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The Indian street dog crisis and multispecies coexistence in tropical urban futures

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Preface

Cities in the Global South struggle with human-animal coexistence conundrums, e.g., in South Asia, old and new collide: people raise livestock informally and feed free-ranging animals within heterogeneously developed, juxtaposed patches. Digital economies boom amidst threats from waste piles linked with zoonotic diseases and conflicts, exemplified by the free-ranging dog crises in India. Humanity's oldest companion now suffers between compassion and rising conflicts. Dogs still scavenge, guard, breed, disperse, and die on streets shaped by traffic, garbage, ritual feeding, and uneven care. Indian Courts, attempting to address the problems, have overlooked the root cause—food subsidies. Sterilisation, shelters, fencing, or removals cannot succeed when urban landscapes provide food subsidies to animals without corresponding responsibility. Episodes of reactive management must yield to urban planning, acknowledging that multispecies communities in shared living spaces are complex and interconnected. I suggest making compassion accountable to public health, animal well-being, and urban ecology.

Main

Urban conflicts with free-ranging animals are reshaping relationships between people and nature in the Global South[1]. Two dominant frameworks—Nature-based Solutions (*NbS*) and One Health—have the promise to address these challenges. The *NbS* advocates protecting and restoring ecosystems to address climate change, food security, and disaster risks[2]. One Health emphasises the systemic interconnections between human, animal, and environmental well-being[3]. But available research discourse on both frameworks overlooks the functional, multispecies relationships embedded in tropical cities. Here, animals provide essential ecosystem services often unaccounted for in contemporary urban planning[4,5].

Way before the rise of modern infrastructure, tropical urban ecosystems have been co-configured by humans, domestic animals and opportunistic species[5,6], like vultures, black kites, crows, dogs, monkeys, pigs, cattle, etc. Animal communities centred around the human niche have been operating at a dynamic interface. These relationships are shaped by mutual behavioural strategies further modulated by human cultural practices and beliefs. Commensals have historically provided critical scavenging services, managing refuse at no cost and reducing disease spillage[4]. This traditional multispecies coexistence was not accidental but emerged from millennia of mutual adaptation. Recently, such cross-species ties have been termed co-cultures, found in how people associate with numerous species in South Asia[4,5,7].

Rapid urbanisation has created inflexions in cross-species ties[8] with the human niche. For instance, urban expansion offers abundant foraging opportunities through waste and other food subsidies. Such profound changes in resource dispersion restructure inter- and intraspecific interactions, creating novel selection pressures by altering how nonhumans interpret environmental cues for decision-making[5,9,10]. On the other hand, humans increasingly see many animal species—that were previously valued for ecological/cultural salience—as nuisances or health threats[5,11]. Consequently, behavioural responses that suited traditional settings become maladaptive in modern contexts[12]. With the majority of humans (up to 65%) living in urban areas that occupy ~4% of the Earth's terrestrial surface, this tension shall further intensify[8,13].

Free-ranging dogs—humanity's oldest nonhuman companion[14]—exemplify this crisis. In India, dogs exist in a volatile space between shortsighted kindness (feeding rituals without population management), escalating conflicts (bites and fear of rabies), and ecological oversight (their waste-scavenging roles and impacts on wildlife are often understudied/overlooked)[15–17]. Recent Indian Supreme Court (SC) directives, issued between August 2025 and May 2026, faced fierce backlash despite aiming to protect public health, revealing deep contradictions in how we value animals within and beyond human-use landscapes[4,11,15]. Through this perspective, I reckon incorporating multispecies coexistence concerns into urban planning for tropical landscapes[6]. We need transitions from reactive crisis management to anticipatory designs that acknowledge complex ecological entanglements and prepare for emerging conflicts and diseases[4,18,19].

The tropical urban systems and chaos

A Delhi-based woman featured in a viral video from July 2025[20]. She booked a motorbike taxi for 180 meters to avoid dogs in the streets. The incident drew reactions online, underscoring a deeper crisis about shared lives with free-ranging animals in India[21–23]. This was not merely about fear or convenience. It exposes how FRDs, once integrated into human-use landscapes as waste scavengers, now trigger anxiety, aversion, and conflicts[4,6,23,24].

FRDs exemplify the growing contradictions about competing priorities in multispecies well-being within South Asian cities (i.e. One Health). It involves people exhibiting cultural tolerance for animals involved in conflicts, which entail negotiating aggressive encounters, based on taxa, space or season[4,22,25]. This paradox—generally prevalent affection mixed with aversion/occassional conflicts[20,26]—defines human relationships with multiple urban animals[1]. Free-ranging animals are patronised, perceived as passive, and often ritually fed by people. To that end, street dog populations respond to gradients in resource availability[15,17,27,28]. When food is abundant, but space, veterinary care, and waste management are not, dog numbers surge[17,26,29]. Inter and intraspecies interactions intensify against the backdrop of changing environments. Such social-ecological change frequently culminates in territorial instabilities that likely feed into aggression, disease spread and persistence[30–32].

In India, Delhi exemplifies extreme density dynamics. Despite occupying an area 160 times smaller than the neighbouring state of Uttar Pradesh, it sustains free-ranging dog densities 70 times higher, concentrating ~35 million people and ~800,000 dogs within 1,500 km². Dogs thrive on approximately 327,069 informal feeding stations and 85,109 garbage points, which provide abundant, spatially concentrated food sources. Over the past 25 years, Delhi has experienced simultaneous dramatic increases in built-up area, human and street dog populations, vehicular density, per capita income, and organic solid waste production—with most indicators rising 200-300%[29,33–35]. These create a tightly coupled social-ecological system where escalating consumption generates enormous waste, which, in turn, sustains elevated populations of FRDs and other commensals[4]. The chronology of the Municipal Corporation of Delhi's (MCD) trifurcation in 2012, followed by its subsequent unification in 2022[36], serves as an exemplar of broader shifts in urban governance and animal management.

These periods have represented a crucial decade of infrastructural transformation, particularly concerning waste management[4]. For instance, the SC directive[37] in the year 2000 mandated that MCD identify alternatives to the three existing sanitary landfill sites. Yet, it remains unimplemented. Significant variability existed across areas under the respective Eastern, Northern, and Southern units of the municipality. The departmental restructuring and fragmentation have thus generated jurisdictional ambiguity, accompanied by shifting priorities[36,37]. While policies are developed based on Western cities[38], a deficit in rigorous consideration of interdisciplinary human-animal dynamics constrains successful replications[15]. The technical expertise in urban ecology is also notably limited[4]. In addition, monitoring systems typically capture episodic snapshots rather than the longitudinal data essential for adaptive management[39,40]. South Asia has had long-standing issues with unsegregated, ephemeral garbage accumulations[4,29]. Consequently, public health, veterinary services, waste management, and urban planning frequently operate in isolation.

Neither the *NbS* nor the One Health frameworks are adequately conceptualised to address the dynamics of people and nature relationships in the Global South[4,5]. For instance, dogs' functional role in waste disposal, which was potentially the cornerstone of this cross-species relationship[14], is progressively becoming obsolete since food production entered a phase of surplus[16,26]. Wealthy urban centres can account for the full daily dietary demands of FRDs via human handouts[15,33]. However, inequitable resource allocation contributes to food wastage within and between variably developed regions. Built environment further modulates animals' access to food-subsidies[4,41]. Problems stemming from inefficient supply chains, food storage issues, political instability, and economic barriers create a highly variable geography of FRDs' dependence on human hand-outs and refuse[29,32,42]. These are profoundly related to the World Health Organisation's mandate of removing dog-mediated rabies[43] by 2030. Currently, suggestions about handling FRDs as disease vectors (rabies and other zoonoses) through capture-sterilisation-vaccination and, most crucially, returning them (CSVR) to their original territories remain silent about the demographic engine: waste, intentional feeding, and their dispersion in variably developed infrastructure in the tropics[15,44]. The consequences ripple beyond visible street encounters, shaping free-ranging animal/wildlife social systems. Collectively, these affect public health, municipal budgets, and ecological networks we barely comprehend[16,17,23,26,32,33].

Empirical vacuum behind FRD crises

The scale of India's human-dog coexistence crisis is staggering. Up to 20 million dog bite incidents occur annually[39], a figure that has been rising in recent decades. Albeit, recently, Thangaraj et al.'s[45] surveys hint at a decrease. Rabies kills approximately 20,000 people per year in India, accounting for 36% of global rabies deaths. These are indicators of systemic failure in managing multispecies coexistence[39]. However, numbers offer only a partial view of the crises. Bite/rabies statistics and crude dog counts rarely capture the spatial, demographic, and behavioural processes that sustain FRD populations. We still lack longitudinal data on population turnover, age structure, reproductive rates, mortality, immigration from adjacent areas, and the corresponding effects of sterilisation, feeding, waste availability, and removals across different urban microhabitats.

India has the world's largest FRD population, estimated at around 60 million in 2008[39]. The FRD crisis extends beyond human health: dogs prey on threatened wildlife, such as kiang (*Equus kiang*), Himalayan serow (*Capricornis sumatraensis thar*), several other wild ungulates and the critically endangered Great Indian Bustard[46] (*Ardeotis nigriceps*), of which fewer than 150 individuals survive. Dogs frequently transmit canine distemper to wild carnivores; for example, it has a high prevalence across all tiger reserves and recently reduced the Gir lion population[47] by 30%. They compete with other scavengers and mesopredators, altering food web dynamics in both urban and peri-urban landscapes. Reportedly, pack-hunting behaviour enables FRDs to take large prey, expanding their ecological niche[5] beyond opportunistic scavenging[32,48]. Yet, empirical understanding of these processes remains fragmented. We do not know how food subsidies alter pack cohesion, site fidelity, dispersal, aggression, or disease transmission; nor do we know how dogs choose to move between markets, residential colonies, garbage points, peri-urban edges, and protected area boundaries. Conservation initiatives myopically prioritise the preservation of wild habitats[49], despite the presence of zoonotic risks at land-use ecotones. Consequently, subsidised facultative scavenger populations that typically inhabit the periphery of several small protected areas are often

overlooked by management[4,18,43,49]. Without empirical data, public-health and conservation management remain reactive, rarely addressing the ecological mechanisms that generate crises.

Life forms in nature employ parsimonious strategies to accomplish life-history goals[12] of survival and reproduction comprehensively. For example, the opportunistic responses of black kites (*Milvus migrans*) in Delhi, which encompass individual-level habitat selection[41] that have population-level outcomes[50], and behavioural responses, e.g. offspring defence[25], are a function of the same urban habitat covariates: access to food subsidies, built environment and green cover. However, managing multispecies coexistence in a modern urban setup is challenged because people/agencies intervene selectively. We frequently treat symptoms, ignoring ecological causation. Our comprehension of how built environments predispose animals to conflict with humans is nascent, e.g., black kite breeders that benefit from ritually tossed meat by Muslims are more likely to attack humans when nesting near, and at the level of balconies in Delhi[25]. This warrants urban planning that anticipates how structural spatio-temporal changes affect demographic and behavioural dynamics. With limited ecological foresight, policymakers and administrators incorporate quick fixes that currently fluctuate between indulgence and aggressive reactions[15,31,51].

Evolving coexistence

Dogs are the only vertebrate species that followed human migration out of Africa into every climate zone, after the human niche expansion 70,000 years ago[52]. Larson notes[14,53], while we do not know exactly when domestication happened, this taxon's genetic distinctness and stability despite continuous proximity to wild canids is noteworthy[54]. Prior research has designated dog-wolf hybrids an "evolutionary doomed valley" between two adaptive peaks—they are neither good dogs nor good wolves. This resistance to backsliding into wildness proves how thoroughly dogs and humans have shaped one another. In 300 years, humans created over 400 dog breeds, fine-tuning them for companionship, work, and aesthetics[14]. We could accomplish this feat because dogs' ancestors adapted in ways that matched inter- and intraspecific social changes[55], eventually cohabiting with people. This mutual shaping, where selection pressures operate not on one species but on what they do together in varied social-ecological contexts, represents co-evolution at its most intimate[7].

Canine populations—dogs, jackals, and occasionally wolves and foxes[32,48]—are woven into daily South Asian life[31]. FRDs rest on pavements, move through markets, and investigate garbage heaps[4,26,32,33,51]. The human-dog dynamic in urbanising tropics is becoming increasingly contradictory[4,33,41]; people take absurd measures to avoid them, based on previous encounter histories. Progressive compaction of urban infrastructure, typical for cities like Delhi[25] forces dogs onto roads[33] (Fig. 1). Street dogs respond to resource dispersion by guarding feeding zones, apparently perceived street sentinels. Their vigilance now faces urban selection pressures from human/vehicular traffic in multi-use streets, convoluting an array of benefits and threats that perpetuate conflicts[16,23,26,33,42,48,51].

We know dogs intimately—and barely at all. Breed genetics have been dissected to explain labradors, danes and pugs[14,53,56]. However, approximately 800 million FRDs[21] inhabiting tropical ecosystems from villages to cities remain poorly understood. *Does their abundance tell us about how tropical cities function ecologically*? These are not simply strays. They are the world's most abundant

carnivores, occupying an overlapping niche between the wild and domesticated, dependent on human resources but ecologically autonomous[48]. Such traits simultaneously make them ecological and social keystones, and public health hazards, considering threats posed by daily nuisance from barking, chasing, and the burden of bites/rabies. Growing ambiguity in their functional ecology confounds how dogs are perceived in developing societies with deteriorating ecosystems[16,26,48].

Humans have lived alongside dogs and other commensals for millennia, yet free-ranging multispecies coexistence remains unsolved in cities[14,41] (Fig.1). Unfortunately, the absence of longitudinal research on FRDs has met public discourse popularised by casual, pet-dog behaviourists. They use inductive reasoning, often fuelling misconceptions that downplay street dog crises[15,33]. FRDs are transitioning from village scavengers that negotiated relatively higher resource unpredictability. In rural settings, dogs roam(ed) widely[48], scavenging dispersed waste and occasionally hunting. Such norms of resource acquisition are associated with territorial dynamics that differ from those in current cities[33,48]. Limited insights about how dogs negotiate intra-specific socialities[55] in the built environments affect cross-species human-dog ties, obscuring long-standing *NbS* benefits[2] and One Health prerogatives[3].

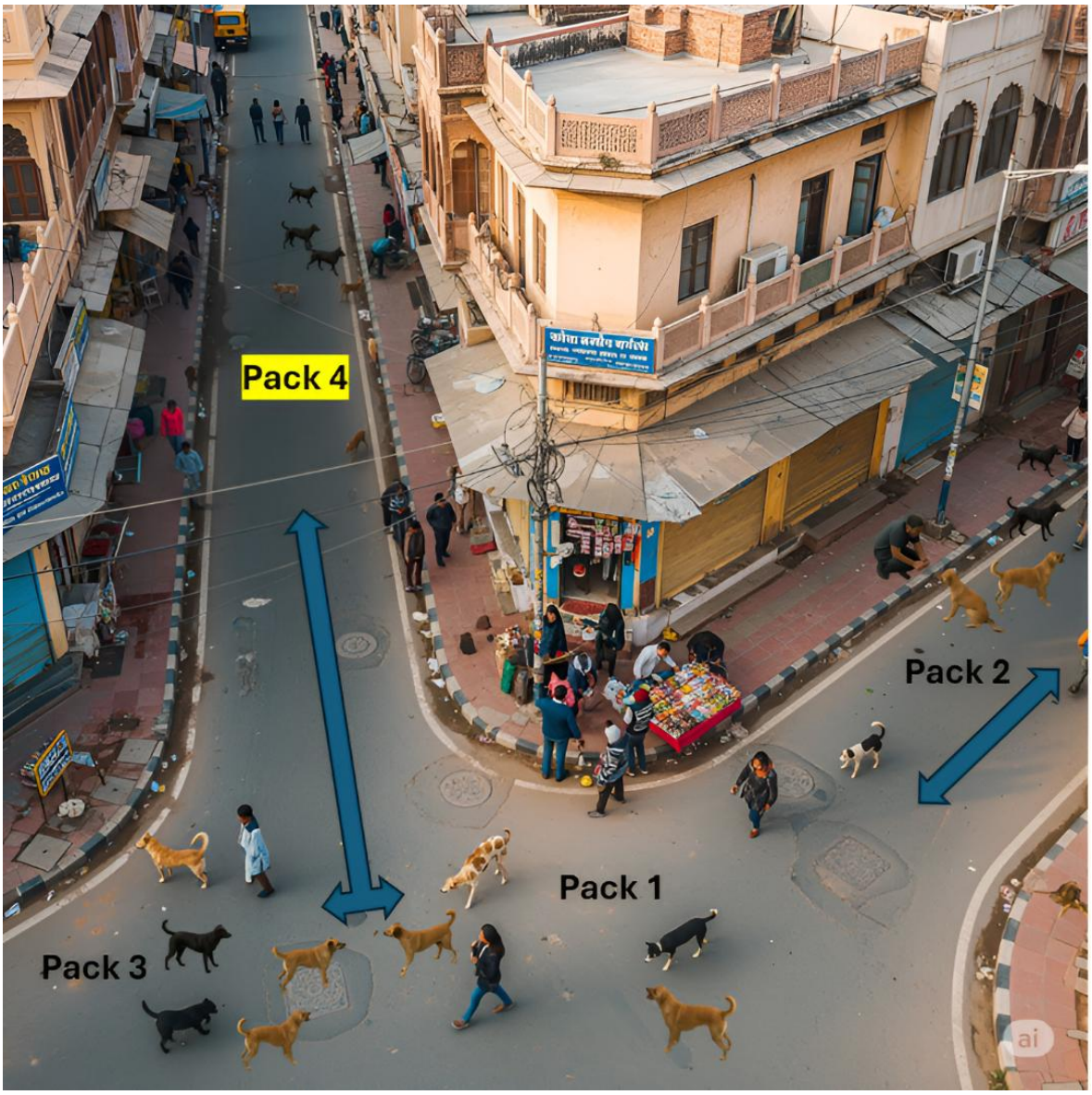

Fig. 1. Urban infrastructure as a behavioural scaffold[25]: structuring canine degrees of freedom and inter-pack dynamics. This image depicts a busy street intersection in an Indian city, where multiple free-ranging dog packs coexist in proximity to humans, commercial stalls, and traffic corridors. The presence of Packs 1, 2, 3, and 4 in distinct spatial zones illustrates how infrastructure shapes the degrees of socio-behavioural interactions among canine groups. While Pack 2 is aligned along a single road segment and exhibits limited, bidirectional interaction, Packs 1, 3 and 4—situated at the crossroad—are positioned at a convergence zone, increasing their degrees of interaction freedom for inter-pack and human encounters. This spatial ecology predisposes the socio-behavioural interface between dogs, other commensals and humans, forming both conduits and barriers[55]. While people view these animals as benign or sacred beings that need to be fed, some perceive them as threats to safety and mobility. This contradiction underpins a multispecies coexistence paradox. Affording food—whether through ritual feeding or waste—induces dogs to respond with heightened alertness and site fidelity. In localities, it creates "sentinel" effects that are variably interpreted. This schematic encapsulates urban entanglement by illustrating how infrastructure implicitly structures canine socioecology. Spatial constraints influence mating, aggression, alliance formation, and feeding hierarchies, which remain poorly understood[55].

The evolutionary trap: kindness with a catch

The prevalence of feeding commensal animals is growing globally[57]. It stems from compassion, often tied to beliefs about *karma* or *dharma*[4,25], which have implications on cross-species reciprocity that maintain mutual tolerance[58,59]. Feeding rituals operate on the emotional immediacy of gratification about socio-cultural beliefs[4,5]. In modern contexts[4], nonetheless, good intentions that are ecologically incoherent create problems[32,48]. The consequences spiral and vary, based on local situations: people avoid streets and some spaces at certain hours; some carry sticks or pelt stones for self-defence, etc.[20,33], which further affect reciprocity and behavioural repertoire. The latter are based on interaction patterns that perpetuate an arms race[55,58,59].

Unfortunately, committed feeders (some feeding up to 100s) poorly comprehend FRDs' investment in aggression, especially when space, time and feeder predictably converge[26,32,33]. Multiple studies, including the work on kites in Delhi, have shown that animals constantly exposed to humans via foraging gains are bolder[57,60]. In adverse encounters, FRDs bark, chase, or bite when exhibiting offspring defence (e.g., see[60]), or when they are deliberately or inadvertently cornered—behaviours typically displayed by nursing females and/or dominant individuals. Committed feeders wrongly believe provisioning helps reduce conflicts (Fig. 1). People misread FRD behavioural exhibits, assuming affiliative, well-fed dogs are never aggressive[6]. But similar to pet-dogs, such FRDs bark at unfamiliar people, or respond aggressively in areas/at specific hours when human and vehicular traffic is low in streets[33]. Multi-use urban thoroughfares frequently subject dogs to persistent and concurrent cycles of feeding and care, as well as regrettable neglect or outright cruelty[26,33,48,57].

The core issue is not the compassionate acts themselves, but executing casual feeding divorced from the One Health vision[17,22,33,42]. The practice of providing food to FRDs without concurrently implementing CNVR and spatial planning diminishes the ecological benefits of scavenging services (i.e. *NbS*)[44]. While the country is extraordinarily diverse, there is profound homogeneity in how different communities tolerate animals[4]. About 50% of India's population now lives in district headquarters—roughly 800 centres experiencing economic transformation. Simultaneously, 87% of Indians never leave their birth district[61]. Thus, people maintain local practices of coexisting with dogs while sharing broader cultural attitudes about animals[4,25,33]. District-centred prosperity[61] is frequently associated with deliberate feeding[33], whose consequences on pack dynamics are unknown.

Such spatial predictability in acts of kindness/patronising attitudes constitutes an evolutionary trap for coexisting people and FRDs. This is based on high incidences of FRD pups and adults being fatally struck by vehicles, while millions of commuters on the streets face bite threats[26,33]. Evolutionary traps refer to rapid environmental changes, often driven by human activity, causing organisms to prefer resources—such as food, habitats, or mates—that reduce their survival and fitness, even when better alternatives exist[62]. Ecological traps occur when organisms fail to adequately mitigate evolutionary traps within a habitat patch, thereby compromising their survival and reproductive fitness[62]; these phenomena are typically linked to rapid, anthropogenic environmental alterations. Given that dogs emerged as a distinct taxon through human social-ecological revolutions, it is plausible that this contemporary coexistence is increasingly compromised by misaligned priorities. Unlike birds and modern humans, who use top-down, macro-spatial visual integration[41], ground-dwelling mammals are constrained by micro-habitat patch dynamics, local memory and social structure. This variation in information parsing ability shapes multispecies relationships

and the extent to which taxa integrate with the human niche. Variable niche adherence is central to (urban) guild-formation on food subsidies[4].

Multispecies well-being warrants systemic approaches

Feeding free-ranging animals enhances breeding success and survivorship[41]. Correspondingly, it also affects spatial behaviour and social structure[63,64]. People who provision FRDs' daily dietary requirements, typically reside in middle or higher-income areas. Thus, as an unintended consequence, they avoid suffering nuisance/aggressive encounters. It contrasts with blue-collar workers, because relatively affluent individuals move predictably within urban environments, owing to the stability of their residential, professional, and recreational zones[33]. Socioeconomically disadvantaged, particularly those commuting on foot or using bicycles/two-wheelers, face disproportionate vulnerability[33,65]. Moreover, wealthier communities frequently outsource FRD feeding/care through informal arrangements. Such spatial and social scaffolding buffers and displaces conflict costs for some stakeholders; multistorey buildings restructure and redistribute encounter risks across urban settings[33] (*unpublished data*). Hence, perceptions of conflict among urban residents often depend on the frequency of exposure to unfamiliar dogs.

Given that dogs congregate in response to feeding at specific points, such as temple premises, market peripheries, and residential communities (Fig. 1), their movement ecology shapes crises[25,33,60]. The state authorities and other agencies attempting to limit populations with CSVR[44] miss the underlying spatial responses, modulated by feeding patterns and waste dispersal[40]. Misplaced empathy[25] prioritises individual feeders' gratification over animals' long-term well-being and alters regional ecology, thereby affecting human, animal, and environmental health (i.e. One Health, which is discussed subsequently)[1,4,5]. State agencies prioritise sterilisation drives in wealthier colonies while neglecting the demographic drivers in adjacent resource-poor areas[33]. Such disjunct measures meet failure[41], since new dogs move in, or existing dogs exhibit higher intrinsic growth to fill the spatial (habitat) niche, called the vacuum effect (Fig. 1). Finally, sterilised dogs can still be a public health concern for years, as long as feeding/waste is ensured[32].

Dogs reproduce rapidly when food is abundant. A fed population without animal-birth control (ABC) measures covering 70% members re-establishes quickly, nullifying CSVR/removal. The Indian FRD situation reflects the complexity of a growing and contentious relationship[23,26,44,48]. For instance, vaccination campaigns that treat dogs as randomly distributed individuals miss how disease spreads through social networks[55,63,64]. Furthermore, urban design that fragments dog territories, e.g., fencing requested by the SC in November 2025 and deemed applicable, vide its May 2025 decree, without understanding ranging patterns and social ranks, can intensify human-dog conflict[38] (Fig. 2).

Discussing the contrast between tiger conservation[49] and coexistence with free-ranging species like FRDs, rhesus macaques, etc., here is instructive. Tiger conservation management rests on scientific foundations that define territorial requirements, prey densities, corridor connectivity, and community engagement protocols. Conservation policies, despite acknowledged shortcomings[66], reflect ecological bases and understanding[49]. Despite the empathy feeders exhibit, we lack a comparable framework for FRDs, considering ecological and public health concerns[3,18,40,44]. We poorly understand the consequences of temporary/permanent removals of individual FRDs on dog social structures[55]. Meanwhile, rapid urban expansion is transforming socio-cultural profiles[4,5], which, in turn, affects tolerance for free-ranging

animals[25]. Regional carrying capacities with respect to territorial aggression and the impact of feeding patterns on FRD survivorship[41] are not known. This knowledge gap has consequences, rendering interventions as guesswork; sterilisation programs operate without data on population turnover rates or immigration[17,44]. Consequently, policy formulation and execution either underperform or backfire. Each domain—public health, conservation, and urban development—operates in isolation[4], missing the systemic nature of the problem; therein, conflicts and health crises are mere symptoms of a deeper dysfunction[4,61].

To start with, we need to address the lack of systematic understanding about how dogs navigate their dual social worlds[5]: conspecific relationships and human interactions[22]. The expansion of impervious surfaces and contemporary infrastructure increasingly disregards traditional coexistence choices[52]. Several questions remain unaddressed, e.g., *what environmental or social cues trigger territorial defence versus tolerance*? *How do dogs assess threats from humans—what aspects concern individual recognition, contextual cues, or spatial learning*? *How does the dispersion of food subsidies shape pack cohesion by affecting regional habitat quality* (Fig. 2)*? What factors determine territoriality, foraging site-fidelity and dispersal of dogs, and how do these relate to age, sex and social rank*[55]?

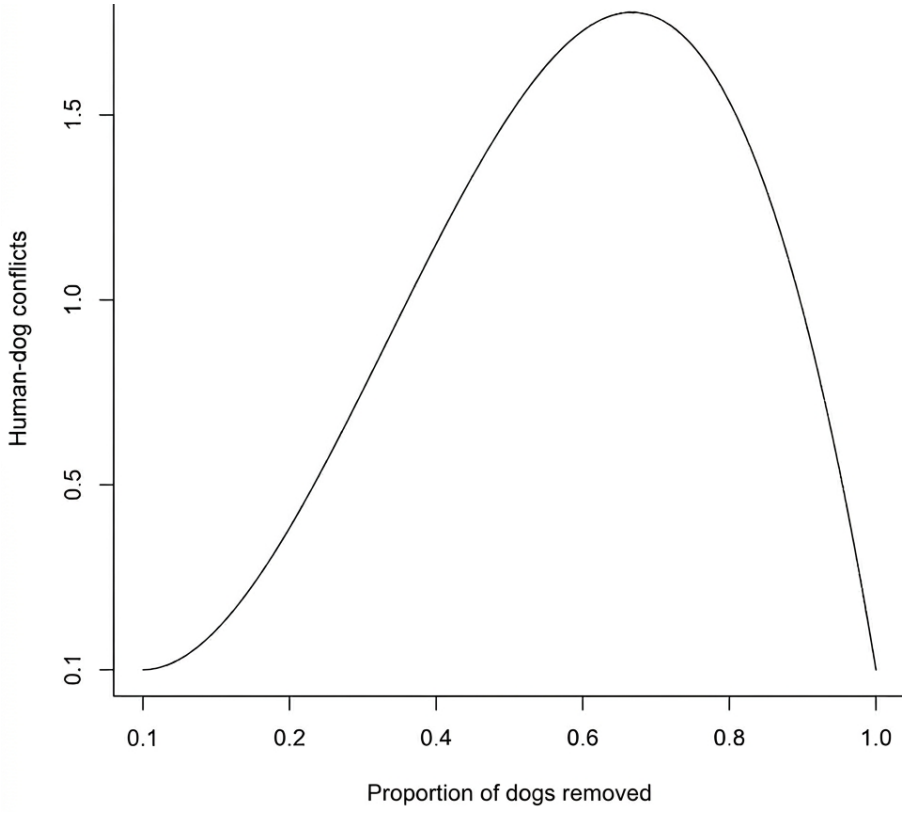

Fig. 2. This simulation of removing dogs predicts an initial increase in conflicts that must then reduce to 0% if we achieve 100% control. Partial dog removal triggers a counterintuitive escalation in conflicts, peaking at 60–70% displacement. This highlights a critical lack of data on canine social structures. Following the network frameworks of Silk et al. (2019)[55], dog packs rely on dominance hierarchies to regulate stability. Removing individuals introduces structural uncertainty, destabilising the network. This disruption sparks elevated territorial aggression as remaining animals renegotiate ranks. Unscientific removals shatter social-ecological scaffolding, compounding conflicts rather than mitigating them.

Theoretical bases of multispecies coexistence

Urban spaces create profound behavioural complications for breeding FRDs that form packs[33]. Dogs face novel selection pressures and employ innate and learned strategies in built environments[48,53,67]. Street dogs are behaviourally attuned to associate human presence with food availability (e.g., see[41]). But we poorly comprehend the contemporary ecological variations of these cross-species associations, e.g., *how does feeding in urban settings affect territorial exhibits to people/other animals, and/or the spaces FRDs guard*? *Does provisioning by people heighten boldness or aggression toward unfamiliar humans/nonhumans that intrude feeding zones*? *How do dogs reconcile pack hierarchies and access to resources, since humans*[55,63,64]*, rather than natural prey in defended territories, determine resource distribution*? Currently, our folk assumptions[5] far exceed empirical knowledge about FRD populations and behaviour, with consequences on coexistence.

To understand the mechanics of this cross-species dependency, we must look at eco-evolutionary trade-offs. Robert Trivers' parent-offspring conflict theory[68] offers a useful lens to comprehend the impacts of provisioning at the human-dog interface. Trivers proposed that parents and offspring have asymmetric interests: offspring benefit from extended parental investment while parents' interest lies in reallocating resources to future reproduction episodes. In Delhi, female FRDs—frequently malnourished—rear large litters, in areas where human support is highly variable (Fig. 3). Provisioning alters this calculus. When humans supplement food, pup survival in their initial months increases, extending the duration mothers nurse and defend. Consequently, parental investment costs increase. It introduces behavioural dilemma[60]: lactating females must navigate conflicting choices between accepting food and defending pups from potential threats people/vehicles pose in streets, e.g., see[25,60].

The complications deepen when pups interact with human feeders. Young dogs imprint on provisioners, following people across streets and roadways where feeding occurs (*unpublished data*). This attachment exposes pups to vehicle strikes[33]. Tragic accidents result not from maternal neglect but from learned associations between humans, pups/adults that gesture food-begging, and specific locations that coincide with traffic corridors[23,26]. Pups that survive face a subsequent challenge: reconciling social bonds with the pack, while extending their dependencies on human feeders. Since the frequency and type of feed by people can vary, FRDs face high unpredictability of multiple orders[22].

We have not mapped physiological and social stressors onto behavioural outcomes in FRDs. For instance, *how do lactating females balance the aggression necessary for pup defence with the tolerance required to access human handouts*? *What happens when provisioning ceases abruptly—do dogs conditioned to human dependency exhibit stress, heightened aggression*? *How does early imprinting on human feeders affect adult territoriality and human-directed behaviour, e.g., begging gestures*? These questions matter because dogs are large carnivores capable of inflicting major injuries, occasionally mauling humans, livestock and wildlife[17,25,32,47,60]. Behavioural dysregulation, born of conflicting selection pressures[60]—which involve human-human, human-dog and dog-dog social interfaces—creates dangerous unpredictability. These sit at the heart of multispecies coexistence conundrums, feeding into a vicious cycle, where patronising attitudes can lead to human/animal suffering[33,60].

Fig. 3. Maternal investment conflicts in urban environments: A free-ranging dog nursing its litter on an Indian street exemplifies the complex resource allocation dilemmas. The visibly malnourished mother supports multiple offspring while navigating access to (unpredictable) anthropogenic food subsidies and territorial restrictions. This image illustrates the "behavioural bottleneck"[60] where parental investment strategies may become maladaptive in human-dominated landscapes. Humans offering handouts often target juvenile animals, inadvertently shaping parent-offspring conflicts. Nursing females require approximately three times more calories than their offspring to sustain lactation[69], which is often not guaranteed in the streets. This triangulated social dynamic—between maternal investment, offspring demands, and human intervention—demonstrates how urban environments create novel challenges, affecting animal well–being and population management. Understanding such complexities is essential for coexistence futures in rapidly urbanising regions.

Ecology of coexistence, ethics and legality

India and other developing tropical regions are in the midst of escalating public health crises driven by changing multispecies coexistence[3,4,18,40]. Policy responses, however, remain reactive and scientifically unmoored. The recent judicial volatility in the SC, which issued several contradictory mandates about FRDs between August 2025 and May 2026, has been a telling feature of growing conundrums. Following nationwide protests, the top court was forced to withdraw its original directive for relocation of ~2.5 million dogs from the National Capital Region. With a revision on August 22, 2025, the SC re-appropriated the regional mandate prescribed by the Delhi High Court (DHC)[38] in 2009. DHC attempted to resolve the FRD crisis, ordering the civic bodies to designate (fixed) feeding areas[70]. Despite the intent, such decrees are ecologically misaligned and poorly address conflicts (Fig. 1- 4). Ecologically unjustified approaches to coexist with FRDs, thus, inhabit two parallel realities: visible acts of kindness masking invisible cycles of suffering.

Euphemistically close to "purging", the May 2026 judgement of the SC warrants immediate removal of dogs from ~1.5 million schools, hospitals, and public transport zones across the country. It mandated fencing to prevent re-entry and banned public feeding (except at designated spots: Fig. 4)[38]. This order ignored infrastructural challenges, financial constraints, and behavioural dynamics that could further drive agonistic dog-human encounters[55]. Fencing around institutions does not address why dogs congregate in these spaces, or food-begging around predictable human activity zones. Without addressing these accessible resources, the order is unlikely to reduce bite frequencies or rabies transmission[15]. The SC orders in November 2025 and deliberations with parties in January 2026 revealed the limitations of ecologically misaligned policymaking. With its latest judgement, the top court missed the opportunity of finding the right middle ground between mass dog removal and well-being concerns[38].

Millions are impacted by FRD conflicts, because an equally numerous sets of people do not like to see starving animals. This perpetuates policy deadlocks at scale: from building complexes to the SC[15,33]. As long as dogs have continued access to food subsidies, propositions to displace part of the population shall intensify confusion[15]. Further extending human-FRD coexistence in Indian streets—as a socio-legal choice—warrants urban reimagination. South Asian cities are conforming to global standards[4,20,38]. Free-ranging animals in crowded streets are hazardous. It exposes nonhumans to vehicular accident trauma, pathogen transmission[4], and territorial aggression[25]. The casual, patronising attitude of feeding animals often overlaps with genuine concern for complete animal well-being. People who feed dogs in the streets expectantly get positive reciprocations[9,22]. Consequently, many feeders wrongly envisage their actions guarantee both canine nutrition and public safety. Coexistence, therefore, needs foresight, requiring reconceptualising human-animal relationships through multispecies ethics in tropical cites[15,23,26,33].

Multispecies ethics is an emerging field that expands moral consideration beyond just humans. However, it cannot be operated without baseline ecological assessments[38]. We poorly understand how large-scale administrative decisions during mega events, e.g., Asiad 1982, Commonwealth Games 2010, G20 meeting in 2023, etc., which displaced animals causing conflicts/affecting image, create short/long-term impacts on free-ranging populations[41,50]. The limited data frequently comes from crude population counts[17]. We need demographic data with granularity about age-structure, intrinsic growth rates, mortality patterns, and spatially explicit distribution across urban microhabitats[39,40,51].

The legal institutions[38] have attempted to provide coexistence mandates, in the absence of qualitative assessments of compassion prevalenec[4], which is changing rapidly. The long-standing and globally discussed tolerance Indians exhibit towards animals, despite conflicts, is eroding against the backdrop of socio-cultural shifts[25]. Such knowledge gaps contribute to policy volatility, prompting retaliations. Social and state institutions need to address the aforementioned social-ecological gaps spanning informal economies, waste management systems, community feeding practices, and spatial priorities[4,5]. Culling is not a possibility under the Indian culture of non-violence (*Ahimsa*) and the legal purview[15]. These gaps keep the nation divided.

Fig. 4. Negotiating intersections of policy and social-ecological reality: here, well-intentioned court orders meet complex entanglements of animal ecology and behaviour. This feeding station board at a university campus represents a South Asian urban challenge—*how do we balance compassionate/patronising expressions towards nonhumans, while being ecologically coherent*? The intention to care for urban commensals is admirable. But concentrated feeding can inadvertently create resource competition hotspots, alter territorial dynamics, and increase conflicts. These questions do not undervalue the empathy people have for urban animals. Realising traditional people and nature relationships within modern, built environments warrants new-age eco-literacy; for example, see Gupta and Kumar 2024[5].

Way(s) to multispecies coexistence

FRDs do not conform to a few, fixed identities, like hapless individuals awaiting rescue, idealised companions, or pests requiring elimination[23,26,33,38]. Similar to other free-ranging animals, these sentient organisms exhibit varying capacities of adherence to the human niche, based on regional social-ecological drivers[41]. Thus, top-down approaches must prioritise limiting FRDs' access to food subsidies in human-use environments over relocation[25]. India and similar tropical systems are vast landscapes that share canine conundrums. Here, scientifically informed and adaptive socio-cultural practices that mediate coexistence would serve better than top-down court decrees. Without such alignment, we risk compromising overall well-being in shared environments[4,60].

Current coexistence principles in South Asia offer One Health lessons. Harnessing the services of commensals[3] captured in traditional beliefs[5] has shifted baselines due to animal demographic responses in tropical urban conglomerates[4,5]. Poor acknowledgement of dynamic human-animal reciprocation causes *1)* disproportionate injuries/property loss; *2)* alienation of under-represented stakeholders, e.g., manual waste scavengers; and *3)* social polarisation. Collectively, these complicate conflict discourses across the city-wilderness continuum[5,58,59]. Compassion, therefore, is not unilateral, given that relatively affluent reap FRDs' affiliative reciprocation from food subsidies, while blue-collar workers, children, and the elderly bear the burden of conflicts[4,25]. These stakeholders lack adequate representation of their concerns[33,38]. Cost-benefit trade-offs characterise human-animal associations; mutual decisions have inherent tensions[25,60]. Hence, street management is not a call to vilify FRDs. But poor acknowledgement of canine conundrums influences policies, empathic responses, and biases urban planning[15].

While the state is focused on managing FRDs, South Asian systems are impacted by poor solid waste management. Removing dogs from vast areas might bring new challenges, due to competitive release of rats, crows, etc., affecting *NbS* and reshaping One Health[50]. Addressing canine conundrums cannot afford to overlook functional links in animal ranging patterns and the spread of diseases through vector ecology[3,18,30,47]. Coexistence futures require pairing waste management alongside a simultaneous implementation of strategic feeding initiatives and CSVR programmes. Together, these could prevent public resistance and social disorder[15], helping public education programs[42,51] adapted to *1)* regional requirements, e.g., addressing barking, chasing or bite threats in urban environments[33,39]; and *2)* livestock and wildlife depredation at the protected area fringes[32]. Awareness campaigns are essential[42], considering the limited public understanding of the aetiology, transmission, and prevention of rabies, particularly in remote regions[5]. Furthermore, sustained, longitudinal monitoring of commensal demography[50] is essential to understanding how tropical cities—from infrastructure and traffic to cultural behaviour and waste disposal—affect animal populations[15]. Cohesive and strategic implementation of coexistence objectives needs institutional restructuring and functional collaborations between state departments and resident welfare associations. Currently, they operate in isolation. For instance, judicial bodies adjudicating matters with timelines detached from ecological realities discounted scientific expertise throughout the hearings.

After all, coexistence is not a fixed state but a dynamic relationship requiring constant steering. This means recognising that *1)* animal feeding decisions have population-level consequences; *2)* territorial behaviour responds to spatial dispersion of resources (food subsidies and mates); *3)* disease prevalence and transmission follow human-impacted animal social networks; and *4)* sustainable management and extension of traditional *NbS* of scavenging services by commensals require One Health principles that are already part of local diaspora in the Global South. Traditional patronising attitudes about nature are

478 frequently creating urban habitats that are ecological traps[62]. To shift from crises to multispecies
479 coexistence, scientific knowledge must be combined with traditional bio-cultural values and practices[5].

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Ethical Statement

The ethical approval for dog study was via permit number 2023/ER/Canine Conundrums/01, from Thinkpaws, with validity: 29.04.2023 to 31.12.2027 and the M.Sc. dissertation committee of Chaudhary Charan Singh University, Meerut, Uttar Pradesh. Since this counting was non-invasive and free-ranging dogs are not under the Wildlife Protection Act, no specific permission from the Department of Forest and Wildlife, Government of NCT of Delhi was required.

Declaration of AI use

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