

An aerial photograph of a mountain valley in Georgia. A river winds through the center of the valley. On a grassy hill in the foreground, there is a large, ancient stone church with two prominent towers. The landscape is lush green, and the sky is clear. The image is framed by white diagonal lines.

ONE HEALTH GEORGIA

**An Assessment of One Health
Operations and Capacities**

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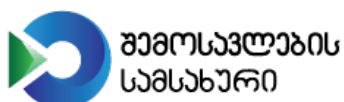
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სსიპ სოფლის მეურნეობის
სახელმწიფო ლაბორატორია

NOTE TO READERS

This report was developed at the same time as the Government of Georgia's recently published *One Health National Action Plan 2023-2025* ([available online in Georgian](#)). We applaud the Government of Georgia for taking an international lead in adapting the global [One Health Joint Plan of Action \(2022 - 2026\)](#) to Georgia's unique, national context.

However, because this report was written concurrently with Georgia's *One Health National Action Plan 2023-2025*, some information presented here may be incongruent with the *One Health National Action Plan 2023-2025*. Reversely, some information present in this report is not represented in Georgia's *One Health National Action Plan 2023-2025*.

We believe both documents provide important background information and recommendations for One Health operations in Georgia, and we encourage you to read both this report and the Government of Georgia's *One Health National Action Plan 2023-2025*.



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2 ACRONYMS

AMR	Antimicrobial Resistance
APA	Agency of Protected Areas
BNSR	Biosurveillance Network of the Silk Road
BSL-2	Biosafety Level Two
BSL-3	Biosafety Level Three
CBD	Convention on Biological Diversity
CBRN	Chemical, Biological, Radiological, and Nuclear
CCHFV	Crimean Congo Hemorrhagic Fever Virus
CoE	Centre of Excellence Initiative
COVID-19	Coronavirus Disease 2019
DMS	Defense, Military, Security
DTRA	United States Defense Threat Reduction Agency
EDP	Especially Dangerous Pathogen
EHA	EcoHealth Alliance
EID	Emerging Infectious Disease
EIDSS	Electronic Integrated Disease Surveillance System
ELISA	Enzyme-linked Immunosorbent Assay
EU	European Union
EuFMD	European Commission for the control of Foot and Mouth Disease
FAO	Food and Agriculture Organization of the United Nations
FETP	Field Epidemiology Training Program
GDP	Gross Domestic Product
GHSA	Global Health Security Agenda
HFI	Human Footprint Index
IHR	International Health Regulations
ILI/SARI	Influenza-like Illness and Severe Acute Respiratory Infections
JEE	Joint External Evaluation
JRA	Joint Risk Assessment
LIMS	Laboratory Information Management System
MCM	Multisectoral One Health Coordination Mechanism
MEPA	Ministry of Environmental Protection and Agriculture

MoILHSA	Ministry of Internally Displaced Persons from Occupied Territories, Labor, Health and Social Affairs
NAHPSG	National Animal Health Programme Steering Group
NAITS	National Animal Identification and Traceability System
NAPHS	National Action Plan for Health Security
NBSAP	National Biodiversity Strategy and Action Plan
NCDC	National Center for Disease Control and Public Health
NFA	National Food Agency
NFI	National Forest Inventory
NGO	Nongovernmental Organization
NITAG	National Immunization Technical Advisory Group
OHZDP	One Health Zoonotic Disease Prioritization
OHHLEP	One Health High-Level Expert Panel
PCR	Polymerase Chain Reaction
PHC	Primary Health Center
PVS	Performance of Veterinary Services
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SC-FELTP	South Caucasus Field Epidemiology and Laboratory Training Program
SLA	State Laboratory of Agriculture
SPAR	State Party Self-Assessment
STAR	Strategic Tool for Assessing Risks
TESSy	The European Surveillance System
TTX	Tabletop Exercise
TZG	Tripartite Zoonoses Guide
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
US CDC	United States Centers for Disease Control and Prevention
WAB-Net	Western Asia Bat Research Network
WAHIS	World Animal Health Information System
WHO	World Health Organization
WHO/EURO	World Health Organization Regional Office for Europe
WOAH	World Organisation for Animal Health

3 EXECUTIVE SUMMARY

'One Health' concepts aim to optimize the collective health of people, animals, and ecosystems. This holistic approach can help to strengthen health security within and between countries, including being better able to predict, detect, respond, and recover from shared health threats. By recognizing the interdependence of humans, domestic and wild animals, plants, and ecosystems, multiple, often siloed, sectors can align under a common agenda. Health threats that cross the human-animal-environmental interface are becoming increasingly common, as most emerging human pathogens recognized over the last 50 years are zoonotic (i.e., of animal origin) and linked to wildlife hosts. To efficiently address the emergence of new disease (like SARS-CoV-2), while managing the burden of endemic ones, a multisectoral One Health approach should be adopted.

Georgia has made notable strides in incorporating One Health concepts into its national biosurveillance and biodefense efforts, but there are opportunities to bolster these efforts through enhanced cross-sector communication, planning, surveillance, and capacity building. Based on an in-depth literature review, an interactive two-day workshop, and three-day regional meeting with One Health stakeholders in Georgia, this report outlines those opportunities and provides recommendations for integrating One

Health concepts into routine health-related activities.

The primary agencies in charge of protecting human, animal, and environmental health in Georgia are the National Center for Disease Control and Public Health (NCDC), R. Lugar Center for Public Health Research (Lugar Center), National Food Agency (NFA) and State Laboratory of Agriculture (SLA). Other sectors including Revenue Service, Ministry of Internal Affairs, universities, and defense also provide financial resources, communication, and emergency preparedness actions, conduct One Health research, and help maintain biodefense and security. These organizations largely operate independently as there are some unclear mechanisms of communication between sectors, but joint planning and response does exist, particularly between NCDC, NFA, and SLA. Despite the relative independence, each sector has implemented several health-related capacity assessments, developed national plans, passed relevant laws and regulations, and implemented biosurveillance research projects in their field (Table 1). Critically a One Health Strategic Action Plan is in development and should be finalized this year. Georgia, however, has not yet completed a National Action Plan for Health Security, and has a few other plans and assessments in development that have yet to be completed or renewed.

Table 1. Completed assessments and plans

PLAN OR ASSESSMENT	COMPLETED? (YEAR)
JEE	Yes (2019)
PVS Evaluation	Yes (2009)
PVS Evaluation Follow-Up	No
PVS Gap Analysis	No
PVS Legislation	Yes (2015)
IHR-PVS Bridging Workshop	Yes (2019)
NAPHS	No
STAR	Yes
OHZDP	No
National AMR Action Plan	Yes (2017)
NBSAP	Yes
JRA	Yes (2019)
CDSS Evaluation	Yes (2019)

JEE = Joint External Evaluation; PVS = Performance of Veterinary Services; IHR = International Health Regulations; NAPHS = National Action Plan for Health Security; STAR = Strategic Toolkit for Assessing Risks; OHZDP = One Health Zoonotic Disease Prioritization Exercise; AMR = Antimicrobial Resistance; NBSAP = National Biodiversity Strategy and Action Plan; JRA = Joint Risk Assessment; CDSS = Communicable Disease Surveillance System.

Regarding biosurveillance, Georgia has a capable and quickly improving ability to detect and respond to zoonotic outbreaks in a timely manner. There is a dedicated list of zoonotic diseases of greatest public health concern, and both animal and human health sectors utilize and feed into an Electronic Disease Surveillance System (EIDSS) that allows for real-time exchange of information between veterinary and healthcare sectors. EIDSS also has a well-functioning laboratory module which is used to share information between public health and animal health laboratories. In addition to EIDSS, two other information sharing systems are widely used in Georgia. A laboratory information management

system is used to link hospitals and clinics to share lab results – which has been particularly helpful to provide timely lab results to suspected coronavirus disease (COVID-19) cases – and a National Animal Identification and Traceability System which records information on animals and their keepers, which veterinarians and inspectors use to track animal vaccination status, illnesses, and health conditions. Connected to these information systems, are laboratory networks that conduct disease diagnostics, molecular sequencing, and research. The Ministry of Environmental Protection and Agriculture (MEPA) is responsible for a lab network that addresses animal and plant diseases, as well as food and water safety, while NCDC/ Lugar Center lead the human health network, which includes biosafety level two (BSL-2) and biosafety level three (BSL-3) facilities. NCDC is also developing a new Chemical Risk Factor Research Laboratory.

Despite the growth in joint collaboration between NCDC, Lugar Center, NFA, and SLA via shared surveillance systems and projects there is no overall One Health coordination mechanism in Georgia, although one is being developed. As it is still being finalized, it is not yet clear as to which organizations will be included in this forthcoming national one health committee, but its main focus will be to harmonize One Health-related actions across all sectors. Smaller scale coordination groups also exist, but these are more targeted to a technical group of human and animal health experts.

Compared to other parts of the world, Georgia, and the Caucasus region, is not considered a hotspot for emerging infectious diseases, but human-led changes in landscapes may be increasing the potential for zoonotic spillover. Several drivers of zoonotic diseases emergence and spread in Georgia include land conversion for agriculture, improper biosafety measures among some small-scale farmers,

animal movement across migratory routes, and limited wildlife surveillance.

Finally, based on the findings of the literature review, two-day workshop, and three-day regional meeting, several actions are recommended to strengthen One Health in Georgia (Table 2). Additional recommendations are in the full report.

Table 2. Recommended actions for advancing One Health in Georgia

RECOMMENDATIONS	
<i>Coordination and Governance</i>	Finalize and formally establish a National One Health Committee that includes representatives from the Ministry of Internally Displaced Persons from Occupied Territories, Labor, Health and Social Affairs (MoILHSA), MEPA, Ministry of Finance, Ministry of Internal Affairs, Ministry of Defense, universities, and other potential One Health stakeholders.
	Finalize, renew, and implement not yet completed national plans and assessments, including a National Action Plan for Health Security (NAPHS), National Forest Inventory, Tripartite Zoonoses Guide, and renewed PVS Evaluation and National Biodiversity Strategy and Action Plan (NBSAP) with a multisectoral group of government experts.
<i>Disease Risk Reduction</i>	Expand zoonotic disease monitoring and surveillance in wildlife using nonlethal methods.
	Enhance public communication about the importance of biodiversity preservation, and safe practices regarding interactions with wildlife
<i>One Health Capacity Building</i>	Improve the transparency and timeliness of health-related information dissemination to additional sectors, departments, and academicians
	Expand joint work/training with veterinarians, environmental health specialists, epidemiologists, and other professionals across the human-animal-environmental health landscape

Overall, Georgia has made substantial growth in developing its human and animal health surveillance capacity, workforce, and infrastructure, especially in the last 10 years. Further adopting One Health approaches – particularly by better integrating environmental health and wildlife sectors into One Health activities – could help strengthen the coordination and

efficiency of the institutions and people that work across the human-animal-environmental spectrum in Georgia.

4 INTRODUCTION

The COVID-19 pandemic has upended daily life and shed a light on the risk of emerging infectious diseases and fragility of our health systems. Like most pandemics of past, all available scientific evidence suggests that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) likely originated from an animal and has since spilled over to humans¹⁻⁴. Globally, most emerging human pathogens recognized over the last 50 years are zoonotic (60%), and the majority (>70%) of these emerging zoonoses are linked to wildlife hosts⁵. This highlights the need for improved multidisciplinary approaches to address zoonotic diseases (i.e., of animal origin) and other shared health threats. The emergence of zoonotic pathogens from wildlife occurs either directly via high levels of human-animal contact, indirectly through livestock hosts as ‘amplifiers’, or via arthropod vectors or environmental exposure. Efforts to prevent emerging zoonoses have targeted these high-risk interfaces, but to be effective they require a high-functioning, multi-sectoral, One Health approach to mitigate risk and facilitate rapid detection and response to emergence events, thereby reducing their impact⁶⁻⁸.

This risk of novel disease emergence varies place by place, but it can be predictable, as certain groups of animals and environmental factors represent a higher risk to human health^{5, 9, 10}. Factors that facilitate the ‘spillover’ of a virus from animals to humans include ecological changes to landscapes, expansion of agricultural practices without adequate

biosecurity, climate change, increased trade and travel, and urbanization^{5,9}. Based on these factors, and its high diversity of poorly studied mammals (particularly bats and rodents), the Caucasus region – including Georgia – has the potential to be an emerging infectious disease hotspot. Furthermore, as a geographic crossroads between the Middle East, Europe, Russia and Asia, the Caucasus’ are a critical region for global security and travel, and improved pathogen biosurveillance in this region is warranted to support rapid detection and response.

The persistent burden of endemic diseases like seasonal influenza, anthrax, rabies, plague, tuberculosis, and antimicrobial resistance and the threat of emerging or re-emerging zoonotic pathogens, including especially dangerous pathogens such as Crimean Congo Hemorrhagic Fever Virus (CCHFV), Tularemia, and others continue to pose challenges to health systems and society – especially when resources are tied up responding to new outbreaks (e.g., COVID-19). Additionally, as the factors that affect outbreaks of both endemic and newly emerging diseases are wide-reaching across populations, environments, and industries, effectively preventing, detecting, and responding to these challenges can be extremely difficult. It requires collaboration at all levels, i.e. a “whole-of-society” approach, to shape and implement policies, risk monitoring and risk reduction practices, maintain coordination, clearly communicate across sectors and with the public.

Therefore, to efficiently address the emergence of new diseases and the burden of endemic ones, a collaborative, One Health approach that integrates strategies and resources from across disciplines and enables cross-sector information sharing, communication, joint surveillance, and

response should be adopted. Georgia has made great progress to enhance its biosurveillance and biodefense activities, but there are opportunities to further invest in and generate benefits from a One Health, multi-sector approach.

5 PURPOSE OF THIS REPORT

It is important to recognize that applying a One Health approach to enhancing health security is typically hindered by the single-sector approach taken by line ministries. This report provides examples of the application of One Health approaches and outlines the opportunity for incorporating an expanded One Health approach to enhance biosurveillance and biodefense activities in Georgia. The information in this report builds on previous findings from

national assessments, plans, workshops, and peer-reviewed literature to provide a comprehensive One Health lens towards planning for, preventing, and responding to health threats in the future. We additionally integrate information and perspectives gained from a two-day virtual workshop and three-day meeting with a broad range of representatives from multiple sectors in Georgia.

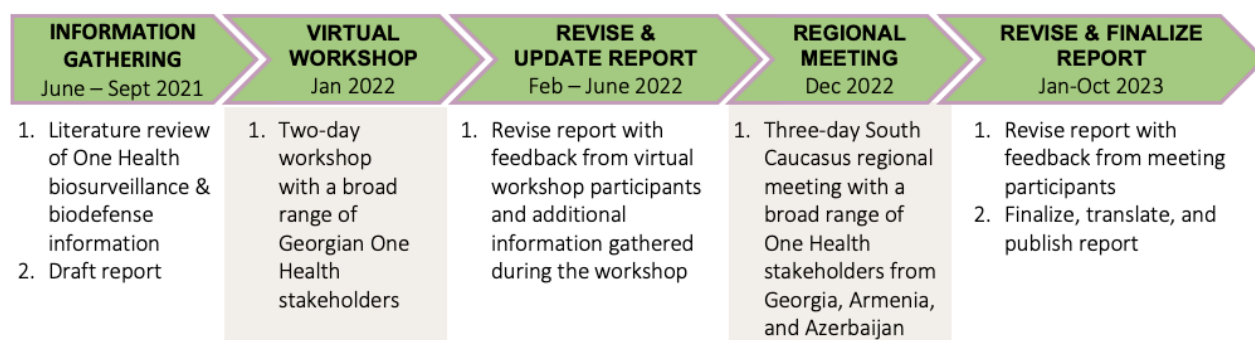


6 METHODOLOGY

This report was developed using a combination of literature review, stakeholder mapping, and roundtable discussions to identify areas for improved multisectoral collaboration in One Health (Figure 1). The process began with a literature review which provided the structure for the draft report. Following the literature review and initial report development, a two-day virtual workshop was held on 20-21 January 2022 with government and academic experts in Georgia to discuss the One Health, biosurveillance, and biodefense activities being implemented in Georgia. Workshop attendees participated in activities and discussions targeted at understanding gaps and opportunities to enhance multisectoral collaboration. After the workshop, the

report was revised based on input from workshop attendees and additional documents gathered as a result of the workshop. Then, in December 2022, EcoHealth Alliance (EHA) hosted a regional meeting with One Health stakeholders from Georgia, Armenia, and Azerbaijan to foster cross-country and cross-sector collaboration, which uncovered additional information that is included in this report. After final revisions, the report was translated into Georgian, and published in English and Georgian online at EcoHealth Alliance’s website (<https://www.ecohealthalliance.org>). A peer-reviewed manuscript summarizing the key findings from our workshop, regional meeting, and literature review is also in preparation.

Figure 1. Process to develop this report.



6.1 Literature review

1) To start, a systematic English-language literature search was conducted using Web of Science and PubMed. The search was limited to the period of 2010-2021(June) and included all publications related to biosurveillance, biodefense, One Health, zoonoses, emerging infectious disease, or related search terms in the Caucasus

region, or in Georgia, Armenia, or Azerbaijan specifically. The initial search yielded 2,061 records, which after reviewing titles and abstracts, was cut down to a final group of 208 papers for full-text review. Of these papers, 91 specifically focused on Georgia. The final group of papers were reviewed for background

information on One Health and biosurveillance/ biodefense as well as examples of multisectoral collaboration between authors, institutions, and sectors. Information from the literature review is weaved throughout this report.

2) A gray literature search was also conducted for documents related to One Health and biosurveillance/ biodefense in Georgia via government websites, general web search, and previously identified sources including World Health Organization (WHO), World Organisation for Animal Health (WOAH, formerly OIE),

and World Bank websites. Background information from these documents and tools is incorporated in this report. In particular, multiple tables and figures from the World Bank's *Operational Framework for Strengthening Human, Animal and Environmental Public Health Systems at Their Interface*¹¹ have been adapted and included as examples in this report.

3) After the virtual workshop (see below), additional scientific publications and gray literature shared by workshop participants was reviewed and included in this report.

6.2 Multisectoral One Health Virtual Workshop

A two-day virtual workshop was held on 20-21 January 2022 convening participants from MoILHSA, MEPA, Revenue Service, and Ilia State University to discuss – and participate in – small group activities related to One Health, biosurveillance and

biodefense practices and policies, as well as identifying emerging infectious disease risk factors in Georgia. A complete list of workshop participants, agenda, and activities can be found in the Annex.

6.3 South Caucasus Regional Meeting on One Health Biosurveillance and Biodefense

A three-day meeting was held in Tbilisi Georgia on 6-8 December 2022 bringing together 45 participants from Georgia, Armenia, Azerbaijan, and EHA. Stakeholders representing 20 different affiliations, including Ministries of Health, Environment, and Agriculture, national security, academia, tourism, revenue

service, and nongovernmental organizations (NGOs) gathered to share insights and expertise on implementing One Health programs and research in the South Caucasus region. Some information generated from the meeting is included in this report (Figure 2).

Figure 2. South Caucasus stakeholders gather to share information and expertise

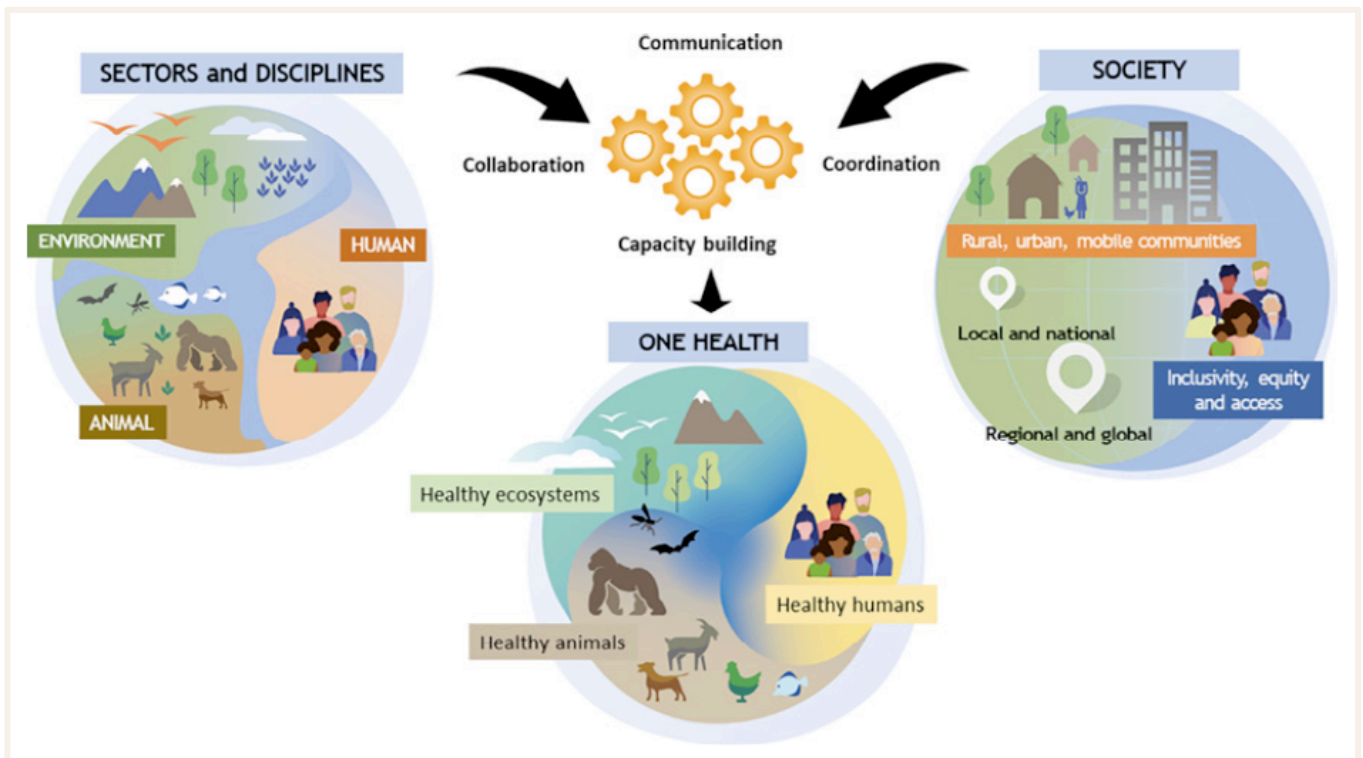


7 ONE HEALTH FRAMEWORKS

The concept of One Health has been recently defined by the WHO One Health High Level Expert Panel (OHHLEP) as “an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems (Figure 3). It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked

and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying 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, taking action on climate change, and contributing to sustainable development”¹².

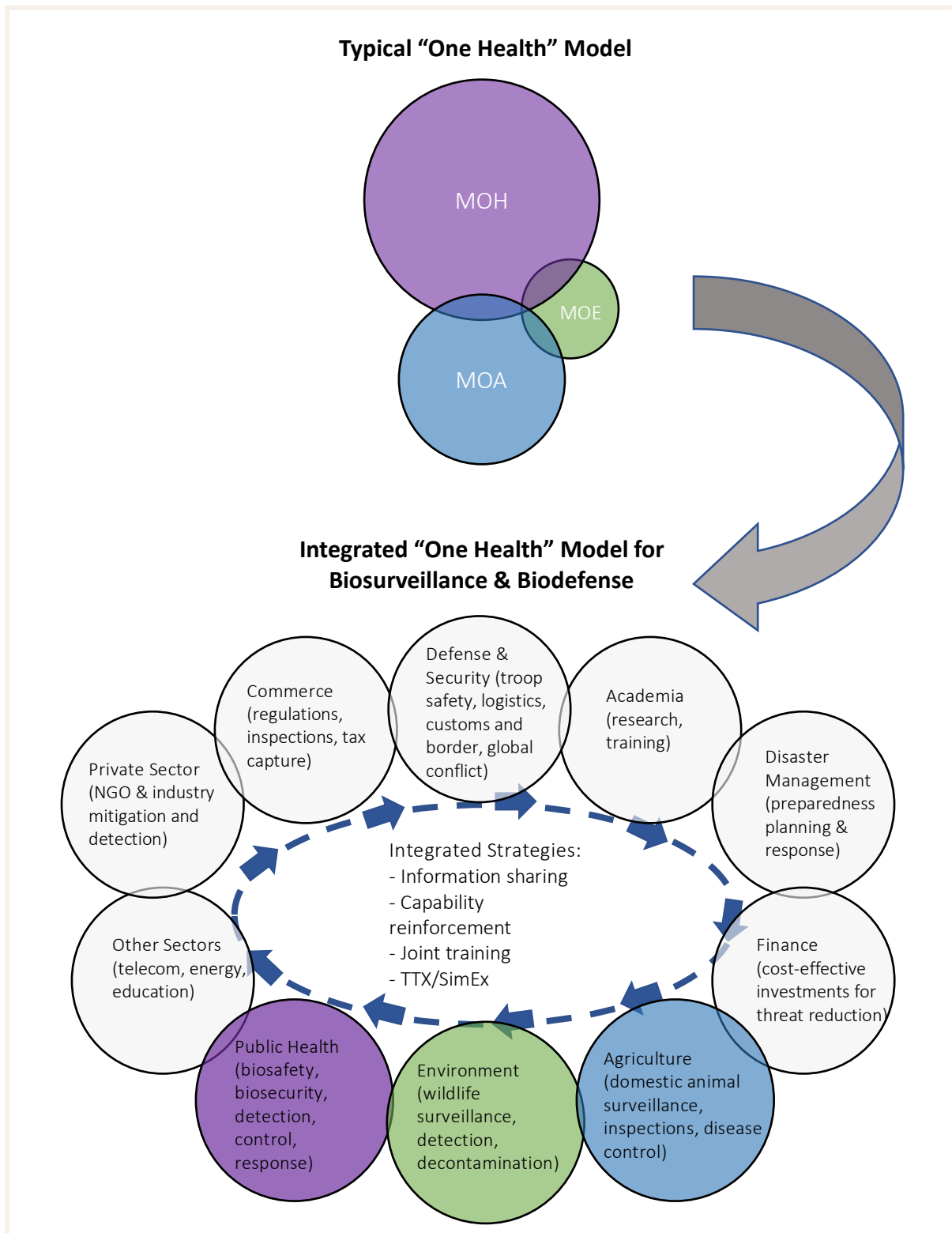
Figure 3. One Health visualization (OHHLEP) Annual Report 2021.



While holistic by definition, in practice, One Health is often driven by activities in and across a couple of sectors, i.e., Ministries of Health and Agriculture, with the environmental sectors typically involved to a much lesser extent. However, as Figure 4 demonstrates when we move away from a simplified, typical One Health model towards a comprehensive One Health approach, a wide variety of sectors can collaborate and contribute to strategies that enhance biosurveillance and

biodefense. Importantly, not every sector will be involved in all One Health activities. Depending on the scenario, one sector may lead or have an outsized role, but that does not mean that other sectors cannot contribute to enhance response efforts. Further, understanding the actions required from each sector – and their cost – can help inform cost-effectiveness analyses of preventative measures that avert disease outbreaks from occurring.

Figure 4. Comparing One Health biosurveillance and biodefense models



8 ONE HEALTH SECTORS IN GEORGIA

It is expected that not every sector will always play an equal role in One Health activities and responsibilities, but that does not mean that sectors outside of health, agriculture, and environment should be routinely excluded. A true One Health approach to preventing, detecting, responding, and recovering from health challenges includes additional sectors like defense, security, academia, disaster relief, and others, that have a vested interest in

improving population health at the local, regional, national, and global levels. Moreover, a clear delineation of responsibilities is essential in both times of emergency and nonemergency for swift action and communication and to reduce duplication of tasks. Specific sectors that play a potential role in implementing comprehensive One Health programs in Georgia are listed in Table 3.

Table 3. Potential relevant One Health sectors in Georgia

SECTOR, MINISTRY, OR ORGANIZATION	SUB-MINISTRY OR DIRECTORATE	RELEVANT ONE HEALTH SCOPE	LIMITATIONS OR ASPECTS NEEDING ADDITIONAL ATTENTION
MoILHSA	<ul style="list-style-type: none"> National Center for Disease Control and Public Health 	<ul style="list-style-type: none"> Zoonotic disease and antimicrobial resistance (AMR) surveillance – case/outbreak investigation laboratory diagnostics, Development of preventive measures/recommendations Communication with relevant public health and veterinary sectors; organization of awareness campaigns Environmental changes such as climate change can be better integrated into one health implementation 	<ul style="list-style-type: none"> “Weak” integration and implementation of One Health approach at a regional level Need to improve event-based surveillance and early warning systems; Antimicrobial surveillance both in humans and animals; Environmental aspects of One Health Developing a regional one health intelligence system, will reduce threats to global health security posed by emerging infection diseases and impact of environmental change.
MEPA	<ul style="list-style-type: none"> National Environmental Agency Scientific Research Center of Agriculture Department of Biodiversity and Forestry National Food Agency State Laboratory of Agriculture 	<ul style="list-style-type: none"> Animal disease surveillance in domestic animals and wildlife Animal disease prevention, investigation control, and response Animal disease notification to WOAHA. Animal disease risk analysis Food safety control in regards zoonotic pathogens Antimicrobials resistant study in animals Lab testing for Veterinary diseases, Food safety, and Diagnosis of plant diseases Review of legislation 	<ul style="list-style-type: none"> There are not enough human and financial resources According to NFA, 60% of veterinarians are >70 years old and need trainings, and there are not enough young veterinarians to replace them Need additional trainings, supply materials, and Professional testing for quality control on especially for rare diseases and Kits

		<ul style="list-style-type: none"> Part of Chemical, Biological, Radiological and Nuclear (CBRN) Security 	
Ministry of Defense	<ul style="list-style-type: none"> Department of Defense Policy and Development Department of Information Technology 	<ul style="list-style-type: none"> Prevention and nonproliferation of hazardous materials Develop SOPs and plans for joint risk assessment in partnership with NCDC Monitor points of entry for communicable diseases Prevent the proliferation of technology, pathogens and expertise that could be used in the development of bioweapons Enhance laboratory methods for disease detection 	<ul style="list-style-type: none"> Ministry of Defense can be siloed from activities of NCDC and could be better integrated into joint training and simulations with other One health stakeholders
Ministry of Finance	<ul style="list-style-type: none"> Revenue Service Border Veterinary Control Customs and Border Service 	<ul style="list-style-type: none"> Sanitary and epidemiological border control: early detection, prevention, notification of suspected cases (coordination with NCDC) Veterinary border control: Detection, prevention, notification of suspected cases (Coordination with NFA) 	<ul style="list-style-type: none"> Arrange intersectoral protocols , develop contingency plans and SOPs, training of responsible staffs.
Ministry of Internal Affairs	<ul style="list-style-type: none"> Emergency Response Department 	<ul style="list-style-type: none"> Coordinate emergency response 	<ul style="list-style-type: none"> Limited formal connection to some other sectors/Ministries
Scientific Bodies	<ul style="list-style-type: none"> Institute of Parasitology and Tropical Medicine Research National Center for Tuberculosis and Lung Diseases, Tbilisi National Academy of Sciences Center for Wildlife Disease Ecology Institute of Zoology Institute of Ecology 	<ul style="list-style-type: none"> Scientific research Elaborating and finetuning new analytical tools/protocols Modeling Communicating results of scientific research to the decision makers National and international collaborations. 	<ul style="list-style-type: none"> Improving communication Financial stability of research Translating research outcomes to One Health policies
Universities and Academia	<ul style="list-style-type: none"> N. Makhviladze, Ecology and Occupational Medicine Institute Tbilisi State University Davit Tvildiani Medical University, Tbilisi Ilia State University, Tbilisi, Georgia 	<ul style="list-style-type: none"> Scientific research, education, training Surveillance of wildlife for zoonoses via research Research investigations for ecology of pathogens and host species Training students and early career scientists and health workers 	<ul style="list-style-type: none"> Collaboration with other institutions Better communication across organizations Financing Translating research outcomes to One Health policies

Other Ministries	<ul style="list-style-type: none"> • Ministry of Education and Science • Ministry of Foreign Affairs 	<ul style="list-style-type: none"> • Provide higher education (e.g., doctoral programs) for future One Health practitioners • Promote scientific and research integrity • Support new generation of Georgian scientists, increase research potential in the scientific institutions and communities, support Georgian scientists' integration into the international scientific area 	<ul style="list-style-type: none"> • Teaching and education are sometimes seen as an unattractive career choice and provides a relatively low salary • Structured doctoral programs are insufficiently resourced, leading to a lack of sustainable, funded research projects
Private Sector, Local Government, and NGOs	Provide technical expertise, training, and support as needed at both the national and local levels		

9 INVESTING IN ONE HEALTH

Given the high cost of new and emerging diseases – like COVID-19 – in addition to the persistent burden of endemic diseases, Georgia would benefit from further investing in a multisectoral, One Health approach to strengthening zoonotic disease biosurveillance and biodefense. Implementing a multisectoral approach to preventing and responding to zoonotic disease outbreaks makes the best use of limited resources, money, and personnel across disciplines, improving the efficiency and effectiveness of zoonotic disease management. It also offers synergies and cross-sectoral coordination which help to expand capacity and efficiency in disease prevention, detection, response, and recovery while avoiding duplication of tasks, ultimately leading to financial savings¹¹. Recent research has shown that investing in One Health for disease prevention, even with a moderate reduction in disease emergence risk, costs just 1/20 of the value of lives lost each year

to emerging viral zoonoses and 1/10 of the annualized economic losses¹³. Similar studies have shown that the cost to prevent pandemics (in the form of preventing deforestation, regulating wildlife trade, and expanding early detection systems for disease surveillance) far outweighs the costs incurred from pandemic outbreaks of zoonoses^{14, 15}.

Moreover, timely control of zoonotic disease is cost-effective and saves lives¹¹. The ongoing SARS-CoV-2 outbreak has shown us that when epidemics spread the cost of combatting them also goes up exponentially. There is a wide range of direct and indirect costs that accrue during a disease outbreak (Table 4).

The COVID-19-induced shutdown in Georgia led to an estimated 6.1 percent reduction in gross domestic product (GDP) in 2020.¹⁶ The short-term impacts of COVID-19 could also substantially increase poverty rates by 9%, impoverish 350,000

people, and force over 800,000 Georgians to suffer downward mobility as a result of the economic shock of the pandemic.¹⁷ The incidence of extreme poverty could also more than double to 7.4%.¹⁷ This information is based on data from 2020, while the devastating economic impact has been substantial as the pandemic continues into 2023.

Livestock disease outbreaks on farms (e.g., African swine fever, foot-and-mouth disease etc.) can also lead to significant financial loss in the agricultural sector. This is critically important in Georgia where agriculture makes up 7-9% of the national

GDP and 45% of the labor force^{18, 19}. Not only is it time and labor intensive to identify the source of an outbreak, cull affected animals, vaccinate others, and quarantine affected communities, it can be expensive to provide government financial compensation for the loss of livestock. It also affects the broader economy as other countries may ban imports of Georgian meat and consumer prices may rise due to lack of supply. In cases where those livestock diseases have the ability to transmit to wildlife species or humans, additional significant impacts could occur.

Table 4. Examples of direct and indirect costs that may result from human or animal disease.

COST CATEGORY	EXAMPLES OF COSTS	
	HUMAN	ANIMAL
Direct costs	Costs of medical treatment; contact tracing; vaccination; restricted movement; job loss, long-term adverse health effects (e.g., long COVID)	Costs of veterinary treatment; culling and disposal of animals; vaccination; farm loss, including number of animals, inability to buy/sell animals,
Indirect costs	Reductions in tax revenue and tourism, loss of ecosystem services; interruptions in schooling, reduced childhood vaccination and treatment of other illnesses; increased “burnout” among healthcare workers and reduced focus on other health issues resulting in increased human morbidity and mortality.	Domestic market and export losses; reductions in tax revenue, revenue from food availability; upstream ripple effects on industry (e.g., feed supply, processors, retailers);

Information from the World Bank One Health Operational Framework¹¹

10 BIODEFENSE, SECURITY, AND ONE HEALTH

10.1 General Overview

Biodefense consists of both combatting naturally occurring biothreats (e.g., CCHFV, Ebola, avian influenza) as well as human generated ones (i.e., intentional, or nefarious attacks with biological agents such as anthrax, botulism, and others). Biological weapons can pose a serious threat to economies, militaries, public health and agriculture, and there is growing concern that more accessible and sophisticated biotechnology tools are making it easier to develop and use bio weapons²⁰. However, the immense impact of SARS-CoV2 (COVID-19) and escalating frequency of new emerging infectious disease events, remind us, that natural disease emergence events, particularly by high-transmissible viruses, may pose a much larger threat to health and national security than intentional bioweapon attacks²⁰. Consequently, enhancing biodefense to include One Health approaches will result in direct gains for national security. Integration of One Health and biodefence can begin with reviewing strategic biodefense documents, such as a National Biodefense Strategy, to ensure that animal, environmental, and public health agencies are aligned and coordinated with biodefense and national security activities.

Like the public health sector, defense, military, and security (DMS) sectors globally are engaged in preventing and mitigating

high consequence health threats. Defense ministries are being tasked to develop medical countermeasures such as diagnostics, vaccines, and treatments for biological threats. Military troops are aiding affected populations by building treatment centers, securing checkpoints, and providing peacekeeping forces to allow aid workers to do their jobs. Law enforcement agencies are protecting healthcare workers and enforcing public health measures such as quarantine. Border control agencies are working to identify infectious agents in goods crossing national borders, while intelligence agencies try to predict where the next infectious disease will emerge, while also tracking nefarious individuals/groups for “manmade” biothreats.

Generally, health sectors globally specialize in functions such as biosurveillance, healthcare and case management, but they are less well suited for logistics and transport or bioweapons disposal functions, which can be supported by DMS sectors²¹. For example, core capabilities of the DMS sector are often aligned with the pillars of handling zoonotic disease outbreaks (prevent, detect, respond, and recover) and can assist in the areas of intelligence, early warning, medical countermeasures, reporting, remains disposition, law enforcement, and capacity-building that supports recovery²¹.

10.2 Biodefense and One Health in Georgia

The primary institution responsible for biosafety, biodefense, and infectious disease identification in Georgia is the NCDC, although the laboratory of Gori Hospital, under the Ministry of Defense, also conducts infectious disease diagnosis and reports notifiable diseases to NCDC. MoILHSA and Ministry of Defense primarily cooperate on the prevention and nonproliferation of hazardous materials under the national Chemical, Biological, Radiological, and Nuclear (CBRN) response plan. In the past few years, multiple simulation and tabletop training exercises have been jointly conducted with health and defense representatives under this CBRN context. Although, NCDC is well equipped to handle disease surveillance and detection, further collaboration between NCDC and DMS sectors could enhance biosecurity integration into health and military operations. A coalition approach like this can create cohesion between departments and localities which can help alleviate competing priorities and demands that traditionally push sectors to operate in silos²⁰.

Georgia also has a strong institutionalized multisectoral emergency response plan under the National Public Security System in the event of a health emergency, and The *National Civil Security Plan* is the main reference that imposes reporting requirements between different agencies.²² Collaboration between public health and security is less well planned for nonemergency events, however. Standard Operating Procedures and plans for joint risk assessments are still under development as are technical documents that regulate joint responses at ports of entry.²² That being

said, a draft resolution “On the approval of the response plan to communicable diseases at land border crossings of Georgia” is being developed (and is expected to be adopted) by NCDC, Revenue Service, and other agencies with support from the International Organization for Migration. The purpose of this plan is early detection and response to infectious diseases and implement measures to respond to possible infectious diseases.

Public health and security staff do participate in multisectoral trainings and emergency response simulations, but there is no unified programme for the joint training of health and law enforcement agencies.²² Therefore, Georgia could benefit from creating or expanding joint training programs for public health and law enforcement and DMS agencies responsible for joint risk assessment and response, including training on specific priority infectious diseases as well as events of unknown origin with respect to persons, baggage, and goods.²²

Georgia also has robust international collaborations on health and biodefense, including with the U.S. Department of Defense on preventing the proliferation of technology, pathogens and expertise that could be used in the development of bioweapons, and enhancing Georgia’s capacity to detect, diagnose, and report bioterror attacks and potential pandemics²³. The largest example of collaboration between U.S. agencies and the Georgian government is the development of the Lugar Center, a state-of-the-art biosafety level 3 research facility constructed by the U.S. Defense Threat

Reduction Agency (DTRA) and now run by the NCDC²³. The NCDC and Lugar Center staff currently lead or participate in several ongoing biosurveillance, and research projects funded through DTRA. The U.S. Army Medical Research Directorate is also co-located within the Lugar Center and coordinates biomedical research with NCDC on topics such as infectious disease surveillance and multidrug-resistant organism therapeutic development.

Georgia also has a strong partnership with the German Biosecurity Program to establish a Southwest Asian Network for Biosecurity in Georgia. Through this partnership Georgian scientists and veterinarians from the NCDC, MEPA and the NFA have worked with the German Biosecurity Programme to develop and enhance laboratory methods for disease identification, support Georgian integration into international research networks, and conduct research and scientific projects on several infectiousness diseases to reduce emerging infectious disease (EID) threats in Georgia²⁴.

Additionally, military personnel are commonly deployed to different geographic locations which can expose

them to new diseases that are not prevalent in their home regions and can lead to disease spread. A 2018 study screening Georgian military personnel for previous exposure to bacterial and viral pathogens found that the highest rate of exposure was to *Salmonella enterica* serovar Typhi (the cause of typhoid).²⁵ Identifying the diseases military personnel are most exposed to can help to improve military health protection planning and guide future surveillance efforts to prevent disease spread.²⁵

Like all countries, Georgia is currently at an inflection point where it can learn from the COVID-19 pandemic and address critical gaps in local, national, and regional biodefense, before the next infectious disease pandemic or biological attack. While some collaboration between health and DMS sectors in Georgia exist, further strengthening of this partnership could lead to improved coordination between sectors. Finally, optimizing the roles of all sectors involved with One Health, including DMS will help to reduce disease burden, negative financial impacts, security risks, and wide societal disruption from infectious disease outbreaks²¹.



11 RISK REDUCTION AND RISK PROFILING

Risk reduction involves measures to decrease the likelihood of hazards impacting humans, animals, or the environment, or to lessen the intensity or severity (reduce the impact of risk) of such hazards²⁶. Risk reduction for zoonotic diseases includes a process of identifying factors that reduce the underlying drivers or factors that determine infection and/or spillover (e.g., joint risk assessment and strategic planning) and then implementing interventions and communication measures to prevent the disease agents from creating health risks at the human-animal-environment interface²⁶.

Examples of zoonotic disease risk factors include:²⁶

- Land use changes, deforestation, habitat loss, and destructive practices such as mining
- Changes to the human-wildlife interface
- Lack of immunization of humans and animals
- Improper food preparation
- Social change such as population growth, density, and migration
- Agricultural practices, including biosecurity and hunting/slaughtering of animals
- Air pollution and climate change
- Chemicals in soil and water

Taking these factors into account in a structured and transparent manner using a multisectoral, One Health approach allows better understanding of the transmission pathways and patterns that can lead to zoonotic pathogen spillover and spread of zoonotic disease²⁶. It is especially important not to overlook environmental factors as pathogens can spread to people through contaminated soil and water, and as climate change worsens extreme weather events like floods may lead to zoonotic and vector-borne disease outbreaks²⁶.



11.1 EID Risk Profiling

The process of identifying potential risk factors and risk reduction practices should be conducted jointly by experts from all relevant sectors to maximize efficiency, provide varying perspectives, and avoid unintended consequences from miscommunication that may increase zoonotic disease impact if sectors are not informed and engaged²⁶.

During both the virtual workshop and regional meeting, participants engaged in the process of identifying EID risk factors specific to Georgia (Table 5). Participants were provided an example risk profile that uses a standard template to identify factors, including country-specific ones, which may affect (decrease or increase) emerging infectious disease risk and impact. The template was used to jumpstart discussion, including to consider the relevance of factors, target gaps in knowledge where further assessment may be needed and identify priorities for emerging zoonoses risk reduction. Using their expert knowledge and the template, this activity aimed to promote a shared understanding across sectors and institutions about potential sources of risk,

as well as potential opportunities for risk mitigation. After the workshop, additional factors were added to the table and the final results are presented in Table 5 below.

The four categories of EID risk factors used in this activity are:

Emergence factors: ecological, epidemiological, or socio-economic conditions that could aid in the new appearance or rapid increase in incidence or geographic range of disease

Spread factors: human and animal movement and travel patterns, infrastructure, density dynamics, or access to key disease detection and control measures that could affect the spread of disease

Vulnerability factors: gaps in disease detection and response capacity, infrastructure, workforce readiness, security, and One Health systems that increase susceptibility to disease outbreak and containment

Protective factors: practices, policies or other conditions that may reduce the risk of spillover or lessen the impacts of a disease following emergence.

Table 5. Risk factors for potential emerging infectious diseases (including zoonotic, vector-borne, and food-borne pathogens) in Georgia

EMERGENCE FACTORS	SPREAD FACTORS
<ul style="list-style-type: none"> • Human-animal contact in animal markets (weekly livestock markets for sale of livestock, cattle, sheep, pigs - sometime single species sometimes mixed. No wildlife) • Animal contact in country border areas • Endemic sites of disease (e.g., anthrax foci) • Animal quarantine points • Shared pastures for animals (places where animals graze together) • Bird hunting is a common activity & trade of hunted game could lead to spillover • Land conversion peaked during soviet times, then many areas were wild again in previous years, but these wild areas are now more and more used for agriculture or are altered due to infrastructure projects • Backyard poultry • Touristic caves, and drinking cave water • Using dead domestic animals for dog food • Live animal (or animal product trade) e.g., dogs, cats, pigeons 	<ul style="list-style-type: none"> • Population living in areas close to sewage problems - either due to damage or weather conditions • Consumers of homemade canned food • Workers involved in animal husbandry, in direct contact with animal products • Population close to animal feces • Animal movement in migratory routes – Georgia is on major wintering routes for several species of birds • Animal Density • Climate change widens habitat of disease vectors (e.g., aedes mosquitoes, ticks (CCHFV)) • Nomadic farming
VULNERABILITY FACTORS	PROTECTIVE FACTORS
<ul style="list-style-type: none"> • Aging problem in public health workforce at local level • No event-based surveillance in place for human health sector • Limitation of veterinarians in villages • Immunodeficiency/immunosuppression • Small-landowner agricultural systems not very regulated • Water sanitation (especially in rural areas) is not always treated • Ethnic groups leading unmanaged milk producing • No climate change risk mapping specifically, especially in animal sector • Currently maps are mostly separate for each disease, would be good to integrate these into single analyses for foci, and human and animal disease risk 	<ul style="list-style-type: none"> • Good collaboration between veterinary and public health side • Access to safe water • Official slaughterhouses for livestock, pigs, poultry • Biosafety points with good animal treatment • Massive vaccinations of animals • Several information raising awareness campaigns for animal owners • Biocides and disinfection • General education about pathogens; Bioethics and Biosecurity training • Hunting of mammals only allowed in game farms and regulated, mostly not allowed - occasional poaching of deer (but generally low density of larger animals) • Risk mapping of bat borne disease • Wildlife Distribution maps of small mammal reservoirs (rodents, insectivores, lagomorphs, ungulates), occurrence data and species distribution models (academic and gov't collaboration) • Food-and-Mouth Disease (FMD) project risk mapping.

11.2 EID Risk Identification and Hotspot Mapping

Most novel infectious diseases originate in wildlife and then spill over to humans.

Those spillover events follow patterns that make them more likely to occur in some areas than others, creating hotspots of disease emergence. Mapping hotspots can help decision makers optimize surveillance efforts and promote public health interventions that reduce the risk of disease spilling over from wildlife to humans.

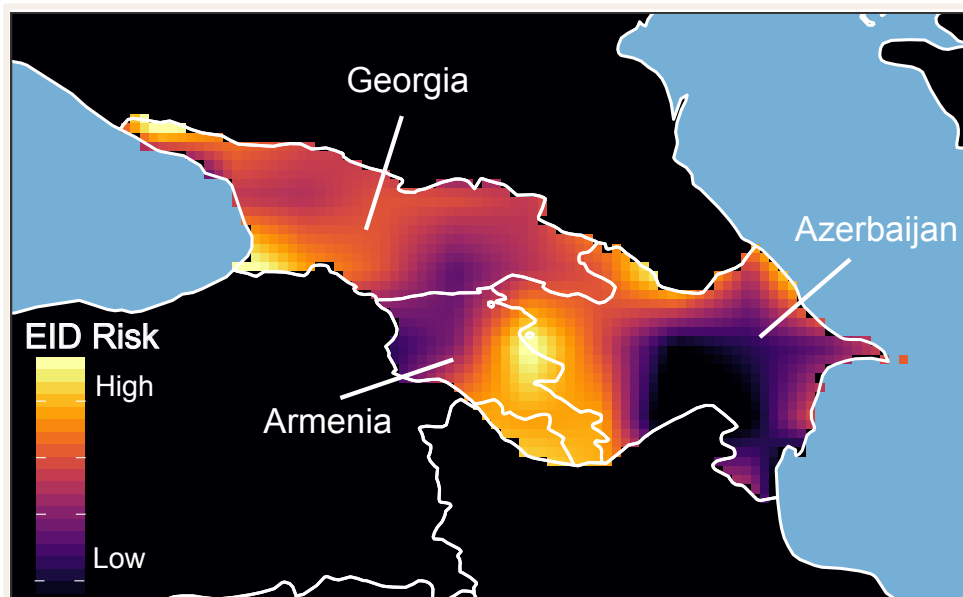
Cross-sector collaboration is also an essential part of identifying risk factors and hotspots for emerging infectious diseases. As zoonotic EID risk mapping requires not just health-related data, but demographic, environmental, biological, and wildlife data⁹, it is important to involve a diversity of sectors in the risk mapping process. NCDC is primarily responsible for mapping zoonotic disease risk in Georgia, but other organizations including SLA and NFA conduct joint projects with NCDC as well as their own mapping exercises and research. Most of the disease mapping currently being done in Georgia is descriptive and focuses on visualizing cases and prevalence/incidence of zoonotic disease across the various regions. This is acutely important work, but there is an opportunity to further build mapping capacity to include spatial analyses that bring together risk maps for multiple diseases, and information from other sectors including animal species distribution, land cover,

livestock density, climate, and other forms of data.

As a whole, the Caucasus represents a potential EID ‘hotspot’ region largely due to the confluence of several ecological and demographic risk factors, including high wildlife diversity, growing human population, land-use change, and agricultural and urban expansion^{5, 9}. It has not traditionally been considered a high-risk region (e.g., tropical regions along the equator: Brazilian Amazon, Central Africa, Southeast Asia), but many global zoonotic disease models do not include all disease emergence points from the Caucasus region⁹. As an example, the risk of wild birds becoming infected with avian influenza and spreading the virus within Georgia is relatively low, but Georgia, Armenia, and Azerbaijan are all located along migratory pathways for wild birds, and the “risk landscape” for spillover is not static. Continual changes in land use, population growth and movement, animal husbandry practices, conflict, climate change, human pressure on environments, as well as other factors are dynamic and alter the risk landscape year over year.

To demonstrate an example of zoonotic EID risk mapping, a previously published analysis⁹ has been downscaled to create a regional zoonotic disease risk model for the Caucasus region (Figure 5).

Figure 5. Preliminary EID ‘hotspot’ map for the Caucasus



This preliminary analysis highlights several important findings:

- 1) the risk of new disease emergence is not uniform across the region.
- 2) the most vulnerable regions for natural biothreats, are across disputed areas and border regions in Armenia and Azerbaijan where environmental exposure of military personnel may be the greatest.

11.2.1 Land use change

Anthropogenic land use change related to agricultural practices is a key driver of EID emergence and spread.⁹ It can increase people’s contact with wildlife, and their pathogens, and has been linked to more than 30% of new diseases reported since 1960.²⁷ As humans continue the process of globalization through land use change, conflict, and migration we need to continuously monitor zoonotic disease risk. For example, socio-economic changes in post-conflict zones have continued to shift the landscape of agricultural production

This preliminary analysis is insightful, but it is hampered by one of the most common challenges in EID risk mapping – a lack of comprehensive, national-level data. In order to improve this model, more granular and country-level data needs to be incorporated. This is a priority area for future research.

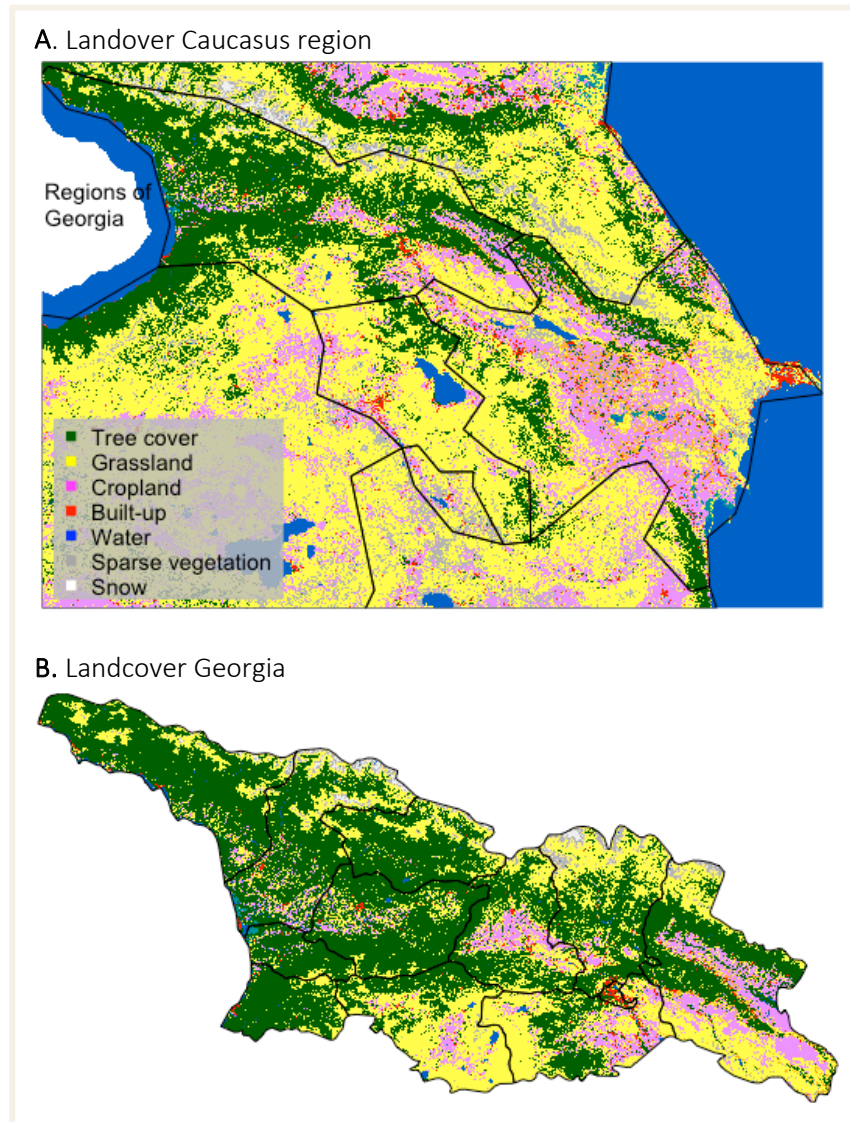
and land abandonment at the Armenia/Azerbaijan border²⁸. Changes in land use, like this, can potentially lead to changes in the zoonotic disease risk landscape.

The Caucasus region is predominately made up of grasslands, cropland, and tree cover (Figure 6). In comparison to its neighboring countries, Georgia has a much larger share of tree cover, and has undergone less conversion of forested and grasslands to croplands. As Georgia

continues its economic development, it will be critical for the country to sustainably develop land, conserve its forests, and

monitor the human pressure it is putting on the environment.

Figure 6. Land cover classifications, Caucasus region. ESA WorldCover project 2021.



A. Land cover Caucasus region. The region is predominately grassland (yellow), cropland (purple), and tree cover (green). **B.** Georgia is largely covered in tree cover with other areas of grassland, cropland, and smaller built-up areas (red). In comparison to neighboring countries, Georgia has a much higher prevalence of tree cover, with relatively lower grassland and cropland. Cropland and agricultural land conversion (from forested areas) have been previously associated with higher potential for zoonotic spillover, so it is important that Georgia sustainably preserves its tree covered-natural land and monitors rates and locations of land conversion.

11.2.2 Human Footprint Index

Another measure of human-derived pressure on the natural environment is the Human Footprint Index (HFI). It is a composite metric that details the cumulative human terrestrial pressure put on the environment. Made up of 8 variables (built environment, population density,

nighttime lights, cropland, pasture, roads, railways, and navigable waterways), it depicts how humans are changing the environment over time. Like most countries, Georgia has significantly expanded its human footprint during the 21st century (Figure 7)²⁹. This expansion

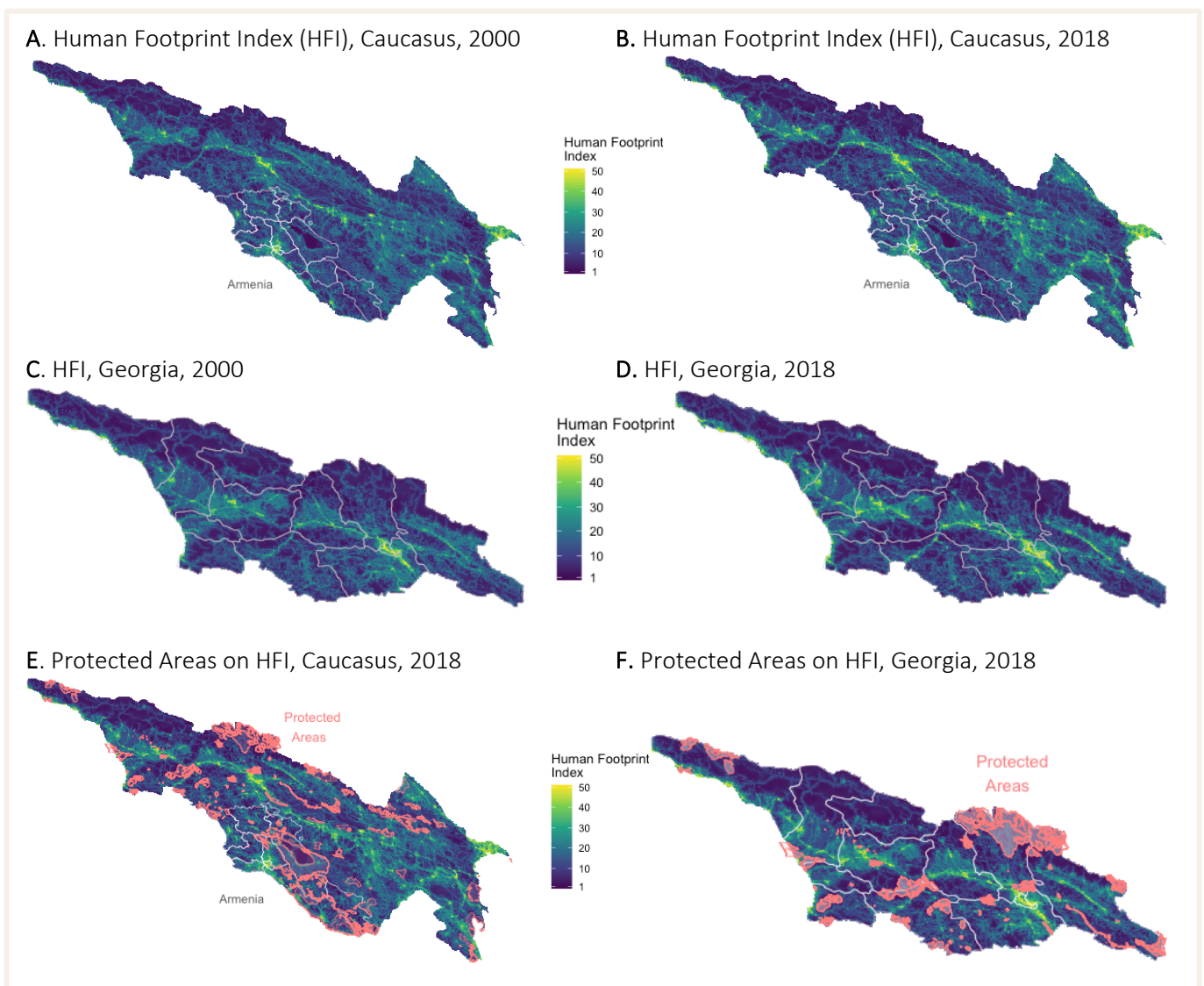
means that human populations are better connected than before, which can lead to economic growth and improved health outcomes, but it can also lead to more rapid disease spread.

Human-led development can be particularly destructive if it replaces natural

habitats, areas of biodiversity, and important wildlife preserves. Fortunately, Georgia has a fairly large swath of protected and conserved areas, particularly around Tusheti National Park, which is approximately 130 kilometers from the most developed areas of Georgia near the capital of Tbilisi.

Figure 7. Human Footprint Index (2000 vs 2018) and protected areas, Caucasus.

The Human Footprint Index provides a map of cumulative human terrestrial pressure put on the environment, from dark blue (low pressure) to bright green (high pressure). Human pressure has increased in both the Caucasus region (A, B) from 2000 to 2018 and in Georgia specifically (C, D). Increasing human pressure is particularly an issue near protected areas (E, F) and areas of high mammalian biodiversity, as it can pose a challenge to environmental preservation and potentially put humans and livestock in contact with wildlife, possibly increasing risk for disease spillover.^{29, 30} There are substantial protected areas in Georgia, especially around Tusheti National Park (F), which are a significant distance from the highest areas of human pressure near Tbilisi.



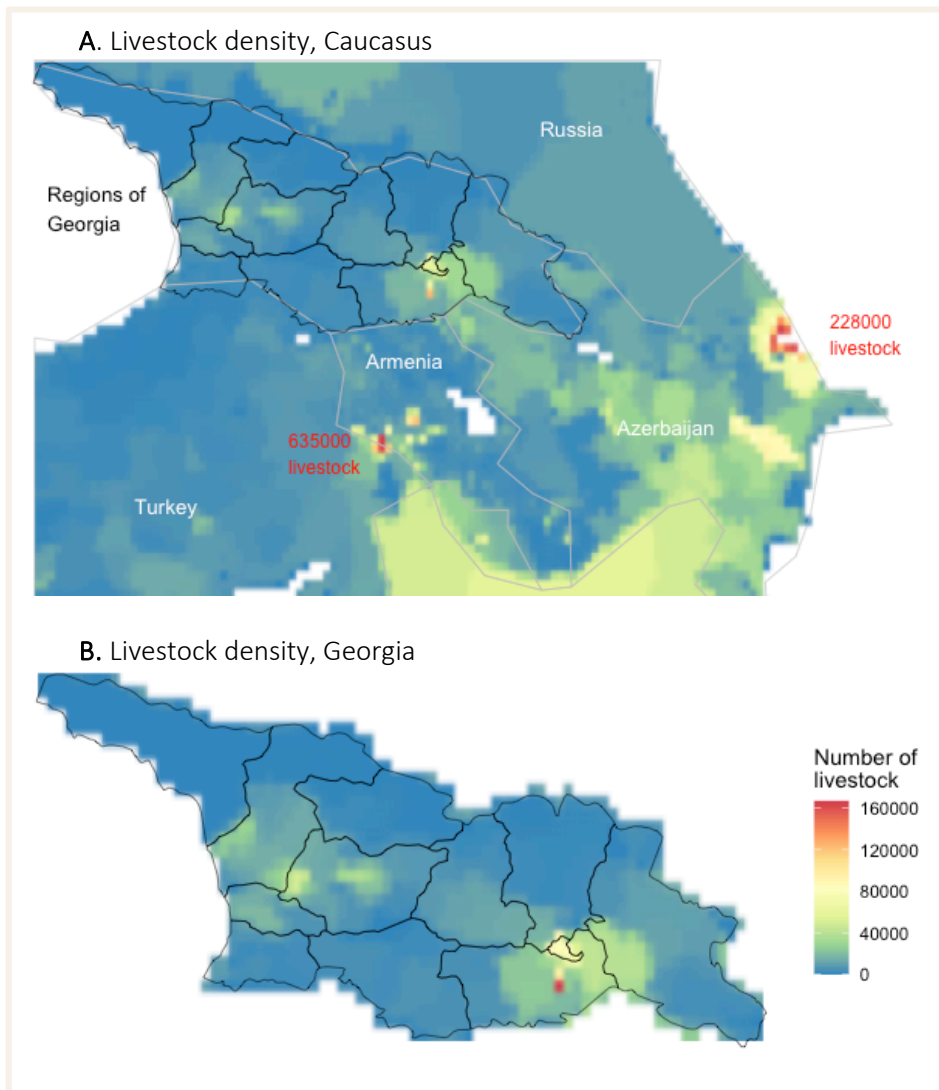
11.2.3 Livestock Density

By concentrating large numbers of animals in small areas, we increase the interactions and opportunities for disease transmission between livestock-to-livestock, livestock-to-human, and livestock-wildlife-human.³¹ This is especially true for intensive livestock production, which is less of an issue in Georgia, compared to other parts of the region, as more than 40% people in Georgia live in rural areas and livestock

(predominately chicken, sheep, cattle, and pigs) is generally held among small-scale subsistence farmers. Overall, although the risk of zoonotic disease spillover is relatively low, increasing extensive transportation networks and the sale and transport of live animals can contribute to the emergence and spread of zoonotic pathogens.³¹

Figure 8. Livestock density, Caucasus region 2015

Total sum of chicken, cattle, goat, sheep, horse, pig, buffalo, and duck from blue (lowest number of livestock) to red (highest number of livestock).³²



A. Compared to other parts of the region, especially Azerbaijan and Iran, Georgia has a lower density of livestock per 10km² area.

B. Within Georgia, there are a few denser areas of livestock, particularly just south of Tbilisi, although the rest of the country maintains a relatively low density of livestock.

12 BIODIVERSITY IN GEORGIA

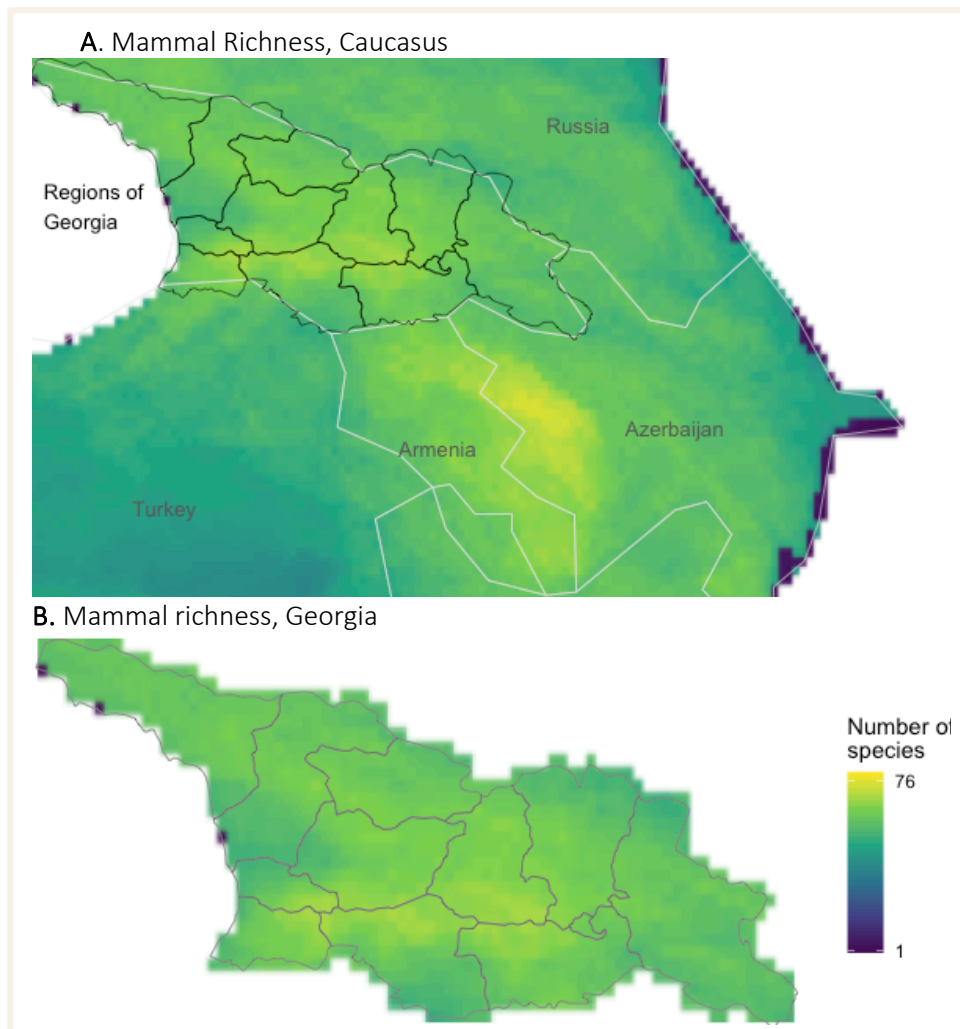
Georgia is a country rich in biodiversity and climactic variability. Climate zones range from humid subtropical to permafrost leading to a wide range of endemic plants and animal species. In addition to the country's forest and aquatic ecosystems, grass and pasture lands are particularly important for livestock grazing. Georgia includes only one of three Endemic Bird Areas in Europe, as well as other unique conservation areas, e.g. habitat for the endangered Caucasian, or Persian, leopard.³³

There are over 16,000 animal species (though the great majority are insects), including 339 birds and 110 mammals including 30 species of bats³⁴ and 40 species of rodents³⁵, which are known to carry the most viruses with zoonotic disease potential.^{10, 36, 37} Among terrestrial mammal species, there is a relatively even distribution across the country and region (Figure 9). The relative abundance of rodents and bats is an important metric for monitoring zoonoses in Georgia, as these species have been associated with elevated risk of hosting or transmitting high consequence zoonotic pathogens.¹⁰



Figure 9. Terrestrial mammal species richness, Caucasus region, 2022.

This figure shows the sum of terrestrial mammal species from blue (lowest number of mammal species) to yellow (highest number of mammal species).³⁸ Areas of greater wildlife diversity are often areas where viral diversity is the highest, thus increasing the potential for EID spillover if interactions between wildlife and humans or livestock occur.^{5,9} **A.** Mammal richness is relatively constant across the region with the richest areas just east of Lake Sevan in Azerbaijan. **B.** Within Georgia, there is little difference in the number of terrestrial mammal species per 10km² area across the country (although different species of mammals reside in different parts of the country).



Georgia has 95 Protected Areas (land: 11.11% and marine 0.67%) with 62 providing management effectiveness evaluations³⁹. There are 93 nationally protected designations, including 13

national parks³⁹. Approximately 40% of the country is covered by forest, most of which provides important biodiversity protection functions⁴⁰ (Table 6).

Table 6. Overview of forest and biodiversity in Georgia

GEOGRAPHIC REGION	FOREST COVER	SHARE OF FOREST AREA DESIGNATED FOR PROTECTIVE FUNCTIONS	SHARE OF FOREST AREA CONSERVED FOR BIODIVERSITY	SHARE OF RURAL POPULATION
Georgia	40%	78%	9%	43%
Caucasus Average (GEO, ARM, AZE)	-	77%	11%	44%

Information from Food and Agriculture Organization (FAO)/United Nations Economic Commission for Europe (UNECE) State of Forests of the Caucasus and Central Asia⁴⁰

Additionally, despite its richness, there are several threats to biodiversity in Georgia. They include illegal/unregulated logging, hunting, and fishing, agricultural practices, including overgrazing and conversion of wild land to agricultural land, climate change, and several others (Table 7)^{36, 40, 41}. Factors that are driving the loss of biodiversity include poor economic conditions – particularly in rural areas – a lack of institutional capacity, financing, and

human resources for biodiversity and conservation within MEPA, and specifically the National Forest Agency and Agency of Protected Areas (APA), lack of reliable biodiversity data. Furthermore, economic incentives underpin many of these threats to biodiversity. For example, the profitability and lack of alternate income sources for rural populations makes illegal logging and natural resource consumption enticing or necessary.

Table 7. Threats to biodiversity in Georgia and their associated drivers

THREATS TO BIODIVERSITY	DRIVERS OF BIODIVERSITY THREATS
<ul style="list-style-type: none"> • Infrastructure development (especially hydropower) • Illegal/ unregulated hunting and fishing • Illegal/ unregulated logging • Agricultural practices, including overgrazing • Mining • Pests, diseases, and invasive species • Municipal waste/ untreated sewage • Gravel extraction • Forest fire • Climate change • Tourism 	<ul style="list-style-type: none"> • Poor social and economic conditions, including a lack of affordable alternatives to illegal logging, hunting, and fishing • Lack of institutional capacity, prioritization, and human resources for biodiversity • Lack of environmental awareness • Unsustainable development • Lack of environmental data and monitoring • Lack or mismanagement of government funds • Legislative gaps and lack of transparency • Poor coordination among government, bilateral, multilateral, private and NGO sectors

Information from United States Agency for International Development (USAID)/Georgia Foreign Assistance Act 119 Biodiversity Analysis³⁶; FAO/UNECE State of Forests of the Caucasus and Central Asia⁴⁰; and the Georgia Sixth National Report to the Convention on Biological Diversity⁴¹

The threats to biodiversity and deforestation are significant issues, in part, because of their role in the emergence and spread of infectious disease. For example, deforestation is considered to have significant negative on human health and is one of the main drivers of zoonotic disease emergence⁴²⁻⁴⁵.

The responsibility of forming and managing environmental policy and projects is the MEPA (Department of Biodiversity and Forestry), with the National Forest Agency and APA playing important roles. In 2012, the government of Georgia overhauled forest management practices and developed Georgia’s first National Forest Policy, which provides oversight for sustainable management and development of forests⁴⁰. A few years later, in 2018, Georgia initiated its first National Forest Inventory (NFI), using mapping and remote

sensing data to gather reliable information about the quantity and quality of Georgian forests and their biodiversity, which will serve as a basis for political and strategic decision-making processes going forward⁴⁰. The results of the NFI were planned to be released in 2020 but have been delayed because of the COVID-19 pandemic. These efforts to preserve Georgian forests and biodiversity is notable, but continue to face challenges, including inadequate financing, rural poverty driving people to unregulated environmental resource extraction, and imperfect legislation to enforce forest management practices⁴⁰.

Georgia is a member of the Convention on Biological Diversity (CBD) and most recently completed its Sixth National Report to the Convention on Biological Diversity in 2020 (Table 8).

Table 8. Biodiversity-related conventions

COUNTRY	The Rio Conventions			Biodiversity- related Conventions				
	UNCBD	UNFCCC	UNCCD	CMS	CITES	RAMSAR	WHC	BERN
Georgia	1994 Accession	1994 Accession	1999 Ratification	2000 party	1996 Accession	1997	1992 Notification of succession	2009 Ratification

UNCBD = United Nations Convention on Biological Diversity,
 UNFCCC = United Nations Framework Convention on Climate Change
 UNCCD = United Nations Convention on Combatting Desertification, CMS – Convention on Conservation of Migratory Species of Wildlife Animals, Cites = Convention on International Trade in Endangered Species of Wild Fauna and Flora,
 RAMASAR = Convention on Wetlands pf International Importance, especially as waterfowl habitat
 WHC = Convention concerning the protection of the world cultural and natural heritage,
 BERN = Convention on conservation of European wildlife and Natural habitats

Georgia is also a signatory on other tax specific international conservation agreements, for example as a party to the UNEP [Eurobats Agreement](#). Coinciding with

its obligations to the CBD, in 2014, Georgia published its most recent “National Biodiversity Strategy and Action Plan of Georgia 2014-2020” (NBSAP), which aims

to improve conservation and sustain biological diversity⁴⁶. As of 2023, an updated NBSAP has yet to be developed in line with the new Kunming-Montreal Global Biodiversity Framework. Because NBSAPs typically drives countries' ecosystem and

biodiversity management priorities and operations, the development of a new plan offers a chance to build in disease risk reduction, creating synergies between Georgia's NBSAP and eventual National Action Plan for Health Security.



13 PUTTING ONE HEALTH INTO ACTION IN GEORGIA

In the following sections we outline seven specific processes for putting One Health into action, or “operationalizing a One Health approach” in Georgia. Operationalizing a multi-sector, One Health approach can take multiple forms and is context dependent, however these broad components, borrowed from previous One Health evaluation and operational frameworks^{11, 26, 47, 48}, are key in establishing an effective One Health response. They include:

1. Existing national infrastructure, capacity, tools, and resources
2. Multisectoral, One Health, coordination mechanism(s)
3. Cross-sectoral biosurveillance system for disease reporting and data sharing
4. Joint priority setting and preparedness planning, including the identification of disease risk factors or geographic disease hotspots
5. Effective and coordinated risk communication
6. One Health workforce development
7. Monitoring, evaluating, and reporting on One Health activities

13.1 Existing national infrastructure, capacity, tools, and resources for One Health collaboration across sectors and disciplines

Operationalizing One Health first requires a thorough understanding of the existing national landscape, including what policies, assessments, plans, funding, implementing projects, data sharing and communication systems, and expert networks are in place. Effective coordination and alignment between these elements are critical but is often a major challenge. Taking inventory of these, whether at a global, regional, national, or sub-national level can help provide potential pathway for synergy at various entry points of a system. For example, in a coordinated system, regulatory frameworks will inform national

capacity assessments, which lead to planning tools, which are then funded and implemented jointly between relevant sectors with support from expert networks and shared data and information systems. Most of the time, however, this flow of action is not as linear as just described, and elements often feed into and inform one another. Notably, these components will vary from context-to-context and country-to-country to reflect changes in risk factors, needs, resources, and governance. Examples of these components specifically for Georgia are depicted below in Table 9.

Table 9. One Health relevant regulatory frameworks, assessments, tools, implementation resources, information systems, and expert networks in Georgia, with year of establishment/latest update

CATEGORY	INVENTORY
<p>Regulatory Frameworks</p>	<ul style="list-style-type: none"> • Ministerial Order #01-2/N - Regulations on the production and delivery of medical statistical information (2016). • Governmental Order #336 - Functioning of Integrated National Surveillance System on Infectious Diseases. (Integrated surveillance includes all sectors: MoILHSA, MEPA, Revenue) • Ministerial decree #42/n-#2-22, 2010. Agreement between MoILHSA and MEPA on the approval of rules of exchanging information on zoonotic diseases by using integrated national surveillance systems. • Decree #1838 on ‘measures to be taken to prevent rabies in 2020 -2023’ • Approval of the rules for monitoring zoonoses and zoonotic agents government decree #323 • Law on Public Health • Law of Health Care • Decree 348 regarding especially dangerous disease supervision and control - not only zoonoses. • National Forest Concept (2013) • Several biodiversity laws are currently in draft form (e.g., Biodiversity Code) • Convention on Biological Diversity • Convention on the Conservation of Migratory Species of Wild Animals • Convention on the Protection of European Wildlife and Natural Habitats • Law on Veterinary Medicine
<p>Capacity Assessments</p>	<ul style="list-style-type: none"> • Joint External Evaluation of IHR Core Capacities • Performance of Veterinary Services (PVS) evaluation mission • Joint Risk Assessment (2019) • Veterinary legislation identification mission • WHO Strategic Tool for Assessing Risks (STAR) • WHO assessment for laboratories for especially dangerous pathogens (EDP) • UNDP Health Impact assessment in environmental framework • 6th National Report to the Convention on Biological Diversity (2014-18) • 2018 – Peer Review Exercise under the Biological Weapons Convention, 22 experts from 17 countries visited the Lugar Center to review the laboratory activities and compliance with BWC requirements • State Party self-assessment Annual Reporting – IHR capacity self-assessment • Assessment of communicable diseases prevention and control systems by European Centre for Disease Prevention and Control (2019) • PVS evaluation mission (2009) • Veterinary legislation identification mission • Self-assessment tool for veterinary services (PVS) • Strategic Risk Analysis for Profiling Health Emergencies • Tracking AMR Country Self-Assessment Survey • WHO/EURO Simulation Exercise 2019 • WHO After action review (2019) • Joint Risk Assessment (2019)

<p>Planning Tools</p>	<ul style="list-style-type: none"> • Response Plan on EDPs – decree 347 • 5-year strategic plan on AMR (ended 2021). Renewal under development • CBRN strategy (2022-2030) and action plan (2022-25) • Tripartite Zoonoses Guide (under development) • National Environmental Health Action Plan • Waste management plan (annual and three-year plan) • National Action Plan for Health Security (NAPHS) planned for near future • ADR regarding transportation (Transport of Dangerous Goods by Road) • National Civil Security Plan • IHR-PVS National Bridging Workshop (2019) • Contingency plans regarding several diseases • National Forest Inventory (under development) • National Biodiversity Strategy and Action Plan of Georgia 2014-2020
<p>Implementation Resources</p>	<ul style="list-style-type: none"> • Government funded state programs - many on surveillance, specific diseases (e.g., TB, HIV/AIDS), and animal vaccination (~9million vaccinations per year) • FMD risk mapping and implementation between MEPA, NCDC and the European Commission for the Control of Foot-and-Mouth Disease (EuFMD) • CBRN center of excellence - includes participation of NCDC, SLA, NFA • Human laboratory network - three zonal diagnostic laboratories and 7 Lab support stations. • MEPA has an animal health lab network 10 lab support stations and 3 zonal diagnostic laboratories • Regional biosurveillance projects (e.g., Biosurveillance Network of the Silk Road, Western Asia Bat Research Network, EUROBAT, MediLabSecure) • Several DTRA funded projects and cooperative agreements with US CDC and other international funders
<p>Information and Reporting Systems</p>	<ul style="list-style-type: none"> • EIDSS: NCDC, NFA and SLA use this. • Informal exchange of information daily via email or phone • The European Surveillance System (TESSy) - NCDC's system for reporting especially used for COVID-19 now. • Laboratory information management systems (LIMS) used at NCDC to link hospitals and clinics to share lab results - also used in COVID-19 data sharing. • NFA - National animal identification and tracing system (NAITS) for Vets primarily under NFA). NAITS integration with EIDSS v7. • IHR reporting • Chemical registry - platform for information sharing • European directive on biocide regulation • Waste material transport materials - platform for info. Sharing, including with - Ministry of Internal Affairs (police)
<p>Expert Networks</p>	<ul style="list-style-type: none"> • One Health Coordination Group • Multisectoral environment steering committee • National Animal Health Programme Steering Committee (farmers and other stakeholders are included) • NCDC, Lugar Center and CBRN center of excellence all provide expert knowledge and training • National Immunization technical advisory group (NITAG) • Several Technical Working Groups

Georgia has several key laws and institutional structures in place to support the governance and expansion of its biosurveillance and biodefense capacities. These include several ministerial decrees on biosurveillance and zoonoses, the Law on Public Health, and several biodiversity laws are under development. The country also has a well-established legal framework for implementation of the International Health Regulations (IHR) with legislative acts to address healthcare, civil security, and emergency situations.²² Veterinary health is also covered under existing legislation, which has been validated by the European Union and the WOAAH.²² The dedicated IHR and WOAAH focal points are based within NCDC and MEPA respectively, and regulatory frameworks for IHR implementation are in place. Yet, there are areas for improvement regarding One Health regulation, specifically around wildlife health in relation to biodiversity preservation and protection. Additionally, while laboratories within NCDC and SLA have successfully implemented strong biosafety regulations, other sectors could improve biosafety adoption²².

In terms of capacity assessments and planning tools, Georgia has put significant effort into the areas of human and animal and human health by completing the WOAAH Performance of Veterinary Services Evaluation, and Veterinary legislation evaluation mission; Joint External Evaluation of IHR Core Capacities; Strategic Tool for Assessing Risks; National Civil Security Plan and several others (Table 8). The country (led by NCDC) is also in the process of developing a One Health Strategic Action Plan and adapting the global Tripartite Zoonoses Guide (TZG)²⁶

developed jointly by FAO, WOAAH, and WHO to the Georgian context. Upon completion, implementing the TZG will be a critical step in improving the country's ability to swiftly and effectively address health threats at the human-animal-environmental interface. In terms of environmental health and biodiversity, there is a recently expired National Biodiversity Strategy and Action Plan, and several new biodiversity laws under development, all in accordance with the CBD (discussed previously in this report). There is also a National Environmental Health Action Plan (2018-2022), signed by all ministries, which outlines five key areas (clean water, safe environment for youth, air pollution, chemical substance exposure, and climate change). This Environmental Health Action Plan is now expired and should be updated within a One Health framework.

Regarding implementation resources, there are several laboratories with diagnostic capabilities, multiple United States Centers for Disease Control and Prevention (US CDC), DTRA, and European-funded capacity development and research projects. Georgia continues to participate in regional surveillance projects including the Western Asia Bat Research Network, MediLab Secure and others. The government of Georgia also finances several public health and animal health programs, including vaccinations and disease surveillance. Through the Lugar Center and the NCDC, Georgia collaborates with several countries globally on One Health projects, including field epidemiology, AMR, and laboratory training. The COVID-19 pandemic was also a driving factor in improving information sharing within the human health sector

with improved diagnostic testing and reporting from health clinics, hospitals, and labs. However, there are still areas for improvement, including developing better mechanisms for more timely information sharing across ministries. More information on surveillance projects and international collaborations can be found further in this report.

Georgia utilizes several electronic information systems across the human-animal-environmental health spectrum, including an EIDSS, National Animal Identification and Traceability System (NAITS), Laboratory information management systems (LIMS), and others. Additional details about these systems can be found further in this report. While these systems are effective in capturing epidemiologic and biologic data, information sharing about ongoing One Health projects and progress could be improved. Additionally, improved metadata standards and criteria for the minimum necessary data needed for

sharing One Health or biosurveillance data across platforms are needed.

With respect to expert networks, while there is no national One Health committee that spans multiple ministries, a dedicated One Health expert group is being developed and there are multiple working groups, including the National Animal Health Programme Steering Committee, National Immunization Technical Advisory Group (NITAG), and several experts that coordinate the CBRN Center of Excellence. Georgia is also an active member of the Global Health Security Agenda (GHSA) and is contributing to the development of the GHSA Zoonotic Disease Action Package (GHSA Action Package Prevent-2), which advocates for countries to adopt One Health approaches, policies, and practices that minimize the spillover of zoonoses, identify the zoonotic pathogens of greatest public health concern and strengthen existing surveillance systems for prioritized zoonoses⁴⁹.

13.1.1 Common Challenge to One Health Implementation and Funding

For longevity and sustainability of One Health systems and programs, regulatory frameworks and policies need to be established in law with dedicated, consistent funding streams. Not having official, institutionally established policies and funding can hinder multisectoral collaboration as priorities can shift every few years depending on which political party and officials are in office. With limited resources and competing priorities, sustained funding is often the biggest challenge to implementing One Health programs. This is true for all countries, from

Georgia to the United States and all countries in between. The existence of a national plan, health information system, or central coordination body is an excellent start, but it is not enough. Funding is needed to implement plans and build data sharing systems where sectors can collaborate with one another to jointly tackle health challenges. Importantly, however, One Health is, and should be context-specific, and funding needs to be allocated to where it can make a difference – which will inevitably look very different in each country. Global funding mechanisms

are beginning to launch or expand, including the Pandemic Fund, Nature4Health, and World Bank One Health project funding, and countries including Georgia could be well placed to receive funding if they continue to show a high-level government commitment to One Health.

Like most countries, Georgia faces a consistent battle for sustained One Health funding. Core surveillance detection and response capacities are partially funded through state programs, but trainings are

not. Georgia also faces other common barriers to implementing One Health, including a lack of awareness, and understanding for why a One Health approach can be helpful, unclear mechanisms of communication between sectors, and a lack of human resources to implement a multisectoral, One Health approach. In rural areas in particular, a lack of trust and communication between human and animal health sectors further plays into the challenge of implementing One Health programs.

13.2 Multisectoral, One Health, coordination mechanism(s)

A multisectoral One Health coordination mechanism (MCM) refers to any formalized, standing, group that acts to strengthen or develop collaboration, communication, and coordination across the sectors responsible for addressing zoonotic diseases and other health concerns at the human-animal-environment interface²⁶. The multisectoral coordination mechanism can be tailored to focus on priority zoonotic diseases or health threats in Georgia including AMR, food safety etc.

Currently, Georgia does not have a National MCM or National One Health committee, but one is currently being developed. Efforts to establish an MCM are being led by the MoILHSA and MEPA. Since the national One Health MCM is still under development details on representation and mandate are not yet final, but the MCM will likely include representatives from MEPA, FAO, SLA, NCDC/MoILHSA, with additional representatives to be determined. Its main

focus will be to harmonize One Health-related actions across sectors.

Despite not yet having established a national-level One Health body, there is a dedicated One Health division within NCDC that is experienced in leading One Health programs. NCDC also has partnerships with NFA/SLA/MEPA and the four organizations have collaborated on an integrated approach to preventing, detecting, and responding to zoonotic diseases for years. There are also lower-level coordination groups, including the National Animal Health Programme Steering Group (NAHPSG), and the COVID-19 National Intersectoral Immunization Council which is chaired by the Minister of MoILHSA and is charged with facilitating the deployment of COVID-19 vaccines in Georgia (Table 10). While the Council is mainly a public health focused and includes representatives from NCDC, municipal public health centers, the Medical and Pharmaceutical Regulatory Agency, and NITAG, it exemplifies how various agencies can coordinate a

successful health response by utilizing their respective strengths. The Ministry of Internal Affairs also has a CBRN taskforce first response unit, but it is not very well

known nationally among One Health stakeholders and could be better integrated into One Health emergency response.

Table 10. Multisectoral coordination groups present in Georgia

NAME OF MULTISECTOR COMMITTEE/GROUP	REPRESENTATIVES	COMMITTEE MANDATE OR RESPONSIBILITIES	FORMALLY ESTABLISHED THROUGH POLICY, MINISTERIAL DECREE, OR LAW?
One Health coordination group	MEPA, FAO, SLA, MoILHSA, NCDC	Planned goal of group is implementation of national One Health actions and harmonization of actions	In preparation. Once finalized, there will be a formal decree by ministers of MEPA and MoILHSA.
Multisectoral environment steering committee	MEPA, NFA, SLA, scientific research centers, MoILHSA, FAO, CDC, DTRA, USAID, NCDC	Coordinate environmental health programs and research across Georgia	Established on order of prime minister
COVID-19 National Intersectoral Immunization Council	Chaired by the Minister of MoILHSA	Facilitate the deployment of COVID-19 vaccines in Georgia	Approved by the Governmental Resolution #67
Ministry of Internal affairs first response unit, (CBRN) taskforce	Ministry of internal affairs	First response and coordination of immediate action with other organizations in the event of an emergency	Formally established with legal jurisdiction for response
Informal research collaborations	Wide range of people depending on the research topic	Doing research on One Health-related topics and producing knowledge and publications	No
Multisector coordination mechanism on AMR	Information not available	Monitor AMR across Georgia	Formalized by government

In a sign of interest and dedication to improving multisectoral collaboration in health, in 2019, Georgia hosted a National Bridging Workshop on the IHR and the WOAHP Performance of Veterinary Services (PVS) organized by MoLHSA, MEPA, WHO, and WOAHP. Coming out of the event, attendees concluded that collaboration gaps between the human and animal health sectors were mostly systemic, not disease specific⁵⁰. The participants ranked the areas in highest need of collaboration as: 1) Standardize and harmonize field investigation and response activities 2) Develop and enhance post-graduate professional educational system 3) Enable evidenced-based joint risk assessment 4) Strengthen collaboration between human and animal health sectors under One Health approach at all levels 5) Improve information dissemination system⁵⁰. The National Bridging workshop also included objectives and actions for each priority area of collaboration – many of which have been completed, including establishing a One Health committee/ working group and conducting a joint risk assessment but it is not clear what progress has been made towards other objectives.

Successfully completing the National Bridging Workshop demonstrates the Georgian government's commitment to improve cross-sector collaboration, yet there are opportunities to involve additional sectors to enhance the country's One Health capabilities. For example, participation in the workshop skewed towards the public health (55% of

attendees) and animal health (45%) sectors. While these two sectors are expected to play significant roles in leading Georgia's efforts to prevent, detect, and respond to zoonotic diseases, there is an opportunity to involve other sectors, including the National Wildlife Agency, Ministries of Defense, Finance, the National Security Services, and the Customs and Border Service, among others, to further enhance One Health systems and cross-sector collaboration. The development of a National Action Plan for Health Security will present an important chance for integration of these and other sectors and stakeholders for a more comprehensive approach.

Overall, it is clear that there is a growing interest in One Health in Georgia with a handful of dedicated champions in government, but formally institutionalizing a One Health mechanism remains to be done. We urge Georgia to continue its effort to establish a national One Health MCM with broad representation across ministries. While institutions such as NCDC, NFA, SLA are justly poised to lead One Health initiatives, other sectors including Revenue Service, Ministry of Defense, and non-governmental experts including university researchers and the private sector would be valuable additions. Once established it will be crucial for the MCM to receive designated financial and human resources so it can fulfill its mandate and coordinate One Health programs and policies across sectors.

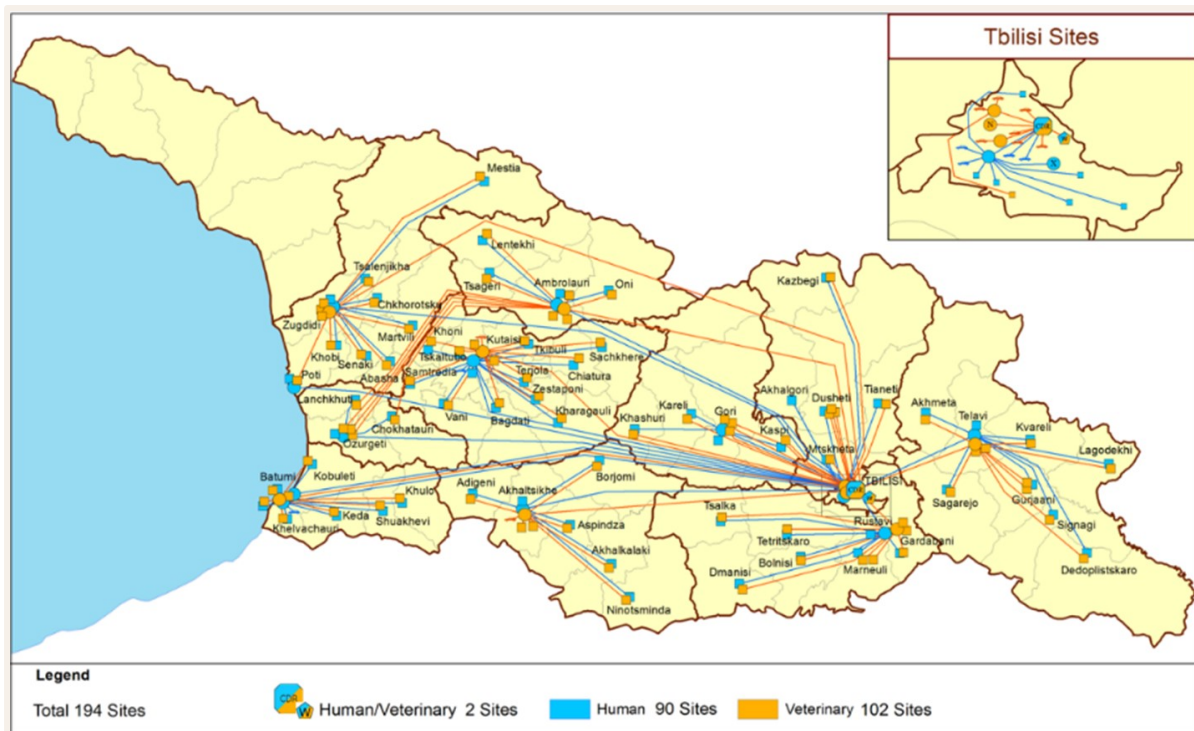
13.3 Cross-sectoral biosurveillance systems for disease reporting and data sharing

Biosurveillance is a process that includes active data gathering, analysis, and interpretation of information relating to disease activity and threats to human, animal, or environmental health, regardless of intentional or natural origin. In addition to detecting potential disease outbreaks it also includes a responsibility to provide decision-makers and the public with accurate and timely information related to disease prevention, mitigation, response, and recovery⁵¹. Information sharing and collaboration between sectors is critical for sentinel surveillance, early detection, and rapid response because zoonotic diseases can be transmitted between people and animals, or via the environment they share²⁶.

Georgia has well-developed surveillance capacity in both the human and animal health sectors, and they each contribute to a shared national EIDSS²². EIDSS is designed with a One Health approach to conduct real-time exchange of information between veterinary and healthcare sectors and facilitates compliance with the IHR (2005)^{22, 52}. The system's key modules

include: Human Cases module, Veterinary Cases module, Veterinary Active Surveillance module, Vector Surveillance module, Laboratory module, Administrative module, Basic Syndromic Surveillance, Aberration Detection and Analysis module which also includes Geographic Information System capabilities⁵². Importantly, the laboratory module is able to link case data with corresponding samples and lab results across public health and animal health laboratories.²² EIDSS also provides direct reporting to the WHO's Computerized Information System on Infectious Diseases and establishes authorized data exchanges with other electronic systems, including the MoLHSA Health Management Information System operated at the hospital level⁵². Currently, EIDSS operates at 194 sites nationally, of which 90 sites represent MoLHSA facilities, 102 sites represent MEPA facilities, and 2 sites are shared by the two Ministries (Figure 10)⁵². NCDC also receives immediate and weekly reports from all health facilities in the country, and all public health centers have the capacity to report through EIDSS.²²

Figure 10. EIDSS sites across Georgia



In terms of zoonotic disease surveillance, passive surveillance is in place in humans and active surveillance is conducted based on disease reporting and the epidemiologic situation.²² NCDC and Lugar Center provide diagnostic capacity for zoonoses in humans, monitor vectors and reservoirs (e.g. ticks, fleas, mosquitoes, rodents, etc.), provide diagnostic capabilities on selected zoonotic diseases, develop communication materials and public health recommendations²². There are 129 monitored infectious diseases in Georgia, 73 are notifiable human disease, and among them, 53 require urgent notification while the rest are submitted as an aggregated report on a monthly basis²². Examples of urgent notifiable zoonotic diseases include tularemia, anthrax, brucellosis, lyme disease, Q fever, flea-borne typhus, spotted fever and other rickettsioses, rabies, hantavirus (cardio-pulmonary syndrome, CCHFV, yellow fever,

dengue virus, leptospirosis and many others. When a human case of a zoonoses is detected, local health care facilities notify epidemiologists in district primary health centers (PHC) via phone. Once the PHC epidemiologist enters information into EIDSS it is immediately available to NCDC and NFA in real-time, who then inform staff at the NCDC Zoonotomology lab to conduct diagnoses. A PHC epidemiologist will then conduct an investigation and enter information into EIDSS which provides real-time notifications to NCDC.²² The NFA is also notified in the event of a food-borne disease outbreak. NCDC also has an Emergency Operations Center (EOC) whose function includes rapid response to such challenges. In terms of regional strengthening of preparedness and response, a rapid response team training course was developed in 2020-2023 and 120 people were created and trained throughout Georgia.

There is, however, no official surveillance programme for zoonotic diseases in wildlife²², however there are numerous biosurveillance projects active in Georgia that involve cross-sectoral collaboration. As the national authority on wildlife, there is a natural opportunity for MEPA to collaborate with NCDC to develop a more formal wildlife surveillance program using a One Health approach that considers the health of wildlife, their natural environment, and humans. Environmental and wildlife data can help authorities recognize specific geographic areas where disease outbreaks may be more likely to occur, which can cut down on outbreak response time and help better target resources. For example, a 2015 study routinely recovered bacterial isolates without human reporting providing

evidence that there is a natural foci for *F. tularensis* (which causes tularemia).⁵³ High numbers of isolates from rodents and vectors suggests they play a role in maintaining an enzootic cycle in Georgia, and continued monitoring of small mammals and environmental sampling may provide an early indication of outbreak risk in humans.⁵³ Other studies, including a 2010 enterovirus surveillance study have also highlighted the importance of environmental and genetic sampling as a way to monitor lineages of enteroviruses which can be a warning sign when new lineages arise that an outbreak may occur.⁵⁴ Developing wildlife surveillance capacity could be an effective mechanism to further integrate One Health processes and cross-sector data sharing into human and animal health surveillance.



13.3.1 Laboratory Data Sharing

Regarding laboratory capacity, there is a strong human health lab network led by NCDC which contains 3 zonal diagnostic laboratories and 7 lab support stations. The focal point of NCDC laboratory system is the Lugar Center which is the main reference laboratory and boasts a BSL-3 facility. NCDC utilizes a LIMS to link hospitals and clinics to share lab results, which has been particularly useful during the COVID-19 pandemic to provide timely lab results to suspected COVID-19 cases. LIMS also links human and animal health with food safety and environmental health to help identify and respond to disease outbreaks, making Georgia's lab system a critical asset to achieving the country's GHSA goals and One Health systems⁵⁵. NCDC is also developing a new Chemical Risk Factor Research Laboratory. The lab will identify and evaluate different environmental contaminants to assess their effect on human health and the environment. It will also research contamination sources of heavy metals (e.g., lead) in the environment as well as commercial products. The laboratory is equipped with modern tools including mass spectrometer with inductively coupled plasma, atomic absorption spectrometer, liquid and gas chromatographs, gas

chromatograph with mass spectrometer, and x-ray fluorescence spectrometers.

MEPA has an animal health lab network with 3 zonal diagnostic laboratories and 10 lab regional laboratories, with the Animal Diseases Control Lab as the focal point. In particular, SLA plays an outsized role in detecting and diagnosing animal diseases and pathogens, assessing the risk of dangerous diseases for animals, facilitating the introduction of new diagnostic tools and laboratory equipment to sustain animal and plant health⁵⁶. The Food and Water Safety and Plant Pests Disease Control laboratory network also plays a critical role in identifying pathogens related to food production, water quality, and plant health. NFA also plays an important role in maintaining animal health and monitoring disease. NFA recently completed the development of a NAITS which records information regarding mandatorily identifiable animals, their keepers and keeping locations across Georgia⁵⁷. There are more than 250 000 animal holdings and data on more than 1 million bovines in NAITS, which veterinarians and inspectors use to track animal vaccination status, illnesses, and health conditions to monitor food production from 'farm to table'⁵⁷.

13.3.2 Regional collaboration for biosurveillance and data sharing

Georgia is an active participant in several collaborative biosurveillance projects in the Caucasus region. These partnerships provide Georgia and neighboring countries an opportunity to share information and skills when it comes to disease outbreaks, One Health workforce development and training, professional connections, and

more. Examples of regional biosurveillance collaborations include:

- Expanding Multidisciplinary Collaboration within the Biosurveillance Network of the Silk Road (BNSR) (2015 – ongoing) – BNSR is an NGO aimed at developing a functional disease

surveillance network in Eastern Europe. It hosts annual cross-border meetings and regular teleconferences between veterinarians and epidemiologists. Georgia chaired BNSR in 2018 and 2021.

- “One Health Network for the Prevention of Vector-borne Diseases Around the Mediterranean and Sahel Regions (MediLabSecure)” (2014 – present) – network of regional public and animal health experts from the EU and neighboring countries. In Georgia there is work with human and animal virology labs, medical entomology lab, and public health and veterinary services.
- “Establishment of a Southwest-Asian network for biosecurity and diagnosis of dangerous infectious diseases” (2014-2016) – included field study on tick-borne encephalitis, international workshop on biosafety/ biosecurity, establish cell culture lab, train junior Georgian scientists.
- “Establishment of Regional Training and Resource Centre in Biosafety, Biosecurity and Laboratory Management in the South Caucasus” (2013-2015) – included establishing a regional training resource and lab management center in biosafety and security, developing collaborative relationships between scientists in other countries in the region, and a

gap analysis of BS&S to develop a training program for lab personnel

- European Union (EU) CBRN Risk Mitigation Centre of Excellence (CoE) Initiative – Regional cooperation in CBRN risk mitigation. The regional CoE for the South East and Eastern Europe region resides in Tbilisi and NCDC, SLA, and NFA all contribute to CoE projects, including managing biological risks, developing human and animal virology laboratories, and epidemiology training.
- Epidemic Intelligence Information System (EPIS)
- European network of Legionnaires disease surveillance
- The European Surveillance System (TESSy) – Georgia NCDC routinely reports to this system (e.g., HIV, ILI/SARI, COVID-19, and Mpox) and it has been especially useful during the COVID-19 pandemic
- VectorNet – European network for sharing data on the geographic distribution of arthropod vectors, transmitting human and animal disease agents.
- Western Asia Bat Research Network (WAB-Net) – regional initiative establishing the first bat research network in Western Asia with the aim of integrating ecological research on bats with virus surveillance to promote bat conservation and safeguard public and animal health.

BOX 1.

Western Asia Bat Research Network

The Western Asia Bat Research Network (WAB-Net) is a regional initiative to establish the first bat research network in Western Asia with the aim of integrating ecological research on bats with virus surveillance and to promote bat conservation and safeguard public and animal health. Led by scientists at NCDC, researchers in Georgia are characterizing the diversity of bats and bat-borne coronaviruses (CoVs) in Georgia while training in best practices for bat sampling and biosafety to improve field sampling efforts and our understanding of bat species native to Georgia, and the region.



13.4 Joint priority setting and preparedness planning, including the identification of disease factors or geographic disease hot spots

Joint, cross-sector planning provides an opportunity for experts from different disciplines to contribute to, and ‘buy-into’ One Health activities from the onset of a project. In doing so, different perspectives are brought forward to enhance projects by sharing knowledge and experiences and preventing duplication of efforts. In Georgia, there is also a legal basis for intersectoral collaboration on zoonotic disease surveillance between the MoILHSA and MEPA, via Ministerial Decree #42/n-#2-22, 2010 and Governmental Decree #336, 2015²². Moreover, in 2013 the NAHPSG was created as a One Health team consisting of the NFA, SLA, NCDC and other stakeholders²². This group serves as an example of how joint preparedness planning and coordination can exist across different sectors. For example, the NAHPSG previously developed a shared list of zoonotic diseases of greatest public health concern. Having a single list shared across disciplines helps to decrease redundancy across ministries and promotes a shared understanding of national zoonotic disease priorities (Table 11). Moreover, a 2010 joint decree from the MoILHSA and the Minister of Agriculture (now MEPA) was declared to mutually share information on zoonotic disease to protect the populations’ health²².

Table 11. Zoonotic diseases of greatest public health concern in Georgia

DISEASES
Brucellosis
Anthrax
Rabies
Avian Influenza
Crimean-Congo haemorrhagic fever
Poxvirus infections
Diseases caused by typhus group Rickettsiae (<i>Rickettsia prowazekii</i>)
Q fever
Haemorrhagic fever with renal syndrome
Tularemia
Plague

The NCDC and WHO completed a zoonotic risk assessment in 2021 and Georgia has completed the WHO Strategic Tool for Assessing Risks (STAR), which provides a systematic and evidenced based approach to classifying priority public health emergency risks. High risks included respiratory measles, respiratory influenza, and COVID-19; medium risks included CCHF, pandemic influenza, and water reservoir collapse; and low risks included several zoonoses such as *F. tularensis*, *B. anthracis*, brucella, and hanta virus. It was also noted that in the event of a zoonotic outbreak of any of these pathogens NCDC would handle the public health activities and NFA would coordinate with NCDC on epidemiological investigation. Despite the joint creation of the list of zoonotic diseases of greatest public health concern, there is no current mechanism for joint risk assessment for zoonotic disease events.²²

In addition to publishing a joint list of priority zoonotic diseases, joint preparedness planning can also improve multisectoral coordination and efficiency. For example, Georgia has a National Civil Security plan, but there is a need for continuous joint training between the

different sectors, including law enforcement and security. More information on public health and One Health roles and responsibilities can be found in Table 3.

13.5 Effective and coordinated risk communication

Effective risk communication relies on all relevant sectors and disciplines working together with technical and policy experts within the multisectoral coordination mechanism sharing information, advice and opinions, and working with affected populations to identify risk factors and potential risk reduction practices²⁶. Incorrect information may have inadvertent economic (e.g., trade or travel impacts), environmental (e.g., culling), social (e.g., stigma) or other consequences that can potentially worsen the situation. Moreover, failure to effectively communicate during a health crisis can lead to panic, insufficient public knowledge and erosion of faith in public health authorities. Thus, effective messaging must be in place for accurate, transparent, and coordinated information flow to the public, ensuring credibility to counter potential misinformation¹¹.

During emergencies, in Georgia, the Ministry of Internal Affairs can communicate through state-owned

broadcasting, or by means of private broadcasting companies with which they have written agreements, to disseminate timely information to the public, making them a critical sector to include in multisectoral, One Health, risk communication.²² Prior to the COVID-19 pandemic, there was no overarching risk communications plan for Georgia²², despite a legal basis to develop one, however as the pandemic grew in 2020, the NCDC quickly developed a risk communication plan to keep the public informed about the COVID-19 situation in Georgia. Public communication about COVID-19 is primarily done through press briefings by the COVID-19 governmental coordination committee, with MoILHSA and NCDC representatives as the main speakers.

In non-emergency times, NCDC and NFA routinely develop and distributes communication materials about the risk of zoonotic diseases as part of educational and awareness raising campaigns (Figure 12).

Figure 12. Examples of zoonotic disease risk reduction awareness raising materials



While public communication may at times be effective, in the National Bridging Workshop on the International Health Regulations the participants voted that improvement of communication with media and stakeholders were two of the priority objective to strengthen intersectoral collaboration for the country.⁵⁰ Compared to other objectives, improving risk communication is seen as more attainable and less-resource intensive. That does not, however, mean it is easy to maintain public trust – especially in the face of disinfection. Georgian representatives have previously noted that

farmers were generally distrustful of veterinarian authorities and often reluctant to follow their recommendations.⁵⁸ Bringing about a change in attitude may require long-term effort and should consider the social structure of target populations. Outside of hiring additional experts in multiple sectors, which can be costly and not financially possible, there is an opportunity to further develop joint communication strategies and public outreach campaigns around priority zoonoses.

In addition to public-facing communication, internal cross-sector communication is also essential. Information silos can sometimes

prevent important information and research from reaching all relevant One Health actors.

13.6 One Health workforce development

One Health workforce development includes the continual process of developing education and training programmes which give individuals the knowledge, skills and abilities they need to meet national and international workforce demand and stay up-to-date on research and best practices in their field²⁶. This workforce includes physicians, veterinarians, biostatisticians, scientists, laboratory technicians, farmers, customs and border agents, communication and security experts, and others who can systematically cooperate to meet relevant IHR and PVS core competencies. Workforce development is critical in cultivating and maintaining a highly qualified health labor force with appropriate training, scientific skills, and subject-matter expertise to sustain health systems over time. Effective training should be at both the “pre-service” level prior to a person getting a degree or job, as well as “in-service” training which provides continual training for employed people. For reference, the threshold for achieving the Sustainable Development Goals is 4.45 health workers per 1,000 people⁵⁹.

Georgia has a well-staffed public health sector with the NCDC and Lugar Center at the forefront of One Health activities in the country. MEPA is also well-staffed and the SLA and NFA provide a qualified labor force to investigate, and diagnosis zoonotic disease outbreaks. In particular, NFA provides veterinary services throughout

Georgia via its 160 state veterinarians and 650 contracted veterinarians across 65 district offices and 12 regional offices. There is, however, disparity in workforce development with public health receiving more resources and attention. For example, a medical human resources development strategy is being created, but environmental health, food safety, and veterinary services have not received the same attention⁵⁰. Additionally, continuing professional education is more developed for medical professionals compared to veterinarians⁵⁰.

Both the number of medical doctors and veterinarians in Georgia has dropped over the last couple of years. The number of medical doctors (per 10,000) was on the rise between 2012-2018, but has since fallen to 51 doctors per 10,000 people in 2020⁶⁰ (Table 12). Similarly, the number of veterinarians has fallen from more than 4,700 per 10,000 people between 2015-2018 to 3,888 per 10,000 people in 2019⁶¹. While it is unclear as to why the number of medical doctors is falling, it appears that an aging and retiring workforce may be responsible for a decline in veterinarians. According to NFA, an estimated 60% of veterinarians are at least 70 years old, and there are not many young well-trained veterinarians in line to replace them. Increasing training for both doctors and veterinarians – particularly in rural areas – would be beneficial, and could provide an opportunity to enhance coordination and

joint educational training through a One Health approach²². For example, Georgia could adapt learning materials from the One Health Workforce Academies, which provides training on the fundamentals of One Health practice, outbreak investigation and response, risk communication, grant writing and much more.⁶² Relatedly, as there is no multisectoral workforce strategy in place, it has been previously recommended that Georgia prepare and

implement a One Health personnel development strategy that includes mechanisms to address projected retirements of regional and district staff²².

Finally, the Joint External Evaluation (JEE) also recommends that Georgia develops a comprehensive biosafety and biosecurity training programme, and make it mandatory for facilities working with infectious agents, and available for other technical personnel²².

Table 12. One Health workforce country-level indicators

INDICATOR	VALUE	YEAR	SOURCE
Veterinarians (number)	3888	2019	WOAH-World Animal Health Information System (WAHIS)
Public animal health professionals (number)	220	2019	WOAH-WAHIS
Community animal health workers (number)	Data not available	Data not available	WOAH-WAHIS
Medical doctors (number)	20379	2020	The National health Workforce Accounts database, World Health Organization, Geneva
Medical doctors (per 10,000 people)	51.09	2020	The National health Workforce Accounts database, World Health Organization, Geneva
Nursing personnel (total)	22126	2020	The National health Workforce Accounts database, World Health Organization, Geneva
Environmental and Occupational Health and Hygiene Professionals (number)	Data not available	Data not available	The National health Workforce Accounts database, World Health Organization, Geneva
Medical and Pathology Laboratory Scientists (number)	41	2020	The National health Workforce Accounts database, World Health Organization, Geneva

Human Resources (IHR SPAR scale 0-100)	60	2020	IHR State Party Self-Assessment (SPAR)
Field Epidemiology Training Program (FETP)	Yes	Since 2009	South Caucasus Field Epidemiology Training Program
Up to date multisectoral workforce strategy (1-5)	2	2018	JEE

13.6.1 South Caucasus Field Epidemiology and Laboratory Training Program

One notable component of Georgia's strong public health workforce is its leadership role in hosting and participating in the South Caucasus Field Epidemiology and Laboratory Training Program (SC-FELTP). NCDC, in collaboration with US CDC, leads the SC-FELTP which trains epidemiologists, clinicians, laboratory technicians, and veterinarians from Georgia, Azerbaijan, Armenia, and Ukraine⁶³. Several national-level public health specialists from Georgia have gone through the SC-FELTP, and another 18 municipal public health specialists have

also participated in a 2-year frontline field epidemiology and lab training program in to provide municipal public health staff with basic epidemiology training²². Since the start of the COVID-19 pandemic, SC-FELTP graduates have played a critical role in the pandemic response, surveillance, sample collection, contact tracing, and lab testing⁶³. In 2023, Georgia also began piloting a One Health FELTP project that pairs public health epidemiologists with veterinarians at the local level, in each rayon.

13.7 Monitoring, evaluating and reporting on One Health activities

Monitoring, evaluating, and reporting is expected in public health, with an extensive list of common qualitative and quantitative metrics including quality- and disability-adjusted life years to name a few. Animal health metrics are also prevalent, but are often focused on absence of disease or population prevalence, rather than overall state of physical and mental wellbeing because of the ties between domestic animals and economic productivity⁶⁴. Environmental health metrics are less well-defined within the human-animal-environmental triad⁶⁴, and are regularly tied to their effect on human health like

climate change, pollution, land coverage, and unsafe water and food. Altogether, there is a lack of universally accepted metrics and methods to evaluate issues and interventions across the human-animal-environment interface, making quantifying the value of One Health challenging^{11, 64}. Specific methods of measuring, evaluating, and reporting One Health is beyond the scope of this report, but several examples can be found in the reference section of this report for more information^{11, 26, 64-67}.

While each One Health program will have different objectives, effective programs

should include multi-sectoral indicators that, for example, evaluate systems, coordination, planning, and training, and be based on a sound theory of change within a defined context^{11, 64}. One Health programs can, and often do, still include disease-specific targets which can be useful in providing concrete examples and providing specificity to discussions¹¹.

The World Bank One Health Operational Framework proposes several high-level national indicators that provide a starting point for evaluating national One Health capability.

1. Core assessments evaluating human, animal, and environmental health e.g., IHR annual self-assessments, JEE and PVS assessments, and assessment of essential public health operations are up to date.
2. Progress toward establishing a national or regional active, functional One Health platform e.g., national MCM on One Health

3. National response plans developed, implemented, and up to date e.g., national action plan for health security, national biodiversity action plan, public health emergency preparedness, performance of veterinary services gap analyses etc.
4. Applied epidemiology training program in place e.g., Field Epidemiology and Laboratory Training Program (FELTP) that includes human disease epidemiologists as well as domestic and wildlife veterinarians.
5. Disease-specific targets (e.g., brucellosis, African Swine Fever, tuberculosis etc.)

Georgia has completed several of the high-level national indicators mentioned above, including developing assessments, national action plans, and participating in the South Caucasus Field Epidemiology and Laboratory Training Program.



14 ONE HEALTH CASE STUDIES

14.1 Veterinary Measures in Farming and Livestock Populations

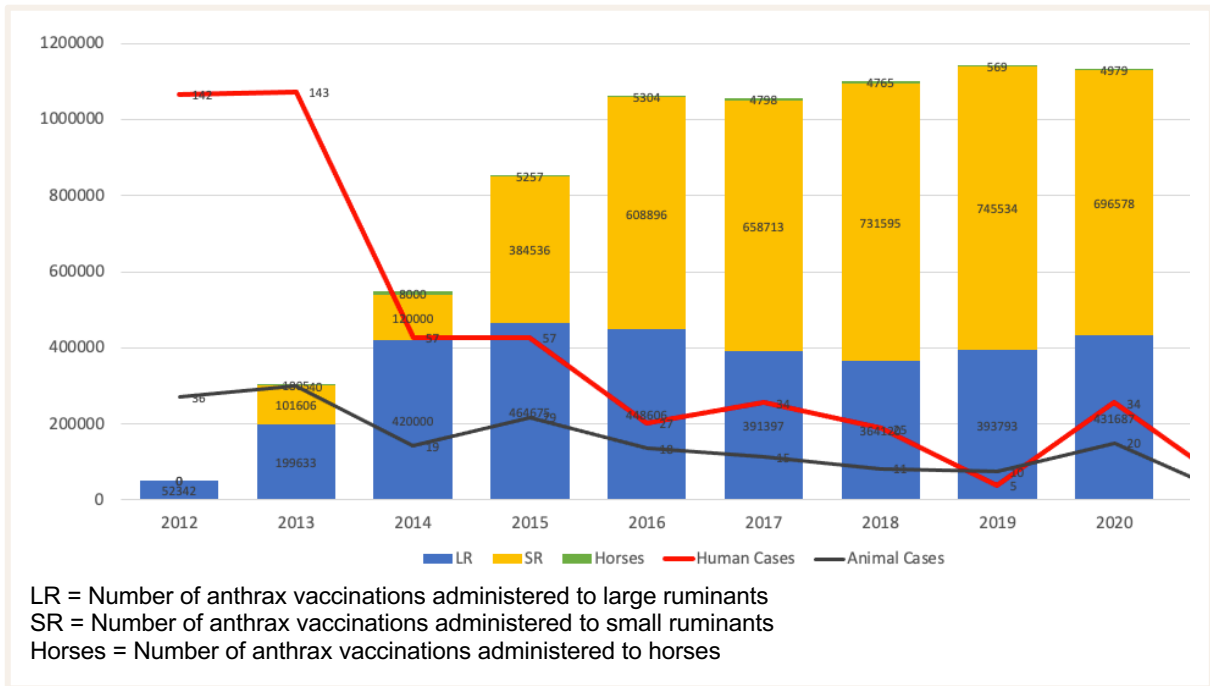
Livestock management and domestic animal farming are important sources of income for many Georgians, but without proper biosafety measures, they can also lead to spillover of zoonotic diseases. Research shows that people who routinely work on farms and with livestock may be at an elevated risk for zoonotic infections. For example, farm related work, including work with hay and contact with multiple types of animals has been correlated with tularemia seroprevalence in Georgia.⁶⁸ There is also evidence that animal tuberculosis is widespread in Georgia, especially in big commercial farms, but prevalence within animals is low.⁶⁹ Moreover, previous studies have shown that the burden of brucellosis affects people who tend sheep, and males and young adults (aged 21-40) as males are more involved in caring for farm and domestic animals^{70, 71}. Pig farming and handling may also pose a threat. It's been reported that pigs and pork mostly move through informal routes e.g., given and sold to friends, relatives, neighbors – sometimes over long distances – which can translate into rapid disease spread⁷².

Considering all of this information the Georgian government has taken a mixed approach to implementing veterinary measures and animal vaccination campaigns. For example, in 2007 the government of Georgia eliminated compulsory annual livestock anthrax vaccination shifting the responsibility to

provide vaccinations from NFA to livestock owners and private veterinarians. A study assessing the occurrence of anthrax outbreaks before and after this change found that the overall risk of human anthrax increased >5-fold, from 0.7 cases per 100,000 in 2000 to 3.7 cases per 100,000 by 2013⁷³. Furthermore, a matched case-control study comparing livestock anthrax cases with owners of unaffected livestock demonstrated that vaccination within the last two years significantly reduced the odds of anthrax in cattle⁷⁴. This research demonstrates how changes in government policy and One Health programs can have substantial impact on the epidemiology of zoonotic disease outbreaks.

Fortunately, starting in 2012 Georgia began making substantial progress to reverse these trends by expanding basic veterinary measures across the country. In particular, NFA resources and capacity have considerably increased in the past decade. While the government did not bring back widespread mandatory animal vaccinations against anthrax (vaccination is only mandatory in high-risk regions and for nomadic animals that pass through these regions), it greatly expanded prophylactic vaccination while also increasing community outreach and awareness raising campaigns. This has since resulted in substantial drops in both human and animal anthrax cases (Figure 12).

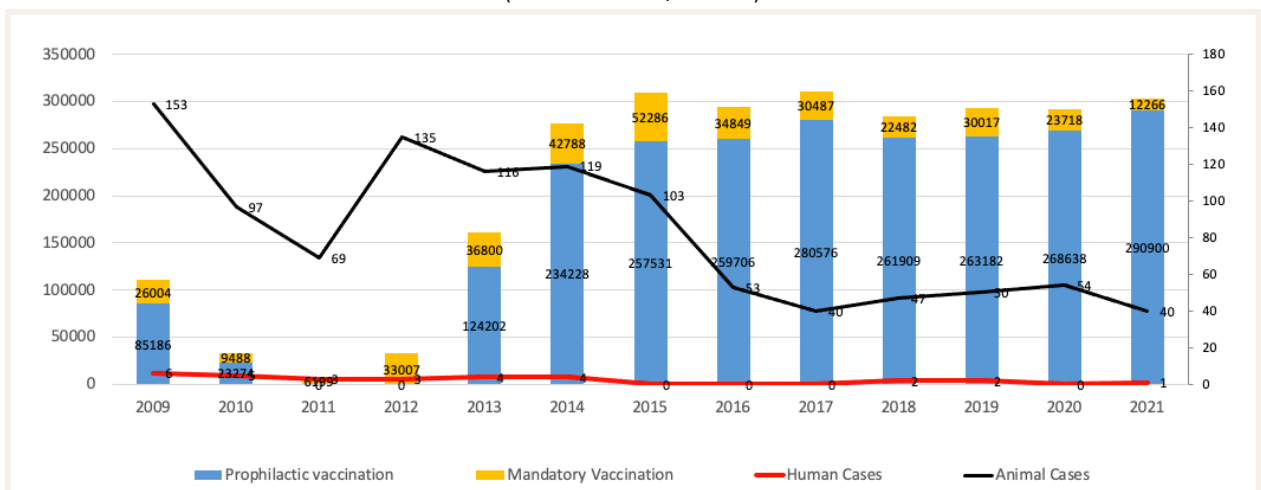
Figure 12. Increased animal anthrax vaccination coverage juxtaposed by decreased cases of human and animal anthrax 2012-2021 (source: NFA/NCDC)



At the same time, comparable veterinary measures were being implemented across other zoonotic disease control programs, including rabies. Following a similar pattern

to anthrax, a large push to increase rabies vaccinations starting in 2013 and lead to large drops in cases of animal rabies between 2012-2021 (Figure 13).

Figure 13. Increased animal rabies vaccination coverage juxtaposed by decreased cases of animal and human rabies 2009-2021 (source: NFA/NCDC)



While there are lots of factors at play that affect disease transmission, these results highlight the human-animal health

linkages, the importance of animal vaccination, proper biosecurity, and need for sustained investment and further

adoption of One Health approaches to raise public awareness and monitor suspected cases zoonoses^{73, 75}. Finally, by adopting a holistic One Health approach that promotes education, biosecurity training, and access to veterinary and financial

services for not just farmers and butchers, but all people involved in the livestock supply chain⁷², Georgia can continue to strengthen its biosecurity, reduce the risk of zoonotic disease emergence, and promote the health of its citizens.

14.2 Responding to COVID-19: A Case Study in Partnership and Preparedness

The US CDC first engaged with Georgia in 1995 and has been a public health and One Health partner ever since. For years, US CDC has worked with MEPA, NCDC, and Lugar Center to increase capacity for laboratory diagnostics, disease surveillance, and outbreak response for control of zoonotic, foodborne, waterborne, and enteric diseases⁵⁵. Through this partnership, Georgia has strengthened its avia influenza surveillance, developed disease control guidelines, and identified zoonotic disease risk factors for humans and livestock.

When the first case of COVID-19 was reported in Georgia in February 2020, this partnership once again sprang into action. Leveraging past projects and public health investments, NCDC was able to convert existing diagnostic and laboratory infrastructure to respond and test for SARS-CoV-2, and SC-FELTP graduates were able to utilize their epidemiologic training to support COVID-19 surveillance across the

country. With US CDC support, NCDC was also able to create a Public Health Emergency Operations Center (PHEOC) at both the national and regional (Imereti, Kutaisi) levels and established an Incident Management System (IMS), which is necessary to strengthen multisectoral response coordination and decision-making. NCDC also worked to integrate COVID-19 testing into existing surveillance programs, deploy vaccinations, and establish a national external quality assurance program for COVID-19 polymerase chain reaction (PCR) diagnostic testing in more than 50 laboratories across Georgia⁵⁵. While the COVID-19 pandemic is still ongoing, the well-established collaboration between US CDC and the Georgian government and decade-long commitment to improving One Health infrastructure demonstrates the value of investing in disease preparedness and risk reduction projects and partnerships long before disease outbreaks start.

14.3 Investigating Akhmeta Virus

Excerpt from Frameworks for Preventing, Detecting, and Controlling Zoonotic Diseases (Shiferaw et al. 2017)⁷⁶.

Akhmeta virus, a zoonotic virus thought to be of wildlife origin, was first discovered in

Georgia in 2013⁷⁶. The virus appeared during a cattle-associated outbreak of

cutaneous lesions among herders in Georgia. In response to the outbreak, a coalition of intragovernmental partners designed and implemented a One Health research and surveillance program. NCDC, NFA, the Laboratory of the Ministry of Agriculture, and US CDC led the outbreak response with a focus on simultaneously collecting and examining data on the epidemiology and characteristics of the virus while also building laboratory capacity to detect infections in humans and animals through Enzyme-linked Immunosorbent Assay (ELISA), PCR, and sequencing diagnostic methods⁷⁶. This investigation has led to expanded surveillance for orthopoxviruses in Georgia and the improved capacity and knowledge through this epidemiologic, ecologic, molecular, and immunologic research.

Another major outcome of this intragovernmental, cross-sector coordination was the initiation of a major ecologic research effort to investigate the geographic distribution and seasonal dynamics of Akhmeta virus in potential

small mammal reservoirs. More than 700 samples from small mammals were collected from multiple locations. Several studies are being conducted to establish the burden of disease and identify possible risk factors for human and livestock infections. Samples from humans suspected to have orthopoxvirus infection are sent to NCDC for diagnostic evaluation and positive samples are characterized locally by nucleic acid sequencing and viral isolation. While the project is still ongoing, this initial work has already resulted in the discovery of additional instances of human orthopoxvirus infection in Georgia, a greater understanding of other prominent etiologies for cutaneous lesions, isolation of orthopoxvirus from terrestrial rodents, and enhanced collaboration around surveillance and response between the human and veterinary public health sectors⁷⁶. This example demonstrates how pathogen discovery research can stimulate innovation and capacity development at the intersection of human, domestic animal, livestock, and wildlife health.



15 RECOMMENDATIONS: Next Steps to Advance One Health in Georgia

Table 13. Recommendations to advance One Health in Georgia

RECOMMENDATION	JUSTIFICATION
<p>Finalize establishing a National One Health Committee. Once established, designate financial and human resources so the committee can fulfill its mandated programs</p>	<p>The foundation for a national multisectoral One Health body is already in place. There are multiple working groups that already focus on One Health-related issues, including the One Health Coordination Group, Multisectoral environment steering committee, National Animal Health Steering Committee, and the COVID-19 National Intersectoral Immunization Council</p>
	<p>NCDC has a dedicated One Health Division within NCDC which leads several One Health projects and policies. However, in accordance with current laws, it does not have the high-level resources to coordinate all One Health policies and activities across the country</p>
	<p>There is government interest at the technical level, including within NCDC (MoILHSA), NFA and SLA (MEPA)</p>
	<p>For it to be a true multisectoral body, the National One Health Committee should have representation from the MoIHLSA (e.g., NCDC), MEPA (e.g. NFA and SLA), Ministry of Internal Affairs, Ministry of Finance, Ministry of Defense, Academia, and potentially other institutions or the private sector</p>
	<p>There is also a strong private sector presence in Georgia that holds many operational responsibilities. To ensure effective multi-sectoral cooperation, incorporating specific operation and reporting links to the private sector could also be beneficial²²</p>
	<p>Establishing a national, multisectoral One Health committee would create cohesion between ministries as they align under a common goal, improve inter-departmental communication, and reduce duplicative projects</p>
<p>Complete a NAPHS with a multisectoral group of government experts</p>	<p>A National One Health Committee would help dismantle the common viewpoint that health is the sole responsibility of the MoILHSA, and it would help shift people’s mindset from “<i>What am I responsible for?</i>” to “<i>What needs to be done to improve our collective health?</i>”, to expand entry points for contributions for effective and efficient efforts for disease prevention through recovery.</p> <p>The process to complete a NAPHS presents an important opportunity for multi-sectoral engagement in prevention, detection, and response. Taking stock of zoonotic disease emergence and spread factors in particular can help to make relevance to multiple sectors clear and facilitate precise entry points for relevant sectors in the development and implementation of the Plan.</p>

	The NAPHS results in a costed action plan, so ensuring a multi-sectoral approach from the onset can ensure the necessary resources for each sector are appropriately identified. This is expected to result in more cost-effective approaches, by shifting more toward prevention instead of a typical reliance on response.
	Tools, such as capacity assessments and national plans that are developed jointly among diverse sectors and stakeholders results in a stronger outputs, improved coordination, collaboration and trust between sectors, and a stronger One Health system overall ⁴⁷
	The burden of assessments is often noted, at times reflecting that gap identified in prior assessments have not been addressed. Improved coordination and stakeholder mapping allows for clear attention to areas in need of attention, including relevant roles, responsibilities, and resources, to promote progressive system strengthening and preparedness.
Develop a renewed NBSAP in line with the new COP 15 framework	The most recent NBSAP was for the period of 2014-2020 and has since expired, and a new one has yet to be developed
	NBSAP's typically drive countries' ecosystem and biodiversity management priorities and operations, the development of a new plan offers a chance to build in disease risk reduction, creating synergies between Georgia's NBSAP and yet to be completed NAPHS
Complete updated PVS Evaluation	Georgia completed a PVS in 2009, but fourteen years later, the country is due for an updated evaluation. There have been great improvements in veterinary services in this time, and an updated PVS evaluation and Gap Analysis would provide concrete recommendations for continued improvement in veterinary services.
Expand zoonotic disease monitoring and surveillance in wildlife using nonlethal methods.	An expansion of wildlife disease monitoring includes developing a functional reporting system and information flow with relevant authorities for wildlife disease events in/around protected and conserved area
	MEPA is the national authority on wildlife and could leverage a strong existing relationship with NCDC to conduct wildlife biosurveillance, sampling, and testing

	<p>Data on wildlife habitats and species richness can help authorities recognize specific geographic areas or species where disease outbreaks may be more likely to occur, which can cut down on outbreak response time and help better target resources.</p>
	<p>Developing wildlife surveillance capacity could be an effective mechanism to further integrate One Health processes and cross-sector data sharing into human and animal health surveillance via EIDSS or other existing information sharing systems.</p>
	<p>Georgia is rich in biodiversity and wildlife surveillance could be paired with existing communication campaigns to raise awareness about the importance of preserving biodiversity, wildlife and protected land.</p>
Conduct subnational disease risk assessment and mapping	<p>Increasing understanding of the sources of risk and advancing risk reduction measures will have generate co-benefits within the agriculture and health sectors as well as broader sustainable development</p>
	<p>Improved metadata standards and criteria for the minimum necessary data needed for sharing One Health or biosurveillance data across platforms</p>
	<p>Prioritize planning at the subnational level to support One Health coordination, including to align diagnostics, screening, awareness, standard operating procedures, and workforce.</p>
Finish the previously initiated NFI	<p>Initiated in 2018, a completed NFI would provide important information about the quantity and quality of Georgian forests and their biodiversity which could be used in future geospatial modeling and EID risk mapping</p>
	<p>Deforestation can be a driver of zoonotic spillover as it destroys wildlife habitat and places wildlife in closer contact with domestic animals and humans. Having data about Georgia’s forests can be used to identify areas where deforestation is happening the most and where wildlife-livestock encounters may occur more in the future</p>
Complete the national-level adaptation and implementation of the global TZG and One Health Joint Plan of Action.	<p>Upon completion, implementing the TZG and One Health Joint Plan of Action will be a critical step in improving the country’s ability to address health threats swiftly and effectively at the human-animal-environmental interface.</p>
Improve the transparency and timeliness of health-related information dissemination to	<p>By ensuring that national plans, capacity assessments and tools, research publications and related documents are publicly available and accessible online, not just in print, it promotes transparency and accountability of work.</p>

additional sectors, departments, and academicians

Although Georgia is a relatively small country and informal communication can be useful, enhancing formal communication mechanisms across ministries, and with academia, would help to better connect a larger network of expert stakeholders to link research activities to ongoing monitoring and risk analysis processes as relevant.

Ensuring the timely, transparent and wide release of results from One Health research and assessments would maximize Georgia’s ability to share its success stories, lessons learned, and best practices both domestically and with other countries. An improvement in information flow and awareness would also enhance Georgia’s ability to drive change and strengthen One Health processes⁴⁷

Enhance one health workforce development

Conduct workforce planning and benchmarking to support a workforce development strategy that supports multi-sectoral assessment and action across the country’s core risks and vulnerabilities

Expand joint work-training with veterinarians, environmental health specialists, epidemiologists, and other professionals across the human-animal-environmental health landscape (outside of SC-FELTP) – including training veterinarians on the public health aspects of One Health and environmental health experts on conservation and its role in zoonotic disease emergence

Given the resource disparity between human and environmental health sectors, it is particularly important to train environmental health professionals to strengthen knowledge capacity on one health principles and approaches, including at regional and municipal levels. The 2023 Budapest Declaration obliges Georgia to implement the principles of Clean Health and develop appropriate policies to ensure a safe environment for human health.

16 CONCLUSIONS

The Republic of Georgia has made notable progress in adopting and implementing One Health strategies, even if efforts have historically been focused on specific disease priorities. With a keen interest in further strengthening multisectoral One Health approaches – particularly at the technical level – there is an opportunity for Georgia to be a One Health leader in the Caucasus region. By formalizing a national One Health body and expanding sectors and stakeholders involved in routine and emergency operations, Georgia will bolster communication, coordination, collaboration, and capacity strengthening

across sectors, leading to more efficient human, animal, and environmental health systems. There is also growing interest from international partners and donor organizations for the operationalization of One Health as part of COVID-19 recovery and overall pandemic prevention and readiness. Support for One Health initiatives in Georgia has gained significant traction over the last several years and added expansion of One Health approaches into biosurveillance and biodefense practice, assessment, regulation, and coordination will bolster the country's health and security going forward.



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18 ADDITIONAL ONE HEALTH RESOURCES, ARTICLES, & REPORTS

This is by no means an exhaustive list of One Health-related resources but is meant to provide examples of several resources for further education as desired.

18.1 One Health

1. One health joint plan of action (2022–2026): working together for the health of humans, animals, plants and the environment
 - a. <https://www.who.int/publications/i/item/9789240059139>
2. One Health Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at Their Interface
 - a. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/703711517234402168/operational-framework-for-strengthening-human-animal-and-environmental-public-health-systems-at-their-interface>
3. WHO-WOAH Operational Framework for Good governance at the human-animal interface
 - a. <https://www.who.int/publications/i/item/who-oie-operational-framework-for-good-governance-at-the-human-animal-interface>
4. Handbook for the assessment of capacities at the human-animal interface
 - a. <https://www.who.int/publications/i/item/handbook-for-the-assessment-of-capacities-at-the-human-animal-interface-2nd-ed>
5. Integrated approaches to health: A handbook for the evaluation of One Health
 - a. <https://www.wageningenacademic.com/doi/book/10.3920/978-90-8686-875-9>
6. One Health Toolkits (several different toolkits, including, stakeholder mapping, policy and advocacy, gender integration, and others)
 - a. <https://www.onehealthapp.org/resources>
7. A systematic review on integration mechanisms in human and animal health surveillance systems with a view to addressing global health security threats
 - a. <https://onehealthoutlook.biomedcentral.com/articles/10.1186/s42522-020-00017-4>
8. One Health: Reducing Disease Risk
 - a. <https://www.iucn.org/resources/policy-brief/one-health-reducing-disease-risk>
9. The Lancet Series on One Health and Global Health Security (a series of several papers, including lessons in One Health collaborations, governance, and ecological equity)
 - a. <https://www.thelancet.com/series/one-health-and-global-health-security>
10. Factors that enable effective One Health collaborations - A scoping review of the literature
 - a. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6892547/>
11. Institutionalizing One Health: From Assessment to Action
 - a. <https://pubmed.ncbi.nlm.nih.gov/30480500/>
12. A system dynamics approach to understanding the One Health concept
 - a. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5587294/>
13. Strengthening multisectoral coordination on antimicrobial resistance: a landscape analysis of efforts in 11 countries
 - a. <https://jopp.biomedcentral.com/articles/10.1186/s40545-021-00309-8>

14. One health-based conceptual frameworks for comprehensive and coordinated prevention
 - a. https://www.g20-insights.org/policy_briefs/one-health-based-conceptual-frameworks-for-comprehensive-and-coordinated-prevention/

18.2 Zoonoses

15. Preventing the Next Pandemic- Zoonotic diseases and how to break the chain of transmission
 - a. <https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and>
16. A Tripartite Guide to Addressing Zoonotic Diseases in Countries
 - a. <https://www.who.int/initiatives/tripartite-zoonosis-guide>
17. Multisectoral coordination mechanisms operational tool: an operational tool of the tripartite zoonoses guide
 - a. <https://www.who.int/publications/i/item/9789240053236>
18. Joint risk assessment operational tool (JRA OT): an operational tool of the tripartite zoonoses guide
 - a. <https://www.who.int/publications/i/item/9789240015142>
19. Surveillance and information sharing operational tool: an operational tool of the tripartite zoonoses guide
 - a. <https://www.who.int/publications/i/item/9789240053250>
20. The three Ts of virulence evolution during zoonotic emergence
 - a. <https://royalsocietypublishing.org/doi/10.1098/rspb.2021.0900>
21. Want to prevent pandemics? Stop spillovers
 - a. <https://www.nature.com/articles/d41586-022-01312-y>
22. Interventions to Reduce Risk for Pathogen Spillover and Early Disease Spread to Prevent Outbreaks, Epidemics, and Pandemics
 - a. https://wwwnc.cdc.gov/eid/article/29/3/22-1079_article

18.3 Environment

23. Country Assessment for the Environment Sector in Health
 - a. <https://www.ecohealthalliance.org/country-assessment-for-the-environment-sector-in-health>
24. Land reversion and zoonotic spillover risk
 - a. <https://royalsocietypublishing.org/doi/10.1098/rsos.220582>

18.4 Biodiversity and Conservation

25. IPBES Workshop on Biodiversity and Pandemics
 - a. https://ipbes.net/sites/default/files/2020-12/IPBES%20Workshop%20on%20Biodiversity%20and%20Pandemics%20Report_0.pdf
26. Biodiversity data supports research on human infectious diseases: Global trends, challenges, and opportunities
 - a. <https://www.sciencedirect.com/science/article/pii/S2352771423000046?via%3Dihub>
27. Healthy people and wildlife through nature protection

- a. <https://portals.iucn.org/library/node/50682>
- 28. Report on monitoring schemes and data collection on biodiversity for food and agriculture in Eastern Europe and Central Asia
 - a. <https://www.fao.org/documents/card/en/c/cb6959en>
- 29. The direct drivers of recent global anthropogenic biodiversity loss
 - a. <https://www.science.org/doi/10.1126/sciadv.abm9982>

18.5 Biodefense

- 30. Building Resilience to Biothreats
 - a. www.ecohealthalliance.org/wp-content/uploads/2019/04/Building-Resilience-to-Biothreats.pdf
- 31. Opportunities for Enhanced Defense, Military, and Security Sector Engagement in Global Health Security
 - a. <https://www.ecohealthalliance.org/engagement-in-global-health-security/opportunities-for-enhanced-defense-military-and-security-sector-engagement-in-global-health-security-2>
- 32. Biodefense in Crisis
 - a. <https://biodefensecommission.org/reports/biodefense-in-crisis-immediate-action-needed-to-address-national-vulnerabilities/>
- 33. Establishing a Multilateral Biodefense & Biosecurity Network
 - a. https://www.g20-insights.org/policy_briefs/establishing-a-multilateral-biodefense-biosecurity-network/

19 ANNEX: ACTIVITIES FROM VIRTUAL AND REGIONAL WORKSHOPS

19.1 Virtual Workshop Participants

The EHA-organized virtual workshop (20-21 January 2022) had ~32 people with representatives from:

- MoILHSA/ NCDC
- MEPA/ SLA
- MEPA/ NFA
- Revenue Service
- Institute of Zoology of Ilia State University
- Deloitte/USAID
- San Diego State University - Georgia
- EcoHealth Alliance

19.2 Regional Meeting Participants

The EHA and NCDC-organized meeting (6-8 December 2022) had ~16 Georgian representatives from:

- NCDC
- MEPA/ SLA
- MEPA/ NFA
- Revenue Service
- Ilia State University

19.3 Activity – Putting One Health into Action

In small groups, workshop participants were tasked with identifying the most important existing national infrastructure, capacity, tools, assessments, and resources for addressing zoonotic diseases by filling out an “Operationalizing One Health Framework” for Georgia. Based on the World Bank’s *Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at their Interface*, this framework is a systematic look at operational tools, strategies and capacity strengthening needs for implementing One Health projects in a given country. The goals of the activity were to:

- 1.) Get all participants on the same page in terms of understanding what resources are currently in place in Georgia
- 2.) Understand where strengths lie, and gaps may exist in terms of implementing a One Health structure

Prior to sending participants into groups to complete this activity, participants were led through a global example, with definitions, of what each component encompasses (Figure 13). Finally, for ease of editing the framework was adapted to a table format so everyone could more easily simultaneously add to the framework without disrupting the formatting (Table 14).

Figure 13. Example operationalizing One Health framework with definitions

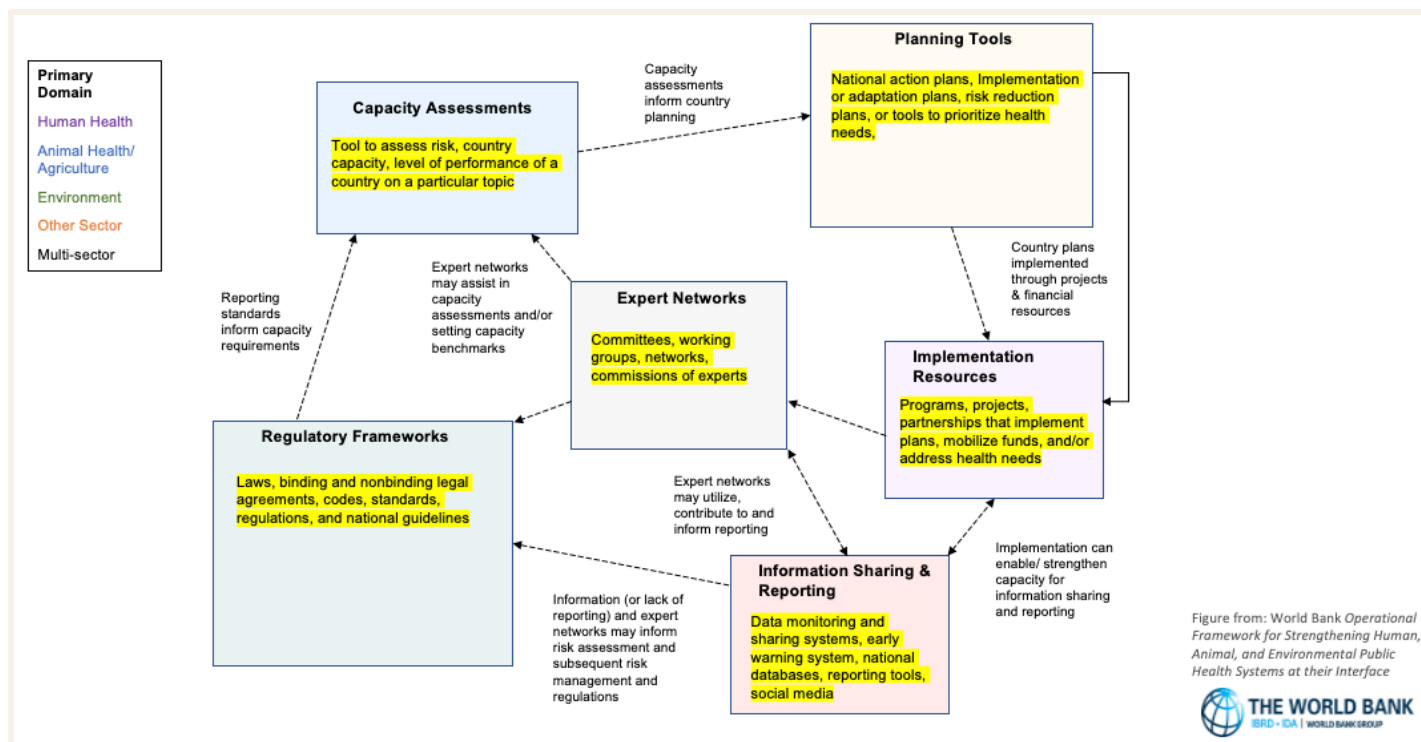


Table 14. Operationalizing One Health framework reformatted to a table for ease of editing

REGULATORY FRAMEWORKS	CAPACITY ASSESSMENTS	PLANNING TOOLS	IMPLEMENTATION RESOURCES	INFORMATION SHARING & REPORTING	EXPERT NETWORKS
<p>Laws, binding and nonbinding legal agreements, codes, standards, regulations, and national guidelines <i>e.g., National One Health Decree, Public health law, Other National Policies etc.</i></p>	<p>Tool to assess risk, country capacity, level of performance of a country on a particular topic <i>e.g., Other PVS evaluations, self-assessments, capacity audits, OH-SMART, WHO STAR etc.</i></p>	<p>National action plans, Implementation or adaptation plans, risk reduction plans, or tools to prioritize health needs <i>e.g., Zoonotic Prioritization tool, National Biodiversity strategies, Action Plans on AMR, Public Health, Environmental health, Vet Services, Biosecurity Emergencies etc.</i></p>	<p>Programs, projects, partnerships that implement plans, mobilize funds, and/or address health needs <i>e.g., Nationally determined funding, human & financial resources, Bilateral agreements, Global funding, International collaborations etc.</i></p>	<p>Data monitoring and sharing systems, early warning system, national databases, reporting tools, social media <i>e.g., Information systems, DHIS2, WhatsApp/Mobile apps, Academic journals, other surveillance or communication systems etc.</i></p>	<p>Committees, working groups, networks, commissions of experts <i>e.g., Working groups, or commissions on AMR, IHR, Biodiversity, biodefense etc.</i></p>

19.4 Activity – Creating an Emerging Infectious Disease (EID) Risk Profile

In small groups, workshop participants were tasked with identifying risk factors that may affect (increase or decrease) EID risk and impact. The goals of the activity were to:

- 1.) Create a shared understanding across sectors about potential sources of risk and opportunities for risk mitigation
- 2.) Begin to outline priority risk reduction measures that could be enacted in Georgia

Participants were provided with an example template (Table 15) previously developed by EcoHealth Alliance and completed with the University of Ghana with the support of the UK Animal and Plant Health Agency – to guide them in filling out the EID risk profile for Georgia. Both the example template and blank template (Table 16) given to participants are provided below.

Table 15. Example EID risk profile template

EMERGENCE FACTORS	SPREAD FACTORS
Key interfaces for wildlife-human contact	Key human movement and animal trade patterns (e.g., rural-urban, cross-border)
Key interfaces for wildlife-livestock contact	
Presence of species associated with elevated. Risk of harboring or transmitting high-consequence pathogens	
Presence of potentially high-consequence pathogens	
Changing practices (e.g., land use, agriculture, wildlife trade)	
	Key density dynamics (e.g., urban slums, refugee camps, large-scale social gatherings)
	Key detection or control factors (e.g., limited interaction with formal health system, access to IPC measures)
	Biosafety and Biosecurity
VULNERABILITY FACTORS	PROTECTIVE FACTORS
Disease detection gaps (e.g., known and novel diseases)	Early warning systems
Workforce gaps (e.g., limited veterinary personnel)	Access to safe water, sanitation, and immunizations
Infrastructure gaps (e.g., limited healthcare facilities, unreliable electricity coverage)	Consistent risk messaging and reliable communication channels
Limited health security coordination or consideration of environmental factors	Multisectoral coordination and harmonization
Instability and fragility	

Table 16. Blank EID risk profile template for workshop participants to fill out

EMERGENCE FACTORS	SPREAD FACTORS
<ul style="list-style-type: none"> • <i>Key interfaces for wildlife-human or wildlife-livestock contact</i> • <i>Presence of species associated with risk of harboring / transmitting high consequence pathogens</i> • <i>Presence of potentially high-consequence pathogens</i> • <i>Changing practices (e.g., land use, agriculture, wildlife trade)</i> 	<ul style="list-style-type: none"> • <i>Key human movement and animal trade patterns (e.g., rural-urban, cross-border)</i> • <i>Key density dynamics (e.g., urban slums, refugee camps, large social gathering)</i> • <i>Detection or control factors (e.g., limited interaction with health system, access to IPC measures)</i> • <i>Biosafety and Biosecurity</i>
VULNERABILITY FACTORS	PROTECTIVE FACTORS
<ul style="list-style-type: none"> • <i>Disease detection gaps (e.g., known and novel diseases)</i> • <i>Workforce gaps (e.g., limited personnel) or training</i> • <i>Infrastructure gaps (e.g., limited health facilities, unreliable electricity coverage)</i> • <i>Limited health security coordination or consideration of environmental factors</i> • <i>Instability and fragility</i> 	<ul style="list-style-type: none"> • <i>Early warning systems</i> • <i>Cultural practices</i> • <i>Access to safe water, sanitation, and immunizations</i> • <i>Consistent risk messaging and reliable communication channels</i> • <i>Multisectoral coordination and harmonization</i>

19.5 Activity – Zoonotic Disease Tabletop Exercise

Schedule

Initial Scenario

- Small group (country) discussion – 45 minutes
- Whole group (regional) discussion – 30 minutes

Coffee Break – 15 minutes

Scenario Update #1

- Small group (country) discussion – 45 minutes
- Whole group (regional) discussion – 30 minutes

Scenario Update #2

- Small group (country) discussion – 30 minutes
- Whole group (regional) discussion – 30 minutes

Lunch Break – 1 hour

Scenario Update #3

- Small group (country) discussion – 30 minutes
- Whole group (regional) discussion – 30 minutes

Scenario Update #4

- Small group (country) discussion – 30 minutes
- Whole group (regional) discussion – 30 minutes

Coffee Break – 15 minutes

Debrief

- Whole group (regional) discussion – 30 minutes

19.5.1 Initial Scenario

One morning, two tourists visiting Ghliana Cave (Imereti region) discovered a large number of dead bats (approximately 300) on the ground of the cave. Most of the bats appeared to be freshly dead, although some bats were in various states of decomposition. There were still bats alive in the bat colony (about 300 remaining, i.e., half of the population appeared to be dead). Thinking this was odd, the visitors informed the local tourism operator who managed the cave of what they saw. The tourism operator took down the names and phone numbers of the visitors and was quite concerned about this situation. The tourism operator was concerned about their revenue from cave tourism being affected, but also the health of the bat population and health of people who may visit the cave. The tourism operator did not know who to notify or how to proceed.

Discussion Questions

Initial outbreak investigation

1. First, who should the tourism operator notify to help with an investigation of this wildlife die-off event? What department, ministry, or other sectors would be *responsible* for investigating this event?
2. Are there any protocols or policies in place for investigating a wildlife mortality event?
3. Is there a specific surveillance and reporting system in place for investigation of unusual mortality events in wildlife species?
4. What would investigators do when they arrived at the field site? e.g., Specifically, how would they collect samples and data?

Testing and diagnosis

1. What laboratory will test the samples? Is there a dedicated wildlife lab?
2. What tests should the laboratory run?
3. Who will analyze the data from the laboratory and analyze the “risk” of any pathogens identified?

Communication and follow-up response

1. Will details of the bat die-off investigation be shared within the government (across sectors)?
2. Will there be any public outreach and communication, e.g., with the media, about the event?
3. Would any risk mitigation measures be put in place at this stage?

Based on the discussion questions, please fill in the “Action & Coordination Table” by writing down the actions your group would take. Then, put an “X” in the box to mark which sectors would be involved in carrying out that action.

----- Pause for Whole Group Discussion -----

Share your plan of action and any questions or challenges that arose during your discussion. [We will use this time to address differences and similarities in response plans between the 3 countries.]

19.5.2 Scenario Update #1

While visiting the cave, the investigative team collected diagnostic samples from 30 dead bats that seemed the freshest. Various organ and tissue samples were collected from necropsied bats, stored in viral transport media, and shipped to the relevant laboratory in-country on ice to attempt to identify the pathogen that caused the mass mortality event. Bacterial assays were run first, and *Bartonella* spp. bacteria were found samples from 2/30 bats, but these seemed inconclusive and possibly not the etiological agent that may have caused the die-off. Additional molecular panels using conserved, viral family level PCR assays were run. Panels for 7 different viral families were run, all samples were negative for 6 of the 7-virus family-level tests. However, liver and spleen samples from 18/30 bats (60% percent of bats sampled) were found positive for Lloviu virus (LLOV) infection. LLOV is a member of the Filoviridae family (in the genus *Cuevavirus*) which has been previously detected in bat populations from other European countries, including Spain, Hungary. In previous studies LLOV was found to be associated with bat die-offs. Several filoviruses have previously been shown to jump between hosts, thus posing a possible risk of zoonotic spillover.

Discussion Questions

1. How should the laboratory and investigative team proceed after identifying LLOV as the likely causative agent?
2. What data information system is used to store the lab results? Who has access to this information?
3. What ministries/departments will be informed of the lab results?
4. Will there be any public outreach and communication now that results are known?
5. What are the reporting and notification requirements for a disease outbreak like this?

Based on the discussion questions, please continue adding to the "Action & Coordination Table" by writing down the actions your group would take. Then, put an "X" in the box to mark which sectors would be involved in carrying out that action.

----- Pause for Whole Group Discussion -----

Share your plan of action and any questions or challenges that arose during your discussion. [We will use this time to address differences and similarities in response plans between the 3 countries.]

19.5.3 Action & Coordination Chart (Example)

1. Write what actions you would take.
2. Write what ministries, sub ministries, departments, NGOs, private sector organizations etc., would be involved carrying out those actions.

		Sectors (sub ministries, departments, organizations etc.)							
		NCDC	Laboratory Ministry of Agriculture	Ministry Environment Wildlife Dept.	Tourism Operator				
Actions	Field Investigation	X							
	Laboratory testing		X						
	Communication	X		X	X				

Action & Coordination Chart

1. Write what actions you would take.
2. Write what ministries, sub ministries, departments, NGOs, private sector organizations etc., would be involved carrying out those actions.

		Sectors (sub ministries, departments, organizations etc.)							
Actions									

19.5.4 Scenario Update #2

A few days after the discovery of the large group of dead bats, cows on a nearby farm begin to get sick. Two cows died and three others were symptomatic (elevated temperature, nasal discharge, and rapid breathing). The farmer contacts their private veterinarian to ask for assistance. After visiting the farm and speaking to the farmer, the veterinarian decides it is necessary to collect diagnostic samples and send them to a laboratory to identify the pathogen that is causing the cows to be sick. Diagnostic tests for common cow diseases (enzootic bovine leukosis, bluetongue, infectious bovine rhinotracheitis, bovine viral diarrhea and anthrax) were all negative. However, just like in the bats, the three symptomatic cows tested positive for LLOV infection (dead cows were not tested) using molecular assays.

Discussion Questions

1. How should the local veterinary office proceed after identifying LLOV as the likely causative agent?
2. What is the normal procedure for handling a disease outbreak on a farm? Is there an action plan for handling situations like this? Is anything different knowing about the nearby bat die-off?
3. What data information system is used to store the livestock lab results? What biosecurity disease prevention and mitigation actions will be put in place given these preliminary results?
4. Will there be any public outreach and communication? Will information be shared with the farmer?
5. What are the reporting and notification requirements for a disease outbreak like this?
6. What additional actions should be taken (from any organization) after getting the lab results?

Based on the discussion questions, please continue adding to the “Action & Coordination Table” by writing down the actions your group would take. Then, put an “X” in the box to mark which sectors would be involved in carrying out that action.

----- Pause for Whole Group Discussion -----

Share your plan of action and any questions or challenges that arose during your discussion. [We will use this time to address differences and similarities in response plans between the 3 countries.]

19.5.5 Scenario Update #3

Several weeks after identifying that LLOV appeared to cause the die-off in the bat population and that spillover between bats and cows had taken place, the investigative team decided to conduct serological tests on humans within the area. The investigative team leads a communication outreach campaign to recruit consenting people to provide samples for LLOV serologic testing. The investigative team was able to enroll 103 people in the study, who provided blood samples. The sampled population included 3 farmers who worked with the sick cows, and 100 other people who lived in the town closest to the cave where the dead bats were found. The serum samples were then sent off to a laboratory for testing. The test results showed that 10% of the human serum samples, including 2 of the 3 farmers, came back LLOV seropositive. None of the people who provided samples remember showing symptoms of being sick recently.

Discussion Questions

1. How should the laboratory and investigative team proceed after identifying cases of likely human spillover of LLOV?
2. What laboratory would have tested these samples? Since these were human samples, is it a different lab than used in Scenarios One and Two? If so, how is information shared between the two entities?
3. What data information system is used to store the lab results? Who has access to this information?
4. What ministries/departments will be informed of the lab results?
5. In addition to collecting blood samples for serological screening, participants were asked questions to understand how they may have been exposed to LLOV. What questions would you ask the participants?
6. What types of public health outreach and communication would be implemented? How would you ensure that the messaging doesn't lead to retaliation against bats?
7. Are there any interministerial or intergovernmental One Health committees that would be involved?

Based on the discussion questions, please continue adding to the "Action & Coordination Table" by writing down the actions your group would take. Then, put an "X" in the box to mark which sectors would be involved in carrying out that action.

----- Pause for Whole Group Discussion -----

Share your plan of action and any questions or challenges that arose during your discussion. [We will use this time to address differences and similarities in response plans between the 3 countries.]

