MONITORING THE SPREAD OF EXOTIC TRANSBOUNDARY ANIMAL DISEASES IN THE REGION

Reporting Period: July 2023 – June 2024

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1. Background

Transboundary animal biosecurity encompasses a range of measures and actions aimed at preventing the spread of animal diseases across international borders. These efforts, coordinated by governments, international organizations, and stakeholders, are crucial for minimizing the risks associated with the introduction, transmission, and establishment of animal diseases. This is essential due to the significant economic, social, and public health consequences that can result from their proliferation. At its core, transboundary animal biosecurity is about protecting animal health, preventing disease spread, and ensuring the integrity of international trade in animals and animal products. It plays a pivotal role in upholding global food security, safeguarding public health, and supporting the economies of nations reliant on livestock and related industries.

Continuous monitoring of exotic transboundary animal diseases, particularly in trading partner countries, is paramount for several reasons. This ongoing surveillance, coupled with the enforcement of biosecurity protocols and quarantine requirements, serves to thwart disease introduction and spread. Early detection facilitates swift response measures, thereby minimizing adverse impacts on animals, public health, and the economy. Furthermore, surveillance data aids in risk assessment, enabling targeted preventive measures to be implemented promptly. By promptly identifying threats and implementing necessary biosecurity measures and public awareness campaigns, transboundary biosecurity risk can be effectively mitigated.

The Bhutan Food and Drug Authority (BFDA) has been at the forefront implementing animal biosecurity measures in international trade involving animals and animal products. Its approach involves a multi-layered strategy, comprising complementary measures applied across the entire biosecurity continuum at pre-border, border, and post-border points.

Pre-border measures focus on preventing biosecurity hazards from entering Bhutan by conducting import risk assessments, establishing certification requirements, conducting audits, and gathering intelligence. Border activities involve thorough import inspections to ensure compliance with stipulated import prerequisites, with animals, products, and vehicles subjected to thorough scrutiny. Additionally, a mandatory post-arrival quarantine is enforced for live animals.

Following the release of animals and animal products into the country, post-border biosecurity measures, such as monitoring and surveillance for exotic diseases, are implemented in collaboration with other relevant stakeholders to maintain biosecurity standards.

2. Assessment of the Biosecurity Situation

For the purpose of managing animal biosecurity for the country, those animal diseases that the country did not experience outbreak in the past five years [July 2019 to June 2024], and those that are subjected to official control measures even if outbreak occurd, were considered exotic to Bhutan. During the last five years, Bhutan reported numerous outbreaks of 13 different animal diseases [excluding aquatic animal diseases] to the Office International des Epizootis

(OIE), now renamed as the World Organization for Animal Health (WOAH). Details are provided in Annexure 1 of the document.

In the last one year i.e from July 2023 to June 2024), outbreaks of animal diseases (exotic to Bhutan) in nine countries in the region (India, Bangladesh, Nepal, Pakistan, Sri Lanka, Maldives, Myanmar, China, and Thailand) were monitored remotely. Risk assessments were conducted, and appropriate risk mitigation measures taken accordingly. Information on disease outbreaks and their spread in the region was gathered from sources such as the WOAH, FAO, WHO, national government websites, media reports, and other unofficial sources. Collectively, these countries experienced 113 outbreaks of 16 diseases (refer Annexure 2) that are considered exotic to Bhutan.

Out of 16 diseases, two i.e African swine fever and Lumpy skin disease entered the country during the period, resulting in significant economic consequences. Hence, the percent of exotic animal diseases prevented from entry into the country has been calculated at 87.50% [100 – {2/16} x 100].

Sixteen animal diseases reported by countries in the region were;

2.1 African swine fever (ASF)

Until 2017, African swine fever (ASF) was confined to Africa and certain European countries. However, in 2018, the virus spread to Asia, affecting over 10 percent of the pig population in multiple countries and causing significant economic losses in the pig sector. The first outbreak in China was reported in Liaoning province in August 2018. By April 2019, ASF had spread to all regions of China and parts of Southeast Asia, including Cambodia, Laos, Thailand, and Vietnam. On April 29, 2020, India reported its initial ASF outbreaks in the states of Assam and Arunachal Pradesh. From thereon, the disease gradually spread to Bhutan (2021), Nepal (2022) and Bangladesh (2023). The disease has now entered European countries too.

In between July 2023 and June 2024, India reported as many as 23 separate outbreaks in the country with huge implications on piggery sector. During the same period, Nepal reported four outbreaks, China 11, while Bangladesh, Thailand and Myanmar reported two outbreaks each.

Between July 2023 and June 2024, Bhutan also endured three separate outbreaks of the disease in the villages of Bangyul (Pemagatsel), Tshogonpa (Trashigang), and Sampheling (Chukha), all of which have been successfully contained.

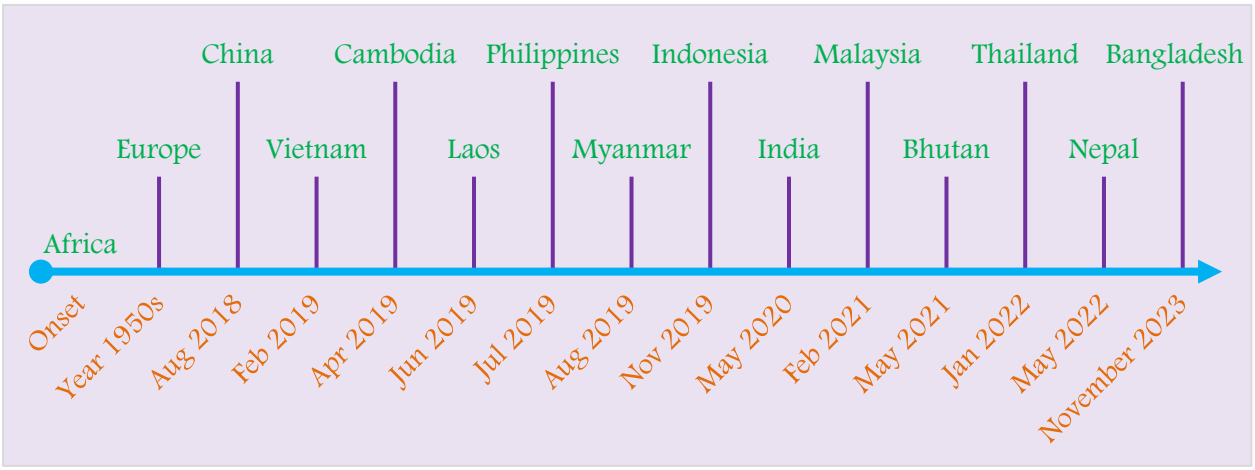

Fig 1: Timeline of ASF spread from Africa to Asia

2.2 Brucellosis

Brucellosis, a zoonotic bacterial infection caused by *Brucella* spp, poses a significant global threat to both human and animal health. Its transboundary transmission, driven by international trade and livestock movement, complicates control and eradication efforts. In South Asia, porous borders and substantial livestock trade facilitate the disease's spread, necessitating regional cooperation. The region has one of the highest global prevalence of brucellosis, affecting both livestock and humans. The disease causes considerable economic losses by reducing livestock productivity through infertility, abortion, and decreased milk production.

Human cases often result from direct contact with infected animals or consumption of unpasteurized dairy products. Traditional farming practices, close human-animal interactions, and raw milk consumption further contribute to the persistence and spread of brucellosis in the region. During the reporting period, Indian state of Kerala reported two human cases of brucellosis. A seven-year-old student from Kadakkal in Kollam has tested positive for Brucellosis in July 2023. Similarly, a dairy farmer in Kerala's Thiruvananthapuram district was diagnosed with Brucellosis disease in October 2023.

2.3 Crimean-congo haemorrhagic fever (CCHF)

Crimean-Congo haemorrhagic fever (CCHF) is a disease caused by the *Nairovirus*, a tick-borne virus from the *Bunyaviridae* family. The disease was first characterized in Crimea in 1944 and later identified in Congo in 1969, leading to its current name. Ixodid ticks, especially those of the genus *Hyalomma*, act as both environmental reservoirs and vectors for the CCHF virus. Various wild and domestic animals, such as cattle, goats, sheep, hares, hedgehogs, and rats, serve as amplifying hosts. CCHF is a zoonotic disease, primarily transmitted to humans through tick bites or contact with infected animal blood. Additionally, human-to-human transmission can occur through contact with infectious blood or body fluids.

CCHF is prevalent in Eastern Europe, particularly the former Soviet Union, throughout the Mediterranean region, North-western China, central Asia, southern Europe, Africa, the Middle East, and the Indian subcontinent, particularly India and Pakistan.

In January 2011, the first human cases of CCHF in India was reported in Sanand, Gujarat, India. Since then, sporadic cases of the disease have been reported in the country, with occurrences in 2013, 2015, and in April 2022, all within the state of Gujarat. By 2015, CCHF was recognized as being widespread among the livestock population in India. Researchers from the National Institute of Virology in Pune discovered CCHF antibodies in cows, sheep, and goats from 22 states and 1 union territory.

Between July and September 2023, Indian state of Gujarat reported two human deaths, and some more diagnosed as positive for the disease. In the same time around, Pakistan's province of Balochistan reported the outbreak of the disease with 28 cases and 10 deaths. Also the province of Khyber Pakhtunkhwa witnessed 14 cases with four deaths.

As of now, the disease has not been detected in Bhutan; however, the vector for the disease, the *Hyalomma* tick, is prevalent in the country.

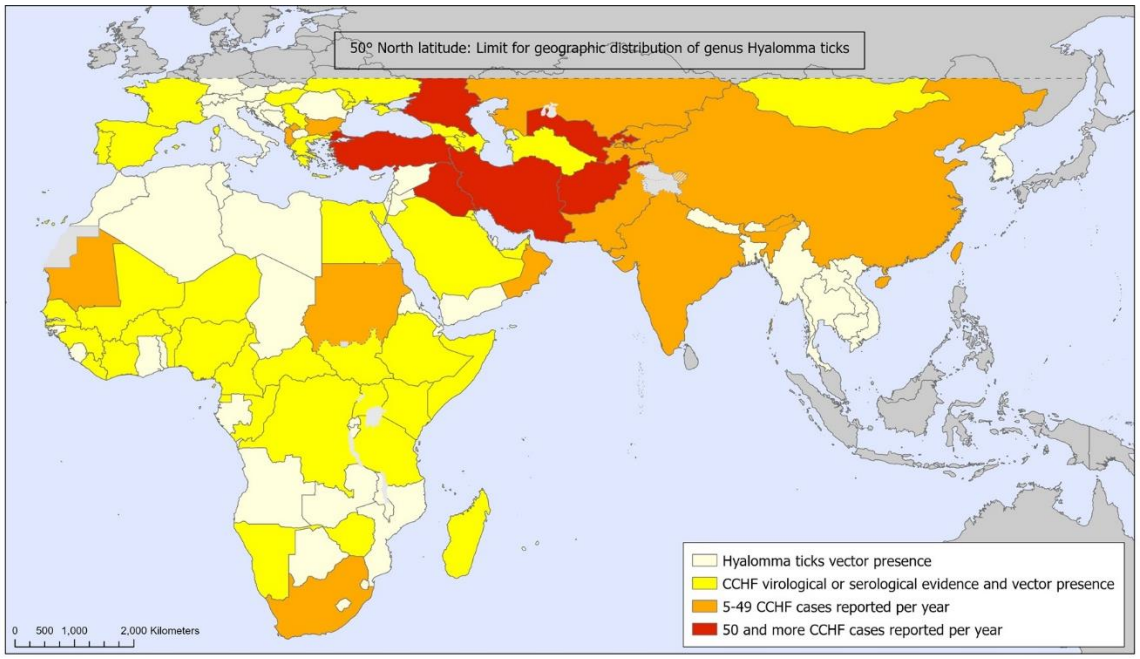

Fig 2: Geographic distribution of CCHF [Source: WHO, 2022]

2.4 Glanders

In July 2023, India reported an outbreak of Glanders that has spread across three states of Punjab, Himachal and Haryana. The veterinary authorities across three states declared 5 km radius of the outbreak areas as infected, and 25 km radius as screening zone for the disease.

Glanders is a contagious and typically fatal disease that affects horses and is caused by the bacterium *Burkholderia mallei*. Humans and other animals such as donkeys, mules, goats, dogs, and cats are also susceptible to the disease, and infections in these species often result in fatality. The disease is characterized by the formation of ulcerating growths, primarily occurring in the upper respiratory tract, lungs, and skin. Glanders is usually contracted through the consumption of contaminated food or water that has been infected with the nasal discharge of carrier animals. The bacteria can enter the body through skin abrasions, nasal and oral mucosal surfaces, or inhalation. In contaminated areas, the organism can survive for over a year, particularly in humid and wet conditions.

Disease was once prevalent worldwide. It has now been eradicated or effectively controlled in many countries, including Bhutan. In the past five years, the disease was reported in India (2018, 2019, 2020, 2021, 2022, 2023), China (2018, 2019) and Nepal (2020, 2021, 2022).

Table 1. Reports of Glanders outbreaks in the region

Country	Years					
	2018	2019	2020	2021	2022	2023
India						
China						
Nepal						

2.5 Kyasanur forest disease (KFD)

Kyasanur forest disease (KFD) is a zoonotic disease transmitted by ticks, causing an acute febrile haemorrhagic illness in humans and monkeys, particularly prevalent in the southern region of India.

The disease is commonly referred to as "monkey fever." It was initially identified in March 1957 in the Kyasanur forest range of Karnataka, India, giving it the name Kyasanur forest disease. The disease is caused by highly pathogenic Kyasanur Forest Disease Virus (KFDV) which belongs to member of the genus *Flavivirus* and family *Flaviviridae*. Transmission of the disease occurs through the infective tick known as *Haemaphysalis spinigera*, which is capable of transmitting the virus to both monkeys and humans. Various animals, including porcupines, rats, squirrels, mice, and shrews, are considered reservoir hosts for the disease.

Monkeys are the main amplifying hosts for KFDV and they are also affected by the virus. Monkeys develop tremendous viremia and infect the ticks, *Haemaphysalis spinigera* which is the vector for disease transmission. Humans contract infection from the bite of nymphs of the tick.

The disease initially reported from Shimoga district of Karnataka (1957) has now spread to many other districts in the state. The disease is gradually spreading and is already reported by the states of Kerala, Tamil Nadu, Goa and Maharashtra in India. In between January and April 2024, Malenadu region of Karnataka alone recorded 12 human deaths, and more than 250 positive cases of KFD.

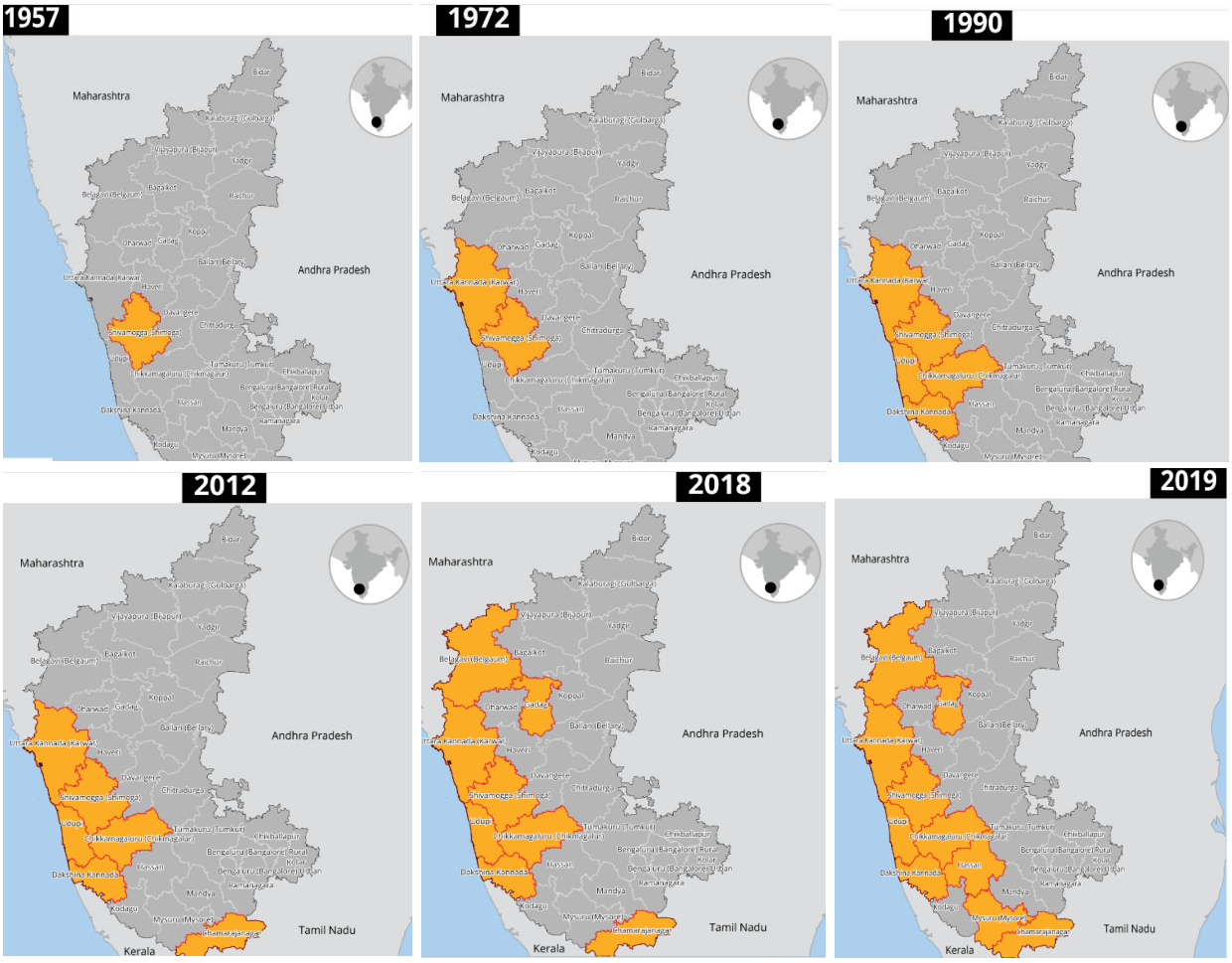

Fig 3: Spatio-temporal distribution of KFD in Karnataka State, India

2.6 Leptospirosis

Leptospirosis is a highly contagious disease that can be transmitted among domestic animals, wildlife, and humans. It is caused by infection with pathogenic bacteria of the *Leptospira* spp. The disease can manifest in both acute and chronic forms, with severity depending on factors such as bacterial virulence, host susceptibility, and the species affected.

Transmission occurs directly or indirectly from asymptomatic maintenance hosts, particularly rats, to other species. This can happen through ingestion of water, feed, and fodder contaminated with urine or by inhalation of urine droplets. *Leptospira* bacteria can survive in the environment for extended periods under favorable conditions such as warm temperatures, moisture, neutral soil pH, and standing surface water, increasing the risk of infection.

Certain agricultural settings pose specific risks for leptospiral infections. Piggeries and cattle herds are proven risk factors, while horses are typically accidental hosts, not primary targets but still susceptible to infection.

Leptospirosis is a common infection during the monsoon in tropical countries. Areas that are prone to flooding and waterlogging during monsoon become the source of infection. Two local media houses reported widespread outbreak of leptospirosis in Odisha state in September 2023.

2.7 Lumpy skin disease (LSD)

Until1980s, Lumpy Skin Disease (LSD) was primarily confined to Africa and West Asia. However, since 2015, it has rapidly spread to new regions, including several South and Southeast Asian countries, which are the most recent areas affected by its expansion.

Lumpy skin disease is a viral disease that affects cattle. It is transmitted by blood-feeding insects, such as flies, mosquitoes, or ticks. It causes fever, nodules on the skin and can also lead to death, especially in animals that have not previously been exposed to the virus. Control options include vaccinations programs, movement control of infected animals, vector control programs etc. Lumpy skin disease can lead to significant economic losses for the farmers.

Between July 2023 and June 2024, many South-Asian countries witnessed extensive and devastating outbreaks of LSD, causing significant economic losses for cattle farmers. India reported 4 outbreaks, Thailand 9, Sri Lanka 3, Bangladesh 1, and Bhutan, Nepal and Pakistan reported 2 outbreaks each.

2.8 Nipah virus

Nipah virus outbreaks occur almost annually in parts of Asia, primarily Bangladesh and India. Human cases have continued to occur sporadically in Bangladesh and India since 2003. Bangladesh saw as many as 10 human deaths out of 14 infected in the year 2023. Within the first month of 2024, Bangladesh saw two cases both of whom have died. Similarly, the Indian state of Kerala also saw six Nipah virus cases in 2023.

Although, Bhutan did not record any Nipah virus outbreak in the country, it is at risk as the natural host of the virus is prevalent in the country. A study conducted by the Indian Council of Medical Research, and the National Institute of Virology have confirmed the presence of the Nipah virus in bats in nine states, and one Union Territory in India. The presence of the virus in bats in the states of Assam and West Bengal has raised concerns, highlighting the need for vigilant monitoring in Bhutan.

Nipah virus causes emerging infectious diseases which first appeared in domestic pigs in Malaysia and Singapore in 1998 and 1999 respectively where over 1 million pigs were destroyed to control the disease. Nipah virus causes respiratory and occasionally nervous signs in pigs, and has a devastating zoonotic potential. The disease is caused by *Nipah henipavirus* belonging to the family *Paramyxoviridae*.

Fruit bats of the family *Pteropodidae,* particularly species belonging to the *Pteropus* genus are the natural hosts for Nipah virus. Nipah virus is known to cause infection in pigs and other domestic animals such as horses, goats, sheep, cats and dogs. The virus is highly contagious in pigs.

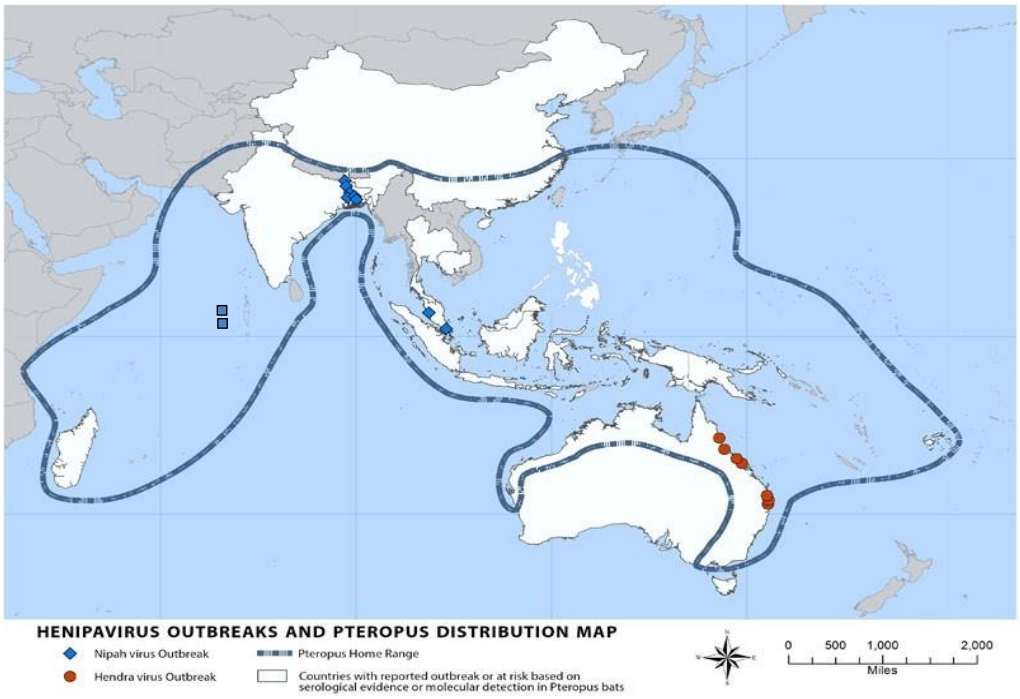

Fig 5: Geographic distribution of *Pteropus* and *Henipavirus* outbreak locations [Source: CDC, 2021]

2.9 Peste des petits ruminants (PPR)

Peste des petits ruminants (PPR) was initially documented in the Ivory Coast in 1942, followed by its subsequent spread to other regions in West Africa. Over time, it has expanded across the entire African continent, the Middle East, and the entirety of the Indian subcontinent. In the past 15 years, PPR has shown rapid expansion within Africa and has reached significant parts of Asia, including Bhutan. Bhutan reported its last PPR outbreak to the WOAH in the second half of 2020, and since then, the country has not recorded any PPR cases.

During the period between July 2023 and June 2024, the Maldives reported two outbreaks of PPR. Similarly, China reported 4 outbreaks, while India and Pakistan reported 2 and 1 outbreaks respectively. In India, outbreaks were reported in the states of Himachal and Jharkhand where more than 60 sheep/goats, and 300 goats respectively have died of the disease.

PPR is an acute or subacute viral disease affecting goats and sheep, characterized by symptoms such as fever, necrotic stomatitis, gastroenteritis, pneumonia, and, in some cases, fatality. Both goats and sheep are equally susceptible to the virus, although goats tend to exhibit more severe clinical signs. Additionally, the virus can impact various species of wild small ruminants.

However, cattle, buffalo, and pigs typically experience subclinical infections, showing no noticeable clinical symptoms.

2.10 Porcine reproductive and respiratory syndrome (PRRS)

Porcine Reproductive and Respiratory Syndrome (PRRS) is a viral disease of pigs characterized by two overlapping clinical presentations involving both reproductive and respiratory systems. The PRRS virus is an enveloped RNA virus in the genus *Arterivirus*, classified in the virus family, *Arteriviridae*. Shedding carriers probably are the most common means of virus introduction to a herd of pigs. The virus is highly infectious. It is present in nasal secretions, urine, semen, mammary secretions and feaces. With the advent of artificial insemination, semen became a major source of viral introduction.

Table 2: RRRS outbreaks in the region

Country	PRRS Outbreaks Reported to WOAH				
	2019	2020	2021	2022	2023
China					
Thailand					
Nepal					

Nepal reported PRRS outbreak for the first time in 2021, and since then, had continuously reported in subsequent years. Thailand and China had been reporting this disease outbreaks continuously for the past 5 years. Also in this reporting period, China reported two outbreaks.

2.11 Scrub typhus

Scrub typhus, also known as bush typhus, is a disease of humans caused by a bacteria called *Orientia tsutsugamushi*. Scrub typhus is an acute infectious disease spread to people through bite of certain kinds of trombiculid mites, or chiggers (larval mites). The causative agent of scrub typhus, the bacterium *O. tsutsugamushi*, is primarily a parasite of mites. The mites, during their larval stage, acquire the infection from wild rodents or other small animals. The infection is passed to humans when a mite larva bites a person.

Indian state of Odisha reported widespread outbreak of the disease in the second half of 2023. While prevalence of the disease both in human and animal population in Bhutan is not known, it is worth monitoring its occurrences in our neighbourhoods.

2.12 Avian influenza (A/H3N8)

Influenza A (H3N8) viruses are commonly found in birds, typically causing minimal to no disease in domestic poultry and wild birds. However, cross-species transmission of A (H3N8) avian influenza viruses has been reported in various mammals, including dogs and horses. Human infections with avian influenza viruses, including A (H3N8), are generally sporadic and occur under specific circumstances, often due to exposure to infected poultry or contaminated environments.

China reported human infections with the virus in Guangdong province (February 2023), and in Zhongshan City in March 2023. The patients had a history of live bird exposure before the onset of the disease. On 9th August 2023, the country reported first human death at Guangdong province due to this disease. The patient had multiple myeloma and died of severe infection, suggesting that Avian Influenza H3N8 virus infection could be lethal for immunocompromised persons.

2.13 Avian influenza (A/H5N1)

H5N1, a strain of the avian influenza A virus, can cause illness in humans and various animals. Highly pathogenic and adapted to birds, H5N1, commonly known as avian influenza or bird flu, poses a significant threat. This strain primarily circulates among bird populations, especially in Southeast Asia, where it is highly contagious and often fatal to domestic poultry.

Since December 2003, H5N1 has led to substantial mortality in poultry and wild birds across Asia, the Middle East, Europe, and Africa. Frequent outbreaks in domestic poultry have rendered the virus endemic in several countries. As of 2011, the Food and Agriculture Organization identified Bangladesh, China, Egypt, India, Indonesia, and Vietnam as countries where the H5N1 virus is endemic in poultry.

Between July 2023 and June 2024, countries in the neighbourhood reported as many as 14 outbreaks of the disease. China reported 7 outbreaks, while India and Nepal reported 5 and 2 outbreaks respectively.

2.14 Avian influenza (A/H5N5)

H5N5 is a strain of the avian influenza A virus that can infect birds and potentially other species. Although not as widely known as H5N1, H5N5 is still a concern due to its pathogenicity and ability to spread among bird populations. The virus is highly contagious among birds, particularly domestic poultry, and can cause significant mortality.

Outbreaks of H5N5 have been reported in various regions, affecting both wild and domestic birds. The spread of this virus among bird populations poses a risk to the poultry industry and raises concerns about potential transmission to humans and other animals. Monitoring and controlling H5N5 outbreaks are essential to prevent widespread infection and to mitigate its impact on agriculture and public health. Chinese Taipei reported one incident of H5H5 outbreak in poultry population in August 2023.

2.15 Avian influenza (A/H5N6)

In August 2023, China reported 2 human cases of influenza A/H5N6 from Sichuan province. Both the cases had a prior history of exposure to domestic or wild birds before the onset of symptoms. From 2014 to date, 86 human cases of avian influenza A (H5N6) have been reported by Chinese health authorities. On 8th May 2024, Chinese authorities also reported first human death due to the virus to the WHO. The case was a 52-year-old female labor worker from Quanzhou City, Fujian Province.
H5N6 is a subtype of the species Influenza A virus. Infected birds shed the virus in their saliva, mucous, and feces. The virus was first detected in poultry in 2013, since then spreading among wild bird populations and poultry around the world. Humans can be infected through unprotected contact with infected birds or contaminated surfaces.

2.16 Avian influenza (A/H9N2)

Influenza H9N2 is the most common subtype of influenza viruses among Chinese chickens, causing significant economic losses to the poultry industry despite long-term vaccination programs. In China, the H9N2 virus has been detected in various avian species, including chickens, ducks, quail, pheasants, partridges, pigeons, silky chickens, and egrets. While chickens infected with H9N2 typically do not show severe symptoms, some may exhibit depression and

ruffled feathers. Humans can contract the H9N2 virus through inhaling airborne droplets or dust, or by coming into contact with contaminated feed or water.

In July 2023, a human case was reported from the Guangxi Autonomous Region. Similarly, first human case of H9N2 was reported by India in its West Bengal state on April 26, 2024. Although, H9N2 is also known to circulate in poultry in a number of Asian countries, most of the human cases have been reported in China with recent detection in India. Illnesses are usually mild and affects children.

3 Conclusion

Monitoring animal biosecurity on a daily basis in countries within the region, especially those involved in trade partnerships, is essential for comprehensive national biosecurity management. Between July 2023 and June 2024, countries in the region reported 113 outbreaks of 16 different animal diseases that are exotic to Bhutan. To prevent these diseases from entering the country, the Bhutan Food and Drug Authority (BFDA) enforced/implemented various biosecurity measures throughout the year. These measures included conducting biosecurity risk assessments, establishing import conditions, performing import inspections, facilitating animal quarantine, and monitoring and enforcing on-farm biosecurity practices. Despite these efforts, African swine fever and Lumpy skin disease entered Bhutan. These diseases were introduced by illegal pork importers and free-flying biting flies respectively, from across the border.

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Disclaimer from the author:

The information compiled in this document were also sourced from media as well as unofficial channels to be used exclusively for animal biosecurity management in Bhutan. BFDA and the author claim no responsibility for the accuracy of the information reported herein.

Annexure I:

Animal Disease Outbreaks Reported by Bhutan to WOAH (July 2019 - June 2024)		
Semester, Reporting Year	**Animal Disease**	**Outbreaks in (Animal category)**
Jan-Jun-2024	African swine fever virus	Domestic
Jan-Jun-2024	Sheep pox and goat pox	Domestic
Jul-Dec-2023	African swine fever virus	Domestic
Jul-Dec-2023	Lumpy skin disease virus	Domestic
Jul-Dec-2023	Sheep pox and goat pox	Domestic
Jan-Jun-2023	African swine fever virus	Domestic
Jan-Jun-2023	Anthrax	Domestic
Jan-Jun-2023	Brucella abortus	Domestic
Jan-Jun-2023	Foot and mouth disease virus	Domestic
Jan-Jun-2023	Haemorrhagic septicaemia	Domestic
Jan-Jun-2023	Infectious bursal disease	Domestic
Jan-Jun-2023	Influenza A viruses of high pathogenicity	Domestic
Jan-Jun-2023	Influenza A viruses of high pathogenicity	Wild
Jan-Jun-2023	Lumpy skin disease virus	Domestic
Jan-Jun-2023	Newcastle disease virus	Domestic
Jan-Jun-2023	Peste des petits ruminants virus	Domestic
Jan-Jun-2023	Rabies virus	Domestic
Jul-Dec-2022	African swine fever virus	Domestic
Jul-Dec-2022	Anthrax	Domestic
Jul-Dec-2022	Brucella abortus	Domestic
Jul-Dec-2022	Foot and mouth disease virus	Domestic
Jul-Dec-2022	Haemorrhagic septicaemia	Domestic
Jul-Dec-2022	Infectious bursal disease	Domestic
Jul-Dec-2022	Lumpy skin disease virus	Domestic
Jul-Dec-2022	Newcastle disease virus	Domestic
Jul-Dec-2022	Peste des petits ruminants virus	Domestic
Jul-Dec-2022	Rabies virus	Domestic
Jan-Jun-2022	African swine fever virus	Domestic
Jan-Jun-2022	Anthrax	Domestic
Jan-Jun-2022	Brucella abortus	Domestic
Jan-Jun-2022	Foot and mouth disease virus	Domestic
Jan-Jun-2022	Haemorrhagic septicaemia	Domestic
Jan-Jun-2022	Infectious bursal disease	Domestic
Jan-Jun-2022	Lumpy skin disease virus	Domestic
Jan-Jun-2022	Newcastle disease virus	Domestic
Jan-Jun-2022	Peste des petits ruminants virus	Domestic
Jan-Jun-2022	Rabies virus	Domestic
Jul-Dec-2021	African swine fever virus	Domestic
Jul-Dec-2021	Anthrax	Domestic
Jul-Dec-2021	Brucella abortus	Domestic

Jul-Dec-2021	Classical swine fever virus	Wild
Jul-Dec-2021	Foot and mouth disease virus	Domestic
Jul-Dec-2021	Haemorrhagic septicaemia	Domestic
Jul-Dec-2021	Infectious bursal disease	Domestic
Jul-Dec-2021	Peste des petits ruminants virus	Domestic
Jul-Dec-2021	Rabies virus	Domestic
Jan-Jun-2021	African swine fever virus	Domestic
Jan-Jun-2021	Anthrax	Domestic
Jan-Jun-2021	Brucella abortus	Domestic
Jan-Jun-2021	Classical swine fever virus	Wild
Jan-Jun-2021	Foot and mouth disease virus	Domestic
Jan-Jun-2021	Haemorrhagic septicaemia	Domestic
Jan-Jun-2021	Infectious bursal disease	Domestic
Jan-Jun-2021	Lumpy skin disease virus	Domestic
Jan-Jun-2021	Peste des petits ruminants virus	Domestic
Jan-Jun-2021	Rabies virus	Domestic
Jan-Jun-2021	Sheep pox and goat pox	Domestic
Jan-Jun-2021	Sheep pox and goat pox	Wild
Jul-Dec-2020	Anthrax	Domestic
Jul-Dec-2020	Brucella abortus	Domestic
Jul-Dec-2020	Foot and mouth disease virus	Domestic
Jul-Dec-2020	Haemorrhagic septicaemia	Domestic
Jul-Dec-2020	Infectious bursal disease	Domestic
Jul-Dec-2020	Lumpy skin disease virus	Domestic
Jul-Dec-2020	Peste des petits ruminants virus	Domestic
Jul-Dec-2020	Rabies virus	Domestic
Jul-Dec-2020	Sheep pox and goat pox	Domestic
Jul-Dec-2020	Sheep pox and goat pox	Wild
Jan-Jun-2020	Anthrax	Domestic
Jan-Jun-2020	Brucella abortus	Domestic
Jan-Jun-2020	Classical swine fever virus	Domestic
Jan-Jun-2020	Foot and mouth disease virus	Domestic
Jan-Jun-2020	Haemorrhagic septicaemia	Domestic
Jan-Jun-2020	Infectious bursal disease	Domestic
Jan-Jun-2020	Newcastle disease virus	Domestic
Jan-Jun-2020	Rabies virus	Domestic
Jul-Dec-2019	Anthrax	Domestic
Jul-Dec-2019	Brucella abortus	Domestic
Jul-Dec-2019	Foot and mouth disease virus	Domestic
Jul-Dec-2019	Infectious bursal disease	Domestic
Jul-Dec-2019	Rabies virus	Domestic

Annexure II: Countries in the region that experienced disease outbreaks [that are exotic to Bhutan] during the period July 2023 - June 2024

Exotic diseases	Countries in the region that experienced disease outbreaks [that are exotic to Bhutan] during the period July 2023 - June 2024								
	India	Nepal	Bangladesh	China	Thailand	Myanmar	Sri Lanka	Pakistan	Maldives
African swine fever	Jul-Dec 23 (16) Jan-Jun 24 (7)	Jul-Dec 23 (2) Jan-Jun 24 (2)	Jul-Dec 23 (1) Jan-Jun 24 (1)	Jul-Dec 23 (7) Jan-Jun 24 (4)	Jul-Dec 23 (1) Jan-Jun 24 (1)	Jul-Dec 23 (2)	X	X	X
Brucellosis	Jul-Dec 23 (1)	X	X	X	X	X	X	X	X
CCHF	Jul-Dec 23 (3)	X	X	X	X	X	X	Jul-Dec 23 (5)	X
Glanders	Jul-Dec 23 (1)	X	X	X	X	X	X	X	X
Kyasanur forest disease	Jan-Jun 24 (1)	X	X	X	X	X	X	X	X
Leptospirosis	Jul-Dec 23 (1)	X	X	X	X	X	X	X	X
Lumpy skin disease	Jul-Dec 23 (4)	Jul-Dec 23 (2)	Jul-Dec 23 (1)	X	Jul-Dec 23 (8) Jan-Jun 24 (1)	X	Jul-Dec 23 (2) Jan-Jun 24 (1)	Jul-Dec 23 (1) Jan-Jun 24 (1)	X
Nipah virus	Jul-Dec 23 (3)	X	X	X	X	X	X	X	X
Peste des petits ruminants	Jul-Dec 23 (2)	X	X	Jul-Dec 23 (1) Jan-Jun 24 (3)	X	X	X	Jul-Dec 23 (1)	Jul-Dec 23 (1) Jan-Jun 24 (1)
PRRS	X	X	X	Jul-Dec 23 (1) Jan-Jun 24 (1)	X	X	X	X	X
Scrub Typhus	Jul-Dec 23 (1)	X	X	X	X	X	X	X	X
H3N8 (Avian Influenza)	X	X	X	Jul-Dec 23 (1)	X	X	X	X	X
H5N1(Avian Influenza)	Jul-Dec 23(2) Jan-Jun 24 (3)	Jul-Dec 23 (2)	X	Jul-Dec 23(5) Jan-Jun 24 (2)	X	X	X	X	X
H5N6 (Avian Influenza)	X	X	X	Jul-Dec 23(2) Jan-Jun 24 (1)	X	X	X	X	X

H5N5 (Avian Influenza)	X	X	X	Jul-Dec 23 (1)	X	X	X	X	X
H9N2 (Avian Influenza)	Jan-Jun 24 (1)	X	X	Jul-Dec 23 (1)	X	X	X	X	X

Note: Period during which outbreak occurred is provided in cells against the disease (row) and the country (column). Number in bracket represents number of outbreaks during the period