be required for all stray cattle. The aim of this policy, one assumes, is to more easily charge the farmer for damages their cattle cause, and possibly encourage farmers to not allow their cattle to roam freely. It is possible the enforcement of this policy could be applied unevenly—based on socio-economic income or caste—and more vulnerable farmers be held accountable than those of better means or social position. This is a concern, but data generated by these cows could also lead to a better understanding of human-cattle conflicts, which might offer further solutions for cow welfare.

8.5.3 Minimize or end dairy farming

Ceasing milk production and making certain remaining cattle live in accordance with the five freedoms[23] (AHS, 2016) is the only way to ensure that cattle are not victims of exploitation. At this time, this looks like a daunting task in a country that currently produces the largest volume of milk in the world, and where milk is seen as a desirable, even a sacred,

[23] According to the American Humane Society, The Five Freedoms of Animal Welfare are: Freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury and disease; freedom to express normal and natural behavior (accommodating a cow's need to be with a herd); and freedom from fear and distress.

food. Milk consumption has been on the decline in the United States for the past several years because of the increased popularity of milk alternatives (Sitzer, 2019), but it is difficult to say if this trend will impact India, where buffalo and cow's milk consumption is on the rise (Jitendra, 2019). Two things would need to happen in order for India to cease milk production. First, there would need to be other work for dairy farmers in transition, that would provide equivalent economic benefits and level of dignity. Secondly, there would need to be acceptable alternatives for consumers. Perhaps coconuts—another entity considered sacred to many Hindus and already widely used in the cuisine of southern India—could gain in popularity as a dairy alternative. Realistically, given the current role of cattle in the socio-political and economic landscape of India, this is an unlikely solution to address cow welfare in the near future. Nevertheless, there are several scholars and formidable NGO's—including People for Animals, Humane Society International, and PETA India—all dedicated to this end (Narayanan, 2018b).

8.6 Further areas of research

This thesis has provided an overview of socio-political and personal reason for why cows remain in India's cities, how urban dairy cows are managed, ways in which human and cow health are linked, and how cow welfare might be improved in cities. There are several topics of inquiry that could add to this research, which include: (1) further knowledge of the amount and types of toxins that reside in the milk and meat of urban dairy cows, and (2) topics of further multispecies ethnographic and behavioural research into the lives of urban dairy cattle.

Lack of data on the amount of toxins that urban dairy cow milk contains is a weakness of this study, but it remains an important topic that invites additional research in the interest of public health. Research on human exposure to plastic pollutants—that occurs through common plastic packaging when coming into contact with food, especially dairy foods—and data from the effect of marine debris on marine fish and mammals, informed my understanding of how milk might absorb and transfer plastic pollutants between cows and humans (Gall & Thompson, 2015; Gore et al., 2015; Ma et al., 2016; Setala et al., 2014; Teuten et al., 2009). It is highly likely, but not definitive, that milk from urban cows contains contaminants. To further this research, a controlled study on milk from these urban dairy cows is the next step in adding to our understanding of plastic pollutants and human-cow-milk entanglements. Additional research should also provide data on heavy metals and other known carcinogens in milk from urban dairy cows.

In addition to milk, studying the toxins in bovine meat samples from urban abattoirs may also give more insight into the material entanglements between cows, plastic waste, and humans. India is also the second largest exporter of beef, even though as Naryanan (2019b) astutely observes, the country does not have a 'beef industry'. Arguably, this meat is sourced from infertile dairy buffalo, cows, and oxen. Although they make up a minority demographic of cattle in India, at least some of these cattle will be butchered and their meat eaten. Cattle and dairy buffalo meat are the cheapest meat in India and in this context the beef of urban cows would be eaten by marginalized groups—Muslims and Dalits—and therefore urban cow meat is potentially a public health issue for subaltern groups. Because official reports on the number of cattle involved in the export trade are vague, it is difficult to determine the amount of urban cattle that would make it into live transport ships and sold to other countries.

Research on the plastic contaminants in the carcasses of live export cattle could also be an area of further research.

The cow ethnography presented in this thesis occurred over the course of nine days and cannot be used to make definitive statements about cattle behaviour. Further multispecies methods research on urban dairy cows could provide more information about cow mobilities, preferences for grass over rubbish, time spent in companionship of other cows or alone, areas of territory, and frequency of a cow's voluntary return to the cowshed. Observations regarding urban cow behaviour would also benefit from research that compares cow behaviour in densely urban, suburban, and per-urban sectors of a city.

Another rich topic of enquiry would be the cow-calf relationship of urban dairy cows. Many farmers interviewed kept female, and sometimes male calves, in their herd for months or years and these relationships between mother cows and their offspring carry on far longer than cows in other dairy cow management settings. The relationships and bonds that urban dairy cows are allowed to form with their calves is unique, as is the fact they leave them for most of the day; this deserves a more detailed, diverse, and nuanced inquiry.

Finally, a multispecies methods comparison of urban dairy cow with urban dairy buffalo would provide a much needed analysis of dairy buffalo, which are subaltern to cows and arguably suffer as much or more than urban dairy cows, given they are not allowed opportunities to roam freely and therefore receive little exercise. Dairy buffalo are genetically similar animals to cattle, yet there is less advocacy for their welfare and fewer efforts to rescue them from abusive situations. At 150 million bovines in India, they comprise half of the dairy milk industry and they are a worthy topic of inquiry for their socio-political, economic, and material importance in India's dairy and beef industries in the country.

8.7 Conclusion

I returned to Mysore in the summer of 2017, two years after I collected data for this thesis. I returned to Shilpa's cowshed and spoke with her owner. He informed me that she had died in the summer of 2016 of 'bone fever', at nine years old after bearing him many calves. She was a cow of which he was quite fond, evidenced by the fact that she was the only cow in his cowshed that he had given a pet name.

She did not lead an ideal life for a cow, yet she likely lived a more interesting and rich life than her counterparts do in industrial settings, and perhaps she had opportunities to be curious and contented even in the risky environs of the city. Despite her exposure to and consumption of plastic waste—and many other types of debris—she lived approximately twice as long as the average dairy cow does in an industrial dairy farm (Tsuruta, Misztal, & Lawlor, 2005). And she was able to live with her calves for their first six months or longer—a situation which rarely, if ever, occurs in other dairy cow husbandry settings.

It is a goal of animal geographies and political ecology to work to end the exploitation of vulnerable and marginalized groups such as 'food' animals. Thus, it is important to understand human motivations for perpetuating industries that foster the exploitation of livestock, such as the interdependencies between cows and humans explored in this study.

This thesis situates urban dairy cattle in socio-political, economic, and material systems of Indian life to render the lives and welfare of Mysore's urban cows visible. Plasticity makes contributions to critical animal studies and more-than-human geographies in the following ways: 1) *Rhetorical plasticity* serves to deepen our understanding of the complex dynamic existing between human and animal identities. These ideas contribute to

scholarship about 'political' animals (Hobson, 2007) and animals as agents in the construction of nationalist identities (Govindrajan, 2018; Narayanan, 2018a, 2018b; Pandian, 2008). Rhetorical plasticity may also prove useful as a concept to analyse co-constituted flows of power between human-animal-economic assemblages in political ecology (A. J. Hovorka, 2018; Margulies & Bersaglio, 2018; Margulies & Karanth, 2018; Srinivasan, 2016; Srinivasan & Kasturirangan, 2016).

2) Genetic and behavioural plasticity. As humans navigate social, political and environmental challenges in the Anthropocene, the ability of plants and animals to adapt to a rapidly changing world will require genetic and behavioural plasticity. As cities continue to grow, and our climate changes more rapidly, the genetic and behavioural plasticity of animals will be of great importance to whether animals adapt to or die from the changes taking place across the planet (Schilthuizen, 2018). Human pollution has irreversibly become a more-than-human problem and plasticity will be a key to species survival, moving forward. (Doherty, 2019; M. J. Hird, 2012, 2015).

The *plasticity of plastics*—a theory that proposes plastic is both a solid and a fluid waste—adds to other theories of plasticity. It embraces the recognition that our evolving understanding of the impact of thousands of different types of plastics—and the chemicals they are made of—constantly challenge our baseline perceptions of the world (Gabrys et al., 2013). Plastics might easily qualify as an excess material presence in the Anthropocene, one that creates terror, is described as a 'monster', or is a substance—like nuclear isotopes and greenhouse gasses—that instil anxiety about humanities' uncertain future (2018). Naming the fluidity of plastic waste echoes Liboiron's concept of plastic marine debris as a 'miasma' (Liboiron, 2013). Better theories and metaphors will help us understand how plastic waste

functions in the environment, and enable us to recognize its disparate temporalities as both instantly disposable and materially eternal (Gray-Cosgrove et al., 2015; Hawkins, 2018; Liboiron, 2015, 2017). We will then be better attuned to navigate the potential harms this manifold, omnipresent substance will have to organisms and environments (Liboiron, 2017) alike, what Bubandt and Tsing (2018) describe as 'the art of living on a damaged planet'.

Malabou proposed plasticity as a paradigm for our age that brings material plasticity to the forefront of our awareness, and challenges understandings of individual identity (Malabou, 2005b, 2008, 2012), organisms (Malabou, 2012), and environments as static entities (Malabou, 2015a). This case study applies plasticity to the subject of the urban dairy cow and proposes plasticity as an organizing principle that allows us to see more clearly the political and material entanglements and the dynamic forces between animal, human, and industrial materials. The concept of plasticity can be of use in conceptualizing which animals will be able to adapt to environmental fluctuations, or to find conservation strategies for those animals that do not have adequate plasticity in the face of significant ecological upheaval. This will include the ability to successfully navigate risky environments (Srinivasan, 2019)—such as cities—but also the ability to adapt to dangers caused by human waste sites, environmental pollution, and climate change. Moving forward, plasticity will be a key to species survival. (Doherty, 2019; M. J. Hird, 2012, 2015). *Plastic Cows* seeks to contribute to the academic discourse surrounding plasticity and help clarify the challenges and choices regarding animal welfare, human health, and the health of our planet.

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