Case Study
LIBERIA
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In May 2022 the World Organisation for Animal Health started officially using the acronym WOAH. Before its official acronym was OIE which stands for Office International des Epizooties.
I. Executive Summary

The term “One Health” refers to an integrated approach that sustainably balances the health of people, animals and the ecosystem, and it is a key element for pandemic prevention. Old and new health threats demonstrate how our changing interactions with animals and the environment affect development outcomes. In a post-COVID-19 world, where emerging infectious diseases (EIDs) are becoming more frequent and worsening in impact, preventing pandemics should be a primary focus for policymakers, public health officials and citizens. This case study targets policymakers and teams within the World Bank and other organizations who aim to prevent future outbreaks by adopting a One Health approach. Likewise, it aims to analyze the situational snapshot of Liberia, the progress it has made towards a One Health approach, identify vulnerabilities and drivers, and finally present key recommendations to prevent future pandemics.

ONE HEALTH IN LIBERIA

Liberia is extremely vulnerable to pandemics from constant interaction between humans and animals, limited access to education and healthcare, poor infrastructure and natural resource exploitation. The success of a One Health approach requires joint action among various sectors, acknowledgement of vulnerabilities and the drivers of potential pandemics and identification of hotspots for zoonoses and potential areas for collaboration.

The Government of Liberia has made significant strides toward the implementation of One Health. Along with its development partners, the Government is combating the spread of communicable diseases through community engagement and improvements in public health and social protection. But, despite existing governmental programs and projects from international partners (such as the World Bank REDISSE projects, Breakthrough Action, AFROHUN and FAO projects), Liberia remains vulnerable to disease outbreaks. The risk of pandemics not only stems from the effects of climate change, natural disasters, and changes to ecosystems, but also from inequality and a lack of prevention of EIDs at source.

As deforestation and human activities in forests such as mining, farming and hunting increased, so did the influx of humans into wildlife habitats and the displacement of wildlife (such as bats, rodents) into human settlements, which put people at risk of zoonotic diseases—and potential epidemics that can remain undetected until it is too late.

Considering the main drivers that increase interactions among humans, livestock and wildlife, short, medium and long-term recommendations were developed at the human, animal and ecosystem levels. For humans, Liberia can promote public awareness and health education campaigns, decentralize health and medical drug services to increase affordability and accessibility, increase surveillance and invest in water, sanitation and hygiene (WASH) measures to improve health outcomes. For animals, the country can expand animal disease surveillance prevention and control, invest in veterinary services and training and use technology in livestock facilities to protect animal health. For the environment, it can increase enforcement, develop stricter policies and early warning systems and improve county governance to reduce pandemic risk.

National and global ramifications of One Health must be understood for collaboration and coordination to succeed. Although there is much room for strengthening systems, Liberia is underway to implementing a coordinated One Health approach.
II. The One Health Approach

The term One Health refers to an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems (Figure 1). It recognizes the connections and interdependency among the health of humans, domestic and wild animals and the wider environment, including ecosystems.

This approach aims to mobilize multiple sectors, disciplines and communities at different levels of society to work together to foster well-being and tackle threats to health and ecosystems while addressing the collective need for clean water, energy and air; safe and nutritious food; climate change resilience and sustainable development (FAO, OIE, UNEP and WHO 2021).

Emerging infectious diseases (EIDs) are becoming more frequent and worsening their social and economic impacts, exposing the world to repeated pandemic threats. The yearly probability of an occurrence of extreme epidemics may increase up to threefold in the coming decades (Marani et al. 2021).

In 2020, the global economy contracted by 4.3% because of COVID-19, which amounts to about USD$3.6 trillion worth of lost goods, services and other output (Figure 2).

Old and new health threats, resulting in pandemic risks, demonstrate how our changing interactions with animals and the environment can impact development outcomes. Interactions among people, animals and the environment have changed: human population is increasing, intensive farming practices are growing, environmental disruptions and deforestation are worsening and the movement of animals and animal products has shifted from increased trade.

Preventing pandemics should be a primary focus for policymakers, public health officials and citizens. Implementing a One Health approach will improve countries’ ability to effectively prevent, detect, respond and recover from outbreaks, prepare for future pandemics and accomplish development goals such as improved health and economic security, climate resilience and food safety.
Almost 75% of EIDs in humans have their origin in animals (domestic or wild).

SARS (2003): $30–50 billion
H1N1 (2009): $45–55 billion
EVD (2014): $10–53 billion
Zika (2015): $7–18 billion


How much will the next pandemic cost?

SARS: Severe Acute Respiratory Syndrome; H1N1: Swine Flu (primarily caused by the H1N1 strain of the flu virus); EVD: Ebola Virus Disease; Zika: Zika Virus; COVID-19: Coronavirus disease caused by the SARS coronavirus 2 (SARS-CoV-2)
III. Liberia: A SNAPSHOT

As proven by past outbreaks in the country, Liberia is extremely vulnerable to pandemics. A combination of limited access to education and healthcare, poor infrastructure, natural resource exploitation and constant interactions between humans and animals put Liberia at high risk for future outbreaks.

Liberia’s economy has showed steady growth, and the country possesses abundant natural capital, but Liberia remains among the world’s poorest countries. The country’s GDP grew steadily from 748 million to 3.1 billion between 2003 and 2013 (World Bank, 2014). The government’s vision is to become a middle-income country in the long-term (WBG CPF 2018, p.1). However, deep inequality and high poverty rates impede progress. Almost half the population live in rural areas, and Liberia has not been able to leverage its natural wealth to promote sustainable and broad-based income growth (WBG SCD 2018, p.1).

Healthcare in Liberia is improving but the country is still battling to achieve nationwide access to healthcare and to fund certain health institutions. Access to healthcare is challenging for the high percentage of people living in rural areas. For example, two thirds of rural families must travel more than an hour to access a health center (Carll 2021). Furthermore, the Ebola outbreak weakened the healthcare sector that was already inefficient and left the country vulnerable to future outbreaks of Ebola and other diseases (WBG 2018). In addition, the consecutive avian influenza and the Ebola crisis also pointed the need for an enhanced institutionalized, inter-ministerial, communication, coordination and close collaboration in dealing with future epidemics as well as global pandemics such as COVID-19 (OIE PVS Gap Analysis, 2016). On the other hand, the JEE 2016 report also highlighted the need to establish a multisectoral and interdisciplinary coordination and communication structure with animal health, wildlife, the environment, and other relevant sectors in order to
strengthen and sustain using the One Health approach (JEE 2016). Lastly, the Ebola outbreak helped Liberia realize the need for strengthening surveillance systems in veterinary, public health, and environment (OIE PVS Gap Analysis for Liberia, 2016). The Government, with the help of multiple international organizations, has worked to improve the healthcare sector and address these weaknesses.

The country's rich natural capital and Liberians' regular contact with forests make it important to address the risks of these interactions and strengthen institutions to prevent and respond to emerging infectious diseases. Liberia has very rich biodiversity hosting 43% of the upper Guinean forest ecosystem making it a biodiversity hotspot in the region: it is the most forested country in West Africa (Brown 2014 and Republic of Liberia et.al 2018)\(^1\) and nearly half of the population live within 2.5 kilometers of a forest, which makes them crucial for Liberia's economy (World Bank 2020 and Nthara and

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\(^1\) 79% of the country’s land area is covered by forests and Liberia has approximately 43% of the remaining Upper Guinean forests, which cover 6.69 million hectares. These forests are home to many unique species of plants and animals: 881 known fauna species, of which 0.8% are endemic and 4.2% threatened, and at least 2,200 flora species of vascular plants, of which 4.7% are endemic (Nthara and Srivastava 2020).
Although biodiversity and wildlife resources are plentiful, they are also at risk. The country is on track to lose significant wildlife populations, mainly from illegal hunting, large-scale poaching and wild animal meat trade (WA BiCC 2019). For many communities in Africa, wild animal meat (meat derived from wild animals) is a significant source of protein. According to estimates, wild animal meat accounts for 30 to 85 percent of Africans’ daily protein consumption (Douglas and Lonneke 2005).

**Agriculture, including forestry, is an important sector in Liberia’s economy, but is at risk from climatic events, which increase the likelihood of disease outbreaks.** In 2020, agriculture, including forestry, accounted for 31% of Liberia’s GDP and 43% of total employment (WBG Open Data and International Trade Administration 2021). However, the agriculture sector—and the country as a whole—is severely exposed to natural hazards and climate-related risks. In the context of Liberia’s multidimensional fragility, the impacts of major natural disasters or a pandemic can be devastating (WBG CPF 2018). Projected increases in rainfall and floods, combined with poor access to health facilities, poor hygienic practices and lack of access to safe drinking water will cause increasing susceptibility to disease outbreaks, with rural areas being the most vulnerable (WBG Climate Change Knowledge Portal). There are efforts to prevent and prepare for the spread of EIDs, and the Government has begun to implement a One Health approach. However, identifying core vulnerabilities in the country and the main drivers for EIDs is crucial for targeted policy interventions.

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**BOX 1: The impact of Ebola Virus Disease (EVD)**

Liberia was the epicenter of the worst outbreak of EVD in recorded history, with over 10,000 cases that killed almost 4,800 people (Soucheray 2018). Although the situation improved significantly after 2016, the EVD epidemic had pronounced socio-economic impacts, with women being disproportionately affected (Korkoyah and Wreh 2015). GDP growth in the country decreased to almost 0% and the country received donations from development agencies and other donors of more than USD$3.6 billion to fight the epidemic (CDC 2019 and UNDP 2014). The EVD outbreak led to restrictions on trade and transportation, reduced tourism, decreased agricultural production and mining activity, increased unemployment and had a high fiscal impact (Mercy Corps 2019). A 2015 study found 142 linkages among 40 drivers of EVD—including deforestation, hunting, ecosystem changes, industrial plantations, changes in demand for wild animal meat, food security and forest fragmentation—the division of land into smaller parcels used for different purposes. The EVD epidemic was a lesson in the interconnections among human, animal and ecosystem health.

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2 Forestry alone is the fourth largest contributor to the economy, contributing 10% to Liberia’s GDP.
3 Top donors were the United States, United Kingdom and Germany.
IV. Identifying vulnerabilities and main drivers

Liberia is extremely vulnerable to climate events. However, the risk of pandemics not only stems from the effects of climate change and natural disasters, but also from inequality and lack of prevention of EIDs. These vulnerabilities, hotspots for EIDs and the main drivers of risk are explored below.

A. TWO CORE VULNERABILITIES

1. Climate change

Liberia is highly vulnerable to climate change impacts, ranking 173 out of 182 countries on the ND-GAIN Index (2018). Climate change is directly connected to various drivers of EIDs, contributing to circulation and exposure.

Liberia faces challenges from the impact of climate change coupled with many socio-economic problems such as poverty, poor infrastructure and weak institutions. Due to the low-level adaptive capacity in different sectors, the impact of climate change is severe. For instance, in forest-dependent communities, extreme climate change events hinder people’s ability to meet basic requirements for food, water, wood fuel and medicine (Republic of Liberia 2018).

2. Inequality: socioeconomic and gender disparities and centralization

Although improving, persistent inequality, socioeconomic disparities and a lack of infrastructure and governmental presence compound existing vulnerabilities during disease outbreaks. The historical centralization of administrative, political and

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4 Climate change puts the whole West African region at high risk of increased temperatures and impacts water availability across Liberia, including flooding due to increased intensity of rainfall, coastal erosion and sea-level rise (World Bank 2021).

5 The ND-GAIN Index ranks 181 countries using a score that calculates a country’s vulnerability to climate change and other global challenges and their readiness to improve resilience. Liberia is ranked with a high vulnerability and low readiness score.
military authority in the executive branch fueled inequality. Poverty data reveal deep and entrenched differences among regions, genders and social groups. A strong division of roles in rural Liberia calls for the need to empower women towards One Health implementation at the community level. Furthermore, poverty rates are far higher in rural areas than in urban centers, and non-monetary poverty indicators such as access to healthcare, education and public services are marked by acute geographical and gender disparities (WBG 2018). The Government has invested in extending its administrative apparatus in a decentralization process by establishing “Service Centers,” or suboffices, in major provincial centers (FAO 2021). Still, there are important drugs that can be difficult to obtain such as ribavirin for hepatitis C and rabies post-exposure prophylaxis despite being recognized as a country where rabies is endemic. In the 2018 annual report, the National Public Health Institute (NPHIL) registered 1,645 dog bite cases and 10 related deaths (G. Voupawoe et al, 2021).

These marked inequalities can diminish One Health efforts. For example, in the EVD response, cooperation by local communities was limited, in part because of the Government’s failure to engage local leaders. The youth of King Gray Community—in Monserrado County, near Monrovia—resisted the construction of a treatment facility, leading to long negotiations while EVD raged (UNDP 2014). Similarly, despite the growth of the logging and mining sectors, Liberia’s more remote regions remain underdeveloped because of the country’s limited and dilapidated road network (World Bank 2018).

B. RISK HOTSPOTS OF EMERGING INFECTIOUS DISEASES

Heat maps of predicted relative risk distribution of zoonotic EID events (Figure 6 – Allen et. Al 2017) show the counties of Nimba, Bomi, Montserrat, Bong and Grand Bassa to be at high risk. These counties have an increased level of deforestation and active mining exploration concessions. In addition to the risk of introduction of diseases through animals and cross border movement from neighboring countries considering the porous borders, there is a weak surveillance system. The risk of introduction of transboundary animal diseases (TADs) is higher in bordering counties compared to other regions of the

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**BOX 2:** Centralization of the health sector in Liberia

A clear example of the country’s centralization legacy is the health sector; 60% of medical personnel are based in Monrovia (which has about a third of the country’s population) and the rest is unevenly distributed in the other 14 political subdivisions. During the EVD crisis, excessive centralization meant that even sound planning documents, like the 2007 National Health Policy and Plan, were poorly implemented. For example, since drug supplies are scarce outside Monrovia, ambulances periodically commute to Monrovia to pick up medicine, which is costly in terms of fuel and maintenance and subjects the drugs to pilfering (UNDP 2014). However, this situation is improving, as the Government has invested in extending its administrative apparatus in a decentralization process by establishing “Service Centers,” or suboffices, of the main state institutions, in major provincial centers (FAO 2021).

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6 Liberia ranks 177th out of 188 countries on both the World Bank’s Human Development Index and Gender Inequality Index.
country. Prevention and control is also a challenge for endemic diseases like Lassa fever, which remains a major public health concern in Liberia and West Africa at large. To date, Lassa fever is endemic in 6 out of the 15 counties in Liberia (Bong, Grand Bassa, Nimba, Margibi, Lofa, and Montserrado) (Liberia IDSR Epidemiology Bulletin 2021).

C. MAIN DRIVERS OF EIDs

Infectious disease threat events are increasing in frequency. Liberia has distinct climate variations, creating conditions conducive for the transmission of zoonotic diseases. Certain pathogens may be more prevalent in this area where veterinary and medical services are scarce and the sanitation and health infrastructure are suboptimal, causing significant veterinary, medical and/or public health
problems. The wild animal meat trade in Liberia has drastically reduced due to the Government and conservation partners, efforts in discouraging the trade through awareness and confiscation of wild animal meat from illegal traders. As part of their One Health approach, the Forest Development Authority of Liberia started burning sizeable quantities of confiscated wild animal meat in the South East and North Western parts of the country (Gonkerwon 2020). The Liberian Chimpanzee Rescue and Protection (LCRP) is Liberia’s first and only chimp sanctuary and conservation facility, rescuing chimps from illegal animal wild meat traders. The main drivers of emerging infectious diseases are below (shown in figure 7).

As deforestation and human activities in forests such as mining, farming and hunting increased, so did the influx of humans into wildlife habitats and the displacement of wildlife (such as bats and rodents) into human settlements, which put people at risk of zoonotic diseases in Sub-Saharan Africa (Grotto and Ricci 2014)—and potential epidemics that can remain undetected until it is too late. Acknowledging and addressing underlying drivers of emerging infectious diseases is crucial for prevention and for the operationalization of a One Health approach. Political interests, biodiversity loss, a legacy of conflict and other drivers reinforce patterns of vulnerability, reshaping disease landscapes, influencing traditional coping mechanisms and affecting health service provision (Dzingirai et al. 2017).

1. Drivers that increase interactions between livestock and wildlife

- **The growing livestock sector poses major risks.** Livestock is an important part of the agriculture sector and contributes to the household and community economy (Republic of Liberia 2014). Although it represents only 14% of agricultural GDP, the livestock sector has been growing steadily since 2000. Development of livestock is important for a decrease of wild animal meat consumption and for the availability of alternative sources of protein. However, a limited veterinary services and growth toward wildlife territory are risks for the transmission and spread of diseases.

2. Drivers that increase interactions between humans and wildlife

- **Increased proximity.** Increased interaction with wildlife means that Liberians are becoming more exposed to zoonotic diseases. This proximity is especially exacerbated in places where land use has recently changed: in Liberia, incursion into forests for logging, farming, hunting, extractive activities or simply migration patterns keep rural populations at risk from frequent interaction with wildlife.

- **Threatened biodiversity.** Growing human activities in areas rich in biodiversity are exposing people to zoonotic pathogens. Liberia’s biodiversity is threatened by growing human activities such as hunting (for commercial sale and personal consumption), logging, agro-industrial crops and mining (Front Page 2017). As many as 192,000 hectares of forestland is lost annually from logging, shifting cultivation and other activities such as agro-industrial plantations (palm oil, rubber). Additionally, poor management and inadequate government oversight over the forest sector have led to illegal and uncontrolled logging (WBG 2015).

- **Liberia faces a deforestation crisis, and increasing deforestation is raising the risk of disease outbreaks.** For example, the 2014 EVD outbreak is theorized to have begun through contact with an infected animal from a rural village in neighboring Guinea following heavy deforestation of the area. EVD spread quickly to more than 28,000 people in West Africa, including 11,000 Liberians (Parshley 2016). In this context, authorities play a key role in widening and deepening the coverage of sustainable forest management programs and strengthening the governance of the forest sector at a local level (Nthara, K. and S. Srivastava 2020). Despite

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7 The country lost 12.2% of forest cover from 1990 to 2010; net forest depletion increased from 0.5% in 2005 to 32% in 2015, with an estimated deforestation rate of 0.46% per year (Nthara, K. and S. Srivastava 2020).
8 The World Bank is supporting the Government of Liberia through a USD$37.5 million Liberia Forest Sector Project, which seeks to sustainably manage natural resources and create opportunities for forest-dependent communities. However, the project does not include a component on One Health related activities.
existing reforestation projects, the extent and rate of forest cover removal exceed replacement efforts (Republic of Liberia 2017).

- **Wild animal meat represents an important source of animal protein for humans in Liberia, but its consumption is associated with an increased risk of zoonotic diseases**—including EVD. Despite these health risks, wild animal meat consumption used to be widespread throughout West Africa and common in both urban and rural areas (Ordaz-Németh et al. 2017). Increased access via roads likely facilitated hunting and extraction in areas that were previously hard to reach.

During and after the EVD crisis, Liberians decreased their wild animal meat consumption for health reasons—mostly in rural areas—thanks to education campaigns and a wild animal meat ban in 2014. But some wild animal meat sellers have resumed their activities under the misconception that EVD has disappeared (ReliefWeb 2015). Although there is no clear evidence, some studies suggest that global lockdowns adopted to combat the COVID-19 pandemic could directly increase the wild meat trade, due to reduction of alternative sources of income and disruption of supply chains for domestically reared meats (McNamara et al. 2020). Of the particular concern is the continued illegal hunting and trade in non-human primates in Liberia, including for consumption, with confiscations by law enforcement occurring recently (i.e. the first quarter of 2022).

In 2021, the FAO, MoA and FDA conducted a wild animal meat value chain study where 183 hunters participated. 46% are not aware that wild animal meat can transmit diseases to humans, 87% avoided killing fruit bats because of EVD; 50% are selling baby monkeys as pets, which has very serious zoonotic implications, and 70% find dead animals when hunting. This shows the evidence of risky behaviors along the wild animal meat value chain (FAO, MoA and FDA survey 2021 unpublished).

### 3. Drivers that increase interaction between humans and livestock

- **Proximity.** Households involved in livestock rearing usually have informal grazing areas, with poor access to centralized slaughter facilities. This close proximity

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**BOX 3: Endangered biodiversity in Mount Nimba and Northern Nimba County**

Mount Nimba was listed among the most important zones for conservation of biodiversity of moist forests of the sub-region (Koffi Bene et al. 2013) because of the presence of a wide variety of plant and animal species. Wildlife and forest cover depletion and human activities are directly connected in these areas: a study showed that 56% of the decline in wildlife in Nimba County stems from hunting and 26% from mining. Concomitantly, forest degradation mainly results from agriculture and mining. In 2011, 57% of hunted animals in Nimba County were rodents and 21% ungulates (mammals with hooves) (Koffi Bene et al. 2013). In a country where Lassa fever is endemic and where nearly 100 cases were reported in 2018 (WHO), these interactions can increase the risk of outbreaks.

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9 Shared by Guinea, Côte D’Ivoire and Liberia, the area has enjoyed a strict status of protection since 1944, but it has unfortunately been degraded due to hunting, exploitation of timber and large-scale mining activities focused on the extraction of iron ore—which constitutes the mountain body of Mount Nimba—diamonds and other commodities (UNESCO).
leaves those involved in livestock farming and animal product preparation, who typically do not have access to formal training in livestock production, at risk of exposure to disease threats. This is particularly concerning as the informality of livestock rearing areas in some areas puts livestock at risk of exposure to wildlife through poor biosecurity. The implications of human-domestic animal proximity is also evident for diseases linked to non-livestock animals in Liberia, such as canine rabies.

4. Factors that exacerbate outbreaks

• **Poor sanitation in high-density areas increases disease risk.** In 2013, only 13% of rural households had access to improved sanitation (compared to 50% in urban areas). The EVD emergency exposed the deterioration of the capacity and quality of water, sanitation and hygiene (WASH) services in urban centers. It highlighted the gap in service provision to vulnerable communities, especially to slum residents (Government of Liberia 2013).10

• **Limited access to healthcare impedes early diagnosis of outbreaks.** Although the situation has improved slightly following the civil war, diagnostic services in hospitals and clinics are typically limited to the most common infections, resulting in the potential to miss the early stages of outbreaks. GeneXpert machines have recently been deployed through Regional Disease Surveillance Systems Enhancement (REDISSE) Project and other projects to support rapid screening for select diseases, but sample throughput are limited. Additionally, rural populations face physical challenges in accessing health services, particularly during the rainy season. Private and government-run clinics are operating but are not consistently financed, and hospitals frequently suffer from lack of fuel and electrical disruptions that impede the quality of care.

• **Limited veterinary services make detection of animal diseases difficult.** Livestock services are provided by the Animal Resource Division of the Technical Department at the Ministry of Agriculture, but it is unable to deliver adequate services to livestock producers due to limited resources. There are limited veterinary services, and financing for the Animal Resource Division is insufficient (Republic of Liberia 2014). The process for the creation of the National Livestock Bureau in Liberia started in March 2022, and is expected to be submitted to the House of Representatives for approval. In 2014, there were no trained veterinarians working in the Ministry of Agriculture and the situation was similar in the counties; one county livestock officer with an animal science background, trained for a few months in primary animal health care, is responsible for huge areas. There is no community or county veterinary hospital (Republic of Liberia 2014). In 2020, there was a small anthrax outbreak in cattle in Monrovia, for which a One Health investigation was initiated to prevent human infections (OIE 2020). These kinds of episodes must be monitored, because as the livestock sector grows, veterinary services are not growing at the same pace. As part of the One Health effort in improving the Animal Resource Division, FAO with USAID handed over a model Animal Quarantine Centre, built with funding from the UN Multi-partner Trust Fund and USAID near the Liberia-Guinea border. This center will enhance the country’s ability for early detection, prevention and treatment of animal diseases (Karmo 2021).

• **Solid waste management is one of the greatest public health threats in Liberia.** and proper waste collection and disposal systems are overcrowded (Gad Boe 2020); waste management is largely restricted to Monrovia, although the sewage system only covers around 14% of the city. As a result, waste is largely emitted into the environment or incinerated.

• **The current centralized administrative structure can exacerbate outbreaks, as the EVD experience demonstrated. It is also a challenge for One Health implementation.** Despite a major objective of the One Health Coordination Platform (Republic of Liberia 2013), only 20% of households had access to improved water sources and 4% to improved sanitation. Furthermore, slums in Monrovia have poor sanitary facilities and lack running water, which contribute to increased rates for disease transmission (UNDP 2014). When EVD struck, the two most affected counties were Montserrado (where Monrovia is located), and Margibi; density and lack of appropriate sanitation were the main reasons for the spread of EVD (UNDP 2014).
Liberia 2018) being the collaboration and facilitation of discussions on issues concerning human, animal and environment health, the risk of centralization remains and will potentially lead to bypassing important stakeholders—especially in rural areas.

- Coastal flooding and sea-level rise pose especially serious risks, as Liberia’s coastline includes many of its most densely populated and economic centers, as well as numerous informal settlements composed of extremely poor households with little ability to either minimize their exposure to natural disasters or cope with the effects of environmental shocks (World Bank 2018). For example, almost 90% of the population in Monrovia is at risk of flooding from sea level rise.

**BOX 4: Post-conflict legacy and risk**

Although in 2022 Liberia was no longer included on the list of fragile and conflict-affected countries (World Bank 2022), the recent civil war badly crippled much of its economy, damaged its physical infrastructure and undermined its institutional capacity. Additionally, the impact of climate change and constant depletion of natural resources from deforestation and degradation could further intensify conflicts over these resources (World Bank 2018). After the civil war, control of Liberia’s forests remained in the hands of the Government, and companies with land extraction rights failed to provide community development (Cannon 2017). In a country with a strong legacy of conflict, the socioeconomic implications of changing climatic conditions must be closely monitored.
V. One Health in Liberia

The success of a One Health approach requires joint action among various sectors, acknowledgement of the vulnerabilities and drivers of potential pandemics and identification of hotspots for zoonoses and potential areas for collaboration among sectors. This case study attempts to fill that gap: it will address how actors came together in Liberia, which components are missing and the main drivers and vulnerabilities to emerging infectious diseases at the human-animal-ecosystem interfaces. It will also assess viable targeted interventions to reduce risks.

A. ENABLING ENVIRONMENT FOR IMPLEMENTING A ONE HEALTH APPROACH

A supportive enabling environment depends not only on the presence of laws and regulations, but also on their implementation. The adoption of a One Health approach requires strong political support at the highest levels but also at the local level (FAO 2021). Annex I provides an overview of actors and stakeholders from the Government and other organizations who are key for the prevention of emerging infectious diseases and the operationalization of a One Health approach.

The Government of Liberia has made significant strides toward the implementation of One Health (Annex II provides an overview of the institutional and legal framework relevant for One Health). Along with its development partners, the Government is combating the spread of communicable diseases through community engagement and improvements in public health and social protection. In 2018, the Government launched the National Action Plan for Health Security, the National Action Plan for Antimicrobial Resistance and the One Health Coordination Platform Governance Manual at the second national One Health Coordinating Platform meeting, in collaboration with many development partners (WHO 2018). In 2021, with FAO support, the Liberia One Health Governance Manual was revised, adding two technical working groups: Anti-Microbial Resistance and Risk Communication and Community Engagement (Jah 2021). This built on the establishment of Liberia’s One Health Platform which seeks to bring together key sectors in the fight against infectious disease outbreaks in support of the implementation of the Global Health Security Agenda.

The Ebola outbreak exacerbated the lack of coordination among government institutions since various ministries competed for resources. Similarly, the competition for donor funding impaired collaboration among civil society organizations, international NGOs and the Government (UNDP 2014). However, the Government recently has made significant efforts and showed strong political will to facilitate and implement a One Health approach.

B. EXISTING EFFORTS

In addition to several initiatives being undertaken by the Government to create national plans and implement a One Health Platform, there is a strong presence from various international organizations. The World Bank has several projects in Liberia, the highlight for One Health being the REDISSE program, which focuses on building disease-surveillance and response capacity at the regional and national levels in West Africa. Furthermore, the Liberia Social Safety Nets project created a system for reinforcing the resilience of vulnerable households. These efforts focus on early detection and effective response and recovery but not on upstream prevention to tackle root sources of risk (WBG CPF 2018).

The Food and Agriculture Organization of the United Nations (FAO) has an office called Emergency Centre for Transboundary Animal Diseases (ECTAD) that is responsible to implement projects that could incorporate a One Health component: in collaboration
with the Ministry of Agriculture with the support of the Global Health Security Agenda (GHSA) Program, FAO-ECTAD organized a two-days capacity-building training for commercial poultry and free-range poultry farmers and vendors from live bird markets (FAO 2019). Additional training for commercial poultry and free-range poultry farmers was also conducted with funding from GHSA. In May 2019, the FAO-ECTAD in collaboration with the University of Liberia and the Ministry of Agriculture trained and certified 28 Community Animal Health Workers (CAHWs) on basic animal health and production and introduced them to the Animal Disease Surveillance and Response (ADSR) system developed and launched in 2019 (FAO 2020). The MoA has identified 12 priority diseases (8 zoonotic and 4 non-zoonotic) that are immediately notifiable at National and International levels. The system reports events using the Event Mobile Application-information (EMA-i) app of the FAO through the Emergency Prevention System Global Animal Disease Information System (EMPRES-i).

FAO-ECTAD conducted the second batch of training 29 CAHWs in collaboration with the University of Liberia and Ministry of Agriculture (FAO 2021). The World Bank’s REDISSE program also provided training to 170 CAHWs. Furthermore, the FAO in-Service Applied Veterinary Epidemiological Training (ISAVET) Program, provided training to 26 veterinarians throughout various African countries, Liberia being one of them (FAO 2019). The ISAVET aimed to improve African countries’ capacity to detect and respond to emerging and re-emerging infectious diseases and transboundary animal diseases. Field epidemiologists in veterinary medicine are in charge of providing effective and timely surveillance and epidemic response.

The capacity strengthening from district to national level includes participation from the animal health sector.

In 2021, through the support of REDISSE, the MoA trained 30 officers (County Surveillance Officers, Quarantine Officers, Livestock officers, and FDA Wildlife Rangers) in ISAVET. In addition, five staff of the Central Veterinary Epidemiology Unit of the MoA benefited from both frontline and intermediate FETP implemented by Africa Field Epidemiology Network (AFENET) in collaboration with the MoH and NPHIL. The National Public Health Institute of Liberia (NPHIL) and partners now report via an Integrated Disease Surveillance and Response (IDSR) system, which includes reporting on dog bites and rabies and other public health events. The Forestry Development Authority has recently appointed a focal point for wildlife to the World Organisation for Animal Health (WOAH) which could help formalize a mandate for wildlife health under a government institution. USAID has funded several projects that take a One Health approach, including the PREDICT project that conducted behavioral risk studies in people and pathogen screening in wildlife for Ebola and related viruses, the PREDICT project discovered the Zaire ebolavirus strain that caused the 2014 Ebola outbreak in Northern Liberia in an insect eating bat (Miniopterus inflatus). This is the first finding of Zaire ebolavirus in a bat in West Africa, adding to other evidence suggesting that bats serve as a natural wildlife reservoir for Ebola and other related viruses (NPHIL 2019). USAID Liberia mission is applying a One Health approach to investments on conservation activities and establishment of protected areas, through both the STOP spillover project — which builds on the work of the PREDICT project — and the Conservation Works Activity (2021-2026). USAID is also supporting Breakthrough Action in risk communication with the goal of delivering effective quality social and behavior change (SBC) activities in Liberia that will result in improved demand and use of health services for malaria, maternal, neonatal, and child health and nutrition; family planning/reproductive health; adolescent health; and water, sanitation, hygiene (WASH); and to help communities engage in behaviors that help prevent zoonotic and non-zoonotic infections in line with the Global Health Security Agenda (Breakthrough2021).
The Liberian government has signaled its strong intent to strengthen capacity in collaboration with international agencies, undertaking key health security assessment and planning processes (Figure 5 provides a summary visual). In 2016, the World Health Organization conducted a Joint External Evaluation (JEE) mission in Liberia, with the JEE report showing the political willingness to invest in International Health Regulations capabilities and the existence of strong partnerships and stakeholder involvement. However, the JEE also shows several areas for improvement, such as the need for interventions in the animal health sector and for legal revisions to enable a One Health Approach. In 2018, an IHR-PVS National Bridging Workshop (NBW) was held in the country, developing a national roadmap with specific activities that will help strengthen coordination and collaboration and enhance capacity of sectors to contribute to collective goals, with a timeline from 2019-2024 (Republic of Liberia 2018). Encouragingly, this process included participation from central, county, and district levels, with strong participation from human and animal health and environment sectors, helping to diagnose sub-national needs and identify implementation priorities to reinforce systems at all levels. While some progress was impacted by the COVID-19 pandemic, implementation of the joint national roadmap remains a priority, with ongoing technical support from WHO and WOAH. Additionally, the mobilization of the One Health Coordination Platform for assessment and planning processes, such as the National Action Plan for Health Security, demonstrates Liberia’s commitment to taking a One Health approach when identifying gap areas needing investment and in setting priorities.

A 2019 World Bank study addressed the lessons learned from previous epidemics. The Ebola crisis highlighted the weaknesses in country ownership of health outcomes and the ability to coordinate multiple implementing partners. Similarly, poor country financial

### TABLE 1: Summary of key assessment, planning, and coordination missions conducted in Liberia.

<table>
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<tr>
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<tbody>
<tr>
<td>Year</td>
<td>2013</td>
<td>2016</td>
<td>2018</td>
<td>2018</td>
</tr>
<tr>
<td>Key outputs and/or follow-up action</td>
<td>Mission report developed, 2016: PVS Gap Analysis ; 2018: PVS Legislation 2019: PVS Evaluation Follow-up; PVS Laboratory (requested). Investments in animal health system strengthening have been made, including enhancements to the Central Veterinary Laboratory and the establishment of the Animal Disease Surveillance and Response system in 2019</td>
<td>Mission report; led to stakeholder workshop in 2017 to review key findings, some which are now addressed in roles and responsibilities under the NAPHS 2019: Country self Assessment of JEE 2021: JEE and NAPHS Implementation Evaluation National Validation Workshop</td>
<td>Costed action plan developed with clear ministry-specific roles and One Health coordination roles; implementation under way 2021: Implementation Evaluation national validation workshop 2021: IHR State party self-assessment and annual report (WHO 2018, 2019, 2021)</td>
<td>Roadmap developed; implementation under way February 2022 review of the national bridging workshop</td>
</tr>
</tbody>
</table>
management systems characterized the response to EVD, additional financing mechanisms were slow considering the urgency and steps had to be taken to modify instruments, like the World Bank’s Crisis Response Window. Finally, this study concluded that disease surveillance, particularly at the human-animal-environment interface, was sorely lacking in Liberia (as well as Guinea and Sierra Leone) and that health systems capacity was weak. Specific steps have been taken to address several of these deficits, including prioritization of specific actions for event prevention and management. Implementation progress toward these targets actions is being made, including by developing the animal health system as well as enhancements in the human health sector (e.g. case management guidelines for suspected Ebola and Lassa fevers).
VI. One Health Actions: recommendations

Focusing on prevention is key to reducing risks—and therefore addressing drivers—of emerging infectious diseases. As the analysis shows, humans, animals and ecosystems are deeply entwined. Therefore, prevention and preparedness should reflect the interconnectedness throughout sectors through targeted actions. Importantly, Liberia’s existing One Health convening and assessment and planning processes conducted to date provide an important foundation for further investment and progress. At the same time, building up sectors individually can also help to better target risks to reduce the likelihood of disease spillover and be sufficiently prepared for quick detection and effective response if outbreaks do occur. The occurrence of spillover events of diseases known to occur in the country, such as Lassa fever, provides a way to track progress over time toward the enhancement of prevention capabilities. There are multiple drivers of disease emergence and spread in Liberia, which lead to increased risk. However, stronger coordination between sectors and targeted efforts are key to prevent pandemics.

Overall, for a better implementation of a One Health approach, key offices, bureaus and institutions need to strengthen coordination and communications, including among the international partners that are involved in country projects.

A. HUMANS

Short-term interventions

1. Launch public awareness and education campaigns

Leveraging the success of awareness campaigns for EVD prevention, regular public education campaigns on threats and risks of zoonotic diseases can be a deterrent for practices that increase exposure (Dopoe 2020). The Government can empower women to strengthen knowledge and skills for effective disease prevention and control—targeting women for capacity-building will also ensure that children are well informed and develop healthy practices.

Targeting medical personnel should also be considered. Established in 2012, the Liberia College of Physicians and Surgeons is the Government of Liberia’s flagship program to train Liberian medical specialists across the country’s 15 counties (Dopoe 2020). The Government can leverage this program to include training on One Health.

2. Community engagement

During the EVD outbreak, the Ministry of Internal Affairs was set in charge of local leadership and community engagement. The Government invested in community engagement structures as part of the Ebola response and a Routine Immunization Campaign. Both strategies have shown good results (Bedford et al. 2017). Similar strategies could be used for prevention of outbreaks and to mainstream One Health. Additionally, the Government can leverage existing education and community engagement programs like the National Adult Education Association of Liberia (NAEAL) and the Liberian Youth Network (LIYONET) to educate about risks and health issues. Each county Government can improve community engagement at all levels to foster maximum participation of stakeholders, given the history of centralization and inequality. This can aim at community infection prevention and control, including for Lassa fever.

Medium-term interventions

3. Increase and decentralize health and medical drug services

Access to appropriate drugs is crucial to prevent the spread of diseases. However, this infrastructure is lacking in services and reach. The National Drugs Service can be expanded to establish medical drug depots in each county, with associated financing to ensure affordability (UNDP 2014).
Additionally, the Government can focus on access to health services: this could include subsidies for maternal and child healthcare (including immunization) to promote early recovery and prevention and decentralize the health sector into rural areas.

**4. Increase surveillance**

The Government can expand surveillance activities to determine baseline information on the presence or absence of pathogens detected elsewhere in the region, including for livestock and wildlife zoonoses and tick and mosquito-borne diseases. Data collection on anti-microbial resistance (AMR) is non-existent, therefore AMR data collection should be given priority.

**Long-term interventions**

**5. Invest in WASH and solid waste management**

To reduce the risk of exposure and outbreaks, it is crucial to invest in WASH infrastructure throughout the country but focusing primarily on high-density areas such as slums in Monrovia. This will promote effective prevention and control of infection by healthcare providers. Similarly, it would be wise to invest in solid waste management systems since it is one of the greatest public health threats in the country.

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**FIGURE 8:**

*Key recommendations to prevent EIDs through a One Health approach*

<table>
<thead>
<tr>
<th>HUMANS</th>
<th>ANIMALS</th>
<th>ECOSYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short-term interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public awareness and education campaigns</td>
<td>Empower communities</td>
<td>Improve county governance</td>
</tr>
<tr>
<td>Community engagement</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium-term interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase surveillance</td>
<td>Expand animal disease surveillance and control</td>
<td>Increase enforcement and stricter policies</td>
</tr>
<tr>
<td>Increase and decentralize health and medical drug services</td>
<td>Promote a One Health laboratory network</td>
<td>Adopt early warning systems</td>
</tr>
<tr>
<td><strong>Long-term interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invest in WASH and solid waste management</td>
<td>Increase veterinary services and education</td>
<td>Recover deforested areas</td>
</tr>
<tr>
<td></td>
<td>Increase use of technology in livestock facilities</td>
<td></td>
</tr>
</tbody>
</table>
B. ANIMALS

Short-term interventions

1. Empower communities

Empowering communities to increase their participation in land and wildlife management, primarily in rural areas that have increased contact with wildlife, will help with disease management. The Forestry Development Authority (FDA) can develop capacity in wildlife health to investigate disease events in wildlife and increase baseline understanding of zoonotic pathogens circulating in Liberia.

And, linked with the ecosystem, communities can be empowered to enhance awareness of forest conservation issues (World Bank 2016), potentially leveraging the existing community “eco-guard” mechanism and other stewardship practices.

Improving coordination and information flow between sectors, and among district, county, and national levels, will help to enhance understanding and target resources where needed. Joint communication, training, surveillance, procurement mechanisms, simulation exercises, response guidelines, and other needed coordination activities identified under the IHR-PVS National Bridging Workshop roadmap can be prioritized as a foundation for immediate action and quick wins, while also pursuing longer-term investments that this incremental strengthening can build on. However, this requires local government support to enhance the process as without their cooperation, activities at the local level might be hindered.

Medium-term interventions

2. Expand animal disease surveillance and control

The Government can leverage the existing surveillance system in the human health sector and expand surveillance systems and disease control activities to target other diseases besides dog rabies. For example, leveraging the Community Events-Based Surveillance (CEBS) that was implemented in eleven out of fifteen counties. In addition, there is an intrinsic need to integrate both animal and human health Community Event-Based Surveillance (CEBS) activities (Community Animal Health Workers and Community Health Assistants/volunteers).

3. Promote a One Health laboratory network

A network of laboratories to test for human and animal diseases would pay dividends. Laboratory services are crucial for faster detection of zoonotic pathogens throughout the country—especially in rural areas. Not only for the detection of zoonotic diseases there is a general need to also institute a sample transport system wherein samples from rural areas are submitted to relevant labs for timely testing and reporting for public health actions.

Long-term interventions

4. Increase veterinary services and education

The Government can promote a new mechanism to increase financing for veterinary services for institutions of the Ministry of Agriculture, for example the Animal Resource Division. Considering the almost non-existent network of national veterinary professionals, there is a developed Veterinary Workforce Development Strategy that outlined veterinary profession gaps and capacity development pathway that are categorized into short, medium and long terms. The Government and partners can leverage existing tools like the Global Dog Rabies Elimination Pathway (GDREP) to obtain cost estimates for treatment of various zoonotic diseases to guide financing and investment (Garmie Voupawoe et al. 2021).

5. Use technology in livestock facilities

The Government can leverage international funding to prevent outbreaks within the livestock population through the use of technology such as remote monitoring sensors, automated weighing, electronic ear tags, climate-controlled areas, thermal imaging and the use of chips for the traceability of animals.
C. ECOSYSTEM

Short-term interventions

1. Empower communities

Considering the limited enforcement capacity, communities should increase their participation in land management and forest conservation issues (World Bank 2016), by leveraging the existing community “eco-guard” mechanism, and the Government can reinforce the role of the Environmental Protection Agency (EPA) and Forestry Development Authority (FDA).

2. Work on county governance

A key aspect of achieving decentralization is to devolve services to the counties. Therefore, strengthening governance at the county level by informing community dialogue and actions and setting rules on the collection of forest products (Nthara and Srivastava 2020) are key. Counties also can promote and expand the network of protected areas or areas under improved conservation management. Noting the reliance on forest products for food security and livelihoods in many communities, adoption of safer practices may be an achievable short-term target.

Medium-term interventions

3. Increase enforcement and stricter policies

The Government can increase enforcement of environmental policies and standards, especially for highly damaging sectors such as logging, mining and industrial agriculture, and consider ways to reduce disease risk from the onset of natural resource and agriculture-linked development activities. The 2006 National Forestry Reform Law aims at assuring the sustainable management, conservation, protection and sustainable development of Liberia forest land, but enforcement is lacking (Government of Liberia 2006). Similarly, it can decentralize control and inspection for compliance with environmental standards established by the Environmental Protection Agency of Liberia, while increasing national coordination to identify and fill gaps in overall capacity. Stricter policies on deforestation and illegal activities are also necessary and go together with stronger enforcement.

4. Early-warning systems

It is critical to implement early-warning systems for natural hazards in highly vulnerable areas to diminish the impact of harmful climate events. Reporting on wildlife disease event and pathogen detection should also be incorporated into the national surveillance system to capture a broader scope of information and target risk reduction campaigns.

Long-term interventions

5. Recover deforested areas

Tropical forest regrowth is an effective and nature-based strategy for promoting sustainable development, restoring ecosystems, slowing climate change and protecting biodiversity. In Liberia, a program to recover forests can have a positive impact in the long-term, but it also requires community engagement and strict enforcement of environmental protection laws.

Prevention through a One Health approach—and further recommendations at the human, animal, and ecosystem levels—should also be based on additional careful analysis—by the government or implementing institutions—of alternative interventions, their associated costs, benefits, feasibility of implementation, and effectiveness in reducing risks of outbreaks of EIDs.
VII. Key takeaways

1. **One Health is an integrated unifying approach** that aims to sustainably balance and optimize the health of people, animals and ecosystems.

2. The success of a One Health approach in Liberia requires joint action among various sectors, acknowledging the vulnerabilities and drivers of potential pandemics and identifying hotspots for zoonoses and potential areas of collaboration among sectors.

3. Liberia is extremely vulnerable to pandemics. A combination of limited access to education and healthcare, poor infrastructure, natural resource exploitation and constant interactions between humans and animals put Liberia at high risk for future outbreaks.

4. **Agriculture, including forestry, is an important sector** in Liberia’s economy, but is at risk from climatic events, which increase the likelihood of outbreaks.

5. A supportive enabling environment depends not only on the presence of laws and regulations, but also on their proper implementation. Implementing a One Health approach requires strong political support at the highest levels but also at the local level.

6. The legacy of conflict and centralization increases the challenges for a widespread and coordinated government network focused on positive health outcomes for people, animals and the environment.

7. Despite centralization, the **Government of Liberia has made significant strides toward the implementation of One Health**; along with its development partners, the Government is striving to combat the spread of communicable diseases through community engagement and improvements in public health and social protection.

8. **Climate change and inequality are core factors that increase the vulnerability** of the country to pandemics, affecting prevention and preparedness.

9. **Infectious disease threat events are increasing in frequency.** For this case study, the main drivers were presented in the form of interactions.

10. **Disorganized growth in the livestock sector increases** interactions between livestock and wildlife, creating conditions for the spread of diseases.

11. Increasing human activities in wildlife territory, deforestation and wild animal meat consumption increase interactions between humans and wildlife, exposing people to unknown pathogens.

12. In the ongoing interactions between humans and livestock, **limited veterinary services increase the risk of zoonotic diseases in humans.** Poor sanitation, diminished access to healthcare, lack of appropriate solid waste management and coastal flooding are additional crucial drivers that can exacerbate outbreaks.

13. Short-term, medium-term and long-term interventions have been identified at the human, animal and environmental levels, which leverage existing institutions and programs and address core drivers of emerging infectious zoonotic diseases.
VIII. References


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# Annex I

Key actors and stakeholders for prevention of emerging infectious diseases and a One Health approach

## I. HUMAN HEALTH

<table>
<thead>
<tr>
<th>Actor/Stakeholder</th>
<th>Category</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>Government</td>
<td>• Health security: health policy, plans and standards</td>
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<tr>
<td></td>
<td></td>
<td>• Laboratories</td>
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<td></td>
<td></td>
<td>• Disease reporting</td>
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<td></td>
<td></td>
<td>• Risk communication</td>
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<td></td>
<td>• Community health workers</td>
</tr>
<tr>
<td>Ministry of Gender, Children and Social Protection</td>
<td>Government</td>
<td>• Demography and gender</td>
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<td>• Access to finance</td>
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<td>• Labor</td>
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<td>• Informal and traditional context</td>
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<td>• Policy environment</td>
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<td>• Land rights</td>
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<td></td>
<td></td>
<td>• Enabling environment and opportunities</td>
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<tr>
<td>Ministry of Internal Affairs</td>
<td>Government</td>
<td>• Community engagement</td>
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<tr>
<td></td>
<td></td>
<td>• Local leadership, at the county level</td>
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<tr>
<td>National Public Health Institute of Liberia</td>
<td>Government (semi-autonomous)</td>
<td>• Integrated disease surveillance and reporting</td>
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<tr>
<td></td>
<td></td>
<td>• National Public Health reference laboratory</td>
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<tr>
<td></td>
<td></td>
<td>• Research (human and animal pathogens)</td>
</tr>
<tr>
<td>Ministry of Youth and Sports</td>
<td>Government</td>
<td>• Demography, youth and gender</td>
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<td></td>
<td></td>
<td>• Access to finance</td>
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<td>• Labor</td>
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<td>• Institutional and formal context</td>
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<td>• Informal and traditional context</td>
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<td>• Policy environment</td>
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<tr>
<td></td>
<td></td>
<td>• Land rights</td>
</tr>
<tr>
<td>National Drugs Services (NDS)</td>
<td>Government</td>
<td>• Procurement of medical supplies</td>
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<tr>
<td></td>
<td></td>
<td>• Drug management</td>
</tr>
<tr>
<td>The Armed Forces of Liberia</td>
<td></td>
<td>• Health security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Health policy, plans and standard</td>
</tr>
<tr>
<td>The World Bank</td>
<td>Multilateral</td>
<td>• Policy environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Multisectoral functions: Animal health services, human health surveillance, environmental protection</td>
</tr>
<tr>
<td>US Institutions:</td>
<td>Donor</td>
<td>• Policy environment</td>
</tr>
<tr>
<td>- USAID</td>
<td></td>
<td>• Financing for animal health projects and human health investments</td>
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<tr>
<td>- US CDC</td>
<td></td>
<td>• Laboratory systems strengthening and disease screening</td>
</tr>
<tr>
<td>- US Department of Defense</td>
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<td>- NIH</td>
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<tr>
<td>Local communities</td>
<td>Stakeholders</td>
<td>• Prevention of EIDs, wildlife and forest management</td>
</tr>
</tbody>
</table>

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11 Adapted from FAO (2021) *Strengthening the enabling environment for responsible investment in agriculture and food systems—Evidence for Liberia*. Rome. URL: [https://doi.org/10.4060/cb2131en](https://doi.org/10.4060/cb2131en)
### II. ANIMAL HEALTH

<table>
<thead>
<tr>
<th>Actor/Stakeholder</th>
<th>Category</th>
<th>Role</th>
</tr>
</thead>
</table>
| Ministry of Agriculture | Government | • Concession-based development  
• Policy environment  
• Informal and traditional context  
• Animal health service |
| Animal Resource Division | Government | • Livestock policy  
• Veterinary support |
| Central Agriculture Research Institute (CARI) | Government | • Public support |
| Department of Livestock | Government | • Monitoring, control and prevention of diseases  
• Animal health |
| FAO | Development partner | • Fisheries, agriculture  
• Laws and regulations  
• Infrastructure  
• Institutional and formal context  
• Emergency Centre for Transboundary Animal Diseases (ECTAD) |
| World Food Programme | Development partner | • Value chains  
• Food security  
• Traditional agricultural practices |
| AFROHUN | Non-governmental | • Implementing interventions at spillover points to prevent zoonotic disease  
• Assessing risk reduction practices and policies to prevent spillover and mitigate amplification and spread of disease |
| BreakThrough Action | Non-governmental | • Deliver effective quality social and behavior change (SBC) activities |
| LCRP | Non-governmental | • Recuing chimpanzees who are victims of the illegal wild animal meat trade |
| Community Animal Health Workers | Government | • Prevention, detection and control of zoonotic and non-zoonotic diseases |

### II. ECOSYSTEM HEALTH

<table>
<thead>
<tr>
<th>Actor/Stakeholder</th>
<th>Category</th>
<th>Role</th>
</tr>
</thead>
</table>
| Ministry of Land, Mines and Energy | Government | • Environmental standards for concessions  
• Planning and development  
• Enforcement |
| Environmental Protection Agency | Government | • Environmental policy  
• Sustainability  
• Youth and gender  
• Enforcement  
• Intersectoral coordination |
| Forestry Development Authority | Government | • Environment and natural (forest) resource management  
• Wildlife authority |
| USAID | Donor | • Policy environment  
• Informal and traditional context  
• Protected area and biodiversity management |
Annex II

Institutional and legal framework in Liberia, relevant for One Health: An Overview

- "Public Health Law 2017"
- "Laboratory Strategic Plan 2016 (5-year)"
- "National Laboratory Policy 2011"
- "National Action Plan for Health Security"
- "National Action Plan for Antimicrobial Resistance"
- "Liberian Institute for Biomedical Research"
- "National Public Health Institute"
- "National Forestry Reform Law 2006"
- "Biosafety and Biosecurity guidelines (no legislation)"
- "Draft National Environmental Health Policy"
- "National Wildlife Conservation and Protected Area Management Law of Liberia of 2016 (proposed amendments, 2021)"