BCOMING

D6.1 SURVEILLANCE SYSTEMS ANALYSIS

Project acronym: BCOMING

Project title: Biodiversity Conservation to Mitigate the risks of emerging infectious diseases

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Executive Summary

The ultimate goal of WP6 to design, develop adapted One Health community-based surveillance systems at the interface between animals (domestic and wild) and humans, ensuring early detection of emerging pathogens of concern;

The evaluation of existing surveillance networks has been achieved qualitatively at both national and local level in Guinea using participatory and Stakeholder Mapping Analysis (SMA), quantitatively at national and institutional level in Guadeloupe using participatory approaches and OASIS framework, qualitatively and at the national level in Cambodia using participatory approaches and individual interviews

In Guinea, engagement and participation of actors was good at all levels, allowing a good progress of the work. M. Tesh, PhD student, individually interviewed or organized focus group discussions (FGD) with more than 80 people from the community involved in disease surveillance to perform a Stakeholder Map analysis, describing actors involved, relations between actors, information flows and decision processes.

In Guadeloupe, the system specifically focus on West Nile virus. The evaluation highlighted the strengths of the system, such as diagnostic laboratories, surveillance tools, network speed, and stability. Weaknesses in the system, including coordination, collaboration, information dissemination, specificity, and flexibility, were also identified. Strengthening of surveillance system integration was the focal point of recommendations, addressing both the local (Guadeloupe) and national (mainland) levels. During the feedback workshop, four recommendations from the evaluation were collectively selected and prioritized: (i) updating the inter-ministerial circular describing the functioning of the West Nile surveillance system, (ii) establishing a steering committee and an animation structure, (iii) intensifying awareness among field actors, and (iv) creating an annual epidemiological bulletin

In Cambodia, there is currently no multisectorial surveillance system or platform in place. Active surveillance design is commonly associated with project funding opportunities. Although there is no OH surveillance system, some mechanisms enable the human and animal health sectors to exchange and share data when their systems detect zoonotic disease cases.

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1. Rationale

Exposure to zoonotic diseases is substantially underreported globally, especially in tropical areas where access to the health care system is limited. Detecting the circulation of zoonotic pathogens in wildlife before they spillover to domestic animals or humans is challenging because of the absence of morbidity and mortality in some reservoir species, and the cost of implementing wildlife surveillance in tropical countries is high (Ryser-Degiorgis 2013). Alternatively, the detection of emergences in humans must be sufficiently early to prevent a regional spread of the disease. Current centralized surveillance (of pathogens, their reservoirs and their vectors) and early detection systems are expensive and limited to only a few countries (Watsa and Group 2020). Hence, sustainable tools relying on local resources to improve animal and human health monitoring and the early detection of emerging infectious diseases are needed (Kutz and Tomaselli 2019) .The ultimate goal of WP6 to design, develop adapted One Health community-based surveillance systems at the interface between animals (domestic and wild) and humans, ensuring early detection of emerging diseases of concern.

The integrative surveillance systems will be composed of three components. Firstly, the core component will be an event-based participatory One Health surveillance system that will be co-designed and evaluated for zoonotic diseases at the project sites. This process will also ensure that stakeholders are committed to implementing operational actions at the national level. Currently, the deployment of such a surveillance component still requires a methodological design effort to promote the involvement of local communities and environmental stakeholders to ensure better acceptability of the identified actions and sustainability through its inclusion in the national animal surveillance system. In the framework of the BCOMING project, we will first assess the existing surveillance systems **(Task 6.1)** using the OASIS tool and scenario tree modelling (Hendrikx, Gay et al. 2011). Then, we will use the results of the ChaRL participatory process (WP7) to assess the risk perception of the actors who would use the surveillance system, their potential or actual involvement in the surveillance activities and identify the indicators to be monitored (Task 6.2). Then, approaches rooted in social sciences, such as stakeholder mapping, behavioural economics and companion modelling, will be used to identify the difficulties faced by local stakeholders to engage in a change of practice, to define incentive schemes to overcome their obstacles, to analyse how stakeholders' decisions are made and what mechanisms drive their choices, and to co-construct a common and shared representation of the ideal surveillance system (Task 6.3). Secondly, a programmed and targeted surveillance system will be developed for viral families with a known zoonotic potential (Task 6.4). Once calibrated, the three SIR models developed under Task 4.2 (coronaviruses in bats in Cambodia, filoviruses in bats in West Africa and West Nile virus between Culex mosquitoes and wild birds in Guadeloupe) will be used to design cost effective surveillance strategies. Sampling strategies maximizing the probability of detection of the pathogen will be developed by considering the logistical and economical constraints of surveillance in the study areas. Finally, the optimal surveillance strategies will be tested (sensitivity of the surveillance systems) via further field surveys performed in collaboration with WP2 partners and technical officers from veterinary, public health and environmental services.

Assessing the existing surveillance systems is a prerequisite to (i) enable the community to find an organization that would allow them to detect and communicate the presence of an emerging zoonotic disease, a rare event, and (ii) to co-design and co-develop with community and health authorities an efficient these One Health (or integrated) surveillance systems. The assessment of these systems includes:

- A description of the wildlife, human health and animal health surveillance system at a local, intermediate and national scales: actors, type of events detected, information flow and communication channels
- A description of the exchange mechanisms that exist between actors and sector-specific (human health, domestic animal health, wildlife health) systems
- Identify the strengths of this local system (what is considered functional) and identify the gaps, obstacles and weaknesses.
- Estimate their ability to detect this emergence if it were to occur.

2. Cambodia

The goal was to understand and describe the operation of all existing health surveillance systems (HSS) in Cambodia from the national to the local levels, and more precisely to Identify and describe existing health/OH surveillance system at the targeted study province, Stung Treng, including all relevant stakeholders involved and a clear understanding of their communication flow and how they communicate each other with the system

a. Study site

Stung Treng province, and the Thala Borivat district was firstly identified in the frame of ZooCov project (Toward an integrated surveillance of potentially zoonotic Betacoronaviruses in the wild animal value chains of Cambodia; https://umr-astre.cirad.fr/recherche/projets/zoocov) project (Figure 1). Stung Treng province was selected as wildlife meat trade and consumption, and environmental human-driven changes have been reported (Kong, Diepart et al. 2019), and existence of bats colonies hosting SARS-CoV-2-related viruses have been documented (Lim, Cappelle et al. 2018, Delaune, Hul et al. 2021).

Stung Treng province is located in the northeast, bordering with Laos PDR. It is largely covered by forest, however logging, fishing, and intensification of agriculture place heavy strain on the region's reserves (*Rural Livelihood Strategies in Cambodia: Evidence from a Household Survey in Stung Treng*, n.d.). Several karstic caves have been registered in the province and host several bats colonies of various species, including horseshoe bats (Delaune, Hul et al. 2021).

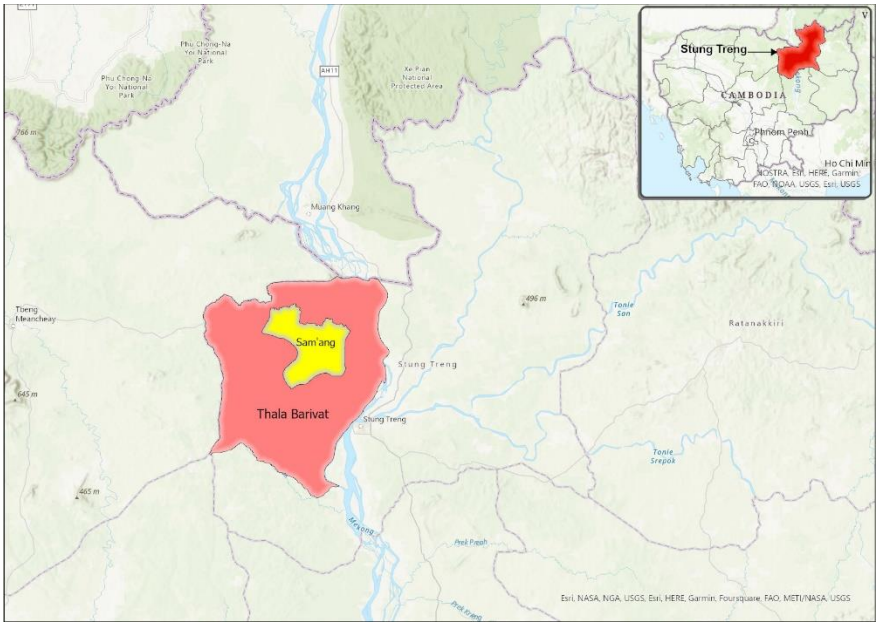

Figure 1. Location of the study site in Cambodia

b. Methods

Based on the expertise and knowledge of S. Chea about the area and surveillance actors, semi-structured interview (SSI) and focus group discussion (FGD) protocol, including interviews guidelines, consent forms were developed, and a list of key informants was compiled including community, local authorities, animal health sector, wildlife/environment sector, human health sector, and NGOs.

c. Results

11 key informants were interviewed in January-February 2024. The list and functions are provided in Table 1.

Interviewee's Institution	Sector	Number of interviewee
Provincial Animal Health and Production Office	Animal Health	1
Provincial Department of Environment (PDoE)	Wildlife/Environment	1
PDoE Protected Area Director	Wildlife/Environment	1
Forestry Administration Cantonment (provincial level)	Wildlife/Forestry	1
Forestry Administration Division (District level)	Wildlife/Forestry	1
Provincial Department of Health (PDoH)	Human Health	1
Health Center (District)	Human Health	1
District Governor	District authorities	1
Commune Chief	Commune authorities	1
Community Forestry	Community	1
Angkor Center for Conservation and Biodiversity (ACCB)	Conservation and Wildlife Rescue NGO	1
Total		11

Table 1. List of key informants interviewed in Stung Treng province, Cambodia

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These interviews allowed to re-construct the theorical structure of the 3 sectors (human, domestic animals and wildlife health (Figure 2), as well as the communications flows within and between each sectors (Figure 3,4,5)

9 focus group discussion were conducted in March 2024 by divided into three level groups, 7 community forestry, 1 district+commune, and 1 provincial level in Table 2, to validate the finding of the lack of communication between the 3 sectors among.

Focus Group discussion Participant list						
No	Meeting site	Position	Sex		Total	
			M	F		
1	Phnom Chumrok Sat community forestry	Villager	2	0	2	27
		Committee	0	0	0	
		Community	6	5	11	
		Village authority	7	1	8	
		Village malaria worker	1	0	1	
		Village health support group	0	4	4	
		Village animal health worker	0	0	0	
		School director	1	0	1	
2	Phnom Brochum Mith community forestry	Villager	4	5	9	27
		Committee	0	0	0	
		Community	8	1	9	
		Village authority	3	0	3	
		Village malaria worker	0	1	1	
		Village health support group	1	3	4	
		Village animal health worker	0	0	0	
		School director	0	0	0	
		Traditional midwife	0	1	1	
3	Thalaborivat district level	Commune authority	10	2	12	20
		Health Center	1	1	2	
		District governor	1	2	3	
		Forestry administration	1	0	1	
		Provincial department of environment/Wildlife sanctuary director	1	0	1	
4	Chher Teal Preurs community forestry	Villager	3	3	6	19
		Committee	0	0	0	
		Community	9	0	9	
		Village authority	0	1	1	
		Village malaria worker	0	0	0	
		Village health support group	1	1	2	
		Village animal health worker	0	0	0	
		School director	0	0	0	
		Traditional midwife	0	0	0	
		Commune autority	1	0	1	
5		Villager	5	2	7	20

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	Kiri Sok San and Anlung Chrey protected area community	Committee	0	0	0	
		Community	5	3	8	
		Village authority	2	0	2	
		Village malaria worker	0	0	0	
		Village health support group	0	1	1	
		Village animal health worker	0	0	0	
		School director	0	0	0	
		Traditional midwife	0	0	0	
		Provincial department of environment/Wildlife sanctuary ranger	1	0	1	
		Health Center	1	0	1	
6	Prey Kranhong community forestry	Villager	9	1	10	19
		Committee	0	0	0	
		Community	1	0	1	
		Village authority	5	1	6	
		Village malaria worker	0	0	0	
		Village health support group	0	1	1	
		Village animal health worker	1	0	1	
		School director	0	0	0	
		Traditional midwife	0	0	0	
		Provincial department of environment/Wildlife sanctuary ranger	0	0	0	
		Health Center	0	0	0	
7	Stung Treng provincial level	Provincial department of environment	1	0	1	12
		Division of forestry administration	2	0	2	
		Provincial department of health	1	0	1	
		District Rapid Response Team	1	2	3	
		Worl wild fund for nature (WWF)	1	0	1	
		The culture and environment preservation association (CEPA)	1	0	1	
		Angkor center for conservation and biodiversity	1	0	1	
		Provincial department of agriculture, forestry, and fisheries/Animal health office	2	0	2	
8	Prey Tamoa community forestry	Villager	7	0	7	27
		Committee	0	0	0	
		Community	12	0	12	
		Village authority	3	0	3	
		Village malaria worker	0	0	0	
		Village health support group	1	1	2	
		Village animal health worker	0	0	0	
		School director	0	0	0	
		Traditional midwife	0	2	2	
		Provincial department of environment/Wildlife sanctuary ranger	0	0	0	
		Health center	0	0	0	
		Private health service	1	0	1	

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		Villager	4	1	5	
		Committee	2	1	3	
		Community	1	1	2	
		Village authority	5	1	6	
		Village malaria worker	1	0	1	
		Village health support group	1	4	5	
		Village animal health worker	1	0	1	
		School director	1	0	1	
		Traditional midwife	0	0	0	
		Provincial department of environment	0	0	0	
		Health Center	0	0	0	
9	Phnom Prasat community forestry	Private Health service	0	0	0	24
Total					192	

Table 2. List of focus group discussion participants in Stung Treng province, Cambodia

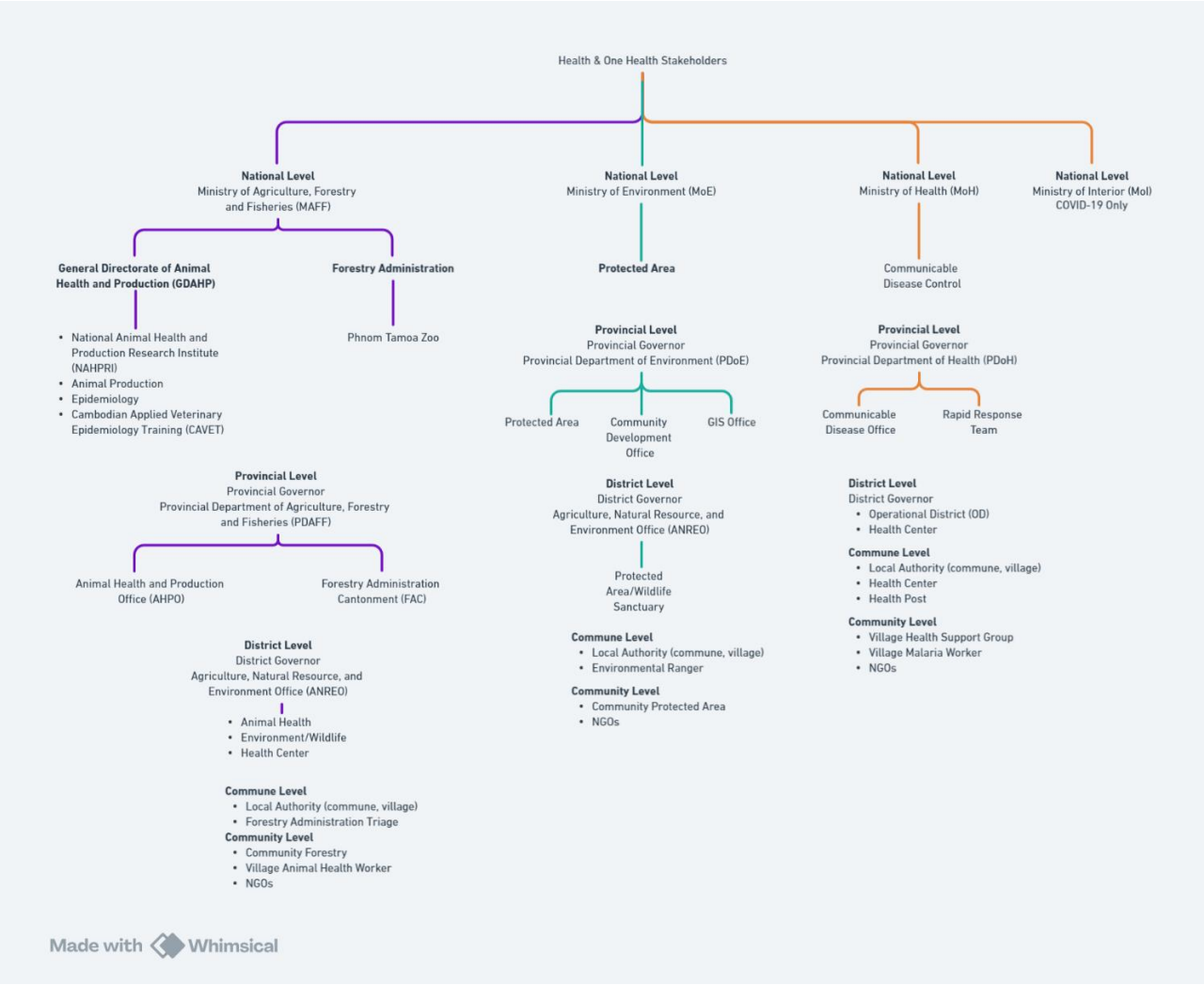

Figure 2. Theorical structure of human, domestic animals and wildlife health sectors in Stung Treng province, Cambodia

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Through the SSI, the OH surveillance stakeholders were identified in different levels within the government administration structures, community and non-government organization. This theorical structure also help to gives a bigger view of the possible OH issues communication between stakeholders.

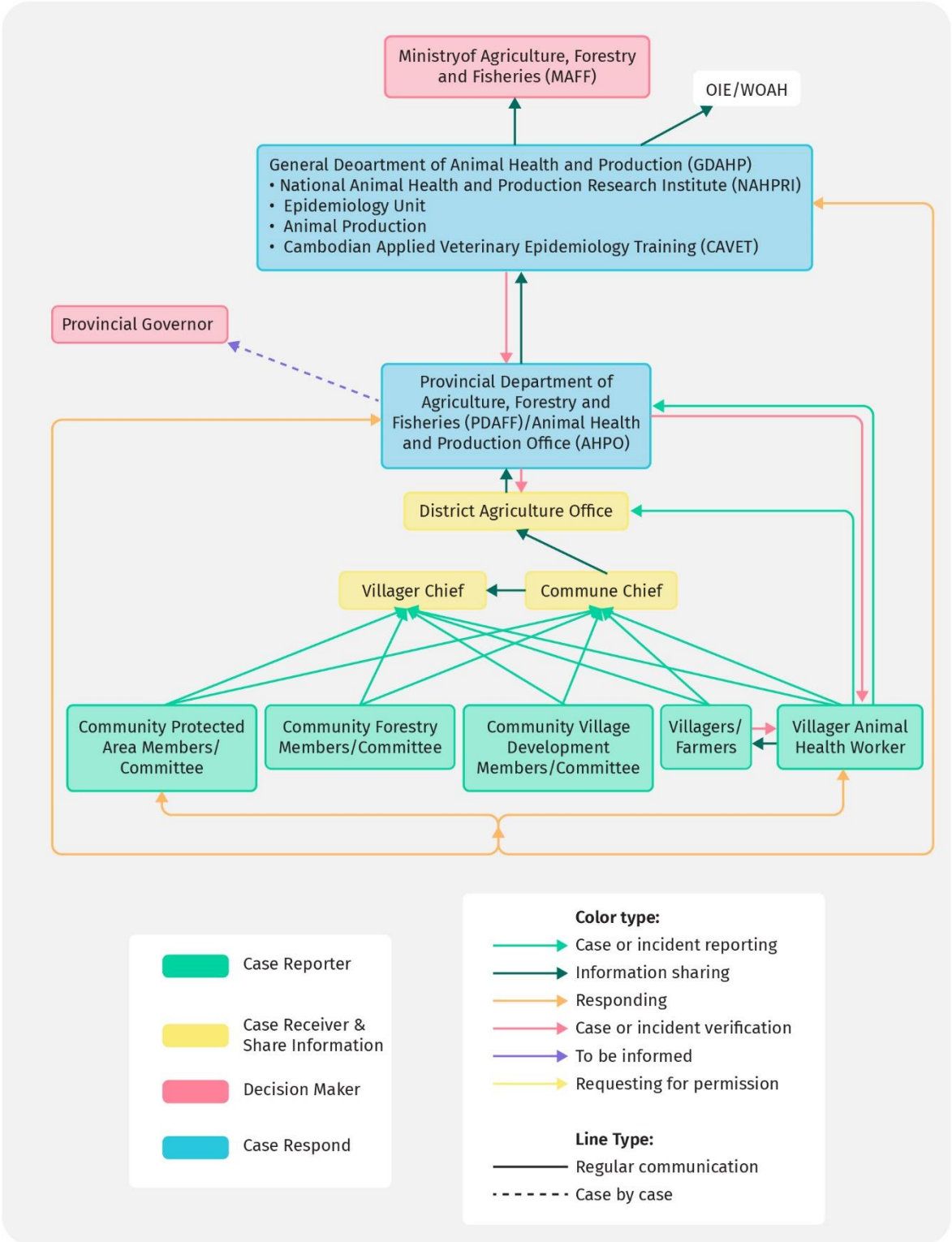

Figure 3. Domestic animal health sector communication flow in Stung Treng province, Cambodia
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Results of the FGD showed that some communities shared information on animal health with NGOs whereas others shared with the village animal health workers. Some communities do not know who they should communicate with in case of abnormal event. Animal health issues are well shared within the community, as part as classical chat. The main reasons why animal health issues are not communicated are/ (i) people do not want to lose money and sell their sick animals as quick as possible; (ii) assume that nothing will be done by authorities; (iii) they do not know who to talk to.

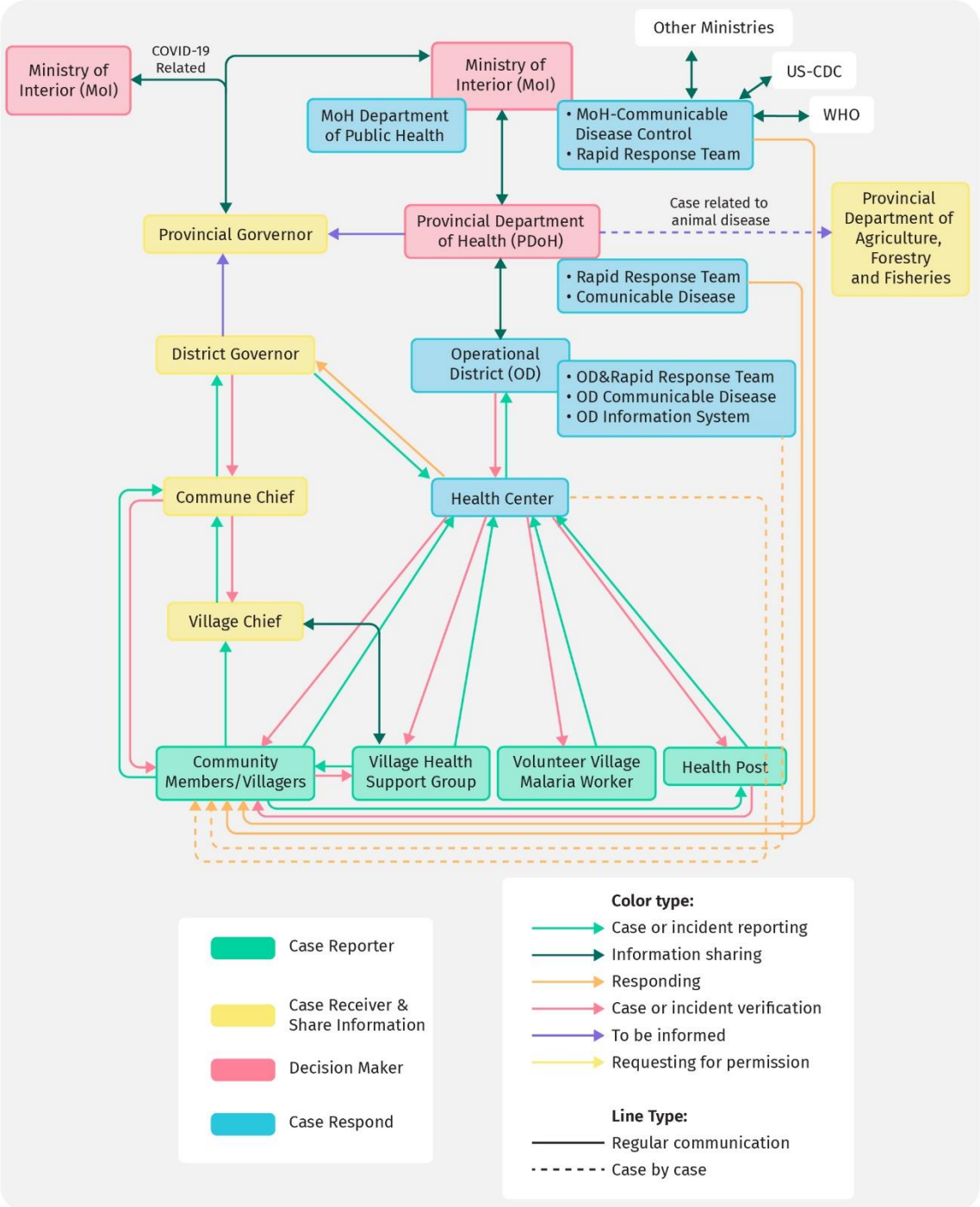

Figure 4. Human health sector communication flow in Stung Treng province, Cambodia
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Targeted and even-based human health surveillance systems were identified at the provincial level. Malaria surveillance do use an application to record all event detection through village workers network. CamEWARN digital case-based surveillance is identified currently functioning at in Stung treng. The human health sectors share health issue information if they encounter any cases related to animal or zoonotic disease related/zoonotic. But the routine way of communication between human and animal health sectors is during workshops.

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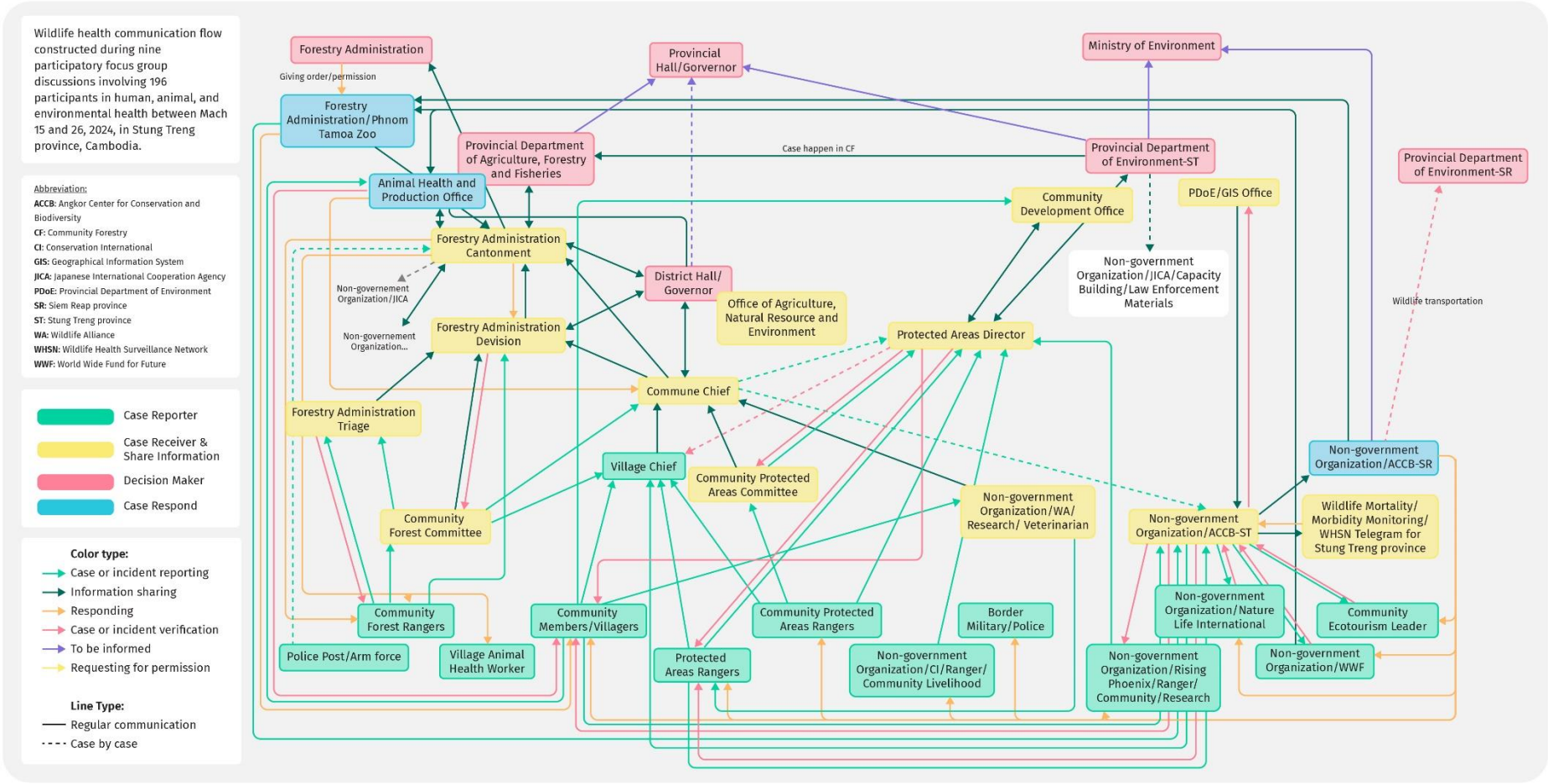

Figure 5. Wildlife health sector communication flow in Stung Treng province, Cambodia

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There are two main government wildlife authorities that manage wildlife and environment: provincial department of environment (PdoE) and forestry administration (FA). The provincial department of environment often shared information of health issue with FA. Sometime, PDoE may also share information with the domestic animal health sector if there any domestic animal found sick or dead within their management sites. The forestry administration is sitting in the same department with animal health office, which create a closer connection and facilitate communication between both sectors. In addition, the forestry administration communicate with Phnom Tamoa zoo. Wildlife health is not common and some groups never had to manage wildlife health issues. Poisoning was also raised out during the FGD at the community level. The community members may hesitate to report any poisoning case knowing it is an illegal act. If they get sick by eating poisoned wildlife, they prefer to go to the private clinic for treatment without reporting the poison case to wildlife authorities.

3. Guinea

a. Objectives

The aim of this first task was to describe the existing surveillance systems in Guinea and identifying their strengths, constraints and needs. This work was carried out as part of the EBOSURSY project funded by the European Union (https://rr-africa.woah.org/en/projects/ebo-sursy-en/) from 2019 and has been updated as part of the BCOMING project.
The first study, carried out in 2019-2020, aimed to describe disease surveillance systems, from the central to the community level, in order to identify the strengths as well as the constraints and limitations of the system. This analysis includes the identification of the various structures involved in surveillance. The second study, carried out in 2022, aimed to analyse multisectoral collaboration in Ebola virus disease surveillance in Guinea, with the following aims to describe and assess collaboration between the animal, human and environmental health sectors and to identify the strengths and limitations of collaboration between the sectors. The third study, also carried out in 2022, aimed to describe surveillance tools used to communicate between the different levels of the surveillance in Guinea and identified the limit to their use.
Throughout this work and until the end of 2023, the surveillance systems are constantly evolving, so the data has been updated regularly by the PhD student funded by BCOMING, Maxime Tesch.

b. Materials and Methods

i. Study site

The three studies were carried out from the central level, in Conakry, to the local level where two sites were selected, Temesadou and Guedembou in the prefecture of Gueckedou in Guinée forestière (Figure 6).

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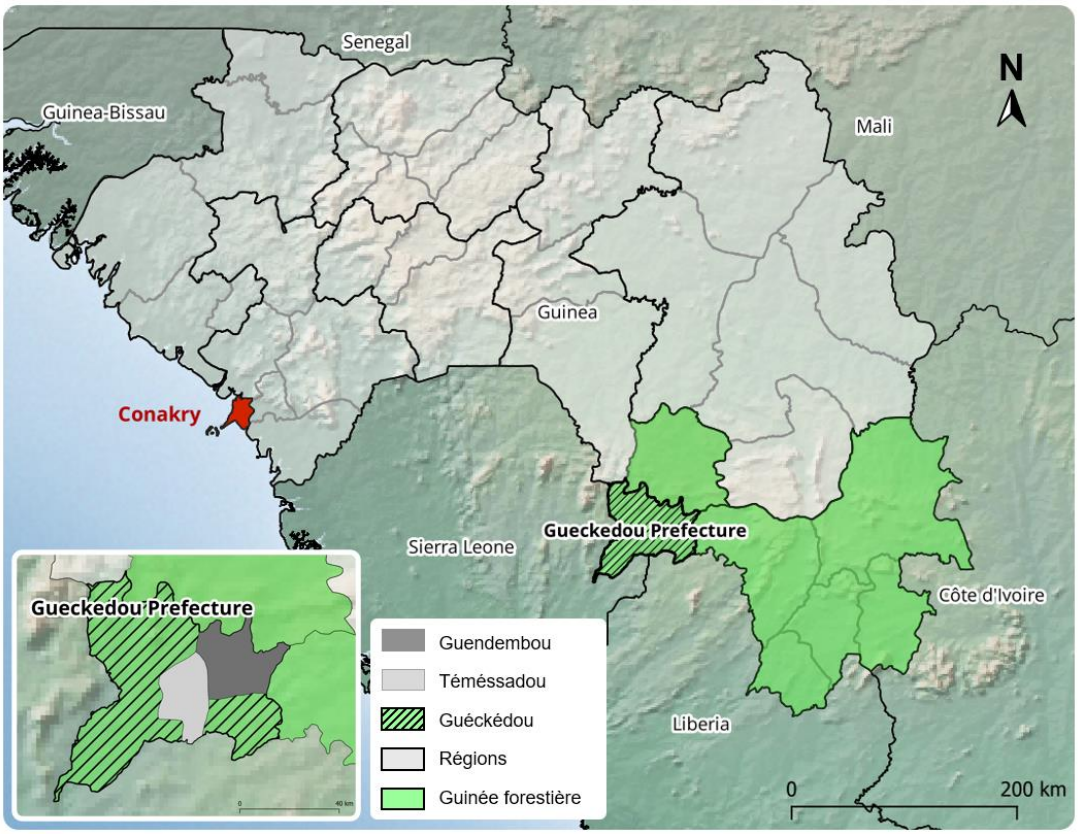

Figure 6. Map of the Republic of Guinea and locations of study areas Map of the Republic of Guinea and locations of study areas

Interviews and FG were conducted in two pilot sites, Temessadou-centre et Guendembou-centre. In red : Conakry, capital city. Map created using Free and Open Source QGIS software (https://qgis.org), ArcGIS Hub (https://hub.arcgis.com/), Natural Earth (https://www.naturalearthdata.com/), Amerigeo (https://data.amerigeoss.org/). © Maxime Tesch

ii. Data collection

Participatory approaches have been used to collect data and enable stakeholders to come up with solutions to their own development problems (Goutard, Calba et al. 2022). Among other things, they enable intervention and surveillance strategies to be developed that are adapted to all the stakeholders involved, considering the socio-economic and cultural constraints of each.

Data of the general framework of the surveillances systems, their components and the surveillance tools used have been collected through interviews.
A preliminary mission took place in Guinea from March 6 to April 28, 2023. The aim was to understand the flow of information between the community members most exposed to zoonotic diseases and alarming events. Participatory information-gathering workshops were held over a 1-week period in two localities in the area called Guinée Forestière, and more precisely in the Guéckédou Préfecture, which was the starting point for 2014 Ebola epidemic. Several participatory tools were used, including proportional piling, flow diagrams and simple ranking.

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Then, the system's strengths and weaknesses have been assessed using the Surveillance Evaluation Tool (SET) method developed by the Food and Agriculture Organization (FAO). Then, the multisectoral collaboration was analyzed using the ECoSur tool (Bordier, Delavenne et al. 2022)

c. Results

During the first mission 17 individual interviews and 8 focus groups were carried out with the help of a translator, who is also a long-standing collaborator for activities in this area. Occupations of these participants are provided in Figure 7.

N°	Date (JJ/MM/YYYY)	Place	Group designation	Nb of participants	M	F	Duration	Tools used	Language
1	23/03/2023	Moussayah	TEST – Breederss, Hunters & Traditionnal Healers	8	6	2	1h08'	Pro. Piling	Kissi
2	07/04/2023	Conakry	Ema-i Management, FAO	2	1	1	46'	NA	French
3	14/04/2023	Téméssadou	Mix Breeders, Hunters & Traditionnal Healers	13	13	0	58'	NA	Kissi
4	15/04/2023	Téméssadou	Mix Community actors	10	8	2	1h20'	Pro. piling	French
5	15/04/2023	Téméssadou	Schoolteachers	2	1	1	45'	NA	French
6	16/04/2023	Téméssadou	Mix Matrones ; Community representatives	9	0	9	1h14'	Pro. piling, Venn Diagram	Kissi
7	16/04/2023	Téméssadou	Breeders	1	1	0	43'	NA	Kissi
8	17/04/2023	Téméssadou	Public Crier	1	1	0	43'	NA	Kissi
9	18/04/2023	Guendembou	Matrones	8	0	8	1h08'	Flow Diag. ; S-Ranking	Kissi
10	19/04/2023	Guendembou	Breeders	6	6	0	1h14'	Flow Diag. ; Seas. Calendar	Kissi
11	19/04/2023	Guendembou	Hunters	9	9	0	1h20'	Flow Diag. ; S-Ranking	Kissi
12	20/04/2023	Guendembou	Traditionnal Healers	6	4	2	1h35'	Flow Diag. ; pro piling	Kissi
13	20/04/2023	Guendembou	Schoolteacher	1	1	0	33'	NA	French
14	20/04/2023	Guendembou	Public Crier	1	1	0	37'	NA	Kissi

Figure 7. Table of interviews conducted as part of the joint BCOMING/EBORSUSY assignment. Pro. Piling stands for proportional piling, Flow Diag. for Flow diagram, S-Ranking for Simple ranking, and Seas.

Preliminary analyses of these interviews highlighted the following points: (i) material and logistical difficulties in communicating and quickly alert reporting (road conditions, mobile network, cost of telephone); (ii) existence of previously ignored key informants, such as the public crier, village elders and schoolteachers that could play an important role within the surveillance system at the community level ; (iii) the importance of seasonality for all categories of players, modifying communication each year.

Since 2019, more than 100 surveillance stakeholders (group and individual interviews) were interviewed by the evaluation team. These stakeholders belong to the public health, animal health and environmental health sectors, from central to community level.

Description of the surveillance systems. Public health surveillance and animal health surveillance are currently carried out by the National Health Safety Agency (ANSS) and National Veterinary Services (DNSV). The wildlife surveillance component has been recently constructed and will be coordinated by the Guinean Office of National Parks and Wildlife Reserves (OGPNRF) in collaboration with DNSV and the support of FAO. A National the One Health Platform is in place at central level, and multi-sector investigation teams are already operational in the field. The platform is also represented at the prefectoral level and at community level thanks to the existence of Community Agents (Figure 7).

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Data are transmitted from the local to the central level using papers, phone calls and through the DHIS2 (human sector) and the EMA-i/EMPRES-i (animal health sector, deployed by the FAO) tools (Figure 8).

Multisectorial collaboration. The governance mechanisms, the steering committee and the coordination committee are functional at the level of the One Health platform, and these functions are formalized in documents. This multi-sector collaboration, although in need of strengthening, is in place at all levels from regional to sub-prefectural. Surveillance is part of this collaboration and the information collected by the three surveillance systems is shared within the platform's activities. In addition, those involved in surveillance in the various sectors are aware of the importance of multisectoral collaboration in monitoring and preventing the emergence of zoonotic diseases.

Strengths, limitations and needs. Material and human resources remain a priority to enable better coverage of the surveillance systems on the national territory. In addition, the need for training and capacity building is a key point raised by many One Health platform stakeholders, especially at the local level. Despite the high level of implementation of DHIS2 and EMA-i tools in Guinea, constraints related to the network coverage have been identified. A number of strengths relating to the use of these tools have been identified, such as the motivation of stakeholders in surveillance and reporting, the speed with which information is circulated and the standardization of data.

d. Discussion and perspectives

FAO, in collaboration with the One-Health platform, is working on the interoperability of the systems. In addition, a surveillance tool will be also deployed for the environmental sector.
Within BCOMING project, Cirad in collaboration with DNSV and OGPNRF, and with the support of AfriCam project (funded by AFD) is developing a One-Health event-based pilot surveillance system at Temessadou and Guedembou considering the needs and constraints of surveillance stakeholders, especially those at the community level. This initial study aiming to understand and describe existing monitoring systems is a prerequisite for building the pilot system.

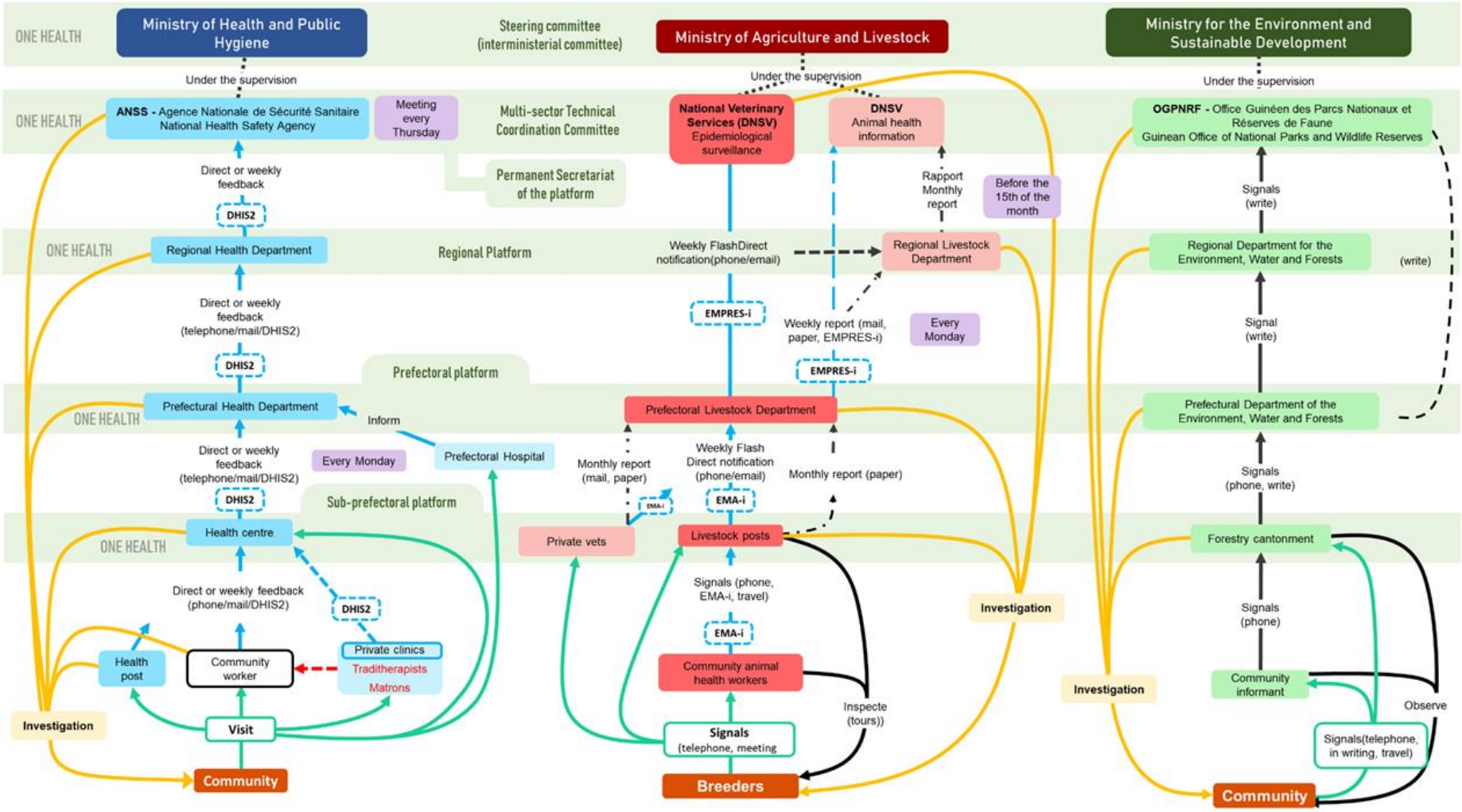

Figure 8. Structure of the surveillance systems in Guinea

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4. Guadeloupe

a. Objectives

West Nile virus was first identified in Guadeloupe in 2002 through serological evidence in horses and domestic poultry (Quirin, Salas et al. 2004). Surveillance data analysed in the veterinary field has helped characterize areas at risk for circulation in the territory. The epidemiological surveillance network for the West Nile virus has been established with several components: poultry, equine, human, entomological, and more recently, wildlife. However, the absence of clinical cases in humans and in equines and the presence of other vector-borne diseases with a greater impact on human health seem to have reduced interest among stakeholders and, consequently, activities within the network. Despite its zoonotic nature and vector-borne transmission, which lends itself particularly well to the implementation of an integrated system, West Nile virus surveillance in Guadeloupe has remained relatively segmented. Yet, such a system appears relevant given the risk of introducing new strains of the West Nile virus through migratory bird corridors in Guadeloupe and, more generally, a favourable context for emerging vector-borne diseases.

b. Method

An evaluation of the West Nile surveillance system was conducted using the OASIS method to revitalize and rethink the system towards a more integrated and effective framework.
The OASIS evaluation method is based on a scoring grid developed in a Microsoft Excel spreadsheet. It comprises 78 assessment criteria divided into 10 sections covering the key aspects of the monitoring process. To score these criteria, the OASIS tool includes a detailed questionnaire that collects all the information needed to obtain a detailed and complete description of the system being assessed. The questionnaire is divided into 10 sections, in the same way as the rating grid. Each section focuses on one component or a set of activities carried out in the network. A scoring guide supports the assessment by guiding the allocation of scores. It details for each criterion what each score corresponds to. The scoring grid contains spreadsheets that automatically generate three distinct outputs from the assessment. These different graphical representations will make it possible to identify the obstacles and levers within the monitoring system
Before starting the OASIS assessment, preliminary work was carried out to identify the institutions making up the West Nile surveillance network in Guadeloupe. These organisations are located at national and local level, and in different areas: human, equine, domestic avian, wild avian and entomological.

Before starting the interviews, an interview guide was created based on the OASIS questionnaire. This was designed to contain all the questions that would later be used to complete the questionnaire. Depending on the stakeholder's organisation, a selection was made of the sections to be covered. In total, 15 individual (n=10) and paired (n=5) semi-structured interviews lasting approximately one hour were conducted face-to-face or via Teams with stakeholders involved in West Nile virus surveillance in Guadeloupe. The interview period ran from 7 March to 13 April 2023. Participants were selected according to their role in surveillance, so that all stakeholders were represented, but also according to their availability and willingness to participate. A total of 20 people were interviewed. All key institutions and actors were included in the study.

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The results were then communicated to all participants through a report and during a feedback workshop organized in October 2023.

c. Results

The information gathered during the interviews, supported by the bibliography, enabled us to gain a better understanding of the West Nile surveillance system in Guadeloupe and the various organisations that make it up. As the discussions progressed, a map of the West Nile virus surveillance network in Guadeloupe was drawn up, and is presented in Figure 9. The zoonotic and vectorial nature of the disease associated with the West Nile virus means that there are several surveillance components to the system: human, domestic animal, wild bird and entomological. The steering bodies set the broad guidelines and objectives for the system. The scientific and technical support bodies are made up of scientists and technicians capable of designing, drawing up and criticizing the monitoring protocols to be put in place in line with the objectives set. The central co-ordination bodies will centralize, analyses and disseminate the data collected, co-ordinate the system's activities and, if necessary, lead the scientific and technical support bodies. The central laboratory is the only laboratory able to confirm an infection on behalf of the surveillance system. The intermediate units are located between the data collectors and the central coordination body. Their role is to coordinate field activities and to validate and, if necessary, correct the data collected before it is sent to the central coordinating body.
The local laboratory is the laboratory in the area that analyses the samples collected as part of the monitoring system. Data collectors are those directly involved in the system in the field, responsible for detecting events and collecting data, as defined in the monitoring protocol. Data sources are the entities in which the data to be collected is located (breeding farm, equestrian centre, biological laboratory).

The interpretation of OASIS graphical outputs (Figure 10) highlighted the strengths of the system, such as diagnostic laboratories, surveillance tools, network speed, and stability. Weaknesses in the system, including coordination, collaboration, information dissemination, specificity, and flexibility, were also identified. Strengthening of surveillance system integration was the focal point of recommendations, addressing both the local (Guadeloupe) and national (mainland) levels.

Section 1. The general objective of the West Nile surveillance system is to detect the presence of the virus in the country at an early stage, in order to adapt preventive and control measures. This objective is considered to be consistent with the health situation (absence of virus circulation). At the national level, the surveillance objectives have been defined, but there is a lack of coordination between the various components. The specific context of Guadeloupe (specific eco-epidemiology, silent and repeated circulation of the West Nile virus) requires them to be adapted to the local scale. However, this has never been done.
Section 4 "Laboratory" obtained the best score. In the animal section, analyses are carried out locally at CIRAD. If the result is positive, the sample is sent to the National French Agency for Food Safety (ANSES Maisons Alfort, France) for confirmation. In the human section, no analysis is carried out locally. If a clinician suspects WN virus infection, the sample is sent to the National Reference Center for arbovirus The diagnostic tests carried out in the various laboratories are relevant and well managed by all those involved. The laboratories are accredited. Reagents are regularly and the various laboratories undergo inter-laboratory tests. The resources allocated to laboratories for

monitoring the West Nile virus are considered adequate at national level, although a lack of human resources has been noted. Laboratory analysis results are of high quality and delivered within a defined, verified and respected timeframe.

The "Monitoring tools" section was also one of the best rated. The resources allocated to data collectors and the quality of the samples are judged to be satisfactory. The French procedures for reporting suspected cases are simple. However, Guadeloupe is an island and surveillance protocols have been established at national level for the various surveillance components, but they are not adapted to the overseas territories, which have a very specific context. The SAGIR surveillance protocol for monitoring wild birds, for example, is adapted to the bird species found in mainland France, but needs to be adapted to local species. Data monitoring is efficient in the system.

The "Institutional field organization" section is assessed as satisfactory. Intermediate units are responsible for coordinating the actions of field collectors. These intermediate units have sufficient resources to carry out their monitoring activities. This is also the case for the data collectors. However, the coordination between these intermediate units is currently very limited. This is particularly true for the equine and domestic avian sections.

Diagnostic results are well communicated individually to those working in the field and in all the monitoring sections. The resources allocated to communication also appear to be sufficient. However, apart from these monitoring results, there is few/no communication within the network. During the semi-structured interviews, veterinarians discovered the existence of surveillance carried out on sentinel chickens. If a case is detected as suspicious or positive, there is little chance of the information reaching the field worker if he or she has not taken the sample. As far as humans are concerned, communication between local and national levels is very effective and regular. In the case of animals, this communication takes place very rarely, if at all. Communication with central coordination bodies is rare and very formal. Communication between the different surveillance strands was found inadequate.

However, the quarterly frequency of active sampling and the number of farms sampled are too low. It also appears to be difficult to achieve in the context of event-based monitoring, There is also a lack of awareness among collectors. Wild birds are monitored by the SAGIR network, but as mentioned above, the protocol needs to be adapted to the species present in Guadeloupe. Entomological surveillance is carried out by CIRAD, but the results are not yet. available for this action. Sampling rates for sentinel chickens are close to 100%, and the size of the sample taken is deemed sufficient to obtain very good sampling accuracy, improving the score for this section.

No evaluation has yet been carried out on the surveillance system, and there are no functional performance indicators. In terms of training, the situation is similar, with no training provided in the West Nile virus surveillance system in Guadeloupe.

During the feedback workshop, four recommendations from the evaluation were collectively selected and prioritized: (i) updating the inter-ministerial circular describing the functioning of the West Nile surveillance system, (ii) establishing a steering committee and an animation structure, (iii) intensifying awareness among field actors, and (iv) creating an annual epidemiological bulletin. An action plan was drafted for each recommendation during the workshop to facilitate their implementation.

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d. Conclusions

Shifting the West Nile surveillance system into a more effective and integrated framework should be perceived as a long-term investment by stakeholders and decision-makers, which could benefit other surveillance networks, particularly for problematic zoonotic diseases in the region such as leptospirosis.

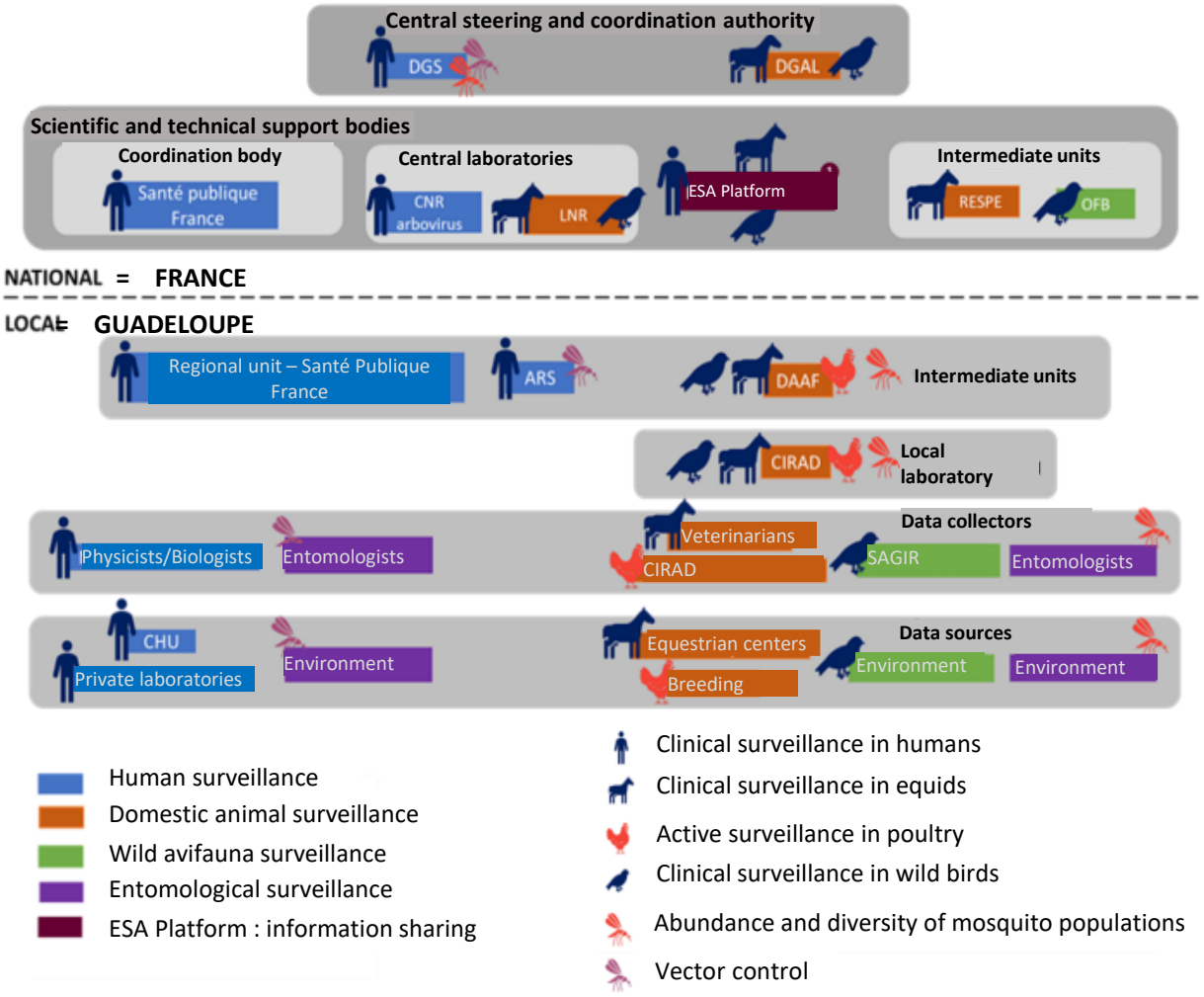

Figure 9. Mapping of stakeholders involved in WNV surveillance in Guadeloupe

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Scoring of the 10 OASIS sections (% of the maximum score)

Section	Résultat graphique	Score (score atteint/score maximal possible)[a]
Section 1 : Objectifs et champ de la surveillance (n=5)		67% (10/15)
Section 2 : Organisation institutionnelle centrale (n=8)		46% (11/24)
Section 3 : Organisation institutionnelle de terrain (n=9)		63% (17/27)
Section 4 : Laboratoire (n=14)		83% (35/42)
Section 5 : Outils de surveillance (n=15)		67% (28/42)
Section 6 : Modalités de surveillance (n=9)		52% (14/27)
Section 7 : Gestion des données (n=9)		67% (18/27)
Section 8 : Formation (n=6)		17% (3/18)
Section 9 : Communication (n=9)		56% (15/27)
Section 10 : Evaluation (n=5)		17% (2/12)

Figure 10. Strengths and weaknesses of the WNV surveillance system in Guadeloupe

5. Conclusion

Animal and human health surveillances systems have been qualitatively and quantitatively assessed in the 3 countries of concern using methods that have been adapted to actors and socio-epidemiological contexts: absence of West Nile virus in Guadeloupe, Ebola threat in Guinée and known circulation of Coronaviruses in bats in Cambodia. These results will pave the way to co-construct with communities involved an integrated and community base surveillance system within the common years.

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