



# Animal Markets and Zoonotic Disease in Indonesia



# COUNTRY SUMMARY: INDONESIA

## CULTURAL CONTEXT

Indonesia is situated in one of Southeast Asia's four biodiversity hotspots. It is experiencing rapid economic growth and is the world's 10th largest economy in purchasing power. These factors, with strong global and local demand for wildlife products, make it a critical player in both legal and illegal wildlife trade. It is a large source, destination and transit point for smuggling and laundering wildlife into Southeast Asia and other regions worldwide. Wild animals are traded in Indonesia for a variety of purposes including consumption for protein, as delicacies, traditional medicine, as status symbols, entertainment, biomedical research, and for companionship as pets. Cultural beliefs and tradition contribute to the demand. Generally demand for wildlife products has increased noticeably in recent years due to the rapid growth in population and accelerating globalization. Wildlife trade is an important source of income for people of lower socioeconomic status and generates considerable revenue nationally.

## ANIMAL MARKETS

Most cities host several animal markets, selling wild animals, their products, and livestock and domestic animals. Due to the increase in domestic meat production in recent years, the number of these markets is expected to increase. Live animal markets sell a diverse range of species and taxa, and differ in size, from small-scale, local pet-shops to large multi-story markets. In recent years there has been a significant increase in virtual markets. Poultry is a major source of protein produced on both large and small scales. The country imports more than half its beef and cattle; domestically, most is from smallholder farms. There are also many captive wildlife breeding farms.

## DRIVERS OF ZOOONOTIC DISEASE RISKS

Along market supply chains, live and dead animals and products are transported together, providing opportunity for cross-species transmission. Hygienic conditions of animal markets are often poor, completely lacking biosecurity and biosafety measures. Some breeding facilities in Indonesia have been suspected of facilitating the laundering of wild caught animals, passing them off as captive-bred and exacerbating risk of disease transmission among animals; transparency in captive breeding operations is often lacking. Close contact among humans and wildlife in a variety of settings exacerbates disease risk. Monkey forests, or monkey temples, are particular pressure points for disease transmission, with thousands of humans bitten and scratched each year. Hunting practices have been boosted by rapid urban and infrastructure development; socioeconomic changes supporting commercial networks are resulting in increased wild meat transport from rural forests to urban areas. Market-oriented hunting

increases hunters' dependence on trading and the number of stakeholders involved, particularly where there is a lack of alternative income opportunities. Bats are hunted and traded by the millions; the scale and nature of this trade poses serious zoonotic risks. Research and data on zoonotic disease rates in Indonesia are scarce making it difficult to analyze and understand the sources of risk.

## **RISK MITIGATION AND RELEVANT CHALLENGES**

Comprehensive national legislation to regulate wildlife trade exists but implementation and enforcement are inadequate. Law enforcement is undermined by limited political will, insufficient resources, low capacity, inadequate inter-agency cooperation, and lack of transparency. To be successful, future reforms need to be multifaceted and coordinated, with multi-agency collaboration. The strong cultural importance of wildlife markets, traditional consumption and use of wildlife, widespread beliefs of medicinal power and/or status associated with wildlife, and the rampant popularity of Indonesia's pet trade presents widespread zoonotic risk. So too does the country's growing livestock sector, particularly where these various forms of animal industries interact. Considerable cultural diversity poses challenges for uniform regulatory action as does the nation's diffuse system of governance.

## **AUTHORS**

This report was written by Magdalena S. Svensson (Oxford Brookes University, England), Silvana Sita, Britha Mahanani, and Farabby Asslam Pareke.

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## INTRODUCTION

Southeast Asia is a region with high levels of biodiversity, and Indonesia is situated in one of the region's four biodiversity hotspots.<sup>1</sup> Straddling the equator, Indonesia, with vast forested areas, is further considered one of the world's megadiverse countries and has high levels of endemism.<sup>2</sup> Indonesia has experienced rapid economic growth over the last few decades and has become the world's 10th largest economy in terms of purchasing power parity.<sup>3</sup> These factors, coupled with a strong local demand<sup>4</sup> make the country a hotspot for both legal and illegal wildlife trade. Due to its geographic setting and status as a major trading nation, Indonesia is a large source, destination and transit point for the smuggling and laundering of wildlife to Southeast Asia and other regions worldwide.<sup>5</sup> With over 18,000 islands, Indonesia is the world's largest archipelago, comprising a very complex geography with vast and porous borders that are difficult to monitor and control, which facilitates transit of both domestic and internationally sourced illegal wildlife and wildlife products.<sup>6</sup> Within Indonesia most cities have several animal markets, selling wild animals, or their products, as well as livestock and domestic animals.<sup>7</sup> The country also produces over 19 million goats, 17 million sheep, 17 million cattle, and 3.5 billion chickens annually.<sup>8</sup> Due to the gradual increase in domestic meat production across the country in recent years,<sup>9</sup> the number of these markets is also expected to increase.

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**Figure 1.** The distribution of some key live animal markets that sell animals for pets (red dots) and wet markets that sell animals for food (green dots) in major cities across Indonesia highlighted in this paper.



## CULTURAL CONTEXT OF WILDLIFE AND DOMESTIC ANIMAL TRADE

In Indonesia, wildlife trade is an important source of income for people of lower socio-economic status, but the trade also generates considerable revenue nationally. In Asia, Indonesia is the largest supplier of legal and illegal wildlife products.<sup>10</sup> According to government figures, the revenue earned from wildlife export alone in 2020 was US\$747 million<sup>11</sup> and the domestic song-bird keeping business reached US\$140 million in 2020.<sup>12</sup> While difficult to provide an accurate figure due to its clandestine nature, the value of the illegal wildlife trade in Indonesia has been estimated to be between US\$640 million and US\$1 billion annually.<sup>13</sup> At both domestic and international levels, the majority of wildlife trade is legal, with economic factors being recognized as the key drivers.<sup>14</sup> Nevertheless, poor governance and management structures represent major constraints to achieving safe and sustainable legal trade and violations of wildlife trade regulations and export quotas are widespread in the country.<sup>15</sup> When the benefits from legal trade fail to materialize, the lucrative gains from illegal trade become more attractive. Consequently, it is likely that much illegal wildlife trade occurs on the fringes of legal trade.

10. [USAID] United States Agency In International Development Wildlife Conservation Society (2015a). Wildlife Crime in Indonesia: A rapid assessment of the knowledge, trends and priority actions, [https://pdf.usaid.gov/pdf\\_docs/PA00KH52.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH52.pdf).

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12. Abdila, R (2020). Perputaran Uang Komunitas Pecinta Burung Tembus Rp 2 Triliun Setiap Tahun <https://www.tribunnews.com/bisnis/2020/08/11/perputaran-uang-komunitas-pecinta-burung-tembus-rp-2-triliun-setiap-tahun>.

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Wild animals are traded in Indonesia for a variety of purposes including consumption for protein intake and delicacies, traditional medicine, status symbols, entertainment, biomedical research and for companionship. Pet keeping is an extremely popular pastime in Indonesia, with birds being the most common household pet.<sup>16</sup> It is a tradition with deep cultural roots that keeps a central place in the urban culture of modern Indonesia,<sup>17</sup> and this is particularly prevalent in Java where it has been estimated that around one-third of Java's 36 million households keep birds.<sup>18</sup> In Javanese culture, owning a bird is perceived as a symbol of achievement and settlement. Traditionally, it was believed that to live a full life, a man would need to have a house, wife, horse, dagger and a bird.<sup>19</sup> The species of bird kept depends on various factors such as age and socioeconomic status. Some bird species, such as the zebra dove, were believed to bring good fortune to its owners and ward off evil spirits. Today birds are kept for their conspicuous plumage, behavior and song, but also as status symbols of sophistication and wealth.<sup>20</sup> Since the 1990s the popularity of keeping birds for the purpose of entering them in singing contests has risen sharply.<sup>21</sup> Winners of bird singing competitions receive big money prizes, making it appealing. Competition songbirds are referred to as *kicauan*, and *kicau-mania* is the lively cultural phenomenon that has swept across many Indonesian cities.<sup>22</sup>

Various species of primate such as gibbons, macaques and langurs are also popular in the illegal pet trade in Indonesia.<sup>23</sup> Slow lorises, a small nocturnal primate, have frequently been observed in trade, where they are highly desired for their 'cute' appearance.<sup>24</sup> Cultural beliefs and traditions in Indonesia can also contribute to the demand for certain species. For example, slow lorises and flying foxes have reportedly been used in black magic and traditional medicine.<sup>25</sup> Slow loris oil (a mixture of blood, bile and coconut oil) is commonly used as a love potion, whereas the blood and bones are used for malicious purposes to inflict mental or physical pain on others or to destroy someone's business.<sup>26</sup> Additionally, eating the liver and hearts of flying foxes is believed to cure asthma.<sup>27</sup> Bushmeat hunting is typically opportunistic, rural and for self-consumption. However, wild animals are also traded commercially, as, for instance, to some Chinese communities, mainly in Jakarta, and Batak

16. Jepson, P. (2012). Towards an Indonesian bird conservation ethos: reflections from a study of bird-keeping in the cities of Java and Bali. In *Ethno-ornithology* (pp. 343-360). Routledge; Jepson, P. (2012). *Birding Indonesia: A Birdwatcher's Guide to the World's largest Archipelago*. Tuttle Publishing.
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27. Sheherazade & Tsang, S. M. (2015). Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation*, 3: 324-330.

people in Sumatra and on Batam Island in Riau.<sup>28</sup> One of the hotspot locations for bushmeat trade is North Sulawesi<sup>29</sup> where markets offer meat from domestic animals as well as from wildlife. Other primates traded for consumption include the Sangihe Island tarsiers<sup>30</sup> and Bornean orangutans.<sup>31</sup> Although the current situation is not known, in 2011 it was estimated that between 1,950 and 3,100 orangutans were killed annually for consumption in Borneo.<sup>32</sup>

Consumption of wild meat can differ among religious groups.<sup>33</sup> Sulawesi Island is predominantly a Muslim population, but the province of North Sulawesi has a large Christian community. In Muslim culture, wild meat is typically not consumed, but is very popular among Sulawesi Christians, and has for decades been part of their cultural habits, especially around holidays.<sup>34</sup> Bushmeat is so ingrained in the local diet in North Sulawesi that snake and bat meat are often sold in supermarkets,<sup>35</sup> some studies observed wildlife meat in 10 of 14 supermarkets surveyed in this province.<sup>36</sup> The predominantly Christian population in North Sulawesi is not religiously prohibited from consuming wildlife, unlike the Muslim population who observe halal dietary restriction in other parts of Indonesia.<sup>37</sup> In Balinese culture, people have traditionally killed turtles for religious and traditional ceremonies, consumption, sales in relation to tourism, and for handicraft.<sup>38</sup> Before 2000, Balinese food products made from turtle meat were sold in such a great quantity at restaurants and traditional stalls that it led to excessive exploitation.<sup>39</sup>

Indonesia also has a meaningful domestic animal production industry. Poultry is a major source of animal protein in the country and the country consumes over 6 kg of chicken on a per capita basis.<sup>40</sup> Only 10% of the production is done in large integrated conglomerates (handling everything from breeding to slaughter and transport) with the rest being produced by contractors and independent producers.<sup>41</sup> For the most part, the country is self-sufficient when it comes to poultry and imports very little poultry.

When it comes to domesticated farmed red meat, the country is only able to meet approximately 45% of the domestic demand and turns to exports, primarily from Australia to meet the rest of the

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28. Luskin, M. S., Christina, E. D., Kelley, L. C., & Potts, M. D. (2014). Modern hunting practices and wild meat trade in the oil palm plantation-dominated landscapes of Sumatra, Indonesia. *Human Ecology*, 42(1), 35-45.
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34. Sheherazade & Tsang, S. M. (2015). Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation*, 3: 324-330.
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37. Sheherazade & Tsang, S. M. (2015). Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation*, 3: 324-330.
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country's demand. In 2016, Indonesia imported over 312 million kg of beef meat and cattle.<sup>42</sup> To reduce the country's dependency on imports, the government has tried several different animal farming incentives over the last several decades but none have made any meaningful impact. Of the domestic production, 90% of cattle comes from smallholder farming systems (with 2 to 50+ animals depending on land availability) supported by 6.5 million farmers living in rural areas, and the remaining 10% is from more commercial farmers and large beef cattle companies whose target market is concentrated in Java island.<sup>43</sup> Antimicrobial use is widespread in Indonesia's farmed animal production system. Such excessive risk increases pathogenic bacterial resistance in humans, making them more prone to disease.<sup>44</sup>

## OVERVIEW OF MARKETS

### Types & Scale

Animal markets occur throughout the country in different forms.<sup>45</sup> The live-animal and wildlife markets are often referred to as 'bird markets' in Indonesia, due to the predominance of birds on sale, although other animals are also regularly sold for pets, and to a lesser extent for consumption and traditional medicine.<sup>46</sup> Indonesian animal markets differ vastly in size, from small-scale local pet-shops to large multi-story markets, such as Pramuka Bird Market in Jakarta that contains over a hundred individual shops and is potentially the biggest animal market in Southeast Asia (Fig. 2). During one survey of Pramuka market in 2014, more than 16,000 birds were observed on display, comprising some 200 species.<sup>47</sup> The exact number of live animal markets in Indonesia is unknown, but most cities in Java, Bali, and Sumatra have at least one large bird market and a number of smaller markets and shops. Bird trade on the islands of Java, Bali and Sumatra is well documented, but huge volumes of birds have also been observed for sale in wildlife markets across Kalimantan.<sup>48</sup>

42. Agus, Ali, Widi, Tri Satya Mastuti (2018). Current situation and future prospects for beef cattle production in Indonesia — A review. *Asian-Australas J Anim Sci.* 2018 Jul; 31(7), 976–983, <https://doi.org/10.5713/ajas.18.0233>.

43. Agus, Ali, Widi, Tri Satya Mastuti (2018). Current situation and future prospects for beef cattle production in Indonesia — A review. *Asian-Australas J Anim Sci.* 2018 Jul; 31(7), 976–983, <https://doi.org/10.5713/ajas.18.0233>.

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46. Chng SCL, Eaton JA, Krishnasamy K, Shepherd CR & Nijman V (2015). In the market for extinction: an inventory of Jakarta's bird markets. *Petaling Jaya: TRAFFIC*; Iskandar, B. S., Iskandar, J., & Partasasmita, R. (2019). Hobby and business on trading birds: Case study in bird market of Sukahaji, Bandung, West Java and Splendid, Malang, East Java (Indonesia). *Biodiversitas Journal of Biological Diversity*, 20(5): 1316-1332; Nijman, V., Morcatty, T., Smith, J. H., Atoussi, S., Shepherd, C. R., Siritwat, P. et al. (2019a). Illegal wildlife trade—surveying open animal markets and online platforms to understand the poaching of wild cats. *Biodiversity*, 20(1), 58-61.

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**Figure 2.** Pramuka Bird Market in Jakarta, from the outside and inside. Photos by Farabby Asslam Pareke

Indonesia also has markets where consumption-oriented, perishable goods, such as fresh meat, are on sale in partially or fully open-air settings.<sup>49</sup> The Tomohon market in Northern Sulawesi is Indonesia's largest and most notorious market selling wildlife for consumption. There are at least seven other smaller markets across Indonesia.<sup>50</sup> Wildlife meat was found to be routinely available for sale in 73% of markets and supermarkets in North Sulawesi with the species most commonly observed were flying foxes, snakes, rats, and wild pigs.<sup>51</sup> Researchers estimated that more than a million bats are hunted and sold in these Sulawesi markets each year.<sup>52</sup> In Central Kalimantan intensive hunting and trade of flying foxes also occur, mainly near the largest transport hubs of Banjarmasin and Palangka Raya.<sup>53</sup>

Traditionally, live animal markets in Indonesia consisted of the conventional brick-and-mortar markets; however, in recent years there has been a gradual shift to virtual markets.<sup>54</sup> In 1996 the first Indonesian internet cafe opened up, and since then the country has seen a rapid increase in internet users, with 50% of the population having access to the Internet in 2019.<sup>55</sup> Indonesians are amongst the most prolific social media users, particularly of Facebook.<sup>56</sup> The increased connectivity and ease with which people could access the internet led to an increase in online wildlife trade.<sup>57</sup> Initially, the sale of wildlife occurred on e-commerce websites and on classified online forums, but due to lobbying from conservation groups of infectious agents, into a confined space.<sup>58</sup> Furthermore, the poor conditions in which

49. Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887; Lin, B., Dietrich, M. L., Senior, R. A., & Wilcove, D. S. (2021). A better classification of wet markets is key to safeguarding human health and biodiversity. *The Lancet Planetary Health*, 5(6): e386-e394.

50. Paddock RC and Sijabat DM (2020). Where Bats Are Still on the Menu, if No Longer the Best Seller - The New York Times. <https://www.nytimes.com/2020/05/13/world/asia/coronavirus-bats-market-Indonesia.html> [Accessed on July 25, 2020].

51. Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887.

52. Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887.

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56. Nurhayati-Wolff, H. (2021a) Indonesia: social network penetration Q3 2020 <https://www.statista.com/statistics/266729/smartphone-users-in-indonesia/>.

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live, and dead, animals and their derivatives were kept in the markets provide plenty of opportunity for cross-species transmission, either through direct or indirect contact.<sup>59</sup>

## Drivers

Demand for wildlife and wildlife products in Southeast Asia has increased noticeably in recent years due to the rapid growth in population and accelerated globalization. Many among the growing middle-classes, who have experienced increased buying power, view wildlife products as luxury and status items.<sup>60</sup>

Wild meat consumption has long been a staple of rural communities across Indonesia. For instance, in North Sulawesi locals report consuming flying foxes at least once a month, but the frequency increases enormously around Christian holidays.<sup>61</sup> The province imports about 500 metric tons of bats for consumption from other parts of Sulawesi.<sup>62</sup> Hunting practices have been largely affected by rapid urban and infrastructure development, as well as socio-cultural changes. These factors have assisted the development of commercial networks, which results in wild meat increasingly being transported from forests to urban areas. This market-oriented hunting may increase hunters' dependence on trading and the number of stakeholders involved, further increasing the pressure on wildlife.<sup>63</sup> The lack of economic alternatives in some regions has further exacerbated the change from subsistence hunting in favor of commercial hunting.<sup>64</sup> Accessibility is a big enabler as to where markets exist. Improved communications and connectivity, including road developments, has been shown to facilitate the expanding extraction and trade of wildlife.<sup>65</sup> For instance, trade in Sulawesi increased rapidly in the 1980s and 1990s due to road improvements making transportation of meat and animal products easier.<sup>66</sup> Researchers found that distance between villages and markets were related to the extent to which villagers engaged in commercial bushmeat trade.<sup>67</sup> Wildlife consumption does not only occur in rural areas or at wildlife markets. Restaurants and "local waroeng" in towns across Indonesia also offer wildlife on menus, including snakes, pangolins, turtles, monkeys.<sup>68</sup>

Other drivers may also increase the appeal of certain species for the wildlife market.

Researchers found that demand and opportunity-based factors were the main drivers in the Indonesian

59. Nijman, V., Spaan, D., Rode-Margono, E. J., & Nekaris, K. A. I. (2017). Changes in the primate trade in Indonesian wildlife markets over a 25-year period: Fewer apes and langurs, more macaques, and slow lorises. *American Journal of Primatology*, 79(11), e22517.

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61. Sheherazade & Tsang, S. M. (2015). Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation*, 3: 324-330.

62. Sheherazade & Tsang, S. M. (2015). Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation*, 3: 324-330.

63. McNamara, J., Rowcliffe, M., Cowlishaw, G., Alexander, J. S., Ntiama-Baidu, Y., Brenya, A., & Milner-Gulland, E. J. (2016). Characterising wildlife trade market supply-demand dynamics. *PloS one*, 11(9), e0162972; Pattiselanno, F., Lloyd, J. K., Sayer, J., Boedihartono, A. K., & Arobaya, A. Y. (2020). Wild Meat Trade Chain on the Bird's Head Peninsula of West Papua Province, Indonesia. *Journal of Ethnobiology*, 40(2), 202-217.

64. Pangau-Adam, M., & Noske, R. (2012). Wildlife hunting and bird trade in northern Papua (Irian Jaya), Indonesia. In *Ethno-ornithology* (pp. 95-108). Routledge; Luskin, M. S., Christina, E. D., Kelley, L. C., & Potts, M. D. (2014). Modern hunting practices and wild meat trade in the oil palm plantation-dominated landscapes of Sumatra, Indonesia. *Human Ecology*, 42(1), 35-45.

65. Luskin, M. S., Christina, E. D., Kelley, L. C., & Potts, M. D. (2014). Modern hunting practices and wild meat trade in the oil palm plantation-dominated landscapes of Sumatra, Indonesia. *Human Ecology*, 42(1), 35-45.

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67. Pangau-Adam, M., & Noske, R. (2012). Wildlife hunting and bird trade in northern Papua (Irian Jaya), Indonesia. In *Ethno-ornithology* (pp. 95-108). Routledge.

68. Author's personal observations.

parrot trade, e.g. the ease at which species can be sold, the enjoyability (i.e. most attractive to consumers), their economic value and accessibility by hunters.<sup>69</sup>

Another key driver of demand for wildlife products in Indonesia has been the traditional medicine industry. While this cultural practice dates back thousands of years, in recent times, Asia's rising population, rapid economic growth and the increased popularity of traditional medicines have seen a rise in use.<sup>70</sup> This practice is deeply ingrained in many Asian cultures, and in Indonesia a wide variety of species are hunted to meet both a domestic and international demand.<sup>71</sup> Primate species, including long tailed macaques, langurs, orangutans, siamangs and slow loris, are used for a variety of purposes in Indonesian traditional medicine, such as treating asthma.<sup>72</sup> Tigers (*Panthera tigris*) believed to be aphrodisiac, as well as treating arthritis, pain and other diseases. Sunda stink badger (*Mydaus javanensis*) is believed to treat fever and rheumatism, and Asian palm civet (*Paradoxurus hermaphroditus*) to treat body pain.<sup>73</sup> Anecdotally, maroon langurs (*Presbytis robicunda*) are also hunted in parts of Kalimantan for their value in traditional medicine.<sup>74</sup> Seahorses are also exploited in Indonesia for traditional medical purposes and are believed to be aphrodisiac and to treat sexual disorders.<sup>75</sup>

With the online wildlife markets increasing in Indonesia it provides traders with an opportunity to sell protected wildlife comparatively easy and safely.<sup>76</sup> Social media sites are difficult to monitor and regulate, with both traders and buyers remaining relatively anonymous, which drives even further this online market to increase.<sup>77</sup>

## MARKET SUPPLY CHAINS

In Indonesia, the different elements involved in the sourcing, collection, processing and transportation of wildlife and wildlife products are highly complex and variable depending on location, the species and the desired use. Wildlife trade in Indonesia further consists of a complex network of actors from a wide range of social and economic backgrounds, from poor rural villagers to small-scale traders

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69. Pires, S. F., Olah, G., Nandika, D., Agustina, D., & Heinsohn, R. (2021). What drives the illegal parrot trade? Applying a criminological model to market and seizure data in Indonesia. *Biological Conservation*, 257, 109098.
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73. Alves, R. R. N., Pinto, L. C. L., Barboza, R. R. D., Souto, W. M. S., Olivera, R. E. M. C. C., & Vieira, W. L. S (2013b). Primates in traditional folk medicine: world overview. In R. R. N. Alves and I. L. Rosa (eds). *Animals in Traditional Folk Medicine: Implications for Conservation*. Berlin, Springer, pp 171–206.
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77. Lavorgna A (2014). Wildlife trafficking in the Internet age. *Crime Sci*. 3: 1–12; Hinsley, A., Lee, T.E., Harrison, J.R. & Roberts, D.L. (2016) Estimating the extent and structure of trade in horticultural orchids via social media. *Conservation Biology*, 30, 1038–1047; Krishnasamy K. & Stoner S. (2016). *Trading Faces: A Rapid Assessment on the Use of Facebook to Trade Wildlife in Peninsular Malaysia*. TRAFFIC, Petaling Jaya, Malaysia

to wealthy, politically connected importers and exporters.<sup>78</sup> Hunting and capturing tends to be carried out in or near remote forested areas, by rural residents who receive little income,<sup>79</sup> or by organized and specialist hunting networks.<sup>80</sup> Hunting methods for wildlife often depend on the species targeted, although across Indonesia, the use of snares is still the most common method used.<sup>81</sup> In Sulawesi, hunters use hooked ropes and nets for hunting of bats, and sometimes air rifles and kites with hooks.<sup>82</sup> When hunting rats, traditional bamboo traps, air rifles, and hole traps are used to catch them. Wild boars are hunted using shotguns, wire traps, or baited snares, often transported live to the markets. Babirusa and anoa are hunted deep in the forest, slaughtered on site and transported back to the villages.

In the case of primates, different hunting methods are employed depending on the purpose or the species. On Java Island for example, the capture of live long-tailed macaques for export is often carried out with help from a local indigenous group known as the Baduy. A female macaque is used as bait to attract other macaques, which are subsequently caught using nets and then placed in wooden transport crates by hand. When hunting protected primate species such as gibbons and langurs for consumption, hunters will typically use air rifles to kill or wound the animal, and dogs may be used to locate the animal once it has fallen to the ground. For large adult orangutans the hunters may spend many hours shooting the animals many times before it dies. If a female primate carrying a baby was shot, the unharmed infant is often carried back alive and sold in the pet trade. Hunting of nocturnal slow lorises may occur in the day or the night, but at night the use of flashlights are used to locate their reflective eyes. Once a slow loris has been spotted in a tree, the tree will be shaken until the animal falls to the ground, or in some cases, the hunter will climb the tree and capture the animal by hand. The live slow lorises are then placed in a cloth sack to be transported out of the forest.<sup>83</sup>

Some indigenous hunters are involved in the live trade of protected bird species, whilst many bird species, specially parrots, are overharvested for the pet trade.<sup>84</sup> The method of hunting can also vary depending on the ethnicity of the hunters. In for example Central Sumatra, Minangkabaus people hunt in large social groups with the use of dogs, whereas Malay smallholder farmers usually hunt with snares or air rifles. Professional hunters herd wild boar into wire net traps in oil palm plantations at night, whereas wealthy sport hunters use firearms from vehicles to hunt for personal consumption.<sup>85</sup> Hunting can also be opportunistic in nature, occurring in conjunction with small and large-scale agriculture (e.g. for oil palm)

78. Nijman, V. (2010). An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation*, 19(4), 1101-1114; [USAID] United States Agency In International Development Wildlife Conservation Society (2015a). *Wildlife Crime in Indonesia: A rapid assessment of the knowledge, trends and priority actions*, [https://pdf.usaid.gov/pdf\\_docs/PA00KH52.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH52.pdf).

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80. Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887.

81. Pangau-Adam, M., & Noske, R. (2012). Wildlife hunting and bird trade in northern Papua (Irian Jaya), Indonesia. In *Ethno-ornithology* (pp. 95-108). Routledge; Luskin, M. S., Christina, E. D., Kelley, L. C., & Potts, M. D. (2014). Modern hunting practices and wild meat trade in the oil palm plantation-dominated landscapes of Sumatra, Indonesia. *Human Ecology*, 42(1), 35-45.

82. Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887.

83. Authors' personal observations.

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85. Luskin, M. S., Christina, E. D., Kelley, L. C., & Potts, M. D. (2014). Modern hunting practices and wild meat trade in the oil palm plantation-dominated landscapes of Sumatra, Indonesia. *Human Ecology*, 42(1), 35-45.



or land clearing, mining, and as a by-product of human-wildlife conflict, which it is often the case with orangutans.<sup>86</sup>

Trade intermediaries or middlemen typically collect, process, store and transport wildlife from hunters to traders and consumers, both for the domestic and international markets.<sup>87</sup> Usually roles of hunters, intermediaries, market traders, and market vendors/restaurant owners involved in the illicit wildlife trade are well defined from hunting to trading.<sup>88</sup>

In Papua, the supply chain also has many actors involved in collecting, buying, transporting and selling wildlife, where often harvested wildlife, such as snakes, are sent to licensed breeding farms in Jakarta or Bali, from where they are either exported or sold in the domestic pet trade.<sup>89</sup>

According to the Indonesian Central Bureau of Statistics 2015 report, there were 172 legally licensed breeding farms of wildlife across Indonesia in 2015.<sup>90</sup> This number had declined to 160 in 2020, with most farms being located in West Kalimantan, West Java and Bali.<sup>91</sup> The most common animal class bred in these farms across Indonesia were fish, such as Arowana, and Anthozoa (corals), followed by reptiles and birds. There are also specialized breeding facilities for insects and mammals, for example, long-tailed macaques and sugar gliders (*Petaurus breviceps*).<sup>92</sup> Initially, the sale of wildlife occurred on e-commerce websites and on classified online forums, but due to lobbying from conservation groups, these platforms began to ban sale of protected, illegally traded species.<sup>93</sup> In 2012, much of the trade began to shift to the social media platforms Facebook and Instagram. On Facebook, wildlife trade and ‘animal lover’ community groups began to form at a rapid rate.<sup>94</sup> These groups provide space for traders to safely and easily advertise their stock to hundreds of thousands of potential buyers. Sellers no longer need the establishment of trusted connections along the complex trade chain from source habitat to market place. The use of courier services, online bank transfers and even the use of third-party bank accounts meant that the exchange of goods and money could take place anonymously without the need for face-to-face encounters.<sup>95</sup> From 2015 to 2020, 14,067 Facebook advertisements were observed, comprising 15,187 protected wildlife individuals, in 1,022 Indonesian Facebook groups.<sup>96</sup> These

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86. Campbell-Smith, G., Simanjourang, H. V., Leader-Williams, N., & Linkie, M. (2010). Local attitudes and perceptions toward crop-raiding by orangutans (*Pongo abelii*) and other nonhuman primates in northern Sumatra, Indonesia. *American Journal of Primatology*, 72(10), 866-876; Freund, C., Rahman, E., & Knott, C. (2017). Ten years of orangutan-related wildlife crime investigation in West Kalimantan, Indonesia. *American Journal of Primatology*, 79(11), 22620.
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88. Pattiselanno, F., Lloyd, J. K., Sayer, J., Boedihartono, A. K., & Arobaya, A. Y. (2020). Wild Meat Trade Chain on the Bird's Head Peninsula of West Papua Province, Indonesia. *Journal of Ethnobiology*, 40(2), 202-217.
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94. USAID (2015b). *Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context*, [https://pdf.usaid.gov/pdf\\_docs/PA00KH4Z.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH4Z.pdf).
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96. [IARI] International Animal Rescue Indonesia (2020). *Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar*. INTENSI Magazine, November 2020. ISSN 2747-1446.

advertisements were posted by 8,036 different trader accounts, and additionally more than 4,000 people posted about wishing to buy protected wildlife.<sup>97</sup> Java is a hotspot for illegal online trade with the highest amount of trade activity occurring in West Java (with 2,355 Facebook groups), followed by East Java (1,444) and Central Java.<sup>98</sup>

Indonesia also has a large number of offline ‘animal lover’ communities. Organizers of these communities regularly hold gatherings for like-minded people who keep wildlife as pets.<sup>99</sup> Community members share tips on how to care for - and breed - their pets, and assist potential buyers on how to purchase them from the black market.<sup>100</sup> Before a series of repressive operations from the Ministry of Environment and Forestry in 2015 and 2016, slow loris communities would openly gather in public spaces.<sup>101</sup> The popularity of these ‘slow loris lover’ communities undoubtedly contributed to an increase in demand and volume of slow lorises in illegal trade.<sup>102</sup> Animal exhibitions such as ‘reptile expos’ organized by reptile enthusiasts are regularly held in shopping malls and are commonplace in most big Indonesian cities. Despite their public location, these events are usually unregulated and see a variety of protected species being offered for sale.<sup>103</sup>



**Figure 3.** Photos by Farabby Aslam Pareke “Slow loris lovers” gathering and civets being offered for sale at a pet fair in Bogor.

97. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

98. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

99. USAID (2015b). Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context, [https://pdf.usaid.gov/pdf\\_docs/PA00KH4Z.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH4Z.pdf); Morgan, J., & Chng, S. (2017). Rising internet-based trade in the Critically Endangered ploughshare tortoise *Astrochelys yniphora* in Indonesia highlights need for improved enforcement of CITES. *Oryx*, 52(4), 744-750; Gomez, L., & Bouhuys, J. (2018). Illegal otter trade in Southeast Asia. TRAFFIC, Petaling Jaya, Selangor, Malaysia.

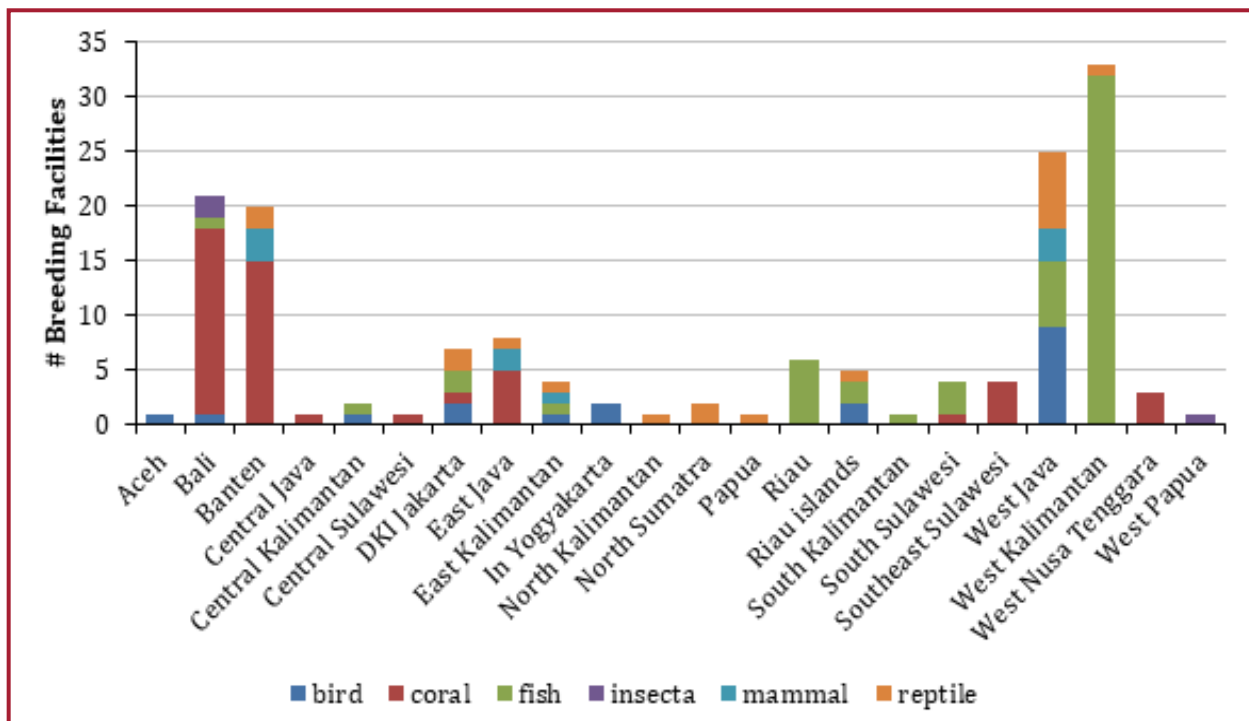
100. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

101. Pahlevi A and Rahmad R. (2015) Tampilkan Satwa Dilindungi, Komunitas Kukang Diamankan BKSDA Kalbar. <https://www.mongabay.co.id/2015/07/05/tampilkan-satwa-dilindungi-komunitas-kukang-diamankan-bksda-kalbar/>.

102. Fig. 3; [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

103. Stengel, C. J., Shepherd, C. R., & Caillabet, O. S. (2011). The trade in tortoises and freshwater turtles in Jakarta, Indonesia revisited. TRAFFIC Southeast Asia, Petaling Jaya, Malaysia; Morgan, J. (2018). Slow and steady: The global footprint of Jakarta’s tortoise and freshwater turtle trade. Petaling Jaya, Malaysia: TRAFFIC Southeast Asia Regional Office.

In all of the aforementioned marketplaces, there is an increased chance of contact and sustained proximity between wildlife and humans that would promote zoonotic pathogen spillover. Hygienic conditions of these markets are often poor and completely lack implementation of biosecurity and biosafety measures, masks or gloves are for example rarely used. Wildlife traded live in bird markets are often transported and traded in stressful situations, making them more susceptible to infections and therefore present a higher risk of zoonotic disease transmission.<sup>104</sup> These markets facilitate the bringing together of a variety of wildlife species from different areas of Indonesia, each species with its potentially unique burd21). Some breeding facilities in Indonesia have been suspected of facilitating the laundering of wild caught species, for example sugar gliders and pig-nosed turtles (*Carettochelys insculpta*). Wild individuals such as juvenile Boelen’s pythons, Sulawesi forest turtles, and earless monitor lizards are fraudulently declared as captive bred and then exported under the guise of the legal trade to countries like Malaysia, Thailand and the USA.<sup>105</sup> Transparency in captive breeding operations is often lacking. Researchers visited a number of Indonesian breeding facilities for monitor lizards (*Varanus timorensis*), but found no breeding records in any of the facilities they surveyed.<sup>106</sup>



**Figure 4.** Number of licensed breeding facilities in Indonesia by province and animal class traded (BPS 2020).

104. Wang M, Di B, Zhou DH, et al. (2006). Food markets with live birds as a source of avian influenza. *Emerging Infectious Diseases*, 12: 1773-1775; Amonsin A, Choatrakol C, Lapkuntod J, et al. (2008). Influenza virus (H<sub>5</sub>N<sub>1</sub>) in live bird markets and food markets, Thailand. *Emerging Infectious Diseases*, 14: 1739-1742; Smith KM, Zambrana-Torrel C, White A, et al. (2017). Summarizing US wildlife trade with an eye toward assessing the risk of infectious disease introduction. *EcoHealth*, 14(1): 29-39; Petrovan, S. O., Aldridge, D. C., Bartlett, H., Bladon, A. J., Booth, H., Broad, S., et al. (2021). Post COVID-19: a solution scan of options for preventing future zoonotic epidemics. *Biological Reviews*, Online first.

105. Lyons, J. A., & Natusch, D. J. (2012). Over-stepping the Quota? The trade in sugar gliders in West Papua, Indonesia. *TRAFFIC Bulletin*, 24(1), 5-6; Shepherd, C. R., Gomez, L., & Nijman, V. (2020c). Illegal wildlife trade, seizures and prosecutions: A 7.5-year analysis of trade in pig-nosed turtles *Carettochelys insculpta* in and from Indonesia. *Global Ecology and Conservation*, 24, e01249.

106. Arida, E., & Handayani, N. W. (2020). Captive reproduction of timor monitor, *Varanus timorensis* (Gray, 1831) in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 457(1), 012004.



In addition to captive breeding facilities, in Java and Bali, birds are caught from the wild by either rural residents or groups of friends, with the latter typically trapping high value songbirds and selling them to shop owners in rural villages, who then sell them to bird shops in a nearby town.<sup>107</sup>

Consumers and visitors to bird markets and restaurants selling bushmeat, as well as private buyers in the online markets, are the ultimate stakeholders on the domestic market supply chain. The majority of the domestic wildlife trade in Indonesia is for pets, with birds being the animal class with the highest demand among Indonesians.<sup>108</sup> In terms of wildlife trade for consumption, as stated above, in North Sulawesi food markets often offer wild animal meat for sale. Furthermore, online trade can also facilitate the selling of meat and body parts; that is the case of sun bear body parts (e.g. claws, teeth, skin, skull) which are purchased online by Indonesians to be used as trophies and talismans, whereas live cubs are being traded for the local pet trade.<sup>109</sup> Evidence was also found of sun bears (*Helarctos malayanus*) being killed for consumption and for their parts used in traditional medicine (i.e. gall bladders and derivatives), being traded locally, as well as, to foreign markets, such as to Cambodia and China.<sup>110</sup> Water monitor lizards are also widely traded for consumption (i.e. specially to restaurants), use in traditional medicine (i.e. remedies for skin diseases, eczema, asthma) and as an aphrodisiac in the island of Java - although being a Muslim-dominated region which culturally avoids the consumption of wild animals.<sup>111</sup>

## Online Markets

When looking at domestic wildlife pet trafficking, online trade has facilitated the sale of animals in Indonesia: for instance, between 2015 and 2020 slow lorises and Sunda leopard cats were the species traded in the largest number across Indonesia.<sup>112</sup> In regards to international exports of wildlife from Indonesia, both legal and illegal, the import destination often depends on the species and the purpose of trade. For example, orangutans were often smuggled to Thailand to be used for entertainment purposes, where the animals were put in boxing rings to entertain paying guests.<sup>113</sup> Long-tailed macaques, the most commonly traded primate in Indonesia, have been exported in large volumes to the United States and China for biomedical research.<sup>114</sup> Protected primates such as orangutans and gibbons have been

107. Jepson, P., Ladle, R. J. & Sujatnika (2011). Assessing market-based conservation governance approaches: a socio-economic profile of Indonesian markets for wild birds. *Oryx*, 45(4), 482-491.

108. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. *INTENSI Magazine*, November 2020. ISSN 2747-1446; Maulany, R. I., Mutmainnah, A., Nasri, N., Achmad, A., & Ngakan, P. O. (2021). Tracing Current Wildlife Trade: An Initial Investigation in Makassar City, Indonesia. *Forest and Society*, 277-287.

109. Gomez, L., Shepherd, C. R., & Morgan, J. (2019b). Improved Legislation and Stronger Enforcement Actions needed as the Online Otter Trade in Indonesia continues. *IUCN Otter Spec. Group Bull*, 36(2), 64-70.

110. Gomez, L., Shepherd, C. R., & Morgan, J. (2019b). Improved Legislation and Stronger Enforcement Actions needed as the Online Otter Trade in Indonesia continues. *IUCN Otter Spec. Group Bull*, 36(2), 64-70.

111. Nijman, V. (2015). Water monitor lizards for sale as novelty food in Java, Indonesia. *Biawak*, 9(1), 28-32.

112. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. *INTENSI Magazine*, November 2020. ISSN 2747-1446.

113. TRAFFIC (2015). Thailand repatriates smuggled orangutans to Indonesia. <https://www.traffic.org/news/thailand-repatriates-smuggled-orangutans-to-indonesia/> [Accessed August 5, 2021]; Freund, C., Rahman, E., & Knott, C. (2017). Ten years of orangutan-related wildlife crime investigation in West Kalimantan, Indonesia. *American Journal of Primatology*, 79(11), 22620.

114. Foley, KE. and Shepherd, C. R. (2011) Trade in long-tailed macaques (*Macaca fascicularis*). In M. D. Gumert, A. Fuentes and L. Jones-Engel (eds). *Monkeys on the Edge. Ecology and Management of Long-Tailed Macaques and Their Interface with Humans*. Cambridge, Cambridge University Press, pp 20–23; Hansen, M. F., Gill, M., Nawangsari, V. A., Sanchez, K. L., Cheyne, S. M., Nijman, V., & Fuentes, A. (2021). Conservation of Long-tailed Macaques: Implications of the Updated IUCN Status and the CoVID-19 Pandemic. *Primate Conservation*, 35, 1-11.

commonly smuggled to destinations such as Russia and the Middle East for the pet trade.<sup>115</sup> Similarly, snakes and other reptiles are regularly exported to the EU, the US and Japan for pets.<sup>116</sup> Illegal export of Sunda leopard cats have been observed to Japan and the US.<sup>117</sup> A large number of freshwater turtles (Chelidae) are exported from Papua and other parts of Indonesia to supply the international pet trade.<sup>118</sup> Tiger body parts, seahorses, and geckos are exported to supply the domestic and international trade in traditional medicine (e.g. to China and South Korean).<sup>119</sup> CITES-listed fish are traded internationally for a variety of reasons, including the aquarium markets and human consumption, mainly to China and Hong Kong; turtles are traded mainly for consumption or for their carapaces to be used in traditional medicine; whereas snakes, lizards, and crocodylians are traded in large quantities for their skins.<sup>120</sup>

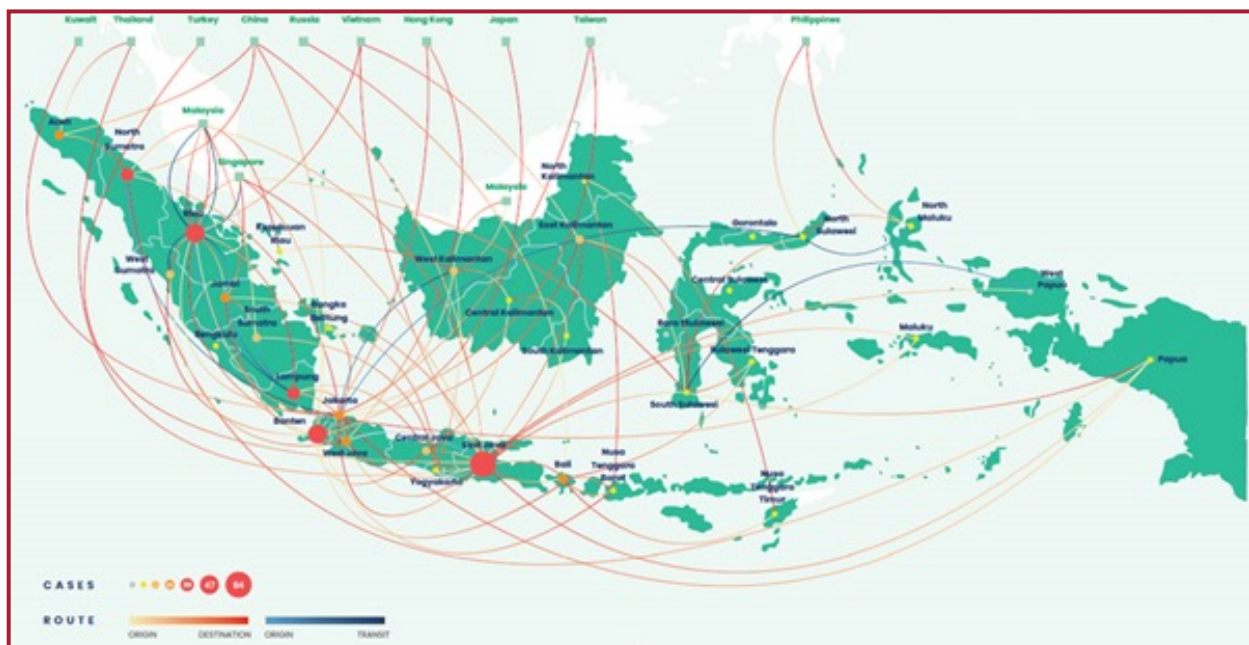
At least 40% of wildlife traders in Indonesia use online platforms for their transactions,<sup>121</sup> with Java being the biggest hotspot location for the online trade for several different species.<sup>122</sup> In the online trade, face-to-face meetings are no longer required and payments are usually made through *Rekening Bersama*, which involves the payment being sent to the bank account of a trusted third party, making it more difficult to track money transactions to be later used as evidence in court.<sup>123</sup> The number of network actors online continues to grow and increase in complexity. The unlimited reach of social media and the difficulty of identifying traders and transactions poses a high challenge to the law enforcement agencies.<sup>124</sup> The supply chain in online markets are also more direct and difficult to disrupt. Whereas the traditional trade process is typically carried out along a linear chain: from hunter to local collector, to intermediary, and then to the market vendors, the online trade allows for any actors along the chain to have direct access to consumers, cutting out various transactions with intermediaries, but increasing the number of potential sellers and transactions.<sup>125</sup>

## Illegal Markets

Illegal traders often smuggle animals internationally in various forms of packaging, usually hiding among other legally traded species or goods, employing minors or elders for the transportation of the

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115. Christofaro, B (2019). A Russian man was arrested after trying to smuggle a drugged orangutan, 5 lizards, and 2 geckos out of Indonesia in his luggage. Insider. <https://www.insider.com/russia-tourist-smuggle-orangutan-indonesia-in-suitcase-2019-3>.
116. Janssen J, Blanken L (2016). Going Dutch: an analysis of the import of live animals from Indonesia by the Netherlands. TRAFFIC, Petaling Jaya; Shaney, K. J., Wostl, E., Hamidy, A., Kurniawan, N., Harvey, M. B., & Smith, E. N. (2017). Conservation challenges regarding species status assessments in biogeographically complex regions: examples from overexploited reptiles of Indonesia. *Oryx*, 51(4), 627-638.
117. Nijman, V., Ardiansyah, A., Bergin, D., Birot, H., Brown, E., Langgeng, A., Morcatty, T., Spaan, D., Siriwat, P., Imron, M.A. and Nekaris, K.A.I. (2019b). Dynamics of illegal wildlife trade in Indonesian markets over two decades, illustrated by trade in Sunda Leopard Cats. *Biodiversity*, 20(1), pp.27-40.
118. Lyons, J. A., Natusch, D. J. D., & Shepherd, C. R. (2013). The harvest of freshwater turtles (Chelidae) from Papua, Indonesia, for the international pet trade. *Oryx*, 47(2), 298-302.
119. Alves, R. R. N., & Rosa, I. L. (2013). *Animals in traditional folk medicine*. Springer-Verlag Berlin Heidelberg. DOI, 10, 978-3.
120. Nijman, V. (2010). An overview of international wildlife trade from Southeast Asia. *Biodiversity and Conservation*, 19(4), 1101-1114.
121. Sinaga, D.A. (2017). Illegal wildlife trade flourishes online in Indonesia. *Jakarta Globe*. <https://jakartaglobe.id/news/illegal-wildlife-trade-flourishes-online-indonesia/> Accessed on August 6, 2021.
122. Morgan, J., & Chng, S. (2017). Rising internet-based trade in the Critically Endangered ploughshare tortoise *Astrochelys yniphora* in Indonesia highlights need for improved enforcement of CITES. *Oryx*, 52(4), 744-750; Gomez, L., & Bouhuys, J. (2018). Illegal otter trade in Southeast Asia. TRAFFIC, Petaling Jaya, Selangor, Malaysia; Gomez L, Shepherd CR and Morgan J (2019a). Revealing the online trade of Sun Bears in Indonesia. TRAFFIC Bulletin, 31(2): 67-71; [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.
123. Gomez L, Shepherd CR and Morgan J (2019a). Revealing the online trade of Sun Bears in Indonesia. TRAFFIC Bulletin, 31(2): 67-71.
124. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.
125. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

animals in airports and seaports.<sup>126</sup> For instance, parrots are usually shipped in small numbers using small cages, pipes, paper boxes, bamboo, and even water bottles in alternated dates and times and with no fixed routes.<sup>127</sup> Depending on the species, the type of product, the distance and geographical location the mode of transport can vary. An analysis of seizure reports collected from local media found that most of the wildlife traded illegally within and from Indonesia was transported predominantly by sea (46%) of which most are birds, air (30%) of which most are reptiles, and over land (24%) through which the majority of mammals were smuggled.<sup>128</sup> Lampung to Jakarta was the route that involved the greatest volume of wildlife (7,553 individuals). The international airport of Soekarno-Hatta was commonly used to transport reptiles from Banten to Hong Kong. The Indonesian ports with the highest volume of wildlife seized on sea routes was Bakauheni in Lampung, followed by Tanjung Perak Port in Surabaya, East Java, and Gilimanuk Port in Bali. In Sulawesi, large quantities of smuggled bats were found during road patrols.<sup>129</sup> Due to their geographic location, the Maluku Islands are a hotspot for hunting and smuggling of parrot species. The proximity to countries such as the Philippines, Australia, and Timor Leste facilitates this international trafficking.<sup>130</sup>



**Figure 5.** Trade routes compiled from 550 seizure cases reported in the local Indonesian media from 2015 – 2020.<sup>131</sup> (IARI 2020).

126. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

127. Bashari, H., & Nurdin, K. (2009). Burung Paruh Bengkok Status Perburuan dan Perdagangannya di Maluku Utara 2008-2009. Bogor: Burung Indonesia; Setiyani, A. D., & Ahmadi, M. A. (2020). An overview of illegal parrot trade in Maluku and North Maluku Provinces. *Forest and Society*, 4(1): 48-60.

128. Fig. 5; [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.

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130. Setiyani, A. D., & Ahmadi, M. A. (2020). An overview of illegal parrot trade in Maluku and North Maluku Provinces. *Forest and Society*, 4(1): 48-60.

131. [IARI] International Animal Rescue Indonesia (2020). Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar. INTENSI Magazine, November 2020. ISSN 2747-1446.



# ZOONOTIC DISEASE RISK AND ANALYSIS

## Examples of Zoonotic Diseases in Indonesia

Beyond the SARS-Cov2 virus, documentation of zoonotic diseases in Indonesia is scarce, making it difficult to recognize the real risk of zoonotic transmission. However, there are some examples of notorious zoonotic diseases reported in Indonesia. Indonesia's Ministry of Health along with the World Health Organization and the Food and Agriculture Organization of the United Nations has identified six zoonotic diseases as priority diseases in Indonesia. These zoonotic diseases include zoonotic influenza (avian and swine influenza), zoonotic coronavirus (COVID-19, MERS-CoV), rabies, anthrax, tuberculosis zoonosis and leptospirosis.<sup>132</sup>

Avian influenza A (H<sub>5</sub>N<sub>1</sub>) is one example of a pathogen believed to have spilled over from animals to humans in Indonesia, with over 140 cases detected in humans between 2005 and 2013.<sup>133</sup> The zoonotic transmission of avian influenza A in Indonesia, which resulted in several human deaths, were found to originate from live bird markets, which are known to be high-risk environments facilitating this type of zoonotic disease transmission.<sup>134</sup> Risks of contamination were most heavily associated with the slaughtering of market birds, particularly in West Java.<sup>135</sup>

When avian influenza spread through Indonesia, rumors circulated that control measures, and perhaps the disease itself, were a ploy to drive small producers out of the business. Questions about who stood to profit from the outbreak weighed down policy responses and led to distrust between small producers and policymakers.<sup>136</sup> During the same outbreak in 2006, Indonesia refused to provide samples from the country's H5N1 influenza to the WHO. Their refusal was founded upon fears that the samples would be shared with pharmaceutical companies in wealthy countries, who would then use them and patent vaccines or other products that developing countries could not afford.<sup>137 138</sup> Such debates and inequities can undermine global health security.<sup>139</sup>

Rabies is endemic to the major islands of Indonesia, including Java, Sulawesi and Flores, but infected areas are increasing, now also including the islands of Bali and Nias.<sup>140</sup> This zoonotic disease is now considered a major public health problem on Bali, and was responsible for 135 human deaths on the

132. [WHO] World Health Organization (2021). Coronavirus disease 2019 (COVID-19): Indonesia situation report – 65. <https://www.who.int/indonesia>. Accessed August 2, 2021.

133. Aditama, T.Y., Samaan G, Kusriastuti R, Sampurno OD, Purb W, Santoso H, Bratasena A et al. (2012). Avian influenza H5N1 transmission in households, Indonesia. *PLoS ONE*, 7(1): e29971; Setiawaty, V., Dharmayanti, N. L. P. I., Pawestri, H. A., Azhar, M., Tallis, G., Schoonman, L., & Samaan, G. (2015). Avian Influenza A (H5N1) Virus Outbreak Investigation: Application of the FAO-OIE-WHO Four-way Linking Framework in Indonesia. *Zoonoses and Public Health*, 62(5): 381-387.

134. Naysmith, S. (2014). Observations from a live bird market in Indonesia following a contained outbreak of avian influenza A (H5N1). *EcoHealth*, 11(1), 50-52.

135. Indriani, R., Samaan, G., Gultom, A., Loth, L., Indryani, S., Adjid, R., ... & Kelly, P. M. (2010). Environmental sampling for avian influenza virus A (H5N1) in live-bird markets, Indonesia. *Emerging infectious diseases*, 16(12), 1889.

136. Siwi Padmawati and Mark Nichter, "Community Response to Avian Flu in Central Java, Indonesia," *Anthropology & Medicine* 15, no. 1 (2008): 31–51, <https://www.tandfonline.com/doi/full/10.1080/13648470801919032?needAccess=true>.

137. Australia had developed an avian influenza vaccine derived from past samples that Indonesia provided to the WHO.

138. Siwi Padmawati and Mark Nichter, "Community Response to Avian Flu in Central Java, Indonesia," *Anthropology & Medicine* 15, no. 1 (2008): 31–51, <https://www.tandfonline.com/doi/full/10.1080/13648470801919032?needAccess=true>.

139. The WHO has since taken some steps to address these concerns in hopes of promoting more-equal benefit sharing among developed and developing countries.

140. Susilawathi NM, Darwinata AE, Dwija IB, Budayanti NS, Wirasandhi GA, Subrata K, et al. (2012). Epidemiological and clinical features of human rabies cases in Bali 2008-2010. *BMC Infect Dis.*; 12:81; Dibia, I. N., Sumiarto, B., Susetya, H., Putra, A. A. G., Scott-Orr, H., & Mahardika, G. N. (2015). Phylogeography of the current rabies viruses in Indonesia. *Journal of Veterinary Science*, 16(4), 459-466.

island between 2008 and 2011.<sup>141</sup> As well as being transmitted to humans from dogs,<sup>142</sup> researchers also found that rabies can also be transmitted from primates, including langurs and gibbons.<sup>143</sup>

*Salmonella* spp. is a prominent zoonotic pathogen found worldwide.<sup>144</sup> One of the transmission sources of this zoonotic disease in humans is from pet reptiles.<sup>145</sup> Reptiles imported to the US, which account for 10% of all animal shipments, potentially carrying *Salmonella* spp., are considered a public health risk.<sup>146</sup> Moreover, concerns are growing about these reptiles as a source of multi-drug resistant *Salmonella*.<sup>147</sup> In a survey conducted on Tokay geckos (*Gekko gecko*), wild-caught in Indonesia and imported to the US, *Salmonella* was found in high prevalence and antibiotic resistance was also detected.<sup>148</sup> High rates of antibiotic drug resistant *Salmonella* strains have also been found in healthy reptiles in pet shops in Indonesia.<sup>149</sup>

Anthrax (*Bacillus anthracis*) is a zoonotic disease that affects livestock and wild ungulates,<sup>150</sup> and has also been regarded as the cause of death for a broad range of mammalian hosts in tropical rainforests.<sup>151</sup> This disease can cause mortality in humans.<sup>152</sup> Several outbreaks of this disease have been reported in Indonesia, some of them causing human fatalities.<sup>153</sup> The most common exposure to humans occurs while handling carcasses (when skinning or butchering infected animals) or consuming contaminated meat.<sup>154</sup>

Other zoonotic diseases that are thought to have infected humans via zoonotic transmission, but to a lesser extent, include the Hantavirus, where one patient Western Java was found to have caught the virus from rodents,<sup>155</sup> and Sparganosis which affects both humans and animals, caused by plerocercoid larvae. One of the possible sources of infection is consumption of wild meats, such as snakes, and it has

141. Susilawathi NM, Darwinata AE, Dwija IB, Budayanti NS, Wirasandhi GA, Subrata K, et al. (2012). Epidemiological and clinical features of human rabies cases in Bali 2008-2010. *BMC Infect Dis.* 12:81.

142. Putra, A. A. G., Hampson, K., Girardi, J., Hiby, E., Knobel, D., Mardiana, W. et al. (2013). Response to a rabies epidemic, Bali, Indonesia, 2008–2011. *Emerging Infectious Diseases*, 19(4), 648.

143. Gautret P, Blanton J, Dacheux L, et al. (2014). Rabies in nonhuman primates and potential for transmission to humans: a literature review and examination of selected French national data. *PLoS Neglected Tropical Diseases*, 8(5): e2863.

144. Marin, C., Lorenzo-Rebenaque, L., Laso, O., Villora-Gonzalez, J. and Vega, S. (2021). Pet reptiles: A potential source of transmission of multidrug-resistant *Salmonella*. *Frontiers in Veterinary Science*, 7: 1157.

145. Marin, C., Lorenzo-Rebenaque, L., Laso, O., Villora-Gonzalez, J. and Vega, S. (2021). Pet reptiles: A potential source of transmission of multidrug-resistant *Salmonella*. *Frontiers in Veterinary Science*, 7: 1157.

146. Smith, K.F., Yabsley, M.B., Sanchez, S., Casey, C.L., Behrens, M.D., Hernandez, S.M. (2012). *Salmonella* isolates from wild-caught Tokay geckos (*Gekko gecko*) imported to the U.S. from Indonesia. *Vector-Borne and Zoonotic Diseases*, 12(7): 575-582.

147. Smith, K.F., Yabsley, M.B., Sanchez, S., Casey, C.L., Behrens, M.D., Hernandez, S.M. (2012). *Salmonella* isolates from wild-caught Tokay geckos (*Gekko gecko*) imported to the U.S. from Indonesia. *Vector-Borne and Zoonotic Diseases*, 12(7): 575-582; Arnafia, W., Ningrun, S.G. et al. (2016). Isolation of *Salmonella* from reptiles in pet shop and its susceptibility to antibiotics in Indonesia. *Human and Veterinary Medicine International Journal of the Bioflux Society*, 4(4): 177-181; Marin, C., Lorenzo-Rebenaque, L., Laso, O., Villora-Gonzalez, J. and Vega, S. (2021). Pet reptiles: A potential source of transmission of multidrug-resistant *Salmonella*. *Frontiers in Veterinary Science*, 7: 1157.

148. Smith, K.F., Yabsley, M.B., Sanchez, S., Casey, C.L., Behrens, M.D., Hernandez, S.M. (2012). *Salmonella* isolates from wild-caught Tokay geckos (*Gekko gecko*) imported to the U.S. from Indonesia. *Vector-Borne and Zoonotic Diseases*, 12(7): 575-582.

149. Arnafia, W., Ningrun, S.G. et al. (2016). Isolation of *Salmonella* from reptiles in pet shop and its susceptibility to antibiotics in Indonesia. *Human and Veterinary Medicine International Journal of the Bioflux Society*, 4(4): 177-181

150. Carlson, C.J., Kracalik, I.T., Ross, N. et al. (2019). The global distribution of *Bacillus anthracis* and associated anthrax risk to humans, livestock and wildlife. *Nature Microbiology*, 4, 1337–1343.

151. Hoffmann, C., Zimmermann, F., Biek, R. et al. (2017). Persistent anthrax as a major driver of wildlife mortality in a tropical rainforest. *Nature*, 548: 82–86.

152. Fasanella, A. Galante, D., Garofolo, G., Jones, M.H. (2010). Anthrax undervalued zoonosis. *Veterinary Microbiology*, 140(3-4): 318-33; Juwita, S., Purwanta, Muflihanah and Djatmikowati, T.F. (2018). Identification of Anthras in endemic areas in South Sulawesi Province. *Journal of the Indonesian Veterinary Research*, 2(2): 50-55.

153. Redhono, D. and Dirgahayu, P. (2016). Anthrax Seroprevalence in Central Java, Indonesia. *Indonesian Journal of Medicine*, 1(2): 129-135; Juwita, S., Purwanta, Muflihanah and Djatmikowati, T.F. (2018). Identification of Anthras in endemic areas in South Sulawesi Province. *Journal of the Indonesian Veterinary Research*, 2(2): 50-55.

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155. Kosasih, H., Ibrahim, I. N., Wicaksana, R., Alisjahbana, B., Hoo, Y., Yo, I. H. et al. (2011). Evidence of human hantavirus infection and zoonotic investigation of hantavirus prevalence in rodents in western Java, Indonesia. *Vector-Borne and Zoonotic Diseases*, 11(6): 709-713.

been confirmed in Indonesian bronzeback snakes, which is commonly sold for consumption in markets and kept as pets in Indonesia.<sup>156</sup> This is now considered a health risk due to the high possibility of these snakes to transmit the *Spirometra* parasite.<sup>157</sup> Often snakes are subject to gravely improper husbandry at various stages along the trade chain, making them more susceptible to diseases.<sup>158</sup> *P. knowlesi*, a macaque malaria species that has spilled over to humans, is responsible for severe cases of malaria, sometimes associated with human mortality, and has become one of the most important emerging zoonotic diseases in Southeast Asia.<sup>159</sup> In Indonesia, cases of this malaria in humans have been detected in areas where macaques also occur.<sup>160</sup> Given that macaques are one of the primate species most traded locally in Indonesia as well as traded internationally, this zoonotic disease risk should not be underestimated.<sup>161</sup>

There have also been a number of zoonotic disease outbreaks in Indonesia related to the country's domestic farmed animal production system. Currently the country is facing an outbreak of foot and mouth disease. Between May and August of 2022, over 450,000 cases were reported, mostly in cattle on smaller farms where access to vaccines are particularly problematic. This outbreak is expected to cost the country over US\$1.3B, with the biggest hit on the small farmers whose livelihood depends on the farm's productivity.<sup>162</sup>

A study executed between 2011 and 2013 found that over 5% of farms tested for Leptospirosis had at least one positive cattle. In this study, 757 households sampled across 15 villages. Reported fatality rates of human Leptospirosis cases in 2013 were 33.3%.<sup>163</sup>

Over the past five years, brucellosis has been found in pigs in East Java.<sup>164</sup> and *Coxiella burnetii*, the bacterial pathogen that causes Q fever, has been found in beef cattle in West Java.<sup>165</sup> In addition, gastrointestinal parasites were found in 2017 in 87 of 109 cattle samples from adult beef cattle in 11 villages of the Tangerang district of the Banten Province, located on the island of Java, Indonesia. There is limited research on human infection rates but these parasites are known to have strong zoonotic potential.<sup>166</sup>

156. Yudhana, A., Praja, R. N., & Supriyanto, A. (2019). The medical relevance of *Spirometra* tapeworm infection in Indonesian Bronzeback snakes (*Dendrelaphis pictus*): A neglected zoonotic disease. *Veterinary World*, 12(6): 844.

157. Yudhana, A., Praja, R. N., & Supriyanto, A. (2019). The medical relevance of *Spirometra* tapeworm infection in Indonesian Bronzeback snakes (*Dendrelaphis pictus*): A neglected zoonotic disease. *Veterinary World*, 12(6): 844.

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## Potential Points for Spillover

There are several pressure points along wildlife trade supply chains where the risk of disease transmission is increased, either between animals of the same species, cross-species transmission (to other wildlife or domesticated animals), or ultimately from animal to humans.

In hunting, there is a well-documented risk of zoonotic disease transmission between wildlife and hunters.<sup>167</sup> Bats are hunted, and traded, in the millions throughout Indonesia and the pure scale of this trade poses large risks of disease transmission.<sup>168</sup> Many hunters and market vendors interviewed in parts of Kalimantan were unaware that flying foxes carry potentially fatal viruses, such as the Nipah, Hendra and Lassa viruses, so few protected themselves from physical contact, even though they were frequently bitten by these bats.<sup>169</sup> Flying foxes have also been linked with degenerative neurological conditions such as Alzheimers, Parkinson's, and Amyotrophic Lateral Sclerosis (ALS).<sup>170</sup> Furthermore, a higher risk of zoonotic disease transmissions was found among market vendors that sell larger volumes of wildlife compared to those selling relatively little.<sup>171</sup>

The extremely poor conditions which animals have to endure along the various points of the trade chain, from capture at the source to the point of sale, very often cause further stress, and further opportunity for spread of harmful pathogens,<sup>172</sup> especially in illegal trade.<sup>173</sup> Wildlife trade increases the interface for pathogen transmission between species from different geographical origins while also providing suitable conditions for viral exchange and recombination.<sup>174</sup> The welfare of the animals in transport is often poor, with many reports of injuries,<sup>175</sup> stress and provision of inappropriate food.<sup>176</sup> that can result in poor psychological well-being and the emergence of stereotypic behaviors.<sup>177</sup>

Wild-caught animals sold in markets are reportedly more likely to harbor pathogens due to previous exposure, but poorly captive-reared animals can also serve as a source of zoonotic pathogens. Different species of wild and domestic animals are regularly kept in close proximity in some Indonesian markets, making cross-species pathogen transmission more likely.<sup>178</sup> Furthermore, domestic animals

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168. Breed, A. C., Field, H. E., Epstein, J. H., & Daszak, P. (2006). Emerging henipaviruses and flying foxes—conservation and management perspectives. *Biological Conservation*, 131(2), 211-220; Harrison, M. E., Cheyne, S. M., Darma, F., Ribowo, D. A., Limin, S. H., & Struebig, M. J. (2011). Hunting of flying foxes and perception of disease risk in Indonesian Borneo. *Biological Conservation*, 144(10), 2441-2449; Latinne, A., Saputro, S., Kalengkongan, J., Kowel, C. L., Gaghiwu, L., Ransaleleh, T. A. et al. (2020). Characterizing and quantifying the wildlife trade network in Sulawesi, Indonesia. *Global Ecology and Conservation*, 21: e00887.

169. Breed, A. C., Field, H. E., Epstein, J. H., & Daszak, P. (2006). Emerging henipaviruses and flying foxes—conservation and management perspectives. *Biological Conservation*, 131(2), 211-220; Harrison, M. E., Cheyne, S. M., Darma, F., Ribowo, D. A., Limin, S. H., & Struebig, M. J. (2011). Hunting of flying foxes and perception of disease risk in Indonesian Borneo. *Biological Conservation*, 144(10), 2441-2449.

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177. Moore, R. S., Cabana, F., & Nekaris, K. A. I. (2015). Factors influencing stereotypic behaviours of animals rescued from Asian animal markets: A slow loris case study. *Applied Animal Behaviour Science*, 166, 131-136.

178. Boseret, G., Losson, B., Mainil, J. G., Thiry, E., & Saegerman, C. (2013). Zoonoses in pet birds: review and perspectives. *Veterinary Research*, 44(1), 1-17; Iskandar, B. S., Iskandar, J., & Partasasmita, R. (2019). Hobby and business on trading birds: Case study in bird market of Sukahaji, Bandung, West Java and Splendid, Malang, East Java (Indonesia). *Biodiversitas Journal of Biological Diversity*, 20(5): 1316-1332.

can serve as intermediate hosts for human transmission of zoonotic pathogens harbored by wildlife. Researchers report that primates, along with bats and rodents, have a higher proportion of zoonotic viruses when compared to other groups of mammals, all of which are commonly sold in wildlife and wet markets in, for example, North Sulawesi.<sup>179</sup>

Psittacosis (parrot fever) is a zoonotic pathogen known to be able to infect many bird species worldwide, including songbirds, parrots, and owls as well as domesticated birds such as chickens and ducks,<sup>180</sup> and it is one of the most threatening zoonotic diseases transmitted by birds to humans and can lead to pneumonia.<sup>181</sup> Bird competitions and fairs, which are popular in Indonesia, can be seen as high-risk events in terms of this zoonotic disease, as breeders from all over the country meet in one location to present their birds. Psittacosis, and other zoonotic pathogens, can also present a risk at breeding facilities as humans work closely with the birds and animals, who tend to be housed in small, overcrowded, mixed-species cages, making them highly sensitive to infections.<sup>182</sup> Captive songbirds are often transported and traded in stressful situations throughout Indonesia, making them more susceptible to infections.<sup>183</sup> However, according to some researchers, only a few songbird species present a danger for zoonotic disease transfer to humans.<sup>184</sup> Other animals kept as pets also pose a risk of zoonotic disease transfer, such as primates,<sup>185</sup> and snakes.<sup>186</sup>

The entertainment industry presents similar challenges as those associated with pet keeping, where humans are in close contact with wildlife. Indonesia currently has 84 registered zoos, however, 54 of them are deemed improper by the government and many more unregistered facilities are operating illegally.<sup>187</sup> Surabaya Zoo is the most notorious wildlife park in the country for its high rate of animal neglect and deaths.<sup>188</sup> Petting zoos have been linked to several zoonotic outbreaks, including infections caused by *Escherichia coli*, salmonellae, and *Coxiella burnetii*.<sup>189</sup>

The cultural places of monkey temples, which are also huge tourist attractions, are similar

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188. Saudale, V. (2015). Ministry: Indonesia Has Only Four Decent Zoos. *Jakarta Globe*. <https://jakartaglobe.id/news/ministry-indonesia-four-decent-zoos/> Accessed on August 3, 2021.
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pressure points for zoonotic disease transmission, with thousands of humans being bitten and/or scratched each year.<sup>190</sup> Researchers predicted the likelihood of a visitor to a Balinese monkey temple becoming infected with simian foamy virus (SFV) is about 6 of every 1,000.<sup>191</sup> Balinese temple workers are also commonly reported to get infected by SFV.<sup>192</sup>

In Indonesia urban performance monkeys known as masked or dancing monkeys (Topeng Monyet) are another known reservoir for several simian viruses that have potential for zoonotic disease transfer.<sup>193</sup> Trainers and handlers of these performance monkeys have ongoing, close contact with these often highly-stressed primates, increasing the risk of zoonotic disease transfer of pathogens such as SFV.<sup>194</sup> Topeng Monyet has now been banned in certain parts of Java.

Finally, the increase in wildlife trade over the internet in Indonesia, along with easier transportation, wildlife and zoonotic pathogens now have the potential to spread many hundreds of miles from their point of sale,<sup>195</sup> driving broader global risks. As the wildlife trade becomes increasingly globalized, pathogens have greater opportunity and occasion to spread to new areas and new hosts across these supply chains.

## REGULATORY APPROACH

### Landscape of Existing Regulation and Policies

Indonesia has a range of regulations and policies addressing the wildlife trade and wildlife markets. Indonesia's main law regarding crimes against wildlife is the Conservation Act No. 5 of 1990 (Act on the Conservation of Biological Resources and their Ecosystems), prohibits catching, injuring, killing, keeping, transporting, and trading (domestically and internationally) protected animals or derivatives thereof.<sup>196</sup> The maximum penalty for violation of this law is five years imprisonment and a fine of up to IDR100 million (~US\$7,000). While Act No. 5 of 1990 is generally considered to be fairly comprehensive and adequate, many recommend that certain sections need to be reviewed and updated.<sup>197</sup> Recommendations feature the inclusion of certain non-native species on the protected species list, increasing the severity of sanctions for violations, introducing minimum penalties and the

190. Jones-Engel, L., May, C. C., Engel, G. A., Steinkraus, K. A., Schillaci, M. A., Fuentes, A. et al. (2008). Diverse contexts of zoonotic transmission of simian foamy viruses in Asia. *Emerging Infectious Diseases*, 14(8), 1200.

191. Engel, G., Hungerford, L. L., Jones-Engel, L., Travis, D., Eberle, R., Fuentes, A. et al. (2006). Risk assessment: a model for predicting cross-species transmission of simian foamy virus from macaques (*M. fascicularis*) to humans at a monkey temple in Bali, Indonesia. *American Journal of Primatology*, 68(9): 934-948.

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194. Jones-Engel L, Engel GA & Schillaci MA (2005) An ethnoprimateological assessment of disease transmission among humans and wild and pet macaques on the Indonesian island of Sulawesi. In: *Commensalism and Conflict: The Primate-Human Interface*. American Society of Primatology Publications, Oklahoma.

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196. Indonesia (1990). Act on the Conservation of Biological Resources and their Ecosystems (Act No. 5 of 1990). Available at: <http://extwprlegs1.fao.org/docs/pdf/ins3867.pdf> [Accessed March 12, 2021].

197. Chng SCL, Eaton JA, Krishnasamy K, Shepherd CR & Nijman V (2015). In the market for extinction: an inventory of Jakarta's bird markets. *Petaling Jaya: TRAFFIC*.

inclusion of wildlife-related cybercrime as a violation.<sup>198</sup> There have been repeated efforts to reform this act and strengthen it, but due to lack of agreement between the Ministry of Environment and Forestry, the government's representatives and the House of Representatives these efforts to update have not yet materialized.<sup>199</sup>

In 2018, an updated and revised protected species list was passed nearly 20 years after the previous list was created (Government Regulation No. 7 of 1999 Concerning the Preservation of Flora and Fauna). The latest version is the P.106/2018 Second Amendment to the Regulation of the Ministry of Environment and Forestry 2018 Concerning Protected Types of Plants and Animals. The new list includes nearly 1,000 species, a large proportion of which are birds.<sup>200</sup>

In 1978, Indonesia acceded to the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES), which entered into force in March 1979.<sup>201</sup> Indonesia's Government Regulation No. 8, 1999 (Concerning the utilization of wild plants and animal species), stipulates that trade of all native, non-protected species, listed on CITES or not, is regulated by a harvest and export quota system. The Regulation of the Ministry of Environment and Forestry No. 447/Kpts-II/2003 regulates the harvest quotas of protected and non-protected species and permits needed.<sup>202</sup> Quotas are recommended annually by Indonesia's Scientific Authority and enacted by Indonesia's Management Authority, except for protected species or those listed under CITES Appendix I, which are prohibited from harvest.<sup>203</sup> Captive breeding of protected and unprotected wildlife species is also regulated under the Government Act No. 8 of 1999 which regulates the wildlife use.<sup>204</sup>

General cybercrime in Indonesia is governed under Act No. 11 of 2008, concerning electronic information and transactions, and to a lesser extent by the Act No. 7 of 2014 about trade, which covers online trade transactions.<sup>205</sup> Although Act No. 11 of 2008 contains specific clauses pertaining to goods prohibited for trade, which could in theory include protected species, it is yet to be applied in wildlife crime cases. One obstacle is that this law mandates certain civil investigators to manage online crime cases; however, the forestry investigators with the technical knowledge needed to pursue and assist in such cases, are not provided with the authority they need.<sup>206</sup>

Indonesia has clear customs regulations per Law Number 17 of 2006 as the amendment of Law Number 10 of 1995 on Customs (ICL).<sup>207</sup> Per this regulation, goods coming from non-exempt countries

198. USAID (2015b). Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context, [https://pdf.usaid.gov/pdf\\_docs/PA00KH4Z.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH4Z.pdf); Gokkon B (2018). Indonesian conservation bill is weak on wildlife crime, critics say. <https://news.mongabay.com/2018/04/indonesian-conservation-bill-is-weak-on-wildlife-crime-critics-say/> [Accessed 4 Aug 2021].

199. Pratama, R. A. (2020) New Indonesian law used to crack down on wildlife smuggling. <https://earthjournalism.net/> Accessed on August 3, 2021.

200. Indonesia (2018). Regulation No. 20 of 2018 Ministry of Environment and Forestry (Types of Protected Plants and Animals). <https://www.informea.org/sites/default/files/legislation/Reg%202018%20Ministry%20of%20Environment%20and%20Forestry%20%28Types%20of%20Protected%20Plants%20and%20Animals%29.pdf> [Accessed August 7, 2021].

201. Soehartono T, Mardiasuti A (2002) CITES – implementation in Indonesia. Nagao Natural Environment Foundation (NEF), Jakarta.

202. Indonesia (2003). Regulation of the Minister of Forestry No. 447/Kpts-II/2003. [http://www.flevin.com/id/lgsa/translations/JICA%20Mirror/english/54\\_FORESTRY\\_%20447.2003\\_final.Eng.QC.html](http://www.flevin.com/id/lgsa/translations/JICA%20Mirror/english/54_FORESTRY_%20447.2003_final.Eng.QC.html) [Accessed August 6, 2021].

203. Chng SCL, Eaton JA, Krishnasamy K, Shepherd CR & Nijman V (2015). In the market for extinction: an inventory of Jakarta's bird markets. Petaling Jaya: TRAFFIC.

204. Nijman, V. and Shepherd, C. R. (2009). Wildlife trade from ASEAN to the EU: Issues with the trade in captive-bred reptiles from Indonesia. TRAFFIC Europe Report for the European Commission, Brussels, Belgium.

205. Gomez L, Shepherd CR and Morgan J (2019a). Revealing the online trade of Sun Bears in Indonesia. TRAFFIC Bulletin, 31(2): 67-71.

206. USAID (2015b). Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context, [https://pdf.usaid.gov/pdf\\_docs/PA00KH4Z.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH4Z.pdf).

207. Deloitte. (2019). Indonesian Customs Guide 2019, Deloitte Touche Solutions, <https://www2.deloitte.com/content/dam/Deloitte/id/Documents/tax/id-tax-indonesian-customs-guide-2019-en.pdf>. Accessed November 28, 2022.



(per free-trade recognition) are subject to review by monitoring agents of the Indonesian Directorate General of Customs and Excise (DGCE) agency. Goods must be declared and import duties and taxes are often collected. These customs laws exist in part to reduce the volume of illegal smuggling into the country.

Indonesia's Quarantine Law, Act No. 21 of 2019, on animals, fish, and plants was created to prevent the spread of pests, diseases and invasive agents.<sup>208</sup> It regulates import and export, and domestic movement of wildlife, which all must be reported to the Quarantine Agency. Requirements include that wildlife entering Indonesian jurisdiction must be accompanied by certificates of veterinary health, sanitation and origin, along with other documentation.<sup>209</sup> This law provides opportunities to regulate and manage issues related to zoonotic disease spread.

The Government Regulation No. 13/1994 regulates the hunting of targeted unprotected wildlife and the Decree 616/Kpts-II/1996 on the control of game hunting and required licensing for hunting.<sup>210</sup> The regulation defines wildlife hunting, hunting areas, seasons, equipment, licenses, and the rights and obligations of hunters, and provides for the establishment of hunting parks.<sup>211</sup>

Markets, where seller and buyer directly meet in one place to trade both for goods and services, are regulated through the Decree of the Ministry of Health No. 519/Menkes/SK/VI/2008 which regulates standard requirements, such as market site, commercial zone, building construction materials, ventilation. The National Standardize Body in 2015 endorses the decree by defining the minimum criterion for healthy markets.<sup>212</sup> Furthermore, the Presidential Decree No. 112 of 2007 and the Ministry of Commerce and Industry Decree No. 70/M- Dag/Per/12/2013 also regulate the operation of markets by regulating their structure and development.

Law No. 18 of 2009 on Husbandry and Animal health serves to protect and improve the quality of animal resources and protect the health or lives of humans, animals, plants and the environment, and to provide legal security to businesses that carry out activities in the field of husbandry and animal health. It stipulates that animals should be free from pain and fear at killing.<sup>213</sup> This law is comprehensive but lacks enforcement mechanisms for the animal welfare provisions.<sup>214</sup> Government Regulation No. 95 of 2012 concerning Veterinary Health and Animal Welfare states the five freedom principles of animal welfare and specifies considerations for good practice, including separating sick from healthy animals, mandating cleanliness, providing food and appropriate medicine according to their physiological needs.<sup>215</sup> Due to the strong link between animal welfare and zoonotic disease control, both Law No. 18/2009 and Regulation No. 95/2012 states that zoonosis control shall be carried out by prioritizing risk management,

208. Indonesia (2019). Law No. 21 of 2019 establishing Animal, Fish and Plant Quarantine. <http://extwprlegs1.fao.org/docs/pdf/ins195061.pdf> [Accessed August 8, 2021].

209. Pratama, R. A. (2020) New Indonesian law used to crack down on wildlife smuggling. <https://earthjournalism.net/> Accessed on August 3, 2021.

210. Indonesia (1994). Government Regulation on Game Hunting Affairs (No. 13 of 1994). <http://extwprlegs1.fao.org/docs/pdf/ins10687.pdf> [Accessed August 4, 2021].

211. [WAP] World Animal Protection (2021). Animal Protection Index – Indonesia. <https://api.worldanimalprotection.org/country/indonesia> Accessed on August 3, 2021.

212. Purnomo, B. S., Sofia, A., Andriana, D., & Apandi, R. N. N. (2016, August). Developing Traditional Market Standard: A Socio-Economics-Environment Approach. In 1st Global Conference on Business, Management and Entrepreneurship (pp. 765-769).

213. Indonesia (2009). Law No. 18/2009 on Husbandry and Animal Health. <http://extwprlegs1.fao.org/docs/pdf/ins98701.pdf> [Accessed August 4, 2021].

214. [WAP] World Animal Protection (2021). Animal Protection Index – Indonesia. <https://api.worldanimalprotection.org/country/indonesia> Accessed on August 3, 2021.

215. Safitri, M. A., & Firman, F. (2021). Animal Welfare and COVID-19 in Indonesia: A Neglected Legal Issue. *Hasanuddin Law Review*, 7(1), 1-11; [WAP] World Animal Protection (2021). Animal Protection Index – Indonesia. <https://api.worldanimalprotection.org/country/indonesia> Accessed on August 3, 2021.

emergency preparedness, zoonosis eradication, and community participation.<sup>216</sup> Regulation on zoonosis control is further mentioned in Presidential Regulation No. 30 of 2011 concerning Zoonoses Control. This Regulation recognizes that to accelerate zoonosis control, comprehensive and integrated steps are required from the central and local governments, business society, professional organizations, non-governmental organizations, universities, international institutions and communities.<sup>217</sup> In addition, the Decree of the Ministry of Agriculture No. 237 of 2019 identifies 15 types of zoonoses that require priority to be controlled, which includes avian influenza, rabies, salmonellosis, leptospirosis, and bovine tuberculosis, but does not include COVID-19.<sup>218</sup> However, in May 2020 the Trade Ministry issued a statement supporting the operation of markets, including limitation of visitor number and encouraging outdoor facilities, while implementing health protocol to prevent further spread of COVID-19.<sup>219</sup>

### Analysis of Application: Efficacy, Barriers to Enforcement and Extra-legal Activities

Although Indonesia has comprehensive national legislation to regulate wildlife trade, both legal and illegal, the implementation and enforcement of the laws are often inadequate.<sup>220</sup> In terms of illegal wildlife trade, law enforcement efforts are continually undermined by numerous challenges such as limited political will, insufficient resources, low capacity, inadequate inter-agency cooperation and a lack of transparency.<sup>221</sup> Consequently, many criminals are drawn to this illicit business because of its high-profit and low-risk profile.<sup>222</sup> Indeed, Indonesian market traders are not fearful of law enforcement encounters, which is evident from the numbers of protected species found in wildlife markets.<sup>223</sup> Nevertheless, from 2015-2019, the number of wildlife crime cases reaching Indonesian courts gradually increased, as too did the severity of the associated penalties,<sup>224</sup> which also coincided with the establishment of the Directorate General of Law Enforcement on Environment and Forestry in 2015. While these figures could indicate that efforts carried out by Indonesian law enforcement officials have improved, the persistence of protected species being traded suggests more still needs to be done.

Even with Indonesia's legal and regulated wildlife trade, many aspects of the trade still operate outside of the law. For example, market traders operate without correct license for trade or business,

216. Safitri, M. A., & Firman, F. (2021). Animal Welfare and COVID-19 in Indonesia: A Neglected Legal Issue. *Hasanuddin Law Review*, 7(1), 1-11.

217. Safitri, M. A., & Firman, F. (2021). Animal Welfare and COVID-19 in Indonesia: A Neglected Legal Issue. *Hasanuddin Law Review*, 7(1), 1-11.

218. Safitri, M. A., & Firman, F. (2021). Animal Welfare and COVID-19 in Indonesia: A Neglected Legal Issue. *Hasanuddin Law Review*, 7(1), 1-11.

219. Atika, S. (2020). Indonesian wet markets carry high risk of virus transmission. *The Jakarta Post*. <https://www.thejakartapost.com/news/2020/06/14/indonesian-traditional-markets-carry-high-risk-of-virus-infection.html> Accessed on August 3, 2021.

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221. USAID (2015b). *Wildlife Trade, Wildlife Crimes and Species Protection in Indonesia: Policy and Legal Context*, [https://pdf.usaid.gov/pdf\\_docs/PA00KH4Z.pdf](https://pdf.usaid.gov/pdf_docs/PA00KH4Z.pdf); Freund, C., Rahman, E., & Knott, C. (2017). Ten years of orangutan-related wildlife crime investigation in West Kalimantan, Indonesia. *American Journal of Primatology*, 79(11), 22620.

222. UNODC (2017). *Enhancing the Detection, Investigation and Disruption of Illicit Financial Flows from Wildlife Crime*. Vienna: United Nations.

223. Pires, S. F., Olah, G., Nandika, D., Agustina, D., & Heinsohn, R. (2021). What drives the illegal parrot trade? Applying a criminological model to market and seizure data in Indonesia. *Biological Conservation*, 257, 109098.

224. Aprilia, E., O. Saiful, F. Pareke, M. Hamzah, V. Sabilar, and K. Sanchez. 2019. Combating wildlife crime in Indonesia: building judicial capacity through in-house training workshops to improve the implementation of the law. Presented at Asia for Animals Symposium, Dalian, China; GAKKUM (2019). *Laporan Kinerja 2019*. Direktorat Jenderal Penegakan Hukum Kementerian Lingkungan Hidup dan Kehutanan; [IARI] International Animal Rescue Indonesia (2020). *Potret Penegakan Hukum Perdagangan Ilegal Satwa Liar*. INTENSI Magazine, November 2020. ISSN 2747-1446.

quarantine certificates and other necessary paperwork.<sup>225</sup> wild animals may be harvested in numbers that exceed the designated quota or wild-caught animals are laundered through captive breeding farms where they are passed off as captive bred animals.<sup>226</sup>

Lack of knowledge about legislation may also have an effect on hunting and trade of protected species. For example in Papua, 90% of the hunters claimed they were unaware of any legislation governing the protection of wild animals.<sup>227</sup> Given the lack of awareness about wildlife legislation, the lack of enforcement of the laws, and lenient verdicts it is not surprising that hunting and trade of protected animals continues to grow.<sup>228</sup>

The Conservation Act No. 5 of 1990 stipulates a maximum prison sentence of five years and a maximum fine of IDR100 million. However, maximum fines and imprisonment are rarely applied and there are no minimum fines or imprisonment sentences, which sets Indonesia apart from many other countries.<sup>229</sup> Based on an analysis of 803 court cases involving wildlife crime between January 2015 and August 2020, International Animal Rescue Indonesia (IARI) found that the average recommendation or demand put forward by prosecutors was 14 months imprisonment, whereas the final decision for sentencing handed out by the judges was 11 months.<sup>230</sup> Similarly, with regards to fines, prosecutors only demanded on average 22% of the maximum fine available. In addition, Act No. 5 of 1990 does not stipulate any allocation of national funds for the purposes of protecting wildlife and habitat.<sup>231</sup>

The relatively new Quarantine Law, Act No. 21 of 2019 is more powerful than its predecessor in the prosecution of wildlife crimes and sets high sentences, with a maximum jail term of 10 years and fines of up to IDR10 billion (~US\$700,000).<sup>232</sup> This law allows for prosecution of organized criminal gangs, which was not possible under Act No. 5 of 1990, however the new law's application is limited and difficult to be implemented in cases involving the online trade or wildlife killing.<sup>233</sup>

Presidential Regulation Number 30 of 2011 concerning Zoonoses Control warns Indonesia of animal diseases that can naturally be transmitted to humans, or vice versa, and recommends collaboration between national and local governments, businesses, non-government organizations, and universities. Furthermore, in 2019, Indonesia's president signed the Presidential Instruction (Inpres) Number 4 of 2019 on Capacity Enhancement in Preventing, Detecting, and Responding to Outbreaks of Disease, Global Pandemic and Nuclear, Biological and Chemical Emergencies. This Instruction was

225. Miller, A. E., Gary, D., Ansyah, J., Sagita, N., Muflihati, Kartikawati, & Adirahmanta, S. N. (2019). Socioeconomic Characteristics of Songbird Shop Owners in West Kalimantan, Indonesia. *Tropical Conservation Science*, 12, 1940082919889510.

226. Morgan, J. (2018). Slow and steady: The global footprint of Jakarta's tortoise and freshwater turtle trade. Petaling Jaya, Malaysia: TRAFFIC Southeast Asia Regional Office; Nijman V, Shepherd CR, Mumpuni & Sanders KL (2012) Over-exploitation and illegal trade of reptiles in Indonesia. *Herpetological Journal* 22: 83–89.

227. Pangau-Adam, M., & Noske, R. (2012). Wildlife hunting and bird trade in northern Papua (Irian Jaya), Indonesia. In *Ethno-ornithology* (pp. 95-108). Routledge.

228. Pangau-Adam, M., & Noske, R. (2012). Wildlife hunting and bird trade in northern Papua (Irian Jaya), Indonesia. In *Ethno-ornithology* (pp. 95-108). Routledge; Pratama, R. A. (2020) New Indonesian law used to crack down on wildlife smuggling. <https://earthjournalism.net/> Accessed on August 3, 2021.

229. Pascual, M., Wingard, J., Bhatri, N., Rydannykh, A., & Phelps, J. (2021). Building a global taxonomy of wildlife offenses. *Conservation Biology*. Online First.

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231. Apriyani, L., AR, F. Y., & Erwandi, M. (2018). Comparison of Wildlife Protection Law between Indonesia and the United States. *Hasanuddin Law Review*, 4(2), 181-193.

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233. Pratama, R. A. (2020) New Indonesian law used to crack down on wildlife smuggling. <https://earthjournalism.net/> Accessed on August 3, 2021.

meant to improve the country's ability to manage public health emergencies.<sup>234</sup> But the Indonesian Government was late in declaring COVID-19 as a zoonotic pandemic, and COVID-19 has not been included in the zoonosis priority list and consequently regulatory instruments related to zoonosis cannot be implemented. Indonesia is urged to prepare a better legal framework to anticipate the problem of zoonotic prevention and control.<sup>235</sup>

## PROSPECTIVE REFORM

### Effects of COVID-19 on the Wildlife Trade

Although globally the COVID-19 pandemic seems to have impacted consumer decisions and reduced the demand for wildlife due to the well-advertised link between COVID-19 and wildlife trade, this has not been the case in Indonesia. The aftermath of the avian influenza in 2005 saw a decline in wildlife markets throughout Indonesia and restriction on the international bird trade due to the fear of zoonotic disease risks.<sup>236</sup> In Indonesia, several COVID-19 clusters have emanated from markets, so in early 2020 the Indonesian Traditional Market Traders Association issued a health protocol for markets, with guidelines on routine disinfection, distance between stalls, and barriers between customers and vendors, as well as body temperature checks.<sup>237</sup> But even in the midst of the pandemic, markets remain frequently bustling, as wildlife markets have an important place in the daily lives of millions of Indonesians.<sup>238</sup>

Despite efforts from the Ministry of Environment and Forestry to try to convince local officials to close wildlife markets around the country since the start of the pandemic, most markets have seemingly continued to operate unaffected by the current COVID-19 pandemic, and in many markets the conditions wild and domestic animals are kept in remains the same as before COVID-19 spread.<sup>239</sup> Officials in the city of Solo in Central Java did take note of the warnings and ordered the culling of hundreds of bats at Depok, one of the country's largest bird and wildlife markets. But shortly afterwards the market returned to business as usual.<sup>240</sup> In Central Java market stalls were moved to roadsides, with safe distance in between, this was, however, not possible in Jakarta due to the sheer amount of market stalls.<sup>241</sup> The responses and attitudes to zoonotic transmission by some Indonesian cultures have become apparent

234. Cabinet Secretariat of the Republic of Indonesia. (2019). Presidential Instruction (Inpres) Number 4 of 2019 on Capacity Enhancement in Preventing, Detecting, and Responding to Outbreaks of Disease, Global Pandemic and Nuclear, Biological and Chemical Emergencies. Translated by Ridwan Ibadurrohman. <https://setkab.go.id/en/govt-issues-regulation-to-combat-disease-outbreak/>. Accessed November 28, 2022.

235. Safitri, M. A., & Firman, F. (2021). Animal Welfare and COVID-19 in Indonesia: A Neglected Legal Issue. *Hasanuddin Law Review*, 7(1), 1-11.

236. Shepherd, C. R. (2006). The bird trade in Medan, North Sumatra: an overview. *BirdingASIA*, 5(2006), 16-24; Shepherd, C. R. (2010). Illegal primate trade in Indonesia exemplified by surveys carried out over a decade in North Sumatra. *Endangered Species Research*, 11(3), 201-205.

237. Atika, S. (2020). Indonesian wet markets carry high risk of virus transmission. *The Jakarta Post*. <https://www.thejakartapost.com/news/2020/06/14/indonesian-traditional-markets-carry-high-risk-of-virus-infection.html> Accessed on August 3, 2021.

238. Atika, S. (2020). Indonesian wet markets carry high risk of virus transmission. *The Jakarta Post*. <https://www.thejakartapost.com/news/2020/06/14/indonesian-traditional-markets-carry-high-risk-of-virus-infection.html> Accessed on August 3, 2021.

239. Atika, S. (2020). Indonesian wet markets carry high risk of virus transmission. *The Jakarta Post*. <https://www.thejakartapost.com/news/2020/06/14/indonesian-traditional-markets-carry-high-risk-of-virus-infection.html> Accessed on August 3, 2021; Ng K (2020). Indonesia markets continue to sell reptiles, rabbits and birds in filthy cages despite coronavirus - Independent. <https://www.independent.co.uk/climate-change/news/stop-wildlife-trade-peta-indonesia-market-reptiles-rabbits-birds-cages-coronavirus-a9524291.html> [Accessed July 25, 2021]; Paddock RC and Sijabat DM (2020). Where Bats Are Still on the Menu, if No Longer the Best Seller - *The New York Times*. <https://www.nytimes.com/2020/05/13/world/asia/coronavirus-bats-market-Indonesia.html> [Accessed on July 25, 2020]; Dalton J (2021). Covid: Indonesian markets discovered slaughtering and selling live bats, rats and dogs - Independent. <https://www.independent.co.uk/asia/southeast-asia/covid-indonesia-wet-markets-bats-dogs-b1880750.html> [Accessed on July 25, 2021]; Neubauer, I. L. (2021). COVID or not, 'the desire to eat wildlife' continues in Asia. *Aljazeera*. <https://www.aljazeera.com/news/2021/7/13/bats-bushmeat-still-available-at-asian-markets-despite-suspected> on Accessed on August 3, 2021.

240. Neubauer, I. L. (2021). COVID or not, 'the desire to eat wildlife' continues in Asia. *Aljazeera*. <https://www.aljazeera.com/news/2021/7/13/bats-bushmeat-still-available-at-asian-markets-despite-suspected> on Accessed on August 3, 2021.

241. Atika, S. (2020). Indonesian wet markets carry high risk of virus transmission. *The Jakarta Post*. <https://www.thejakartapost.com/news/2020/06/14/indonesian-traditional-markets-carry-high-risk-of-virus-infection.html> Accessed on August 3, 2021.



in relation to the COVID-19 pandemic. For example, Dayak hunters in Borneo associate COVID-19 with technology and modern life, as they believe the disease travels by plane and impacts urban areas rather than the forests in which they live.<sup>242</sup> Similar reactions were observed in relation to the avian influenza, when Indonesian bird traders were not convinced that influenza even existed, but rather had numerous theories about the virus and its spread,<sup>243</sup> such as songbird competitors from abroad had concocted avian influenza as a rumor, and therefore it was not considered a health threat to the owners and traders.

In an effort to contain the spread of COVID-19, Indonesia did implement lockdowns, travel restrictions, and trade suspensions in 2020, all which may be assumed to help reduce the illegal wildlife trade. USAID did report a decline in such trade as measured by on-the-ground activity. But at the same time, digital advertisements and online trade through social media platforms increased, indicating that traffickers found new ways to connect with potential buyers.<sup>244</sup>

Although online wildlife trade is extremely popular in Indonesia, it did not receive the same call for bans as the physical market places around the world. Researchers found that on Indonesian Facebook groups, of people involved in the trade of wild pets, the connection between zoonosis and trade were only limitedly discussed, despite the vast media coverage relating to COVID-19 and calls for wildlife market bans.<sup>245</sup> Discussions on Facebook instead mainly concerned the maintenance of sales and delivery service due to the pandemic, rather than the risk of wildlife trade aiding the spread of zoonotic diseases. In addition, there were many comments stating people were not afraid of the virus and encouraging others to not be afraid.<sup>246</sup>

## Large-Scale Trends

In Asia, rapid developments of infrastructure are likely to assist criminal groups to access areas which were previously inaccessible.<sup>247</sup> Improvement of communications, connectivity, better infrastructure, and the opening up of wild habitat through, for example, illegal logging facilitates the growth and expansion of wildlife trade.<sup>248</sup>

Overall, wild meat consumption, pet keeping and use for traditional medicine are key drivers for the rampant illegal wildlife trade worldwide.<sup>249</sup> Wild meat has long been a staple of rural communities

242. Thung P.H. 2020. Why Education about Zoonotic Diseases Is Not Reducing Hunting, a View from Rural Borneo, POKOK: Using Anthropology to Mitigate Orangutan Killing and Human-Orangutan Conflict in Borneo. <https://pokokborneo.wordpress.com/blog/>.

243. Shepherd, C. R., Leupen, B. T., Siriwat, P., & Nijman, V. (2020b). International wildlife trade, avian influenza, organised crime and the effectiveness of CITES: The Chinese hwamei as a case study. *Global Ecology and Conservation*, 23, e01185.

244. Abano, Imelda. (June 1, 2021). "Wildlife trafficking, like everything else, has gone online during COVID-19." Mongabay News, <https://news.mongabay.com/2021/06/wildlife-trafficking-like-everything-else-has-gone-online-during-covid-19/>, accessed November 28, 2022.

245. Morcatty, T. Q., Feddema, K., Nekar, K. A. I., & Nijman, V. (2021). Online trade in wildlife and the lack of response to COVID-19. *Environmental Research*, 193, 110439.

246. Morcatty, T. Q., Feddema, K., Nekar, K. A. I., & Nijman, V. (2021). Online trade in wildlife and the lack of response to COVID-19. *Environmental Research*, 193, 110439.

247. Shepherd CR, Compton J & Warne S (2007). Transport infrastructure and wildlife trade conduits in the GMS: regulating illegal and unsustainable wildlife trade. Biodiversity Conservation Corridors Initiative; International Symposium Proceedings 27–28 April 2006. Bangkok, Thailand: Asia Development Bank.

248. TRAFFIC (2008). What's Driving the Wildlife Trade? A Review of Expert Opinion on Economic and Social Drivers of the Wildlife Trade and Trade Control Efforts in Cambodia, Indonesia, Lao PDR, and Vietnam. East Asia and Pacific Region Sustainable Development Discussion Papers. East Asia and Pacific Region Sustainable Development Department, World Bank, Washington, DC.; Pattiselanno, F., Lloyd, J. K., Sayer, J., Boedhihartono, A. K., & Arobaya, A. Y. (2020). Wild Meat Trade Chain on the Bird's Head Peninsula of West Papua Province, Indonesia. *Journal of Ethnobiology*, 40(2), 202-217.

249. Nijman, V., & Bergin, D. (2017). Reptiles traded in markets for medicinal purposes in contemporary Morocco. *Contributions to Zoology*, 86(1), 39-50; D'Cruze, N., Khan, S., Carder, G., Megson, D., Coulthard, E., Norrey, J., & Groves, G. (2019). A global review of animal–visitor interactions in modern zoos and aquariums and their implications for wild animal welfare. *Animals*, 9(6), 332; Stanford, C. B., Iverson, J. B., Rhodin, A. G., van Dijk, P. P., Mittermeier, R. A., Kuchling, G., ... & Walde, A. D. (2020). Turtles and tortoises are in trouble. *Current Biology*, 30(12), R721-R735.

across Indonesia, but with the development of commercial networks wild meat is increasingly being transported from forests to urban areas. This market-oriented hunting may increase hunters' dependence on trading and the number of stakeholders involved.<sup>250</sup> Furthermore, wild meat harvest rates may be affected as modern techniques are used to increase the efficiency of hunting to meet the increasing market demand,<sup>251</sup> It is also possible that greater availability of wildlife and wildlife products for sale increase the number of buyers and quantities purchased, further feeding the loop.

Traditionally, the demand for wild and exotic pet keeping (except for bird keeping) had not represented a big proportion of the wildlife trade in Asia, but this trade has experienced a rapid growth in the past years.<sup>252</sup> The internet has made it easier for private individuals to also become sellers, making physical shops less necessary to conduct the trade, and creating opportunities to forgo any regulations.<sup>253</sup> Innovatively, exotic animal cafes are growing in popularity throughout Asia, and have the potential to severely increase the demand of exotic and wild pets, as well as has associated issues of animal welfare,<sup>254</sup> zoonotic disease transmission,<sup>255</sup> and introduction of non-native species due to pet releases or escapes.<sup>256</sup> Over 250 exotic species are known to occur in animal cafes across Asia, including mammals, birds, and reptiles.<sup>257</sup>

Indonesia also faces increasing demand to supply the international wildlife trade. For example, high demand for pangolins, leading to the depletion of the Indochina pangolin species, has meant traders are moving on to countries such as Malaysia and Indonesia to source and trade them.<sup>258</sup> It is also important to notice the large number of marine animal species traded for ornamental purposes, both internationally and within Indonesia.<sup>259</sup> The commercial value of marine animals in the international pet trade is very high, and the popularity of aquarium keeping has annually been increasing globally.<sup>260</sup> Similarly, snake pets have gained popularity all over the world, as well as in Indonesia, with many common pet snake species occurring in Indonesia. Most snake owners in Indonesia are young adults

250. McNamara, J., Rowcliffe, M., Cowlshaw, G., Alexander, J. S., Ntiama-Baidu, Y., Brenya, A., & Milner-Gulland, E. J. (2016). Characterising wildlife trade market supply-demand dynamics. *PloS one*, 11(9), e0162972; Pattiselanno, F., Lloyd, J. K., Sayer, J., Boedihartono, A. K., & Arobaya, A. Y. (2020). Wild Meat Trade Chain on the Bird's Head Peninsula of West Papua Province, Indonesia. *Journal of Ethnobiology*, 40(2), 202-217.

251. Pattiselanno, F., Lloyd, J. K., Sayer, J., Boedihartono, A. K., & Arobaya, A. Y. (2020). Wild Meat Trade Chain on the Bird's Head Peninsula of West Papua Province, Indonesia. *Journal of Ethnobiology*, 40(2), 202-217.

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253. Kusriani, M., Palesa, S. P., & Masy'ud, B. (2021). Snake pet ownership in the city: A case study in Greater Jakarta, Indonesia. *Biodiversitas Journal of Biological Diversity*, 22(4).

254. D'Cruze, N., Khan, S., Carder, G., Megson, D., Coulthard, E., Norrey, J., & Groves, G. (2019). A global review of animal–visitor interactions in modern zoos and aquariums and their implications for wild animal welfare. *Animals*, 9(6), 332; McMillan, S. E., Dingle, C., Allcock, J. A., & Bonebrake, T. C. (2021). Exotic animal cafes are increasingly home to threatened biodiversity. *Conservation Letters*, 14(1), e12760.

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256. Lockwood, J.L., Welbourne, D.J., Romagosa, C.M., Cassey, P., Mandrak, N.E., Strecker, A. et al. (2019). When pets become pests: the role of the exotic pet trade in producing invasive vertebrate animals. *Frontiers in Ecology and the Environment*, 17(6), pp.323-330.

257. McMillan, S. E., Dingle, C., Allcock, J. A., & Bonebrake, T. C. (2021). Exotic animal cafes are increasingly home to threatened biodiversity. *Conservation Letters*, 14(1), e12760.

258. Semiadi, G., Darnaedi, D. and Arief, A.J. (2009). Sunda Pangolin *Manis javanica* conservation in Indonesia: status and problems. In: Pantel, S. and Chin, S.Y. (Eds). Proceedings of the workshop on trade and conservation of pangolins native to South and Southeast Asia: 30 June–2 July 2008, Singapore Zoo. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia.

259. Akmal, S. G., Zámečníková-Wanma, B. P., Prabowo, R. E., Khatami, A. M., Novák, J., Petrtyl, M., ... & Lalèyè, P. A. (2020). Marine ornamental trade in Indonesia. *Aquat. Living Resour*, 33, 25.

260. Akmal, S. G., Zámečníková-Wanma, B. P., Prabowo, R. E., Khatami, A. M., Novák, J., Petrtyl, M., ... & Lalèyè, P. A. (2020). Marine ornamental trade in Indonesia. *Aquat. Living Resour*, 33, 25.

and their motivation to keep snakes comes mostly from them being influenced by peers, exhibitions and social media. The pet snake is expected to increase even further in the near future, especially in Jakarta and surrounding areas.<sup>261</sup> Expansion of global wildlife trade in and out of Indonesia magnifies the risk of zoonotic disease spread.

## Proposed Reforms

Reforms necessary to mitigate the risk of zoonotic disease arising from Indonesian wildlife markets need to be multifaceted and coordinated, enhancing multi-agency collaboration and entailing different sectors of the society.<sup>262</sup> Primarily, the application of a One Health approach should be strengthened, and meaningful resources allocated to ensure that the health of humans, wildlife and livestock, as well as the environment are considered together.<sup>263</sup> An effective step to minimizing the risk of zoonoses and future pandemics in Indonesia would be to follow China's example and put a complete ban on the sale and consumption of high-risk wildlife species, or to ensure closer control of the trade in high-risk species.<sup>264</sup> Of equal importance is to enforce safe and hygienic practices across wildlife markets and restaurants selling wild meat.<sup>265</sup> Current enforcement and monitoring of these kinds of practices are however limited as regional networks and national agencies in Indonesia are severely underfunded.<sup>266</sup> This makes it of utmost importance to identify locations and species with underlying high zoonotic potential, so that the law enforcement, the application of hygienic rigor and viral testing of humans and animals can be carried out more efficiently. As interspecies and intraspecies mixing of live wildlife, and heightened stress levels due to the poor conditions in which they are kept can compromise immune system responses and increase zoonotic and epizootic disease transmission risk, the improvement of welfare and housing conditions in Indonesian markets would decrease this risk.<sup>267</sup>

Transmission risks of zoonosis disease can occur throughout the wildlife trade supply chain,<sup>268</sup> and improving information and education amongst the various actors involved about zoonotic diseases transmission routes is therefore vital.<sup>269</sup> A longer-term goal would be to reduce consumer demand for high-risk wildlife species and products and to decrease demand in black markets

261. Kusriani, M., Palesa, S. P., & Masy'ud, B. (2021). Snake pet ownership in the city: A case study in Greater Jakarta, Indonesia. *Biodiversitas Journal of Biological Diversity*, 22(4).

262. Aguirre, A. A., Catherina, R., Frye, H., & Shelley, L. (2020). Illicit wildlife trade, wet markets, and Covid-19: preventing future pandemics. *World Medical & Health Policy*, 12(3), 256-265; Wu, T. (2021). The socioeconomic and environmental drivers of the COVID-19 pandemic: A review. *Ambio*, 50, 822-833.

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264. Engel K & Ziegler S (2020). Pandora's Box: a report on the human zoonotic disease risk in Southeast Asia with a focus on wildlife markets. WWF Deutschland

265. Peiris, J. M., Cowling, B. J., Wu, J. T., Feng, L., Guan, Y., Yu, H., & Leung, G. M. (2016). Interventions to reduce zoonotic and pandemic risks from avian influenza in Asia. *The Lancet Infectious Diseases*, 16(2), 252-258.

266. Dobson, A. P., Pimm, S. L., Hannah, L., Kaufman, L., Ahumada, J. A., Ando, A. W., et al. (2020). Ecology and economics for pandemic prevention. *Science*, 369(6502), 379-381.

267. Woo, P. C., Lau, S. K., & Yuen, K. Y. (2006). Infectious diseases emerging from Chinese wet-markets: zoonotic origins of severe respiratory viral infections. *Current Opinion in Infectious Diseases*, 19(5), 401; Breed, A. C., Field, H. E., Epstein, J. H., & Daszak, P. (2006). Emerging henipaviruses and flying foxes—conservation and management perspectives. *Biological Conservation*, 131(2), 211-220.

268. Dobson, A. P., Pimm, S. L., Hannah, L., Kaufman, L., Ahumada, J. A., Ando, A. W., et al. (2020). Ecology and economics for pandemic prevention. *Science*, 369(6502), 379-381.

269. Peiris, J. M., Cowling, B. J., Wu, J. T., Feng, L., Guan, Y., Yu, H., & Leung, G. M. (2016). Interventions to reduce zoonotic and pandemic risks from avian influenza in Asia. *The Lancet Infectious Diseases*, 16(2), 252-258.

by undertaking behavioral change campaigns with regards to wildlife use.<sup>270</sup> Throughout Asia, numerous cultures hold the belief that wild animals and their derivatives have healing powers or that the eating of rare animals is a symbol of wealth.<sup>271</sup> Some researchers also point out the difficulty of overcoming the long-standing and widespread cultural belief that bat meat has medicinal properties which ensures people keep consuming bat meat despite it being high-risk taxa.<sup>272</sup> To effectively mitigate the risks posed by the wildlife trade and control disease transmission it will require an overall change in mentality and behavior throughout Indonesian society. The engagement of trusted, local educators or leaders will be essential to spark awareness and promote the required behavioral changes.<sup>273</sup> Greater awareness and education is needed in rural areas, where the hunting and processing of wildlife occurs, and for people handling, transporting and selling wildlife. However, care has to be taken, as educational messages or campaigns focusing on wildlife trade and the zoonotic risks can prove ineffective, since most people involved in wildlife trade have worked closely with animals and consumed wild meat for a long time and might not personally see a link between contact and disease.<sup>274</sup> Notwithstanding, some well-designed campaigns and the use of incentives can be successful in influencing people to reject the consumption and use of wildlife. In China, for example, campaigns during the COVID-19 pandemic had a positive impact on peoples' attitude toward organic food as opposed to wild meat.<sup>275</sup> In general, the impact on younger generations tended to be larger, as younger generations are more adaptable to change in behavior and diet, compared to older generations.<sup>276</sup>

According to the Institute for Economics and Finance, the COVID-19 pandemic is estimated to have led to a loss of up to IDR127 trillion (nearly US\$9 billion) to the Indonesian economy.<sup>277</sup> The pandemic has caused huge economic and social costs in Indonesia: between February 2020 and 2021 about 1.8 million people became unemployed and 2.8 million people ended up under the poverty line.<sup>278</sup> Now more than ever it is of paramount importance to encourage and facilitate the development of alternative forms of income generation, which can aid in reducing hunting pressure on wildlife and the risk of zoonotic disease transmission.<sup>279</sup> In Indonesia, alternatives to boost and/or diversify income and reduce the need to supplement earnings by selling wildlife could include: improving local agriculture

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271. Aguirre, A. A., Catherina, R., Frye, H., & Shelley, L. (2020). Illicit wildlife trade, wet markets, and Covid-19: preventing future pandemics. *World Medical & Health Policy*, 12(3), 256-265; Daszak, P., Olival, K. J., & Li, H. (2020). A strategy to prevent future epidemics similar to the 2019-nCoV outbreak. *Biosafety and Health*, 2(1): 6-8.

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274. Saylor, K. E., Mouiche, M. M., Lucas, A., McIver, D. J., Matsida, A., Clary, C., ... & Tamoufe, U. (2021). Market characteristics and zoonotic disease risk perception in Cameroon bushmeat markets. *Social Science & Medicine*, 268, 113358.

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278. World Bank (2021). Indonesia Economic Prospects: Boosting the Recovery. Report available online at: <https://www.worldbank.org/en/country/indonesia/publication/indonesia-economic-prospects-iej-june-2021-boosting-the-recovery>. Accessed August 6, 2021.

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productivity, organic farming, ecotourism, craft work, agroforestry and non-meat and non-timber forest product collection and processing.<sup>280</sup> The potential for success of alternative livelihood programs is aligned with the level of engagement and sense of ownership the communities have, and how well-designed the projects are at a technical and social level.<sup>281</sup> It is important to note that replacing wildlife hunting with increased livestock production may also generate additional risks of zoonotic disease spread. For instance, most confirmed human infections of the avian influenza have originated from poultry and pigs, which can also serve as intermediate hosts of zoonotic transmission for influenza and other viruses.<sup>282</sup>

The captive breeding of wild animal species is often carried out with the intention of reducing pressure on wild species,<sup>283</sup> but unless properly regulated and monitored, it has the potential to be an enabler of illegal trade through the laundering of wild-caught and sometimes protected animals.<sup>284</sup> Captive-breeding facilities also have the potential to be high-risk locations for zoonosis transmission.<sup>285</sup> Therefore, closer controls of captive breeding, as well as stricter monitoring of harvest and export quotas are needed.<sup>286</sup>

Regulations and monitoring of both legal and illegal wildlife trade needs to be improved, as does disease surveillance, laboratory diagnostics, outbreak reporting, and investigation techniques.<sup>287</sup> Training of food and veterinary inspectors in the compliance and enforcement of new regulations would be beneficial in reducing the risk of zoonotic disease transmission.<sup>288</sup> In March 2020, the Indonesian Public Health

Association encouraged the Indonesian government to promote public health and safety by facilitating more education and surveillance in regards to COVID-19 and other zoonotic pathogens.<sup>289</sup>

To improve regulation of the legal wildlife trade, closer monitoring of a wider spectrum of legislation could be undertaken, such as the checking of business permits and taxation. More than two thirds of all businesses trading songbirds during surveys in West Kalimantan were lacking permits to operate legally and could be closed down.<sup>290</sup>

Wildlife crime needs to be recognized as a serious crime that can lead to devastating impacts on the environment, livelihoods, government stability, national security and public health. Indonesia's

280. Van Vliet, N. (2000). Livelihood alternatives for the unsustainable use of bushmeat. Secretariat of the Convention on Biological Diversity; Saylor, K. E., Mouiche, M. M., Lucas, A., Mclver, D. J., Matsida, A., Clary, C., ... & Tamoufe, U. (2021). Market characteristics and zoonotic disease risk perception in Cameroon bushmeat markets. *Social Science & Medicine*, 268, 113358; IARI Unpublished (*need citation*)

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288. Buheji, M. (2020). Stopping future COVID-19 like pandemics from the Source-A Socio-Economic Perspective. *Am. J. Econ*, 10(3), 115-125.

289. Djalante, R., Lassa, J., Setiamarga, D., Sudjatma, A., Indrawan, M., Haryanto, B., ... & Warsilah, H. (2020). Review and analysis of current responses to COVID-19 in Indonesia: Period of January to March 2020. *Progress in Disaster Science*, 6, 100091.

290. Miller, A. E., Gary, D., ansyah, J., Sagita, N., Muflihati, Kartikawati, & Adirahmanta, S. N. (2019). Socioeconomic Characteristics of Songbird Shop Owners in West Kalimantan, Indonesia. *Tropical Conservation Science*, 12, 1940082919889510.

existing legal framework needs to be strengthened and the implementation of the law needs to be improved. Indonesia's main Conservation Law, Act No.5 1990 needs to be reviewed and updated. Inconsistencies and legal loopholes that avert successful prosecutions and facilitate traders in their illegal activities need to be addressed. Sentencing guidelines in the Act should be upgraded and include minimum sentences. The inclusion of cybercrime in the law to help deal with the rising threat from online trafficking. Capacity building of law enforcement officials, the judiciary, and other relevant agencies should be carried out to ensure the effective and efficient implementation of the law.

The illegal wildlife trade is a complex issue and therefore engagement and commitment from a wide range of stakeholders from different sectors is necessary. Better collaboration with media in regards to coverage of prosecution of wildlife trade cases would assist in raising awareness and educate the public regarding the legislation and penalties.<sup>291</sup> Illegal wildlife trade is often closely associated with a range of other crimes, including money laundering, bribery and corruption. Increased use of the multi-door approach in prosecution cases, which is a legal approach that relies on using various laws to ensnare perpetrators of criminal acts in the environmental field, would help to maximize punishments handed out and contribute to the deterrent effect.

## CONCLUSIONS

Indonesia's delay in responding to the COVID-19 health crisis has been costly for human health and for the economy.<sup>292</sup> The COVID-19 pandemic has hit Indonesia hard and attention is urgently needed to halt the disease spread, as well as prevent further such events. However, when the world's attention is directed to immediate reactive responses to save lives, limited attention has so far been given to proactive measures in order to prevent future epidemics and pandemics.

The strong cultural importance of wildlife markets, the traditional consumption and use of wildlife and the rampant popularity of Indonesia's pet trade presents many risk factors for the emergence and transmission of zoonoses, throughout the supply chain of wildlife. Additionally, the widespread beliefs of wildlife having medicinal power and/or giving social and economic status, and the vast cultural variation within the country pose further challenges for awareness raising campaigns. With 17,508 islands from which 6,000 are inhabited, Indonesia's borders are hard to control in regards to wildlife trade, both at domestic levels between islands and also the smuggling and export to international destinations. Furthermore, given the several forms of the wildlife trade that are present in Indonesia, the complex array of cultural, social and economical of drivers, and the multitude of species trafficked and legally traded, a holistic, coordinated and multi-faceted approach will be needed to effectively contain and prevent zoonoses from spreading.

Wildlife markets and trade have not ceased to occur in Indonesia during this health crisis. To see a significant change in the number of wild animals being hunted and traded every year, and consequently reduce the risk of zoonotic disease transmission, we - civil society, governments and multiple partners –

291. Gomez, L., & Shepherd, C. R. (2021). The illegal exploitation of the Javan Leopard (*Panthera pardus melas*) and Sunda Clouded Leopard (*Neofelis diardi*) in Indonesia. *Nature Conservation*, 43, 25.

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need to collaboratively work for market reforms and adoption of healthier standards in the supply chain of animal products. Whereas physical animal markets have been highlighted as a major hotspot for the emergence and spread of zoonosis, no less attention should be afforded to the international trade and online wildlife trade.

Most importantly, a longer-term strategy based on the One Health approach and behavioral change principles should be implemented if we are to truly prevent future pandemics. Successful reforms and action plans will require addressing the root causes and drivers of disease emergence, which in turn will require changing our behavior and our actions in relation to ecosystems. Overall, the successful control of zoonoses will require strong policy frameworks, judicious legal mechanisms, well-functioning institutions, and a clear plan for implementing interventions.