



Animal Markets and Zoonotic Disease in India

COUNTRY SUMMARY: INDIA

CULTURAL CONTEXT

India is the second-most populous country in the world with over 1.3 billion people and thousands of animal species, including 14 primate species and at least 109 bat species. India is among the world's largest producers/consumers of dairy and exporters of beef products. It is one of the world's largest producers of eggs and broiler meat. Its relationship with animals is complex and varies across religion, socioeconomic level, geography, and culture. While some farm animals are worshiped, they are also used extensively for protein production and sold for export. India continues to experience increased economic development and growth. It is difficult to gauge the prevalence and risk of zoonotic disease in India because of a lack of data and testing, particularly in poor rural areas with limited access to healthcare, where many residents work or interact closely with animals.

ANIMAL MARKETS

Live animal markets operate across India, selling a variety of animals, including livestock and wildlife sold for food, as well as domestic and exotic pets. Animals enter markets from both domestic and international supply chains and are sold in urban and rural areas. Animal markets may operate within larger local markets, existing as standalone stalls in common markets, pet shops, and meat vendors. Some markets operate daily year-round, others seasonally. Other markets involve tourism/recreation, sanctuaries, ritual slaughter, tribal hunting festivals, and wildlife trafficking (whereby animals are killed for sport or are captured to enter India's wildlife trade to be later sold as pets or killed for meat). Domestic and international demand facilitate the legal and illegal trade of wild animals through a variety of supply chains. For example, civet cats are increasingly hunted and captured in India for coffee production. In terms of livestock, the dairy industry in the country is based on a co-operative model whereby small farmers carry out most of the milk production. The poultry industry consists of two operational models with distinct supply chains: highly formalized and informalized.

DRIVERS OF ZOOONOTIC DISEASE RISKS

Increasing interaction between humans and bats and other wildlife due to development and land-use changes creates a shift in environmental equilibriums that augments opportunities for zoonotic disease spread. Human-animal interfaces are common due to the proximity of animals to humans in multiple contexts, including the many living in the crowded streets of dense cities. Poor sanitation, food contamination, and lack of hygiene, of access to clean water and basic health services also contribute to zoonotic disease risk, intensified by India's population, geographical landscape, and emerging market economy. Markets in India are often open-air or partially covered, allowing insects, rodents, stray

animals, and other potential vectors to contaminate the animal product supply chain. Improper waste management can also result in cross-contamination of urine, feces, blood, and other internal bodily fluids. For animals sold in these markets, stressful conditions and weakened immune systems can increase the risk of infection. A wide array of animal uses, from raising goats for religious slaughter to processing and consuming bats, pose significant public health risks.

RISK MITIGATION AND RELEVANT CHALLENGES

India's laws and regulations are extensive but require better enforcement, weakened by poor administration and lack of infrastructural support. There is a lack of ability to trace back disease outbreaks and limited data to understand how these pathogens spread. Animal market regulation and enforcement is limited and reactionary rather than forward-looking. Without effective regulatory enforcement, the illegal wildlife trafficking persists, as wild animals continue to be hunted for sport, rituals, and illegal trade. Law enforcement officers and other stakeholders lack information about zoonotic disease and disease spread. Gaps in healthcare access and to disease control facilities compound risk. Government bodies, committees and agencies are understaffed and overburdened. Additional resilience can be built into this regulatory framework with greater focus and funding as well as incorporation of One Health principles.

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TABLE OF CONTENTS: INDIA

Introduction	5
Zoonotic Disease, Emergence, and Reemergence	7
Legal and Regulatory Framework of Animal Protection	8
Human-Animal Interfaces	11
Live Animal Market Overview	16
Case Study: Poultry Market (Ghazipur Murga Mandi, Uttar Pradesh)	17
Case Study: Pet Market (Crawford Market, Mumbai)	20
Wildlife Trade and Zoonotic Disease Implications	22
Policy Reform	25
Conclusion	29
List of Abbreviations	32

INTRODUCTION

This paper explores India's disposition to the emergence and re-emergence of zoonotic disease. It investigates current conditions and regulations, as well as the potential contribution of India's live animal markets to future zoonotic disease outbreaks.

The first cases of COVID-19 in India were found in January 2020 among medical students who traveled back to India from Wuhan.¹ The Indian government responded by enforcing a lockdown two months later when COVID-19 cases reached 500.² As of the time of writing,³ there have been over 43 million cases of COVID-19 in India and over 500,000 deaths, although the true number could be closer to 3 million killed by the disease.^{4,5} Inaccurate or incomplete tallies may be attributed to disorganized reporting systems or a desire to downplay the virus' impact; however, the fact remains that India ranks among the worst-affected countries in the world by the COVID-19 pandemic.^{6,7} Part of this impact may be attributable to the fact that India is ranked much lower than many of its Asian middle-income peers in health security, zoonotic disease prevention, health care access, pandemic preparedness, and capacity of health facilities according to the Global Health Security Index.⁸

While India has not been identified as the location of COVID-19's origin, the country's many live animal markets operate with significant zoonotic risk potential. Despite a growing "supermarket revolution," India's rural and urban areas continue to house large and traditional open-air markets where meat, pets, and wildlife are purchased.⁹ High-traffic markets create environments for diseases to spread not only among animals but also to new human hosts. These traditional markets present significant zoonotic concerns due to the sale and slaughter of live animals in public.¹⁰ Caged exotic and domestic animals excrete bodily fluids, feces, and other waste, thereby increasing the risk of potential transmission of dangerous pathogens to those who work, shop, and frequent the markets.

Several demographic and environmental factors make India particularly vulnerable to zoonotic disease outbreak and reemergence. Prior epidemics were able to spread quickly in India due to the country's poorly resourced healthcare systems, variable literacy levels, economic instability, lack of sanitation, and ever-growing urbanization. In recent years, an increasingly robust economy has led to higher demand for animal protein with fish, chicken, goat, buffalo, and pork composing the majority

1. Ipchita Bharali, Preeta Kuman, and Sakthivel Selvaraj, "How Well is India Responding to COVID-19?" Brookings, July 2, 2020, <https://www.brookings.edu/blog/future-development/2020/07/02/how-well-is-india-responding-to-covid-19/>.
2. Ipchita Bharali, Preeta Kuman, and Sakthivel Selvaraj, "How Well is India Responding to COVID-19?" Brookings, July 2, 2020, <https://www.brookings.edu/blog/future-development/2020/07/02/how-well-is-india-responding-to-covid-19/>.
3. *April, 2022*
4. Jon Cohen, "COVID-19 May Have Killed Nearly 3 Million in India, Far More Than Official Counts Show," Science, January 6 2022, <https://www.science.org/content/article/covid-19-may-have-killed-nearly-3-million-india-far-more-official-counts-show>.
5. Worldometer, last updated October 5, 2023, <https://www.worldometers.info/coronavirus/country/india/>.
6. Jon Cohen, "COVID-19 May Have Killed Nearly 3 Million in India, Far More Than Official Counts Show," Science, January 6 2022, <https://www.science.org/content/article/covid-19-may-have-killed-nearly-3-million-india-far-more-official-counts-show>.
7. "Countries Where COVID-19 has Spread," Worldometer, last updated October 5, 2023, <https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/>.
8. "2021 GHS Index Country Profile for India," GHS Index, accessed October 5, 2023, <https://www.ghsindex.org/country/india/>; India is ranked 66th out of 195 countries while Indonesia and Thailand scored 55th and 5th, respectively.
9. McKinsey & Company, The State of Grocery Retail in India (Chicago: McKinsey & Company, 2022), <https://www.mckinsey.com/~media/mckinsey/industries/retail/our%20insights/the%20state%20of%20grocery%20retail%20in%20india/the-state-of-grocery-retail-in-india.pdf>.
10. "Reducing Public Health Risks Associated with the Sale of Live Wild Animals of Mammalian Species in Traditional Food Markets, Interim Guidance," World Health Organization, April 21, 2021, https://cdn.who.int/media/docs/default-source/food-safety/ig--121-1-food-safety-and-covid-19-guidance-for-traditional-food-markets-2021-04-12-en.pdf?sfvrsn=921ec66d_1&download=true.

of the domestic meat market.¹¹ While the demand for bushmeat (most often the endangered Indian Gazelle) is decreasing in India due to economic development, bushmeat is still considered a luxury food item.¹² India's diverse landscape encompasses multiple ecosystems, including wetlands, grassland, desert, forest, as well as marine and coastal areas. While India continues to experience increased economic development, this growth has fueled urban development and encroachment into wildlife habitat, which, in turn, has facilitated the emergence of deadly diseases such as dengue, chikungunya, and Japanese encephalitis.¹³ Local deforestation in Karnataka, for example, has been linked to Kyasanur Forest Disease, a sometimes fatal, tick-borne flavivirus carried by monkeys, rodents, and shrews.¹⁴ Similarly, the Nipah virus has reemerged in India due to the displacement of fruit bats from their habitats, which subsequently led to frequent contact with livestock animals and humans.¹⁵ The increasing interaction between humans and bats due to development and land-use changes creates a shift in environmental equilibriums that augments opportunities for zoonotic disease spread.¹⁶

ZOONOTIC DISEASE, EMERGENCE, AND REEMERGENCE

India continues to suffer the effects of the COVID-19 pandemic; however, this outbreak is only the most recent chapter of India's long history of zoonotic diseases, many of which continue to re-emerge or have become endemic to the region.¹⁷ The bubonic plague first arrived in India on September 23, 1896. Within 25 years, an estimated 12 million Indians died.¹⁸ While the plague originated in Yunnan, China, spilling over through fleas that transmitted the virus from infected rodents to humans, the disease thrived in India due to overcrowded cities, lack of hygiene in public transportation and common areas, and societal factors.¹⁹ Areas such as the Punjab region were most affected due to ongoing battles with other diseases such as malaria, smallpox, and cholera. Although the plague began to subside after millions of vaccinations were administered in 1902–1903, India continues to be threatened by the disease's re-

11. Michael Pellman Rowland, "Demand for Meat is Growing Rapidly in India. This Could Impact All of Us," *Forbes*, December 17, 2017, <https://www.forbes.com/sites/michaelpellmanrowland/2017/12/17/india-meat-increase/?sh=60026b1f33b1>.
12. Rima Kumari et al., "Deforestation in India: Consequences and Sustainable Solutions," in *Forest Degradation Around the World*, edited by Mohd Nazip Suratman et al. (London: IntechOpen, 2020), <https://www.intechopen.com/chapters/66710>; Owen Mulhern, "Bushmeat Consumption in Asia," *Earth*, November 26, 2020, https://earth.org/data_visualization/bushmeat-consumption-in-asia/; "Demand for Bushmeat Fuels Poaching of Endangered Species," *The Times of India*, May 5, 2020, <https://timesofindia.indiatimes.com/city/jaipur/demand-for-bushmeat-fuels-poaching-of-endangered-species/articleshow/75544114.cms>.
13. Kaushik Bharati, "The Resurgence of Chikungunya in India: How Should We Tackle It?" *Ideas for India*, March 1, 2018, <https://www.ideasforindia.in/topics/governance/the-resurgence-of-chikungunya-in-india-how-should-we-tackle-it.html>.
14. Mark Nichter, "Kyasanur Forest Disease: An Ethnography of a Disease of Development," *Medical Anthropology Quarterly*, 1, no. 4 (1987): 406–23, <https://doi.org/10.1525/maq.1987.1.4.02a00040>.
15. Suchitra Chari, "Nipah Virus Re-emerges for the Third Time in India," *Medindia*, reviewed May 31, 2018, <https://www.medindia.net/news/healthinfocus/nipah-virus-re-emerges-for-the-third-time-in-india-179848-1.htm>.
16. T. V. Padma, "Deforestation and Disease: How Natural Habitat Destruction Can Fuel Zoonotic Diseases," *Mongabay*, April 1, 2020, <https://india.mongabay.com/2020/04/deforestation-and-disease-how-natural-habitat-destruction-can-fuel-zoonotic-diseases/>.
17. India is well-acquainted with zoonotic disease. After prior outbreaks of SARS, avian influenza, and Nipah virus disease in South East Asia, the WHO recognized the vulnerability of South East Asian countries to emerging and re-emerging infectious diseases. At a regional meeting on zoonotic disease in 2007, the WHO determined that functional systems for early detection and response to zoonotic disease, as well as a regional strategic framework to implement control and safety, were needed on both regional and country levels.
18. Monil Singhai et al., "Chronicle Down Memory Lane: India's Sixty Years of Plague Experience," *Indian Journal of Medical Microbiology* 39, no. 3 (2021): 279–85, doi: 10.1016/j.ijmmb.2021.06.007.
19. Jai Prakash Narain, "Public Health Challenges in India: Seizing the Opportunities," *Indian Journal of Community Medicine* 41, no. 2 (2016): 85–8, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/pdf/IJCM-41-85.pdf>; Aanchol Malhotra, "When the 1897 Bubonic Plague Ravaged India," *Mint Lounge*, April 26, 2020, <https://www.livemint.com/mint-lounge/features/when-the-1897-bubonic-plague-ravaged-india-11587876174403.html>; *Europeans were often not required to quarantine and it was inappropriate and culturally unacceptable in some families for male doctors to inspect women.*

emergence. In 1994, the plague reappeared in Gujarat, causing panic and population exodus. In 2004, a localized outbreak in Uttarakhand led to eight cases and three deaths.²⁰

Other notable re-emerging zoonotic viruses include the Nipah virus, which was first identified in 1999 among pig farmers in Malaysia, but also caused several outbreaks in India in 2001.²¹ Since then, Nipah has reappeared in India on an almost annual basis, with mortality rates from these outbreaks reaching as high as 91% and averaging 75% over the last two decades.^{22 23} Additionally, Chikungunya fever, first reported in Tanzania, caused outbreaks in India from 1963 to 1973, and it continues to reappear today.²⁴ H1N1, Crimean-Congo hemorrhagic fever, and certain forms of encephalitis are other zoonotic diseases that persist in and spread across several Indian states.²⁵ In India, brucellosis, a flu-like disease that can transfer from livestock to humans, causing fever, headaches, and back pain, is found in many large, organized dairy farms. The virus is considered endemic in all states of India and the recent rise in incidence is due to the intensification of India's dairy industry.²⁶

The true impact of zoonotic disease in India is likely significantly understated because such disease spread often affects poor rural communities with limited access to healthcare, many of whom also work closely with animals. While One Health policies have made strides in India, the implementation of such policies has been challenging due to the low visibility of these issues combined with limited federal guidance and cross-discipline collaboration.²⁷ Unless national policy frameworks are strengthened to improve disease surveillance and interventions while accounting for sociopolitical and cultural nuances, India will continue to face public health challenges from infectious disease.²⁸

LEGAL AND REGULATORY FRAMEWORK OF ANIMAL PROTECTION

Enacted in 1949, the Constitution of India is composed of 25 “Parts” and each Part is divided further into Articles. A total of 395 Articles exist in the Indian Constitution. Additionally, 12 “schedules” of the Constitution elaborate on government policy with respect to certain Articles. Within the Constitution, Fundamental Rights (Part III) are enforceable, while Directive Principles of State Policy (Part IV) and Fundamental Duties (Part IVA) are unenforceable by courts.

20. <https://www.nhp.gov.in/disease/communicable-disease/plague>

21. “Nipah Virus Disease: India,” World Health Organization, September 24, 2021, <https://www.who.int/emergencies/disease-outbreak-news/item/nipah-virus-disease---india#:~:text=In%20India%2C%20the%20first%20Nipah,district%2C%20both%20in%20Kerala%20state>.

22. Brenda S. P. Ang et al., “Nipah Virus Infection,” *Journal of Clinical Microbiology* 56, no. 6 (2018): e01875-17, <https://journals.asm.org/doi/full/10.1128/JCM.01875-17>.

23. Vinod Soman Pillai, Gayathri Krishna, Mohanan Valiya Veetil, “Nipah Virus: Past Outbreaks and Future Containment,” *Viruses* 12, no. 4 (2020): 465, <https://www.mdpi.com/1999-4915/12/4/465>.

24. Prasanna Yergolkar et al., “Chikungunya Outbreaks Caused by African Genotype, India,” *Emerging Infectious Diseases* 12, no. 10 (2006): 1580–3, <https://doi.org/10.3201/eid1210.060529>.

25. T. Dikid et al., “Emerging & Re-emerging Infections in India: An Overview,” *Indian Journal of Medical Research* 138, no. 1 (2013): 19–31, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3767269/>.

26. Hannah R. Holt et al., “Epidemiology of Brucellosis in Cattle and Dairy Farmers of Rural Ludhiana, Punjab,” *PLoS Neglected Tropical Diseases* 15, no. 3 (2021): e0009102, <https://doi.org/10.1371/journal.pntd.0009102>.

27. F. A. Asaaga et al., “Operationalising the ‘One Health’ Approach in India: Facilitators of and Barriers to Effective Cross-sector Convergence for Zoonoses Prevention and Control,” *BMC Public Health* 21 (2021): 1517, <https://doi.org/10.1186/s12889-021-11545-7>.

28. F. A. Asaaga et al., “Operationalising the ‘One Health’ Approach in India: Facilitators of and Barriers to Effective Cross-sector Convergence for Zoonoses Prevention and Control,” *BMC Public Health* 21 (2021): 1517, <https://doi.org/10.1186/s12889-021-11545-7>.

Fundamental Rights of Animals (enforceable in any court)

While fundamental rights are given to “persons” under Article 21 of Part III of the Constitution of India, the Supreme Court has given a widely accepted expanded definition to the term “life” to include the right to a healthy environment.²⁹ In the landmark judgment of *Animal Welfare Board of India v. A. Nagaraja & Ors.*, the right to a healthy environment, under the expanded definition of “right to life,” was interpreted as inclusive of the welfare of animals.³⁰ While Article 21 of the Constitution states that “no person shall be deprived of his life or personal liberty except according to the procedure established by law,” the Supreme Court of India held that “every species has a right to life and security, subject to the law of the land, which includes depriving its life, out of human necessity.” The court further stated, “Article 21 of the Constitution, while safeguarding the rights of humans, protects life, and the word “life” has been given an expanded definition, and any disturbance from the basic environment which includes all forms of life, including animal life, which are necessary for human life, fall within the meaning of Article 21 of the Constitution.”³¹

While the Fundamental Duties and Directive Principles of State Policy are not enforceable in a court of law, they do establish an objective framework for law and policy. The Supreme Court also declared that Article 51A(g) of the Directive Principles of State Policy of the Constitution of India is the “Magna Carta of animal rights” in India. Life, according to the Supreme Court, which includes animal life, “means something more than mere survival or existence or instrumental value for human beings, but to lead a life with some intrinsic worth, honor, and dignity.”³² Sections of the Directive Principles pertinent to animals include Articles 48, 48A, and 51A(g). Article 48 of Part IV of the Directive Principles of State Policy governs agriculture and animal husbandry and states that the “state shall endeavor to organize agriculture and animal husbandry on modern and scientific lines...and prohibiting the slaughter of cows and calves and other milch and draught cattle.” Article 48A concerns the protection and improvement of the environment and the safeguarding of forests and wildlife. Article 51A(g), states that “it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures.”

Laws That Govern Live Animal Markets and Slaughterhouses:

In accordance with the Prevention of Cruelty to Animals Act of 1960, the Government of India enacted The Prevention of Cruelty to Animals (Slaughter House) Rules of 2001. Section 3(1) of the Slaughter House Rules states that “No person shall slaughter any animal within a municipal area except in a slaughterhouse recognized or licensed by the concerned authority.” The Rules continue to specify the amenities in slaughterhouses and the processes for slaughter. The FSSAI only permits operations for animal food businesses slaughtering and selling goats, sheep, pigs, bovine animals, poultry, and fish.

In addition, the Food Safety and Standards Act of 2006 and the Food Safety and Standards Regulations of 2011 govern the licensing and registration of all food businesses and require a license for all slaughterhouses equipped to slaughter more than 50 large animals or 150 or more small animals or

29. *Subhash Kumar vs State Of Bihar And Ors*, 1991 AIR 420.

30. *Animal Welfare Board of India v. A. Nagaraja*, (2014) 7 SCC 547, para 62.

31. *Animal Welfare Board of India v. A. Nagaraja*, (2014) 7 SCC 547.

32. *Animal Welfare Board of India v. A. Nagaraja*, (2014) 7 SCC 547.

1,000 or more poultry birds per day. Unable to adhere to safety, sanitation, and hygiene requirements, many slaughterhouses shut down.³³ The Slaughter House Rules also require veterinarians to certify that animals are healthy, disease-free, and have access to separate isolation pens in order to prevent infectious disease outbreaks. The Animal Welfare Board of India, per the PCA has the authority to, without notice, inspect any slaughterhouse. Beyond these federal regulations, municipal laws can in some cases provide more protection.³⁴

Pet Legislation

Enacted in 2018 by the Government of India, the Prevention of Cruelty to Animals (Pet Shop) Rules are the first set of rules governing the pet industry. The rules require that pet shop owners obtain a Registration Certificate from the AWBI of the state in which such pet shops are located. Rules pertain to location, infrastructure, and space. The requirements include enough space to stand, sit, lie down, turn around, and stretch; veterinarian certifications of good health; microchips on puppies; same species housing; disinfection of rooms from excrement and other waste, among other things; proper ventilation; and quarantine facilities.

Wildlife Legislation

Enacted by the Parliament of India, the Wildlife (Protection) Act of 1972 protects plants and animal species. Organized into six schedules, each with a varying degree of protection, several Amendments have increased punishments. Hunting animals for sport is illegal but hunting is allowed when conducted to prevent crop damage, avoid danger to human beings, or for scientific or educational reasons. It can be argued that these exceptions allow various forms of hunting to occur—seeming to swallow the actual rule—and that perhaps any rationale for hunting could be justified by a broad interpretation of the Amendments.

Noncompliance

While the Supreme Court of India has recognized that animals have certain constitutional protections, animal law in India is largely governed by the Wildlife Protection Act of 1972, the Prevention of Cruelty to Animals Act of 1960, and the Pet Shop Rules. While the Ministry of Agriculture and Farmers Welfare provides oversight to states, the policies, enforcement, and application of India's federal animal laws is not uniform across the states.

Concerned citizens, activists, and environmental groups often report incidents of noncompliance in India's live animal markets, and investigations show that slaughterhouse laws are not always followed. In a 2017 report published by the Comptroller and Auditor General of India (CAG), the agency found expired, incomplete, and retroactively renewed licenses, as well as unregulated food entering the country, and an overall lack of reporting on enforcement and administration of the FSSA.³⁵

33. Parikshit Goyal, "Wet Markets and Food Laws in India: What is Needed to Ensure Safety and Hygiene?" EPW Engage, August 1, 2020, <https://www.epw.in/engage/article/wet-markets-and-food-laws-india-what-needed-ensure-safety-hygiene>.

34. Section 415 of the Delhi Municipal Corporation Act of 1957 states that animals can only be slaughtered at state-registered slaughterhouses.

35. Union Government (Civil), Ministry of Health and Family Welfare, Report of the Comptroller and Auditor General of India on Performance Audit of Implementation of Food Safety and Standards Act, 2006, Report no. 37 of 2017, https://cag.gov.in/uploads/download_audit_report/2017/Report_No.37_of_2017_-_Performance_Audit_on_Implementation_of_Food_Safety_and_Standards_Act,_2006_Union_Government.pdf.

Our research suggests a similar pattern exists with respect to pet shops and the live wildlife trade. Local authorities routinely fail to respond to reports of unregistered pet shops and illegal wild animal sales. Awareness of noncompliance rests on the efforts of concerned activists who respond to public tips of market violations rather than transparency on the part of those enforcing the laws.

HUMAN–ANIMAL INTERFACES

India is the second-most populous country in the world with over 1.3 billion people and 91,000 species of animals, including high-risk zoonotic carriers such as the Indian pangolin, 14 species of primates, and at least 109 species of bats.^{36,37} This report focuses on the livestock, wildlife, and pets found in India's live animal markets, so it does not include the full spectrum of diverse animal supply chains in India. As such, our report is only a snapshot of this larger catalog of risks presented by the country's animal use and trade. India's relationship with animals is complex and varies across religion, socioeconomic level, geography, and culture. While some farm animals are worshiped, others are exploited. Both scenarios, and most in between, present human–animal interfaces that present a risk of zoonotic spillover.

Livestock (Cattle & Poultry): Human–cattle interfaces, and subsequently zoonotic disease potential between humans and cattle, vary throughout India. The fate of cattle in India is determined by the power delegated by the central government to the states and union territories. In 1950, the Constituent Assembly amended the Directive Principles of State Policy (DPSP) under Article 48 of the Indian Constitution to state:

“The State shall endeavor to organize agriculture and animal husbandry on modern and scientific lines and shall in particular take steps for preserving and improving the breeds of cattle and prohibit the slaughter of cow and other useful cattle, specially milch and draught cattle and their young stock.”³⁸

Due to widespread religious and traditional reverence by India's Dharmic population, many states explicitly prohibit cow and calf slaughter while less dharmic-populated states permit slaughter for cows who have reached a certain age. Other states have no such regulations.³⁹ In the states that ban cow slaughter, the sale of beef is also banned. While the DPSP under Part IV of the Constitution serve as guidelines for government policy, they remain subject to much debate in India. Although a national cow slaughter ban has not garnered national support, the Foreign Trade Policy of India prohibits the export of beef from cows, oxen, and calves. Despite this, India ranks among the world's largest producers/

36. Charles H. Southwick and Donald G. Lindburg, “The Primates of India: Status, Trends and Conservation,” in *Primates: The Road to Self-Sustaining Populations*, edited by Kurt Benirschke (Berlin: Springer-Verlag, 1986, https://link.springer.com/chapter/10.1007/978-1-4612-4918-4_12).

37. <https://www.batcon.org/article/the-bats-of-india/>

38. “Organisation of Agriculture and Animal Husbandry,” Constitution of India, Part IV, Article 48, accessed October 6, 2023, https://www.constitutionofindia.net/constitution_of_india/directive_principles_of_state_policy/articles/Article%2048.

39. “Annex II (8) Gist of State Legislations on Cow Slaughter,” Government of India, Department of Animal Husbandry and Dairying, updated May 10, 2019, <https://dahd.nic.in/hi/related-links/annex-ii-8-gist-state-legislations-cow-slaughter>.

consumers of dairy and exporters of beef products.⁴⁰ The reason for these high figures in a country with significant restrictions on cow slaughter is that the slaughter of buffalo, and the export of buffalo meat, is legally permitted throughout India.

Dairy farming also presents health risks and a number of potential zoonotic diseases may occur. The dairy industry in the country is based on a co-operative model whereby small farmers carry out most of the milk production. In rural India, it is common for cattle to live in close proximity to farmers and their family members. Cattle are often situated under the same roof where family members sleep, cook and eat; such close proximity exposes farmers and family members to tuberculosis.⁴¹ *Mycobacterium bovis* (*M. bovis*, or bovine TB), a bacterium found in cows and other hoofstock, including buffalo, is one of the leading causes of death worldwide.⁴² In developing countries such as India, *M. bovis* is responsible for 10%–15% of new human TB cases.⁴³ A 2017 study on the prevalence of bovine tuberculosis found that residents living in unsanitary, overcrowded, and TB-endemic regions suffered most from TB—more so than dairy workers and zoo handlers who had direct contact with cattle.⁴⁴ The majority of the individuals sampled consumed meat from local abattoirs and indicated that no proper inspection of meat and meat products was done prior to consumption. Additional risk factors included poor ventilation, sleeping alongside calves to protect them, raw milk consumption, and living near cattle pens.⁴⁵ Other bovine zoonotic diseases documented in Indian cattle and water buffalo include schistosomiasis, rotavirus infection, leptospirosis, and brucellosis.⁴⁶ The impact of human contact with potentially 300 million cattle, of which 21.8 million are potentially infected with bovine tuberculosis, requires significant disease control interventions.⁴⁷

Chickens and egg-laying hens, as compared to cows, are less controversial in India. India is one of the world's largest producers of eggs and broiler meat.⁴⁸ The poultry industry consists of two operational models with distinct supply chains: highly formalized (shopping malls, supermarkets) and informalized (exclusive chicken dressers, live animal markets, roadside poultry retailers). The first category of formal production facilities controls 80% of India's poultry market share, amounting to ₹64,000 crore (\$8.6 billion) while informal backyard poultry operations contribute ₹16,000 crore (\$2.2 billion). India's poultry production and consumption are expected to grow due to India's shifting food

40. Hannah Ritchie, Pablo Rosado, and Max Roser, "Meat and Dairy Production," Our World in Data, updated November 2019, [OurWorldInData.org/meat-production](https://ourworldindata.org/meat-production).

41. Gopal Dabade et al., "A Study on Zoonotic Tuberculosis in Selected Rural Areas of Bagalkot and Belgaum Districts of Karnataka State," *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases* 9 (2017): 30–35, doi: 10.1016/j.jctube.2017.10.002.

42. "Tuberculosis," *Centers for Disease Control and Prevention*, reviewed April 6, 2020. [https://www.cdc.gov/globalhealth/newsroom/topics/tb/index.html#:~:text=Globally%2C%20tuberculosis%20\(TB\)%20is,%25%2C%20respectively%2C%20from%202017.](https://www.cdc.gov/globalhealth/newsroom/topics/tb/index.html#:~:text=Globally%2C%20tuberculosis%20(TB)%20is,%25%2C%20respectively%2C%20from%202017.)

43. Prachi R. Bapat et al., "Prevalence of Zoonotic Tuberculosis and Associated Risk Factors in Central Indian Populations," *Journal of Epidemiology and Global Health* 7, no. 4 (2017): 277–83.

44. Prachi R. Bapat et al., "Prevalence of Zoonotic Tuberculosis and Associated Risk Factors in Central Indian Populations," *Journal of Epidemiology and Global Health* 7, no. 4 (2017): 277–83.

45. Prachi R. Bapat et al., "Prevalence of Zoonotic Tuberculosis and Associated Risk Factors in Central Indian Populations," *Journal of Epidemiology and Global Health* 7, no. 4 (2017): 277–83.

46. Virginia M. Ventura et al., "Evidence of *Fasciola* spp. Resistance to Albendazole, Triclabendazole and Bromofenofos in Water Buffaloes (*Bubalus bubalis*)," *Annals of Parasitology* 61, no. 4 (2015): 283–9; Maria Cristina Medici et al., "Genetic Diversity in Three Bovine-like Human G8P[14] and G10P[14] Rotaviruses Suggests Independent Interspecies Transmission Events," *Journal of General Virology* 96, Pt 5 (2015): 1161–8; Ben Adler, ed., *Leptospira and Leptospirosis* (Berlin: Springer, 2015), 384; M. M. H. Sewell and D. W. Brocklesby, *BVA Handbook on Animal Diseases in the Tropics* (Amsterdam: Elsevier, 1990), 385; A. S. Hassan et al., "Dynamics of *Mycobacterium* and bovine tuberculosis in a Human–Buffalo Population," *Computational and Mathematical Methods in Medicine* 2014 (2014): 912306, DOI: 10.1155/2014/912306.

47. Sreenidhi Srinivasan et al., "Prevalence of Bovine Tuberculosis in India: A Systematic Review and Meta-analysis," *Transboundary and Emerging Diseases* 65, no. 6 (2018): 1627–40, doi:10.1111/tbed.12915.

48. "India," One Health Poultry Hub, accessed October 6, 2023, <https://www.onehealthpoultry.org/where-we-work/india/>.

habits, urbanization, and poultry's perceived nutritional benefits.

Both formal and informal poultry operations are affected by the threat of zoonotic disease. In January 2021, for example, 50,000 birds were culled due to two avian flu outbreaks in Kerala.⁴⁹ Since most Indian citizens live in agrarian communities, the procurement, transport, and trade associated with livestock impacts livelihoods, cultural practices, and politics. As India's domestic production and consumption continue to increase rapidly, along with poultry exports, so too will zoonotic interfaces. Other livestock animals in India such as goats, rabbits, ducks, and pigeons augment the risk of interspecies transmission and contribute to zoonotic disease outbreaks, including avian tuberculosis.⁵⁰

Tourism (Elephants, Camels): While India has a population of wild free-roaming elephants, its captive population presents a greater potential for zoonotic transmission. Elephants in India can be found in a variety of settings and uses, from zoos to wedding processions and even in sports games such as polo.⁵¹ In a 2017 study of *M. tuberculosis*, authors noted that reports of mycobacterial infections in captive elephants date back to 1925. The authors concluded that “the close interaction between humans and captive elephants is presumed to be a key risk factor for the interspecies transmission of TB.”⁵² Wild elephants are also known to occasionally cross over from their wild habitat to enter nearby villages.⁵³ People in the deserts of Rajasthan revere camels for their milk and use them for tourist rides across sand dunes. While global concerns regarding camel zoonoses have focused on the Middle East and MERS, camel use in India also carries zoonotic risk potential.⁵⁴ In 2009 in northwest India, zoonotic camelpox virus (CMLV) infection outbreaks were recorded in camel handlers who developed scabs and lesions on their fingers and hands.⁵⁵

Discarded, Roaming Street Animals (Cows, Water Buffalos, Dogs, Cats): Human–animal interfaces are common in India in part due to the proximity of animals to humans in multiple contexts, including the many animals living in the crowded streets of dense cities. Cows, water buffaloes, and elephants walk alongside pedestrians who occasionally stop to pet and feed them. An estimated five million cows wander the streets of India, living in close contact with humans and other animals and presenting public health challenges.^{56 57} Struggling farmers and cattle owners often discard unproductive cows, turning them loose to wander or be taken to shelter facilities called gaushalas. While some gaushalas may

49. “Bird Flu Outbreak in Kerala: 50,000 Birds to be Culled in Two Districts,” *The Indian Express*, updated January 6, 2021, <https://indianexpress.com/article/india/bird-flu-outbreak-in-kerala-50000-birds-to-be-culled-in-two-districts-7133691/>.

50. Kuldeep Dhama et al., “Tuberculosis in Birds: Insights into the Mycobacterium avium Infections,” *Veterinary Medicine International* 2011 (2011): 712369, <https://doi.org/10.4061/2011/712369>.

51. Bobins Abraham, “World Elephant Day is Also a Reminder on How We Have Abused the Jumbos for Our Entertainment,” *IT News*, updated August 12, 2020, <https://www.indiatimes.com/news/india/world-elephant-day-reminder-how-we-abused-elephants-for-entertainment-520122.html>.

52. Arun Zachariah et al., “Mycobacterium tuberculosis in Wild Asian Elephants, Southern India,” *Emerging Infectious Diseases* 23, no. 3 (2017): 504–6, <https://doi.org/10.3201/eid2303.161741>.

53. Alan Taylor, “A Wild Elephant Runs Loose in an Indian City,” *The Atlantic*, February 10, 2016, <https://www.theatlantic.com/photo/2016/02/a-wild-elephant-makes-a-destructive-run-through-an-indian-city/462165/>.

54. Lalit Kant, “MERS May Not Be SARS; But India is Still Vulnerable,” *Indian Journal of Medical Research* 142, no. 2 (2015): 103–5, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4613429/>.

55. B.C. Bera et al., “Zoonotic Cases of Camelpox Infection in India,” *Veterinary Microbiology* 152, nos. 1–2 (2011): 29–38, doi: 10.1016/j.vetmic.2011.04.010.

56. Manasi Gopalakrishnan, “India's Sacred Cows are Creating Havoc,” *DW*, December 17, 2018, <https://www.dw.com/en/how-indias-sacred-cows-are-creating-havoc-on-the-streets/a-46771484>.

57. Annie Gowen, “Why India has 5 Million Stray Cows Roaming the Country,” *The Washington Post*, July 16, 2018, <https://www.washingtonpost.com/world/2018/07/16/amp-stories/why-india-has-million-stray-cows-roaming-country/>.

provide protection, others function as places of exploitation, incarceration, and gendered violence for animals.⁵⁸

In addition, feral and domestic dogs and cats continue to populate Indian streets.⁵⁹ According to a recent report, India has approximately 80 million homeless cats and dogs living in shelters or streets and has among the highest pet relinquishment levels of any country.⁶⁰ With 80 million unvaccinated animals living on the street and coming into close contact with humans at playgrounds, schools, food stalls, and in other aspects of day-to-day life, rabies presents a serious public health threat.⁶¹ India has the highest prevalence of dog-mediated rabies deaths of any country, while many other nations have nearly eliminated the disease.⁶² Despite 1.8 million people receiving anti-rabies vaccines, an estimated 20,000 people continue to die of rabies each year in India.⁶³

Sanctuaries: While animal sanctuaries, known in India as *panjarapoles* and *gaushalas*, attempt to rescue animals, they are also potentially vulnerable to zoonotic disease outbreaks due to crowded facilities, insufficient handlers, and lack of adequate veterinary care. This is true across different kinds of animal shelters and sanctuaries. For example, a recent study found that only one of the surveyed sanctuaries vaccinated against brucellosis, and many of the cattle sheltered in *gaushalas* were immunocompromised or carried disease-causing pathogens like *Listeria*, *Streptococcus*, *Staphylococcus*, and *Corynebacterium*.⁶⁴ While some state governments provide vaccinations for cows, oximeters, and thermal scanners, the high cost of veterinarians needed to administer these treatments remains a barrier to access.^{65 66}

High-profile Zoonotic Hosts (*Bats*): The viral hosts of the Nipah virus, fruit bats (also known as flying foxes), are native to India. Individuals become exposed when they come into contact with the bats or with their saliva or fluids, for example, by consuming contaminated date palm sap.⁶⁷ These bats, like most other bat species, are classified under Schedule V (vermin) of the Wildlife Protection Act of 1972, meaning that they can be freely killed or captured in India.⁶⁸ This lack of protection leaves the species vulnerable from a conservation standpoint but also puts humans who kill or interact with the bats at great

58. Perna Katiyar and Suman Layak, "What Made Rural India Abandon Its Cattle in Drovers," *The Economic Times*, updated January 20, 2019, [Hypatia: A Journal of Feminist Philosophy 34, no. 2 \(2019\): 195–221, <https://onlinelibrary.wiley.com/doi/abs/10.1111/hypa.12460>.](https://economictimes.indiatimes.com/news/politics-and-nation/what-made-rural-india-abandon-its-cattle-in-drovers/articleshow/67604493.cms?from=mdr; Yamini Narayanan,)

59. Although pet ownership increased in post-COVID-19 India, most new pets were purchased dogs and cats rather than shelter-adopted animals.

60. "State of Pet Homelessness Index," End Pet Homelessness, accessed October 6, 2023, <https://stateofpethomelessness.com/the-index/>.

61. Amrit Dhillon, "'Not Just a Dog Bite': Why India is Struggling To Keep Rabies at Bay," *The Guardian*, October 14, 2020, <https://www.theguardian.com/global-development/2020/oct/14/not-just-a-dog-bite-why-india-is-struggling-to-keep-rabies-at-bay>.

62. Sreejith Radhakrishnan et al., *Rabies as a Public Health Concern in India: A Historical Perspective*, *Tropical Medicine and Infectious Disease* 5, no. 4 (2020): 162, <https://doi.org/10.3390/tropicalmed5040162>.

63. "Rabies in India," World Health Organization, accessed October 6, 2023, <https://www.who.int/india/health-topics/rabies>.

64. Shweta Bijla et al., "An Analysis of Constraints Faced by Gaushalas in Haryana," *Economic Affairs* 64, no. 1 (2019): 191–5.

65. Arvind Sharma, Catherine Schuetz, and Clive J. C. Phillips, "The Management of Cow Shelters (Gaushalas) in India, Including the Attitudes of Shelter Managers to Cow Welfare," *Animals* 10, no. 2 (2020): 211, <https://doi.org/10.3390/ani10020211>.

66. "Oximeters, Thermal Scanners for Cows in UP 'Gaushalas,'" *Deccan Herald*, updated May 6, 2021, <https://www.deccanherald.com/national/north-and-central/oximeters-thermal-scanners-for-cows-in-up-gaushalas-983143.html>.

67. Brenda S. P. Ang et al., "Nipah Virus Infection," *Journal of Clinical Microbiology* 56, no. 6 (2018): e01875-17, <https://journals.asm.org/doi/full/10.1128/JCM.01875-17>.

68. Natarajan Singaravelan, Ganapathy Marimuthu, and Paul A. Racey, "Do Fruit Bats Deserve to Be Listed as Vermin in the Indian Wildlife (Protection) & Amended Acts? A Critical Review," *Oryx* 43, no. 4 (2009): 608–13, <https://www.cambridge.org/core/journals/oryx/article/do-fruit-bats-deserve-to-be-listed-as-vermin-in-the-indian-wildlife-protection-amended-acts-a-critical-review/9E87AFF63C0B8543A8C182F6C9890664>.

risk. In India, bats are killed for bushmeat and medicinal purposes.⁶⁹ The former practice is most common in the Visakhapatnam and Srikakulam Districts of Andhra Pradesh, as well as in the union territories of the Andaman and Nicobar Islands, and among certain groups of forest-dwelling indigenous peoples.⁷⁰ Consuming bats or processing them for traditional medicines are both extremely dangerous activities that present a high risk of zoonotic disease. These bats, who serve as important pollinators for many fruits in the region, can also carry a host of other deadly pathogens, including *Lyssavirus*.⁷¹

Religious Sacrifice (Goats): Animal sacrifice occurs in both rural and urban areas of India. Section 28 of the PCA carves out a religious exception that allows the killing of an animal in a manner required by the religion of any community. India's religious diversity accounts for many represented faiths, including Hinduism, Islam, Christianity, Sikhism, Buddhism, and Jainism. While some practice religion in a separate and distinct manner from other religious followers, many Indians practice religion in a pluralistic way. Christians are known to celebrate Diwali and Holi and some Hindus celebrate Christmas.⁷² While the Jain religion does not permit killing animals for any purpose, animal sacrifice does occur in Hindu and Islamic communities in India. On Eid al Adha, Muslims slaughter thousands of goats, sheep, and other animals while Hindus who participate in the Gadhimai festival kill goats, rats, buffalos, chickens, pigs, and pigeons as offerings to deities.⁷³ The Supreme Court of India decided in *Durgah Committee v. Ajmer*⁷⁴ that animal sacrifice that is considered essential and integral to a religion is legal while religious practices based on mere superstitions are extraneous and thus are not protected by Article 25 of the Indian Constitution. While Indian courts are increasingly banning animal sacrifice as unnecessary, religious festivals where goats, chickens, pigeons, and water buffalos are killed persist in the temples of Assam, Odisha, Tripura, and West Bengal.⁷⁵ In urban areas, goats are sacrificed in religious festivals where they are tied to posts and killed by a sharp knife. Studies show that bacterial disease is common in the border regions of Tamil Nadu and Karnataka where thousands of goats are bred for slaughter.⁷⁶ The supply chain for goats raised for religious slaughter in India presents manifold opportunities for disease spillover and spread. For example, goats may stand on blood-covered floors, live in crowded pens, and are often denied basic veterinary care.⁷⁷ They can also experience maggot infections.⁷⁸ Anthrax is a

69. Tammy Mildenstein, Iroo Tanshi, and Paul A. Racey, "Exploitation of Bats for Bushmeat and Medicine," in *Bats in the Anthropocene: Conservation of Bats in a Changing World*, edited by Christian C. Voigt and Tigga Kingston (Cham: Springer, 2016), https://link.springer.com/chapter/10.1007/978-3-319-25220-9_12.

70. Simon Mickleburgh, Kerry Waylen, and Paul Racey, "Bats as Bushmeat: A Global Review," *Oryx* 43, no. 2 (2009): 217–34, <https://www.cambridge.org/core/journals/oryx/article/bats-as-bushmeat-a-global-review/747260E678F188D0A89E8A6966DEFBA5>.

71. Jonathan H. Epstein et al., "Nipah Virus Dynamics in Bats and Implications for Spillover to Humans," *Proceedings of the National Academy of Sciences of the United States of America* 117, no. 46 (2020): 29190–201, <https://www.pnas.org/doi/10.1073/pnas.2000429117>.

72. Neha Sahgal et al., "2. Diversity and Pluralism," *Pew Research Center*, June 29, 2021, <https://www.pewresearch.org/religion/2021/06/29/diversity-and-pluralism/>.

73. "Mass Animal Sacrifice Begins Despite Outcry from Activists," *CNN*, December 3, 2019, <https://www.cnn.com/2019/12/03/world/gallery/gadhimai-festival-intl-hnk-scli/index.html>.

74. Vikram Doctor, "Goats Sacrificed on Bakr Id and Animal Rights Issues are Contrasted Subjects and Mustn't Be Confused," *The Economic Times*, updated October 4, 2014, <https://economictimes.indiatimes.com/news/politics-and-nation/goats-sacrificed-on-bakr-id-and-animal-rights-issues-are-contrasted-subjects-and-musnt-be-confused/articleshow/44256659.cms?from=mdr>.

75. Jiveshm Jha, "Animal Sacrifice During Dashain: Striking a Balance Between Tradition and Practice," *Nepal Live Today*, October 13, 2021, <https://www.nepallivetoday.com/2021/10/13/animal-sacrifice-during-dashain-striking-a-balance-between-tradition-and-practice/>.

76. Kumaragurubaran Karthik and Manimuthu Prabhu, "Bacterial Diseases of Goat and Its Preventive Measures," in *Goat Science: Environment, Health and Economy*, edited by Sándor Kukovics (London: IntechOpen, 2023), <https://doi.org/10.5772/intechopen.97434>.

77. "Goats Castrated Without Painkillers and Cruelly Killed: Speak Up!" PETA India, accessed October 7, 2023, <https://secure.petaindia.com/page/46211/action/1?locale=en-GB>.

78. "Goats Castrated Without Painkillers and Cruelly Killed: Speak Up!" PETA India, accessed October 7, 2023, <https://secure.petaindia.com/page/46211/action/1?locale=en-GB>.

major health concern in hilly-terrain regions of southeastern India where anthrax is endemic, with several outbreaks occurring in the last decade. The risk of anthrax is increased among tribes who engage in traditional butchering practices, practice unsafe handling and disposal of contaminated goat carcasses, and among those with poor vaccination coverage.⁷⁹ While the Prevention of Cruelty to Animals (Slaughter House) Rules, 2001 (PCA, 2001) and the Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011 (FSSR) mandate that food animals be slaughtered in licensed slaughterhouses with species-specific equipment, goat slaughter continues to occur outside of the requirements on a massive scale, increasing human–animal disease risk.

LIVE ANIMAL MARKET OVERVIEW

India's live animal markets sell a wide variety of animals: food animals, wild and exotic animals, and pets. Animals enter markets from both domestic and international supply chains and are sold in both urban and rural areas. India's live animal markets exist in a variety of formats, including sub-markets within larger local markets, standalone stalls in common markets, pet shops, and meat vendors. While some markets operate daily year-round, others are seasonal, such as the Pushkar Mela in Rajasthan and Sonapur Melas in Bihar where livestock are traded. There are also weekly markets, or haats, which operate on a low-cost model by avoiding the real estate and operational expenses of permanent markets. Haats, such as those in Jharkhand, can attract 12,000 daily visitors and often pop up in remote villages where sellers pay only nominal fees.⁸⁰ At these markets, independent farmers sell cattle, chickens, goats, and other livestock.

Whether permanent or temporary, markets in India are often open-air or partially covered, allowing insects, rodents, stray animals, and other disease vectors to contaminate the animal product supply chain. Markets are sometimes located in unsanitary environments and often exposed to the elements: soil, water, and hot/humid temperatures. Improper waste management can result in cross-contamination of urine, feces, blood, and other internal bodily fluids.⁸¹ For animals sold in these open-air markets, the stressful market conditions can result in weakened immunity and illness.⁸² A wide variety of species are kept in proximity, thereby increasing the chances of pathogen transfer through various animal hosts and eventually to human consumers.

Animal protection groups consistently assert that several live animal markets sell exotic species alongside domestic animals under unhygienic and stressful conditions, which have the potential to facilitate the transfer of pathogens from one species to another.⁸³ NGOs and others in India have notified the government of markets such as Crawford Market in Mumbai, Russel Market in Bangalore, Murgi Chowk in Hyderabad, and Mir Shikar Toli in Patna, with some urging a ban on such large live animal

79. Krushna Chandra Sahoo et al., "The Landscape of Anthrax Prevention and Control: Stakeholders' Perceptive in Odisha, India," *International Journal of Environmental Research and Public Health* 17, no. 9 (2020): 3094, <https://doi.org/10.3390/ijerph17093094>.

80. Joyona Medhi and Abhishek Basu, "India's Much Neglected Periodic Haats or Weekly Markets: An Equitable Model for Small Farmers?" TwoCircles.net, November 19, 2021, <https://twocircles.net/2021nov19/444154.html>.

81. Parikshit Goyal, "COVID-19: How Safe are Indian Wet Markets?" DownToEarth, June 4, 2020, <https://www.downtoearth.org.in/blog/food/covid-19-how-safe-are-indian-wet-markets--71550>.

82. Clive Phillips, "Coronavirus: Live Animals are Stressed in Wet Markets, and Stressed Animals are More Likely to Carry Diseases," *The Conversation*, April 15, 2020, <https://theconversation.com/coronavirus-live-animals-are-stressed-in-wet-markets-and-stressed-animals-are-more-likely-to-carry-diseases-135479>.

83. "PETA India Exposes Blood-Soaked Live-Animal Markets," PETA, updated November 30, 2022, <https://www.peta.org/blog/india-live-animal-markets/#:~:text=As%20the%20number%20of%20COVID,%2C%20and%20sick%2C%20stressed%20animals.>

markets.⁸⁴ In addition, the Wildlife Conservation Society (WCS) has identified and documented several potentially dangerous wildlife markets across different states in India.⁸⁵ Despite best efforts to expose the danger of such markets, they continue to exist in India. Identifying the exact scale of trade in India's animal markets and its potential for the spread of zoonotic disease is not always possible due to the covert channels used in trading wildlife animals and products.⁸⁶

While the exact number of live animal markets in India is unknown, our report describes the need for reform and regulation to mitigate zoonotic disease threats arising from these animal markets. Our report aims to document in detail two high-traffic live animal markets in India, examining the conditions present that may give rise to zoonotic transmission either at these markets or along animal supply chains more generally. As the report suggests, poor sanitation, food contamination, lack of personal hygiene, and lack of access to clean water and basic health services are just some of the reasons why India bears a heavy burden of infectious disease.⁸⁷ This burden is only intensified by India's massive population, diverse geographical landscape, and status as a developing nation.

Case Study: Poultry Market (Ghazipur Murga Mandi, Uttar Pradesh)

Ghazipur is a city of over four million people located on the holy Ganges River in the northern Indian state of Uttar Pradesh. Important for a variety of reasons, including trade, as well as the production of opium and rose-scented perfume, Ghazipur is home to one of the largest meat markets in India, Ghazipur Murga Mandi (Ghazipur Market). Chickens, geese, ducks, and turkeys are among the poultry birds bred and sold for their meat and eggs at Ghazipur market. The market also provides other animal products such as beef, goat meat, and fish in addition to fruits, flowers, electronics, paper goods, and other household items. Like many other markets in the region, Ghazipur Market is also considered a live animal market. Live animal markets are markets that sell recently killed meat and/or live animals, who are often slaughtered on-site. With over 88 poultry wholesalers operating in multiple open-air stalls adjacent to vegetables, fruits, and seafood markets, Ghazipur Market presents significant zoonotic disease risks.⁸⁸

In January 2021, animal rights activist Gauri Maulekhi filed a plea to ban the slaughter of birds in and around the Ghazipur Market.⁸⁹ Maulekhi sought to shed light on slaughterhouse noncompliance and unsanitary conditions as well as to call attention to recent outbreaks of avian influenza in neighboring states. In support, senior advocate Raj Panjwani stated to the Delhi High Court, "Slaughtering of birds

84. Ishan Kukreti, "COVID-19: Shut Pet Markets, Animal Protection Organisation Urges PM," DownToEarth, April 13, 2020, <https://www.downtoearth.org.in/news/wildlife-biodiversity/covid-19-shut-pet-markets-animal-protection-organisation-urges-pm-70402>.

85. "WCS Calls for Closing Live Animal Markets That Trade in Wildlife in Wake of Coronavirus Outbreak," WCSNewsroom, January 22, 2020, <https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/13738/WCS-Calls-for-Closing-Live-Animal-Markets-that-Trade-in-Wildlife-in-Wake-of-Coronavirus-Outbreak.aspx>.

86. In Ghazipur market, popularly known as the Ghazipur Murga Mandi, chickens are often skinned and de-feathered by bare hands without protective gear. The market sells everything from live eels to dog meat. At Kohima and Dimpaur in Nagaland, dog meat from captured stray dogs is also sold. Across the fish and meat markets of Golbazar Maharajganj in Agartala, Tripura, undercover investigations have shown that traders traffic endangered species, including the sale of protected turtle species' meat. The Golbazar Maharajganj Fish Market in Agartala sells 4,000 turtles each year.

87. Ipchita Bharali, Preeta Kuman, and Sakthivel Selvaraj, "How Well is India Responding to COVID-19?" Brookings, July 2, 2020, <https://www.brookings.edu/blog/future-development/2020/07/02/how-well-is-india-responding-to-covid-19/>.

88. "Help Us Shut Down Disease-Prone Indian 'Wet Markets,'" PETA India, accessed October 7, 2023, <https://www.petaindia.com/features/help-us-shut-down-disease-prone-indian-wet-markets/>

89. "Animal Rights Activist Seeks Ban on Bird Slaughter at Ghazipur Poultry Market," The Hindu, January 13, 2021, <https://www.thehindu.com/news/cities/Delhi/animal-rights-activist-seeks-ban-on-bird-slaughter-at-ghazipur-poultry-market/article33562210.ece>.

in a livestock market without appropriate licenses and in absence of the infrastructure mandated by law makes it a hot spot for the spread of diseases.” According to the plea, Ghazipur market was operating in clear violation of PCA and FSSA, 2006. In fact, after inspecting the market in 2019 and 2020, the Supreme Court appointed the Delhi Slaughterhouse Monitoring Committee, which found that waste was still improperly disposed of a year later, with refuse being dumped into a nearby body of water and blood being swept into sewage drains.⁹⁰ However, after 100 samples from 35 poultry birds tested negative for avian flu, government officials encouraged consumers to continue purchasing poultry from Ghazipur Market.⁹¹ Animal advocates insist that conditions remain unsanitary and corruption prevents the markets from adhering to regulations. When we spoke to Ms. Maulekhi, she insisted that “there are deep-pocketed people who are earning from the horrific conditions thriving in the market.” She further asserts that profits are maximized at the cost of animal welfare.

The Slaughterhouse Monitoring Committee, of which Ms. Maulekhi was a member, observed numerous hygiene and cruelty violations. Carcasses of poultry birds were found lying on the ground in polyethylene bags, as well as wrapped in muddy clothes. Infected sections of carcasses were not removed and therefore were unsafe to enter the food supply. Others had open wounds. No health check systems existed, despite the large volume of birds brought to the market. The birds themselves did not appear healthy; many had broken limbs or wings with infected wounds. Birds were slaughtered in close range to other birds—a violation of the PCA.

Agencies did not have information on the exact number of birds brought into the market, the sources of the birds, or the animals’ health records. Birds were transported on cycle carts, scooters, trucks of various sizes, auto-rickshaw, and motorcycles and then placed in small cages—violating the PCA, the Transport of Animals Rules 1978 amended in 2009, and the Motor Vehicles Act 1988. Many birds were held by their wings as they were stuffed into or taken out from small cages, often leading to injuries. In some cases, severe trauma and injury were caused by handlers who threw the birds around. Piles of dead birds and dismembered carcasses were sorted by handlers without hygiene norms or sanitary measures.

Blood and discarded animal fluid entered sewage drains. This practice was of particular concern as illegal drilling for water also took place near the market, despite the potential contamination from sewage lines. Adjacent to slaughter activity, other stalls prepared food in open, polluted areas. Registration/License certificates, required by the FSSAI, were not displayed in any shop and often were not provided upon request. Despite 84 shops with licenses to sell poultry birds, many of which were expired, no action has been taken by the DAMB to hold licensees accountable for expired licenses.

Over the years, multiple animal welfare interest groups and environmental and public health officials have approached the Delhi High Court to stop the open violation of laws in Ghazipur Market.⁹² While the Delhi High Court, on September 14, 2018, enacted an interim order banning the slaughter of birds in the Ghazipur Murga Mandi and even directed the closure of the slaughterhouses operating from

90. Shubhangi Misra, “3 Yrs After Delhi HC’s Slaughter Ban, Blood Still Flows Freely at Ghazipur Murga Mandi,” *ThePrint*, November 19, 2021, <https://theprint.in/india/3-yrs-after-delhi-hcs-slaughter-ban-blood-still-flows-freely-at-ghazipur-murga-mandi/767537/>.

91. “Bird Flu: Delhi CM Issues Directions to Open Ghazipur Poultry Market After Samples Test Negative,” *The Economic Times*, updated January 14, 2021, <https://economictimes.indiatimes.com/news/politics-and-nation/bird-flu-delhi-cm-issues-directions-to-open-ghazipur-poultry-market-after-samples-test-negative/articleshow/80268414.cms>.

92. “PeTA Urges Authorities to Close Live Animal Meat Markets in India,” *The Times of India*, July 6, 2020, <https://timesofindia.indiatimes.com/india/peta-urges-authorities-to-close-live-animal-meat-markets-in-india/articleshow/76819677.cms>.

inside the market, slaughter resumed five months later.⁹³ Concerned by the impact on water pollution, the court recommended the following:

1. The DAMB ensure that the traders are only engaging in the trade for which they are being provided the premises (i.e., sale of live animals such as livestock and poultry). Activities such as illegal slaughter must be prohibited at the premises of the market and must be carried out only in licensed slaughterhouses. Violators should be prosecuted in accordance with the law.
2. Ongoing slaughterhouse construction activities in violation of the law and Hon'ble Supreme Court order must be stopped immediately.
3. The CWGA must take action against the illegal usage of groundwater at several places in the livestock market.
4. The Delhi Pollution Control Committee (DPCC) may impose the obligation of environmental compensation on those polluting the water and air by discharging hazardous contaminants into drains and creating toxic odors under the Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981, respectively.
5. The Delhi Police may prosecute traders and individuals found transporting birds in violation of the PCA and Transport of Animals Rules 1978.
6. The FSSAI may initiate prosecution against all food business operators who are slaughtering poultry birds or selling fish carcasses without a valid license or registration. Prosecution may be initiated in accordance with the law against those who are violating the conditions of the license and causing a serious health risk to consumers and the public at large.

It is evident, however, from our 2020 investigations and observations, that the Ghazipur regulations remain unenforced.⁹⁴ While Ghazipur Market is just one of India's live animal markets, the lack of regulation and enforcement witnessed are typical of many live animal markets in the country. India's poultry markets present significant concern for the spread of Highly Pathogenic Avian Influenza (HPAI). Open markets without adequate enclosures allow wild birds to initially infect poultry with HPAI, which is then subsequently spread among the overcrowded poultry population. Humans who interface with the market as vendors, consumers, and staff face major zoonotic threats.

This case study emphasizes clear violations of India's animal protection laws. The COVID-19 pandemic prompted the Indian government to take a closer look at live animal markets, and following an audit of municipal slaughterhouses, the FSSAI released a report in February 2020, stating its plans to address the lack of sanitation in meat and fish markets.⁹⁵ FSSAI CEO Pawan Agarwal said, "The issue of hygiene and food safety practices adopted in the meat and poultry sector has become even more significant, at a time when the world is dealing with the novel coronavirus COVID-19."⁹⁶ During the pandemic, the central government issued the Food Hygiene and Safety Guidelines for Food Businesses

93. "Chicken Slaughter Banned at Ghazipur Murga Mandi by Delhi HC," ZeeBusiness, September 25, 2018, <https://www.zeebiz.com/india/news-chicken-slaughter-banned-at-ghazipur-murga-mandi-by-delhi-hc-64573>.

94. Gauri Maulekhi notes: "APMC [Agricultural Produce and Marketing Committee] is not doing anything, not even lifting a finger for so many years in the Mandi despite the matter being in High Court... No records are being maintained about the exact number of birds and fish coming to the market and from where the consignment originated. Their health records are also not being tracked."

95. "FSSAI to Improve Hygiene at Fish & Meat Markets on Account of Covid-19 Outbreak," Hindustan Times, February 17, 2020, https://fssai.gov.in/upload/media/FSSAI_News_Fish_HT_18_02_2020.pdf.

96. "Coronavirus Covid-19: India Enhances Hygiene at Fish and Meat Markets," Food Processing Technology, February 18, 2020, <https://www.foodprocessing-technology.com/news/coronavirus-india-hygiene-markets/>.

During Coronavirus Disease (COVID-19) Pandemic, which govern market vendors at live animal food markets. Live markets in India are currently under scrutiny by the Indian government due to global concern about live animal markets and their potential for zoonotic disease spread.⁹⁷

Animal husbandry is listed as a state subject in the Indian Constitution, and as a result, the laws differ widely across states. The lack of nationwide policies results in a patchwork of regulation, whereby animals are regulated differently from one part of the country to the next. Enforcement also varies across jurisdiction. These disparities also result in hotspots for illegal trade, areas where animals can be transported across borders more easily and smuggled into or out of neighboring countries. Border regions that trade in live poultry have a particularly important responsibility to prevent the import or export of sick birds. A balance needs to be struck between the state and federal levels, maintaining a broadly uniform framework while keeping the law flexible enough to account for cultural differences.

While this report did not cover marine agriculture, it is important to note the growing consumption rates of seafood.⁹⁸ The coastlines of India are abundant with markets selling and supplying fish and seafood further inland and these markets house a large variety of species that are slaughtered in live markets. Yet, they are not well understood and should be studied to better understand the risks they pose for zoonotic disease spread.

Case Study: Pet Market (Crawford Market, Mumbai)^{99 100}

As stated above, the PCA (Pet Shop) Rules of 2018 was enacted by the Government of India to protect pet shop animals and regulate pet shop owners. The rules require pet shop owners to obtain a Registration Certificate from the AWBI. Pet shop owners must also comply with standards under the PCA. More specifically, pet shops must be in quiet locations where loud noises cannot be heard, have adequate infrastructure and space, and ensure that all animals for sale are healthy as certified by a veterinarian. While the rules are comprehensive and provide considerable protection, there is limited compliance. Most of the animals sold in Indian pet shops are bred locally by unlicensed breeders.¹⁰¹ In addition, exotic wildlife may be sold in a pet shop, but many such species are not protected under the Pet Shop Rules 2018.

Pet shop animals are typically denied comprehensive and routine veterinary care, endure cramped, dirty, small cages, and suffer from limited access to food and water. Pets are often sold without vaccinations or deworming procedures, making them susceptible to disease. In addition, animals are held together in close proximity. Cages containing different species of animals are often stacked on top of

97. "Coronavirus Covid-19: India Enhances Hygiene at Fish and Meat Markets," Food Processing Technology, February 18, 2020, <https://www.foodprocessing-technology.com/news/coronavirus-india-hygiene-markets/>.

98. "India Fish Market Share, Size, Growth, Forecast: By Product: Fresh, Frozen, Canned, Others; By Fish Type: Inland Fishes, Marine Fishes, Shrimps, Scampi; By Distribution Channel: Retail, Institutional and HoReCa; By Sector: Organised, Unorganised; Regional Analysis; Competitive Landscape; Key Trends and Developments in the Market; 2024–2032," EMR, accessed October 7, 2023, <https://www.expertmarketresearch.com/reports/india-fish-market>.

99. Due to limited available research regarding India's pet shops, our understanding of the supply chains for pet shops is based on the interviews we conducted with experts who have decades of experience in the field.

100. Crawford Market was renamed Mahatma Jyotiba Phule Mandal; while we acknowledge the official name change approved by the Maharashtra Government, our conversations with citizens of Mumbai confirmed that the market is still widely known as Crawford Market.

101. Mouluka KV, "Buying a Pet? Check Breeder's Credentials," The Times of India, updated October 6, 2021, <https://timesofindia.indiatimes.com/city/hyderabad/buying-a-pet-check-breeders-credentials/articleshow/86796663.cms>.

each other, increasing the likelihood of zoonotic disease transmission.¹⁰²

Crawford Market in Mumbai offers a window into how pet shop supply chains operate in India. Built in 1869 and named after Arthur Crawford, the first Municipal Commissioner of Mumbai under British rule, Crawford Market covers over 22,400 square feet of wholesale markets where a consumer can buy anything from snakes to imported cheeses. Open from 11 am until 8 pm daily, Crawford Market houses fruits, vegetables, poultry, clothes, toys, jewelry, pets, and even endangered species.¹⁰³

Birds and other animals are captured from both protected and unprotected jungles and forests of India before being transported to Mumbai to be sold for profit.¹⁰⁴ While the Wildlife Protection Act (WPA) bans the trade and trapping of indigenous and endangered birds, trade in these animals continues in large numbers in markets such as Crawford. In June 2017, in response to a plea documenting 8,000 birds that were seized and rescued from Crawford Market in recent decades, the Bombay High Court directed the Maharashtra government and the Brihanmumbai Municipal Corporation (BMC) to shut down illegal pet shops at Crawford Market, calling it a “black market.”¹⁰⁵

Yet the illegal pet trade continues. During a 2020 raid, for example, the Maharashtra Forest Department intercepted a truck carrying 94 caged animals and birds, many of which were species protected under the WPA. Without more effective regulatory enforcement, wildlife NGOs face an uphill battle in addressing illegal trafficking. As one group explained, “We are trying to intercept the origin of this trade. Crawford and Kurla markets continue to operate in full swing despite repeated raids this year across the Mumbai Metropolitan Region.”¹⁰⁶

The morbidity and mortality experienced by animals sold at Crawford market is, in part, the result of housing animals in cramped, over-crowded, unsanitary, and stressful conditions where infectious disease is readily contracted and spread.¹⁰⁷ In addition to poor husbandry practices, disease risk is amplified by a lack of regard for regulations. Interviews with observers at Crawford Market revealed not only noncompliance with Pet Shop Rules but also conditions that pose zoonotic disease risks.

A review of animal husbandry practices demonstrated clear violations of the Pet Shop Rules. Crawford market vendors did not provide quarantine facilities for infected animals. On the contrary, healthy animals were housed with sick animals and different species were stacked on top of each other in cages. Many of the cages were overcrowded and some contained dead or dying animals. Cages were exposed to the external environment without protection from inclement weather such as humidity, heavy rain, and cold temperatures. The cages contained animal droppings and some were made of rusted wire

102. Purva Variyar, “India’s Burning Exotic Pet Trade Crisis,” Wildlife Conservation Trust, October 15, 2021, <https://www.wildlifeconservationtrust.org/indias-burning-exotic-pet-trade-crisis/>.

103. *Interview. Meet Ashar. “Crawford Market is a huge market and there are different sections in it. It’s not only the animal section; you get everything for cheap, whether it’s chocolate, fruits, vegetables, products for personal hygiene, shampoo, deodorant, perfume, you name it. And once people walk into the fruit market, the animal section is right next to it. It’s all interconnected. They are not divided, you know, with a wall or anything. At times we have even found that people who have the fruit stalls have kept these wild animals in boxes that are made for mangoes or apples because no one is going to suspect them.”*

104. Vijay Singh, “About 300 Parrots Rescued, Crawford Market Trader, Aide Caught,” The Times of India, April 28, 2013, <https://timesofindia.indiatimes.com/city/mumbai/about-300-parrots-rescued-crawford-market-trader-aide-caught/articleshow/19760855.cms>.

105. Rats are carriers of various infections and can spread contagious diseases and various medical ailments such as leptospirosis, hantavirus pulmonary syndrome, lassa fever, lymphocytic chorio-meningitis (LCM), omsk hemorrhagic fever, rat-bite fever, and salmonellosis. There is a high likelihood of rats spreading diseases to the other animals in the pet shops of Crawford market through direct contact. However, many diseases can also spread simply by breathing in dust contaminated with rodent urine or droppings.

106. Badri Chatterjee, “94 Animals, Birds Rescued During a Raid in Mumbai,” Hindustan Times, December 9, 2020, <https://www.hindustantimes.com/mumbai-news/94-animals-birds-rescued-during-a-raid-in-mumbai/story-0v0xr83DTfOE8OV6zNWWzJ.html>.

107. Deven Jadav, “Sale of Dogs Cats Birds at Crawford Market Mumbai,” Mumbai77.com, updated December 11, 2017, <https://www.mumbai77.com/city/4289/pets/crawford-market-pet-shops/>.

mesh with protruding sharp projections and little to no padding on the cage floors. Some cages contained contaminated feeding trays and poorly cleaned excretion trays. All the terrariums contained unsanitary water. In addition, wild rats roamed freely inside pet shops and near the caged animals. Shops lacked vaccination records for diseases like Polyomavirus and records of deworming.

Many animals were injured or exhibited severe stress. Birds' wings and beaks showed signs of incorrect clipping techniques; many had also lost feathers on their chests. They flew into one another as they moved back and forth, beat their wings, and clung to cage bars. They scratched and bit handlers who tried to grab them. Some were infected with conjunctivitis. Many puppies suffered from upper respiratory health diseases, evidenced by serious mucoid nasal and ocular discharge and crusting around the nose and eyes. Veterinarians diagnosed multiple cases of canine distemper, parvovirus infections, feline panleukopenia, cat flu, feline herpes virus, and calicivirus. Mortality rates were high.

Humans and animals were exposed to each other directly and extensively. Handlers grabbed birds without gloves. Customers came into direct contact with animals. All inhaled aerosolized pathogens and encountered vectors including mosquitoes and external parasites.

As the Crawford Market case study demonstrates, many pet shops operate in violation of India's protective laws. While laws and policies governing pet shops do exist in India, compliance is compromised. Enforcement of existing laws and policies is critical to minimizing the potential for zoonotic disease. Since pet shops such as those found in Crawford market are frequented by direct consumers, the protection of supply chains is not encompassed entirely in a B2B model. Noncompliance with existing protective laws and policies surrounding pet shops creates significant health risks to the public at large. And while there are existing laws and policies designed to create safety procedures at India's pet shops, these guidelines could benefit from the inclusion of provisions that heighten biosecurity, personal protective equipment, sanitation, and hygiene. More stringent inspections, enforcement, and penalties may contribute to decreased violations.

WILDLIFE TRADE AND ZONOTIC DISEASE IMPLICATIONS

With certain exceptions as listed above, hunting is banned by the Indian government under the Wildlife Protection Act, 1972. However, due to the weak implementation of the WPA, wild animals continue to be hunted for sport, rituals, and illegal trade.¹⁰⁸ Bengal foxes, wolves, wild boars, civets, monitor lizards, owls, and many other wild animals are hunted in West Bengal and Central India as part of tribal hunting festivals, which can last up to 45 days. Despite being illegal, the meat of hunted animals is sold at these festivals.¹⁰⁹ Some festivals attract over 50,000 hunters, with each person killing one or more animals.¹¹⁰ While historically a tribal practice, hunting festivals are now frequented by other

108. Human and Environment Alliance League (HEAL), "Hunting Festivals of West Bengal: An Untold Story of Wildlife Massacre," Conservation India, accessed October 7, 2023, <https://www.conservationindia.org/articles/hunting-festivals-of-west-bengal-an-untold-story-of-wildlife-massacre>.

109. Human and Environment Alliance League (HEAL), "Hunting Festivals of West Bengal: An Untold Story of Wildlife Massacre," Conservation India, accessed October 7, 2023, <https://www.conservationindia.org/articles/hunting-festivals-of-west-bengal-an-untold-story-of-wildlife-massacre>; H. Chishi, "Wild Meat Sale at Hornbill Fest," The Telegraph Online, December 8, 2016, <https://www.telegraphindia.com/north-east/wild-meat-sale-at-hornbill-fest/cid/1402983>.

110. Human and Environment Alliance League (HEAL), "Hunting Festivals of West Bengal: An Untold Story of Wildlife Massacre," Conservation India, accessed October 7, 2023, <https://www.conservationindia.org/articles/hunting-festivals-of-west-bengal-an-untold-story-of-wildlife-massacre>.

participants, including students, teachers, farmers, laborers, shopkeepers, factory workers, and even government employees. Cell phones, mapping technology, camera traps, and other sophisticated hunting methods encompass a level of sophistication that ensures successful hunts.¹¹¹ While some hunters participate in the festivals for sport, others, such as poachers in Madhya Pradesh and Haryana, operate as part of larger networks facilitated by local communities. The human–animal contact involved in hunting festivals and illegal trade continues to pose a threat of zoonotic transmission as humans encounter animal blood, feces, and bodily fluids from a wide range of wildlife species.¹¹²

If not killed for sport or personal possession, live wild animals are captured and likely to enter India's wildlife trade to be later sold as pets or killed for meat. Domestic and international demand facilitate the legal and illegal trade of wild animals through a variety of supply chains. Though both the legal and illegal wildlife trade carry the risk of zoonotic disease, the clandestine and unregulated nature of the illegal trade only increases these risks. Exotic birds and rare animals are originally captured in the jungles of the Amazon, Malaysia, Singapore, Thailand, Africa, Papua New Guinea, Australia, and New Zealand before entering India's wildlife trade. Many animals travel in cargo ships and fishing boats before they arrive on the coasts of Konkan and Daman. The animals are then transported by railroads to larger cities like Calcutta, Delhi, Hyderabad, Ahmedabad, and Mumbai.¹¹³ Other animals enter India by land, coming in through Calcutta from neighboring Bangladesh before ending up in illegal markets across the country.¹¹⁴ Many of the wildlife species involved in trade are either endangered, threatened, or vulnerable, with many listed under international conventions such as Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the International Union for the Conservation of Nature (IUCN). Many animals do not survive the rigorous journey to India from their resident country, but those who do often end up in illegal pet stores such as those at Crawford Market.

Turtles: Over 100,000 tortoises and freshwater turtles have entered India through the illegal wildlife trade over the last 10 years.¹¹⁵ Fourteen species of tortoises and freshwater turtles are illegally traded in India.¹¹⁶ The sale of turtle meat is rampant in West Bengal, Bihar, Jharkhand, and parts of Uttar Pradesh.¹¹⁷ The Tripura Forest Department claims that turtles are supplied from neighboring Bangladesh, where such turtle sales are also illegal.¹¹⁸ The Indian Flapshell Turtle, Indian Softshell Turtle, and the Peacock Softshell Turtle, species sought after for human consumption and known for their taste, are each protected by the WPA. However, despite being listed under Schedule I of the WPA, over 1,000

111. Interview with Satyanarayan: Smuggling networks are usually led by international operators who establish a relationship with local well-connected individuals who either hunt the animals themselves or arrange hunting with people with knowledge of forests and animal dwellings. "Annual targets, in half-yearly or quarterly terms, are usually communicated and the catch accumulated at one point and again segregated for transport, whichever way suitable – by road, sea and even air."

112. B. B. Singh and A. A. Gajadhar, "Role of India's Wildlife in the Emergence and Re-emergence of Zoonotic Pathogens, Risk Factors and Public Health Implications," *Acta Tropica* 138 (2014): 67–7, <https://doi.org/10.1016/j.actatropica.2014.06.009>.

113. Vivek Mukherjee, "Why the Exotic Wildlife Trade is Rising Steeply in India," *The Citizen is Hopeful*, June 19, 2021, <https://www.thecitizen.in/index.php/en/newsdetail/index/13/20511/why-the-exotic-wildlife-trade-is-rising-steeply-in-india>.

114. Tanmay Chatterjee, "Bengal Tops in Illegal Wildlife Trade in Eastern India, Int'l Gangs Most Active," *Hindustan Times*, July 21, 2018, <https://www.hindustantimes.com/kolkata/bengal-tops-in-illegal-wildlife-trade-in-eastern-india-int-l-gangs-most-active/story-D7dxJvwKIYaU1TKCwiQvjL.html>.

115. "Over 11,000 Tortoises and Freshwater Turtles Entered Illegal Wildlife Trade in India Every Year Since 2009," *TRAFFIC*, October 1, 2019, <https://www.traffic.org/publications/reports/illegal-testudine-trade-in-india/>.

116. "Over 11,000 Tortoises and Freshwater Turtles Entered Illegal Wildlife Trade in India Every Year Since 2009," *TRAFFIC*, October 1, 2019, <https://www.traffic.org/publications/reports/illegal-testudine-trade-in-india/>.

117. Gokul G. K., "Disappearing Turtles," *WCS-India*, April 21, 2021, <https://programs.wcs.org/india/Newsroom/Blog/ID/16072/Disappearing-Turtles>.

118. Arghya Adhikary, "Illegal Turtle Trade at Agartala, Tripura," *Conservation India*, December 16, 2019, <https://www.conservationindia.org/gallery/illegal-turtle-trade-at-agartala-tripura>.

turtles are sold daily in fish markets such as Maharaj Ganj market in Agartala, India.¹¹⁹ Also sold is the Black Softshell Turtle listed per the WPA as “extinct in the wild,” and elsewhere, as critically endangered. To avoid seizure, the merchants do not sell the turtles intact but rather chop them up into unrecognizable smaller pieces.¹²⁰ Images taken at the sites of such markets depict wet bloody floors with animal parts strewn on the ground, surrounded by dirty walls. Sellers slaughter the animals without protective gear.

Civet cats: Civet cats, who are believed to have transmitted the SARS virus to humans, are increasingly hunted and captured in India for coffee production.¹²¹ Kopi luwak coffee consists of partially digested and fermented coffee cherries that have been defecated by civet cats.¹²² Farmed civet cats are held in close confinement in poor conditions and fed a diet of only coffee cherries. India is the third-largest producer of civet coffee in the world, which sells for approximately \$600/lb when wild-collected, compared to \$100/lb when produced by farm-raised civets.¹²³ These high prices drive dangerous human–animal interactions that have the potential to spread coronaviruses, like SARS or other pathogens. While more research on zoonotic disease vectors stemming from farmed and wild civet cats in India is needed, the production of kopi luwak, purchased around the world, presents a significant risk.¹²⁴

Pangolin: Pangolins are protected by Schedule I of the Wildlife (Protection) Act 1972, which lists endangered species needing the highest level of protection. Like civets, pangolins are natural hosts for coronaviruses¹²⁵. Despite the disease risks they may pose, they continue to be illegally traded. According to a study by TRAFFIC, 5,772 pangolins were seized from the illegal wildlife trade in India from 2009 to 2017, though this likely represents only a fraction of the true number of pangolins trafficked.¹²⁶ In some regions of India, pangolins are kept as pets due to the superstitious belief that they bring wealth. They are also traded for both scales and meat. However, due to excessive hunting, the animal has become so rare that younger members of tribes that traditionally hunted pangolins are no longer familiar with the animal. While pangolin meat is typically consumed or sold in local markets, scales are delivered to middlemen from Kolkata, Chennai, and border towns such as Siliguri in West Bengal, Moreh in Chandel district, Manipur, Shillong in Meghalaya, and Aizawl in Mizoram.¹²⁷ From there, they are typically shipped to China via Myanmar and Nepal for use in traditional medicine. These trade routes are evident by the arrests of Burmese and Nepalese nationals apprehended with pangolin scales in India, and Indian

119. Arghya Adhikary, “Illegal Turtle Trade at Agartala, Tripura, Conservation India, December 16, 2019, <https://www.conservationindia.org/gallery/illegal-turtle-trade-at-agartala-tripura>.

120. “Over 11,000 Tortoises and Freshwater Turtles Entered Illegal Wildlife Trade in India Every Year Since 2009,” TRAFFIC, October 1, 2019, <https://www.traffic.org/publications/reports/illegal-testudine-trade-in-india/>.

121. David Cyranoski, “Bat Cave Solves Mystery of Deadly SARS Virus—and Suggests New Outbreak Could Occur,” *Nature*, December 1, 2017, <https://www.nature.com/articles/d41586-017-07766-9>.

122. Rachel Bale, “The Disturbing Secret Behind the World’s Most Expensive Coffee,” *National Geographic*, April 29, 2016, <https://www.nationalgeographic.com/animals/article/160429-kopi-luwak-captive-civet-coffee-Indonesia?loggedin=true>.

123. “India Starts Producing World’s Most Expensive Coffee,” *The Economic Times*, updated September 11, 2017, <https://economictimes.indiatimes.com/news/economy/agriculture/india-starts-producing-worlds-most-expensive-coffee/articleshow/60461855.cms?from=mdr>.

124. Joshua Milton, “What is the Price of Kopi Luwak? (2023),” *Eleven Coffees*, accessed October 8, 2023, <https://elevencoffees.com/what-is-the-price-of-kopi-luwak/>.

125. Ping Liu et al., “Are Pangolins the Intermediate Host of the 2019 Novel Coronavirus (SARS-CoV-2)?” *PLoS Pathogens* 16, no. 5 (2020): e1008421, <https://doi.org/10.1371/journal.ppat.1008421>.

126. “Nearly 6,000 Pangolins in Illegal Wildlife Trade in India Since 2009,” TRAFFIC, February 16, 2018, <https://www.traffic.org/news/nearly-6-000-pangolins-in-illegal-wildlife-trade-in-india-since-2009/>.

127. M. ShamsurRahman, et al., “Illegal Marketing of Freshwater Turtles and Tortoises in Different Markets of Bangladesh,” *American-Eurasian Journal of Scientific Research* 8, no. 1 (2013): 15–23.

nationals apprehended with Myanmar currency and pangolin scales.¹²⁸ Information gathered from the seizures suggests that the animals appear to have originated from Haryana, Odisha, Nagaland, Meghalaya, Madhya Pradesh, Uttarakhand, and south Indian states including Karnataka and Tamil Nadu. Pangolin smuggling is also believed to be rampant in the state of Maharashtra. Larger traders work with local contacts who then hire poachers to transport pangolin scales in lorries and trucks and sometimes via public transportation. At times, pangolin scales have been seized along with tiger bone, deer antlers, the drug pseudoephedrine, and arms and ammunition, indicating that the pangolin trade has a strong connection with trade in other wildlife, drugs, and arms.¹²⁹ Pangolin scales contribute to the potential for zoonotic disease transmission because their scales carry parasites similar to ticks that can spread vector-borne diseases.¹³⁰

Golden Jackals: With a large geographic range, the golden jackal (*Canis aureus*) population is estimated to be 80,000 individuals with habitats spanning both protected parks of India as well as semi-urban and rural landscapes. Golden jackals are protected under Schedule II, Part II of the Wildlife Protection Act, 1972 Schedule II that provides the same rigorous protection against hunting, killing, or trading as found in the list of animals in Schedule I. Golden jackals are poached and traded in large numbers for ‘jackal horn’ because of superstitious beliefs reinforced by commercial traders of ritualistic worship material, astrologers, and sorcery or ‘black magic’ practitioners, domestically and internationally. Potential zoonotic disease transmission can occur during the capture or horn extraction from the jackal skull as hunters encounter blood, saliva, and cerebrospinal fluids.¹³¹

Migratory Water Birds: Migratory water birds are protected under the WPA, yet poaching by locals in coastal districts of Andhra Pradesh is common. For some hunters, poaching is their main source of income while others are hired by middlemen, who are well-connected in markets such as the Palakollu municipal market, where many species of protected birds are sold in plastic bags.¹³² The birds are shot and displayed on the ground in markets near fish markets, wine shops, and bus stands. Zoonotic diseases associated with birds include tuberculosis, salmonellosis, avian influenza, and other diseases.

POLICY REFORM

Since the initial writing of this report, India has initiated two significant policy changes that may mitigate some of the aforementioned practices driving zoonotic risk, both among livestock and wildlife.

First, in 2022, the Wild Life (Protection) Amendment Act, 2022 came into force.¹³³ While it sought

128. Rajesh Kumar Mohapatra et al., “A Note on the Illegal Trade and Use of Pangolin Body Parts in India,” TRAFFIC Bulletin 27, no. 1 (2015): 33–40, https://www.pangolinsg.org/wp-content/uploads/sites/4/2018/06/Mohapatra-et-al_2015_A-note-on-the-illegal-trade-and-use-of-pangolin-body-parts-in-India.pdf.

129. B. K. Sharma, “The Pangolin Crisis,” Sanctuary Nature Foundation, accessed October 8, 2023, <https://sanctuarynaturefoundation.org/article/the-pangolin-crisis>.

130. Rajesh Kumar Mohapatra et al., “Check List of Parasites and Bacteria Recorded from Pangolins (*Manis* sp.),” *Journal of Parasitic Diseases* 40, no. 4 (2016): 1109–15, <https://doi.org/10.1007/s12639-015-0653-5>.

131. *The golden jackal does not actually have a horn. The extracted “jackal horn” is likely a deformity or tuft of hair in the form of a ball.*

132. Srikanth Mannepuri, “Rampant Bird Poaching Activities in West and East Godavari Districts of Andhra Pradesh,” *Conservation India*, January 12, 2018, <https://www.conservationindia.org/articles/rampant-bird-poaching-activities-in-west-and-east-godavari-districts-of-andhra-pradesh>.

133. The Wild Life (Protection) Act, 1972, last updated April 1, 2023, <https://www.indiacode.nic.in/bitstream/123456789/1726/1/a1972-53.pdf>.

to give effect to India's obligations under CITES, there is no mention of the issues of human-wildlife conflict¹³⁴ and certain provisions have invited critical feedback and words of caution from experts.¹³⁵ The Act, through the proviso under Section 43(2), legalizes the transfer or transport of captive elephants for religious or other purposes by a person having a valid certificate of ownership.¹³⁶ Elephants in captivity and trade lead miserable lives¹³⁷ and also pose the risk of transmission of diseases such as tuberculosis.¹³⁸ This provision can potentially be misused for illegal trade of captive elephants or capture of wild elephants.¹³⁹ Elephants, an endangered species under the IUCN classification, are listed in Schedule 1 of the WPA, which receive the highest degree of protection under law and attract the highest degrees of penal provisions for infringement.¹⁴⁰ Prior to the amendment, the WPA had 6 schedules which have now been revised to 4. Experts opine that the species appear to have been listed without scientific basis with little to no expert consultation.¹⁴¹ This disconnect is worrying since India and its large, vulnerable population is projected to be disproportionately affected by the climate crisis and emerging infectious diseases.¹⁴² The science of conservation and disease ecology must inform the law. Conversely, laws and policies must support scientific development to prevent and mitigate these environmental and public health crises.¹⁴³

Second, there have been some developments in laws and policies for farmed animal welfare pertaining to public health and the spread of zoonosis. New environmental guidelines were issued by the Central Pollution Control Board for dairy farms and gaushalas¹⁴⁴ as well as for poultry facilities.¹⁴⁵ These two sets of guidelines brought small dairy farms with under 25 cows and small poultry units with 5,000 or more birds, respectively, under the purview of the regulatory framework. These guidelines also increased the frequency of the monitoring mechanism, and provided training to local authorities

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134. Ajay Kumar Rana and Nishant Kumar, "Current Wildlife Crime (Indian Scenario): Major Challenges and Prevention Approaches," *Biodiversity and Conservation* 32 (2023): 1473–91, <https://link.springer.com/article/10.1007/s10531-023-02577-z>.
135. Kartik Shanker et al., "Why Amendments to the Wild Life Act are Scheduled to Fail," *Science: The Wire*, January 13, 2023, <https://science.thewire.in/environment/wild-life-act-amendments-scheduled-to-fail/#:~:text=One%20of%20the%20major%20criticisms,listed%20under%20the%20various%20schedules.>
136. Ministry of Law and Justice, "The Wild Life (Protection) Amendment Act, 2022," *The Gazette of India*, December 19, 2022, [https://prsindia.org/files/bills_acts/bills_parliament/2021/The%20Wild%20Life%20\(Protection\)%20Amendment%20Act,%202022.pdf](https://prsindia.org/files/bills_acts/bills_parliament/2021/The%20Wild%20Life%20(Protection)%20Amendment%20Act,%202022.pdf).
137. Jayantha Jayewardene, editor, *Gajah: Journal of the Asian Elephant Specialist Group* 41 (2014), <https://www.asesg.org/PDFfiles/2014/Gajah%2041/Gajah-41.pdf>; Soutik Biswas, "The Tragic Lives of India's Mistreated Captive Elephants," *BBC News*, April 24, 2018, <https://www.bbc.com/news/world-asia-india-43862182>.
138. Sarad Paudel and Srinand Sreevatsan, "Tuberculosis in Elephants: Origins and Evidence of Interspecies Transmission," *Tuberculosis* 123 (2020): 101962, <https://www.sciencedirect.com/science/article/abs/pii/S1472979220301293>; Syed Akbar, "Elephants Turn TB Carriers: India Plan to Wipe Out Disease by 2025 May Be Hit," *The Times of India*, February 21, 2017, <https://timesofindia.indiatimes.com/city/hyderabad/elephants-turn-tb-carriers-india-plan-to-wipe-out-disease-by-2025-may-be-hit/articleshow/57263400.cms>.
139. Shuchita Jha, "Wildlife Protection Amendment Bill: Why 'Religious or Any Other Purpose' Clause has Enraged Animal Activists," *DownToEarth*, August 5, 2022, <https://www.downtoearth.org.in/news/wildlife-biodiversity/wildlife-protection-amendment-bill-why-religious-or-any-other-purpose-clause-has-enraged-animal-activists-84191>.
140. Deepa Padmar, Debadityo Sinha, and Akash Chandra Jauhari, "Captive Elephants and the Wildlife (Protection) Amendment Bill, 2022: A Discussion Paper," *Vidhi Centre for Legal Policy*, August 26, 2022, <https://vidhilegalpolicy.in/research/legal-issues-pertaining-to-insertion-of-proviso-under-section-432-of-wildlife-protection-amendment-bill-2022-discussion-paper/>.
141. Jayashree Nandi, "Proposed Changes to Wildlife Law May Hit Research: Experts," *Hindustan Times*, June 17, 2023, <https://www.hindustantimes.com/india-news/proposed-changes-to-wildlife-law-may-hit-research-experts-101686939894910.html>.
142. "India: Climate Change Impacts," *The World Bank*, June 19, 2013, <https://www.worldbank.org/en/news/feature/2013/06/19/india-climate-change-impacts>; Joint Global Change Research Institute and Batelle Memorial Institute, Pacific Northwest Division, *India: The Impact of Climate Change to 2030* (Washington DC: National Intelligence Council, 2009), https://www.dni.gov/files/documents/climate2030_india.pdf.
143. Jayashree Nandi, "Proposed Changes to Wildlife Law May Hit Research: Experts," *Hindustan Times*, June 17, 2023, <https://www.hindustantimes.com/india-news/proposed-changes-to-wildlife-law-may-hit-research-experts-101686939894910.html>.
144. Central Pollution Control Board, *Guidelines for Environmental Management of Dairy Farms and Gaushalas* (Delhi: Ministry of Environment, Forest and Climate Change, 2021), <https://kspcb.karnataka.gov.in/sites/default/files/inline-files/CPCB%20REVISED%20GUIDELINES%20DAIRY%20FARMS%20%26%20GAUSHALAS%2029-12-2021.pdf>.
145. Central Pollution Control Board, *Environmental Guidelines for Poultry Farms* (Delhi: Ministry of Environment, Forest and Climate Change, 2021), <https://cpcb.nic.in/openpdf.php?id=TGF0ZXNOFmlsZS8zMzFMTYyOTA5OTQwMF9tZWVpYXBob3RvMjg2MjcucGRm>.

for implementation of the guidelines.¹⁴⁶ Dairy farms in violation will be held liable per “Environmental Compensation to be levied on Industrial Units” methodology¹⁴⁷ as well as prosecuted in case of repeat offenses.¹⁴⁸ The poultry industry has been classified as a polluting industry of the “orange” category from its previous categorization of “green.” This will subject poultry facilities with over 25,000 birds to more stringent requirements of consents acquired in order to establish and operate, inspection frequency, and environmental compensation than was previously required.

The Prevention of Cruelty to Animals (Egg Laying Hens) Rules, 2023¹⁴⁹ was passed after the draft had first been floated in 2019 and had invited comments and feedback from stakeholders and interested organizations.¹⁵⁰ However, the amendments it brought about are in complete contravention of the parent act, the PCA. One of the standout issues is that the rules mandate a ‘minimum’ space allowance of 550 sq cms per hen, whereas Section 11(1)(e) of PCA prohibits confining an animal in a cage that does not permit reasonable opportunity of movement, and studies¹⁵¹ establish that 550 square centimeters per hen is not requisite space to even stand up, turn around and spread her wings, much less to express natural behaviors, which is one of the five freedoms of animals protected under the PCA¹⁵².

From 2022 to 2023, several Indian state and union territories received reports of gestation and farrowing crates being used at pig farming facilities.¹⁵³ Gestation and farrowing crates are metal cages of the dimensions of a pig that restrict the movement of mother pigs and piglets. Pregnant pigs are unable to turn around or even stand up without difficulty. Directives are being issued by many Indian state governments and union territories to local authorities to address the issue and implement the prohibition on these crates, which are illegal under the PCA, by preventing their manufacture, sale, and use.¹⁵⁴ This position was confirmed by the Indian Council of Agricultural Research’s National Research Centre on Pig (ICAR-NRCP) that Section 11(1)(e) of the PCA specifically prohibits the confinement of any animal to a cage or a receptacle that fails to offer a reasonable opportunity for movement.¹⁵⁵ The government agency ICAR-NRCP also confirmed that it does not recommend or promote such crates. The government directives observed that being confined in these crates forces pigs to live in their own feces and urine, resulting in body sores and infections.¹⁵⁶ The directives put on record, based on the scientific evidence

146. Central Pollution Control Board, Guidelines for Environmental Management of Dairy Farms and Gaushalas (Delhi: Ministry of Environment, Forest and Climate Change, 2021), <https://ppcb.punjab.gov.in/sites/default/files/2021-10/guidelines%20of%20Dairy%20Farms%20%26%20Gaushalas.pdf>.

147. Central Pollution Control Board, Report of the CPCB In-house Committee on Methodology for Assessing Environmental Compensation and Action Plan to Utilize the Fund (Delhi: Ministry of Environment, Forest and Climate Change, 2019), <https://cpcb.nic.in/uploads/report-15.07.2019.pdf>.

148. Central Pollution Control Board, Report of the CPCB In-house Committee on Methodology for Assessing Environmental Compensation and Action Plan to Utilize the Fund (Delhi: Ministry of Environment, Forest and Climate Change, 2019), <https://cpcb.nic.in/uploads/report-15.07.2019.pdf>.

149. Ministry of Fisheries, Animal Husbandry and Dairying, “Prevention of Cruelty to Animals (Egg Laying Hens) Rules, 2023,” TeamLease RegTech, February 27, 2023, <https://www.teamleaseregtech.com/updates/article/22054/prevention-of-cruelty-to-animals-egg-laying-hens-rules-2023/>.

150. Government of India, “Office Memorandum: Seeking Comments on the Prevention of Cruelty to Animal (Egg Laying Hens) Rules, 2019,” Department of Animal Husbandry and Dairying, May 2, 2019, <https://dahd.nic.in/sites/default/files/OM%20and%20corrigendum.pdf>.

151. B. O. Hughes, “Space Requirements in Poultry,” in *Farm Animal Housing and Welfare*, edited by S. H. Baxter, M.R. Baxter, and J. A. D. MacCormack (Dordrecht: Springer, 1983).

152. *Animal Welfare Board of India v. A. Nagaraja*, (2014) 7 SCC 547.

153. Gautam S. Mingle, “Will Maharashtra Lead the Competition for Pig Farming in India?” *Mid-Day*, updated April 11, 2023, <https://www.mid-day.com/sunday-mid-day/article/will-maharashtra-lead-the-competition-of-pig-farming-in-india-23279978>.

154. “Assam Bans Use of Gestation, Farrowing Crates in Pig Farming,” *The Hindu*, April 12, 2023, <https://www.thehindu.com/news/national/other-states/assam-bans-use-of-gestation-farrowing-crates-in-pig-farming/article66728593.ece>; “Delhi Govt Bans Use of Gestation Crates in Pig Farming,” *Hindustan Times*, June 24, 2022, <https://www.hindustantimes.com/cities/delhi-news/delhi-govt-bans-use-of-gestation-crates-in-pig-farming-101656008910006.html>.

155. PETA, Letter to Chief Secretary of the Government of Meghalaya, April 4, 2022, https://megahvt.gov.in/notification/PETA_India_04Apr2022.pdf.

156. PETA, Letter to Chief Secretary of the Government of Meghalaya, April 4, 2022, https://megahvt.gov.in/notification/PETA_India_04Apr2022.pdf.

presented to state governments, that the extreme stress and frustration caused by the crates causes mother pigs to display stereotypic behavior such as continually biting at the enclosure bars or “chewing” the air.¹⁵⁷ This also causes lower immunity.¹⁵⁸ Pig farms have been the outbreak epicenter¹⁵⁹ for many zoonotic diseases in India with epidemic potential.¹⁶⁰ It is commendable that following the efforts of animal protection groups, most of India’s states and Union Territories have recognized the illegality of these crates and issued orders to district officials for the prohibition to be enforced. The circulars reiterate that any farmer or farm found using the crates will be liable for penal action under Section 11(1)(e) of The Prevention of Cruelty to Animals Act, 1960¹⁶¹, which includes a fine if convicted for the first offense and possible imprisonment in the case of subsequent offenses.¹⁶²

In general, India has a sophisticated central (i.e., federal) and state territory framework to enforce its hunting prohibition. Ultimate authority lies with the Prime Minister of India, who delegates authority down the chain to regional boards, and then to local enforcement officers. However, this system of regulation is not always clear and the appropriate wildlife trade point of contact is often unknown. A search of government, state, and local websites does not contain explicit contact information, rendering enforcement sparse and inconsistent. Witnesses to illegal animal trafficking usually attempt to inform police officers or contact their regional Wild Crime Control Bureau (WCCB). However, the WCCB website lacks important contact information. For example, the Western, Eastern and Central regional WCCB offices do not provide phone numbers.¹⁶³ Additionally, concerned citizens are often reluctant to approach local police officers, who can sometimes be compromised by corruption.¹⁶⁴ As a result, enforcement of wildlife protection laws is weak.

Even when the correct department or officer is contacted and informed, penalties may not be stringent enough to deter illegal trafficking. Section 50 of the WPA authorizes the Director, the Chief Wildlife Warden, or any officer authorized to arrest and detain any person suspected of violating the WPA, including hunting, without a permit. Section 51(1) of the WPA stipulates that any person found guilty of violating the act may be sentenced to up to three years in prison and/or fined up to ₹25,000. The Act divides wild animals into six schedules with escalating levels of protection. Trade of species in Schedule I or Part II of Schedule II invites very stringent punishments: Imprisonment up to 7 years (with a 3-year minimum) and a fine of no less than ₹10,000 for the first offense. For any subsequent offense, fines can reach up to ₹25,000. Species in Schedule V (Vermin) are the only wild animals that can be hunted freely. However, high-risk taxa such as bats and rodents are included under this Schedule, increasing the potential for dangerous human–animal interactions. Schedules III and IV also list protected species but provide for less stringent penalties. While penalties for violations are clearly outlined, the illegal trade

157. PETA, Letter to Chief Secretary of the Government of Meghalaya, April 4, 2022, https://megahvt.gov.in/notification/PETA_India_04Apr2022.pdf.

158. Cynthia Schuck-Paim and Vladimir J. Alonso, “Productivity of Mother Pigs is Lower, and Mortality Greater, in Countries That Still Confine Them in Gestation Crates,” *F1000 Research* 11 (2022): 564, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9379333/>.

159. Z. B. Dubal, S. B. Barbuddhe, and N. P. Singh, *Important Zoonotic Diseases: Prevention and Control* (Goa: ICAR Research Complex for Goa, 2014), <https://ccari.icar.gov.in/Technical%20Bulletin%20No.%2039.pdf>.

160. <https://ncdc.gov.in/WriteReadData/1892s/File618.pdf>

161. Gautam S. Mengle, “Will Maharashtra Lead the Competition for Pig Farming in India?” *Mid-Day*, updated April 11, 2023, <https://www.mid-day.com/sunday-mid-day/article/will-maharashtra-lead-the-competition-of-pig-farming-in-india-23279978>.

162. Section 11(1), *Prevention of Cruelty to Animals Act*, 1960.

163. Wildlife Crime Control Bureau, accessed October 8, 2023, <http://wccb.gov.in/Content/WesternRegion.aspx>.

164. Vivek Mukherjee, “Why the Exotic Wildlife Trade is Rising Steeply in India,” *The Citizen* is Hopeful, June 19, 2021, <https://www.thecitizen.in/index.php/en/newsdetail/index/13/20511/why-the-exotic-wildlife-trade-is-rising-steeply-in-india>.

continues.

Law enforcement officers and other stakeholders also require more education about wildlife laws to make enforcement and prosecution more effective. Aspects of the legal process that can be weak, due to lack of education, training, or resources, include documentation gathering, witness preparation, evidence gathering, and others. Additionally, more severe penalties for wildlife crimes could impact noncompliance.

However, prior to any penalty reform and to devise a strategic plan to address rampant legal violations of India's wildlife, a comprehensive assessment of wildlife market prevalence is first needed. Combining data from enforcement agencies, government and nongovernment organizations, media outlets (including local, regional, and state outlets, and using multilingual news sources), and other relevant information portals may be the first step in scoping the extent of noncompliance.

While the Ministry of Environment, Forest and Climate Change publishes occasional advisories to streamline and formalize the importation of live exotic animals are important, stronger implementation is required. According to the Wildlife Conservation Trust, international wildlife trade laws for native and CITES-listed species are enforced through the Customs Act, 1962. Unless a protected animal is detected by customs officers, there will be no prevention of any illegal trade that may be taking place.¹⁶⁵ Stronger implementation should include stopping primary threats to exotic species: trade of invasive species, zoonotic disease potential, and domestic trade, and stronger welfare standards for captive breeding facilities. Social acceptability also plays a role in wildlife crime reporting. For example, the “Convict” page of the WCCB website includes one of India's most famous actors, who shot endangered antelopes (his third illegal hunting charge) while filming the movie, “Tiger Zinda Hai.”¹⁶⁶ Actor Salman Khan was released with a small cash bail and greeted by large cheering crowds, including many of his over 32 million Twitter followers. Punishments for wildlife crime not only consist of weak or ineffective deterrents, but also lack the cultural buy-in from a population that may not yet consider wildlife poaching a serious crime.

CONCLUSION

Gaps in providing quality healthcare, as well as limited access to disease control facilities, lack of awareness, scarcity of resources, and a shortage of good infrastructure compound the risk of zoonotic outbreaks in India. Identifying these gaps helps to show what reforms are necessary to effectively mitigate the public health cost of live animal markets that can act as a petri dish for pathogens, facilitating high-risk human–animal and animal–animal interactions. Change must begin at the grassroots level by educating those who work with animals directly and those who oversee enforcing animal protection laws.

India's laws and regulations are extensive but require better enforcement. The root of these issues lies in poor administration and a lack of infrastructural support. With greater transparency and accountability at each junction of the transaction chain, as well as the incorporation of One Health principles, resiliency can be built into the governance and regulatory framework. Cross-sectoral pollination and strategically tailored policy responses are necessary to shift from a reactionary approach

165. Purva Variyar, “Why India Needs Stronger Laws to Protect Exotic Species on Its Soil,” Wildlife Conservation Trust, September 29, 2021, <https://www.wildlifeconservationtrust.org/why-india-needs-stronger-laws-to-protect-exotic-species-on-its-soil/>.

166. “Convicts,” Wildlife Crime Control Bureau, accessed October 8, 2023, <http://wccb.gov.in/Content/Convicts.aspx>.

to a responsive and proactive one.

India has a strong legal framework to protect against dangerous human–animal health risks, but such laws must be supported by stronger implementation. Violations should be more transparent, including higher bails and penalties to deter illegal trade and operations. The lack of severe penal provisions may deter prosecutors from taking such violations seriously. Additionally, government bodies, committees, and agencies are understaffed and overburdened. Authorities are inundated with a broad scope of responsibilities instead of core specific competency. Law enforcement agencies and authorities should be equipped with adequate infrastructure (forensic tools, research facilities, high-biosafety labs, and data centers) to conduct successful public health investigations that allow medical testing and evidence collection. With only three Biosafety Level-3 labs in India, effective monitoring and research is not feasible.¹⁶⁷

And at present, there are no overarching policy and regulatory guidelines in the country that effectively tackle biosafety issues. The inability to trace disease origin and proliferation make it difficult to effectively contain and isolate any contributing animals along the supply chains. Additionally, vendors who violate health and welfare standards should be held accountable for expired licenses or unregistered businesses involving live animals. Under the current system, violators of prescribed standards at live animal markets are more apt to pay penalties for each inspection rather than maintain the upkeep of the market according to rules and regulations. Moreover, repeat offenders are rarely prosecuted.

India's animal market regulation and enforcement must shift to being proactive and responsive rather than reactionary. Policy responses should be tailored to the many types of high-risk human–animal and animal–animal interactions at these markets and along the various phases of the supply chains that support them. From procurement to transport to sale, the supply chain is compromised at each step due to the flexibility to comply with the laws designed to protect animals and human health. India's history of zoonotic outbreaks combined with its complex health landscape of emerging and reemerging zoonotic diseases requires modern surveillance technology—sophisticated databases that work in sync with reporting mechanisms. At present, the chain of reporting starts with local hospitals before going to State health committees and then finally to the Central Government. Inefficiencies in reporting and paperwork create significant gaps and delays through which disease can continue to spill over and spread. There is a critical lag time between when a disease is first reported and the ultimate reaction from the Central Government, making clear the need for a more rapid and responsive emergency alert system.

Overall, and to mitigate zoonotic risk, the design and implementation of live animal market policies and guidelines should reflect a deeper understanding of animal markets and supply chains and the risks they pose. Additional support in enforcement, research and policy can be incorporated through building specialized capacity, sensitization, and training. Furthermore, departments or agencies, which share some of the same goals in protecting public health, do not always effectively coordinate their activities. To address complex issues through a One Health framework, bureaucratic interdepartmental collaboration is required.

The connection between environmental health, human health, and animal health must become

167. Amrtansh Arora and Sneha Mordani, "Biosafety Level-3 Labs: Why India Needs More of Them to Brace for Future Pandemics," India Today, updated May 25, 2021, <https://www.indiatoday.in/science/story/biosafety-level-3-labs-why-india-needs-more-of-them-to-brace-for-future-pandemics-1805831-2021-05-24>.

better established within India's regulatory system. Policies such as the National Mission for Biodiversity and Human Well-being are currently being drafted to include a biodiversity and health component that seeks to explore how biodiversity can improve healthcare, including the relationship between biodiversity loss and patterns of infectious diseases that spread from animals to humans. A better understanding of stakeholder collaboration and interdisciplinary research will facilitate increased incorporation into regulatory procedures.

A few examples of successful strategy do exist, and the Government of India should leverage best practices. During a previous zoonotic outbreak, India implemented a national action plan formulated by the DAHD and the Department of Fisheries, Ministry of Fisheries, and the Animal Husbandry & Dairying Department. The national plan relied on a broad-based periodic testing system for farmed birds and live animal markets as well as upgrading apex scientific institutions such as the National Institute of High Security Animal Diseases, Bhopal. The government should build on these efforts going forward. Similarly, the effective response to outbreaks in Kerala and Karnataka between 2014–2016 can serve as a model for such an intervention strategy. The cross-sectoral approaches adopted in these specific action plans need to be adopted on a systemic level, taking a One Health approach to reduce the risk and magnitude of future outbreaks. There is a clear need to tighten the functioning of this machinery, given the impact on public health and the agricultural economy. In addition, publishing a national-level annual report would increase transparency and provide accountability metrics.

The COVID-19 pandemic shed light on the risks that live animal markets pose, and also highlighted that there are many different arrangements at live animal markets and they are not all the same. Through this study, we attempted to document the sheer diversity, scale, and ubiquity of live animal markets in India. In a country like India, most of the population lives in shared spaces with or near domestic and wild animals. In this context, the link between human, animal, and environmental health is pronounced and acute as human actions escalate the risk and the rate of zoonotic disease emergence. Policy needs to recognize and reflect these connections to take a holistic approach to prevention. Currently, zoonotic disease remains a serious risk in India, especially where tribal, rural, and marginalized communities are vulnerable. The public health impact has yet to be properly internalized through the current regulatory system. It remains an externality not fully integrated into policy.

LIST OF ABBREVIATIONS

APMC: Agricultural Produce and Marketing Committee

AWBI: Animal Welfare Board of India

BMC: Brihanmumbai Municipal Corporation

CAG Comptroller and Auditor General of India

DAHD: Department of Animal Husbandry and Dairying

DAMB: Delhi Agricultural Marketing Board

DGFT: Director General of Foreign Trade

DMC: Delhi Municipal Corporation

DPCC: Delhi Pollution Control Committee

DPSP: Directive Principle of State Policy

FMD: Foot and Mouth Disease

FSSAI: Food Safety and Standards Authority of India

FSSR: Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011

FSA: Food Safety Standards Act

INR: Indian National Rupee

MOEFCC: Ministry of Environment, Forest and Climate Change

NOC: No Objection Certificate

PCA: Prevention of Cruelty to Animals Act, 1960

PETA: People for the Ethical Treatment of Animals

PIL: Public Interest Litigation

RTI: Right to Information

SAWB: State Animal Welfare Boards

SPCA: Society for Prevention of Cruelty to Animals

WCCB: Wildlife Crime Control Bureau

WPA: Wildlife (Protection) Act, 1972

WWA: Wildlife Welfare Association