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Organization of the  
United Nations



World Health  
Organization



World Organisation  
for Animal Health  
Founded as OIE



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# Quadripartite One Health Intelligence Scoping Study



Interim Report  
March 2022

The G7 Carbis Bay Health Summit requested that the Quadripartite alliance of the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (WOAH, founded as OIE), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO) conduct a One Health Intelligence Scoping Study (OHISS) 'to identify potential opportunities for improved technical harmonization of their and other prioritized systems to strengthen One Health intelligence'.

## Executive Summary

### The threat

Emerging infectious diseases and other One Health hazards increasingly threaten global health security as human and animal populations continue to grow, trade and travel increase, and the natural environment is further degraded. The emergence of COVID-19 has highlighted the challenge and importance of early detection, risk assessment and rapid alerts of health events in wildlife and domesticated animals that have the potential to spill over and cause human epidemics, as well as the need for monitoring of environmental factors.

### The challenge

There is a critical need to bolster collective and collaborative approaches to identify and assess threats to global health security, to enable prompt and effective action to reduce their potential wide-reaching impact. This requires the adoption of a holistic and adaptive 'One Health' approach that cuts across the sectoral limitations of many national and international systems. To date information is commonly still siloed within organizations or areas of specialization.

### The need

One Health intelligence should be able to provide early alerts of emerging threats, support rapid risk assessments and facilitate timely responses.

Effective One Health intelligence requires:

- Gathering reliable and timely information from across the One Health landscape, mainly from the human, animal and environmental health sectors.
- Strengthened national One Health and sectoral information systems to support international efforts.
- The capability to convert information into actionable knowledge through decision-driven analysis, interpretation and reporting.
- Understanding of 'normal' baseline levels of disease and indicators, so that emerging trends can be quickly identified.
- The capacity to carry out rapid risk assessment to define the likelihood and impact of identified threats, in order to promote more timely, effective and efficient responses.

### The One Health Intelligence Scoping Study

The Quadripartite alliance<sup>1</sup> is working together to reduce global health threats at the animal-human-environment interface and support the adoption of a One Health approach.

The OHISS project is funded by the United Kingdom of Great Britain and Northern Ireland and is being coordinated by FAO, as the lead agency for the project. OHISS is due to be completed at the end of July 2022.

<sup>1</sup> The Quadripartite alliance members are the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (WOAH, founded as OIE), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO).

“Recognizing the **need to engage with expertise across the One Health sectors**, technical experts representing national, regional and global levels, as well as new initiatives and networks have supported the early OHISS work”

## **OHISS outcomes**

OHISS aims to deliver a framework and road map for implementation of Quadripartite-led global One Health intelligence, including early warning. Adaptation of best practices and expert advice will:

- Improve integration of information from ecosystem, agriculture, animal and human health domains.
- Support real-time holistic risk assessment of emerging and ongoing events.

## **OHISS progress**

The OHISS has conducted a series of foundational activities – a systematic literature review, consideration of national best-practice systems for multisectoral information sharing, and a pilot assessment of prioritized Quadripartite activities with the potential to contribute to a global One Health Intelligence System (OHIS). Recognizing the need to engage with expertise across the One Health sectors, technical experts representing national, regional and global levels, as well as new initiatives and networks have supported the early OHISS work.

## **OHISS preliminary findings**

- National information systems are the critical foundation for effective international One Health intelligence. It is recognized that existing systems have varying capabilities and that countries need to implement comprehensive cross-sectoral One Health surveillance systems.
- An effective global OHIS must be flexible and future-proof, with comprehensive data sharing and access. The incentives and disincentives to report to international organizations must be addressed. The current lack of baseline data and underlying knowledge of the human-animal-ecosystem interface limits the ability to rapidly detect and assess emerging threats.
- An effective OHIS should use modern information technologies including big data, artificial intelligence, mobile platforms, new monitoring methodologies and remote sensing.
- The capacity, funding and political support for One Health surveillance systems must be sustained at international and national levels – and not only prioritized in times of emergencies. Investing in One Health intelligence systems provides a net benefit when all costs are considered.
- Internationally, the many One Health initiatives are resulting in duplication and overlap of activities, and inefficient use of resources.



## Progress of activities

OHISS outputs	Progress made (December 2021 to March 2022)	Outstanding activities (April 2022 to July 2022)
<ul style="list-style-type: none"> <li>• Best practices for effective sharing of One Health information at national level identified, for possible scaling up or integration into the new framework</li> </ul>	<ul style="list-style-type: none"> <li>• Systematic literature review to assess available knowledge and information on international and national OHIS.</li> <li>• Hosted an External Advisory Group (EAG) workshop that identified current best practices (at international and national levels) of OHIS and considered the components required for future systems</li> <li>• Identification of national best practice competencies using existing networks</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the extent and comprehensiveness of the literature review</li> <li>• Increase the scope and identification of best practice national One Health and sectoral systems</li> </ul>
<ul style="list-style-type: none"> <li>• Mapping of existing information systems and platforms within the different international organizations, within the member countries, regions, and other initiatives conducted</li> </ul>	<ul style="list-style-type: none"> <li>• Defined scoping criteria for the assessment of One Health intelligence and information systems</li> <li>• Briefings by the Quadripartite organizations on their core intelligence systems</li> <li>• Mapping of prioritized One Health relevant activities of each of the Quadripartite organizations</li> <li>• Engagement with One Health High Level Expert Panel (OHHLEP), Preventing Zoonotic Diseases Emergence (PREZODE), International Pathogen Surveillance Network (IPSN) and other One Health initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• Increase extent of OH activities and approach of prioritized information systems from the Quadripartite organizations</li> <li>• Increase collaboration and information exchange with OHHLEP, PREZODE, IPSN and other One Health initiatives</li> </ul>
<ul style="list-style-type: none"> <li>• Opportunities for greater interoperability of information systems identified</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of a standardized assessment of prioritized One Health relevant activities and systems by Quadripartite organizations, including their capabilities, limitations and opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Complete the initial assessment of the Quadripartite systems and undertake more in-depth studies of key systems</li> </ul>
<ul style="list-style-type: none"> <li>• High-level framework and system design for comprehensive disease intelligence and real-time risk assessment developed</li> </ul>	<ul style="list-style-type: none"> <li>• Initial conceptual framework developed</li> </ul>	<ul style="list-style-type: none"> <li>• Characterize the modular approach to One Health intelligence systems, including mapping of relevant hazards</li> <li>• Complete high-level framework for a One Health intelligence system at Quadripartite level</li> <li>• Provide recommendations for improved system architecture and information workflow</li> <li>• Propose governance mechanisms for international and national OHIS</li> <li>• Engage further with the EAG, international One Health initiatives and other priority stakeholders</li> </ul>

## Next steps and recommendations

In the remaining time available for OHISS, the focus will be on completing the foundational activities to support the finalization of its global One Health Intelligence System framework by the end of July 2022. There will be ongoing engagement with other One Health initiatives to ensure close collaboration and synergies are identified for efficient programme delivery.

Further development of the framework will be required to practically implement operational One Health intelligence. This will require investment in the required IT infrastructure as well as advancement of analytical approaches incorporating both primary health data (e.g. human or animal case of disease) alongside contextual data (e.g. forestry, climate), their development and maintenance. Fundamental to the success of a One Health intelligence system is the ability to work together both at a data and analytical level, which requires international endorsement and support.





# Quadripartite One Health Intelligence Scoping Study



Interim Report  
March 2022

# **Quadripartite One Health Intelligence Scoping Study**

## ***Interim Report***

***31 March 2022***

This interim report presents the progress and preliminary findings of the One Health Intelligence Scoping Study (OHISS) for the four months (December 2021 to March 2022) since its inception. It also sets out the outstanding activities that will be the focus of the no-cost extension up to the project closure (31 July 2022).

### **1. Introduction**

The widescale and far-reaching impact of the COVID-19 pandemic has highlighted the critical impact on the health of animal and human populations and our shared ecosystems, and the need for enhanced early detection. Intelligence systems to detect emerging and existing threats and evaluate their associated risks need to be far more proactive, timely and well-integrated to help address this challenge. The World Health Assembly and other forums have endorsed the need to adopt a holistic One Health approach to addressing health threats. A One Health intelligence approach to support timely hazard identification, early detection and risk assessment could improve the global ability to identify and respond to emerging threats at the human-animal-ecosystems interface in a timely manner to reduce their health, welfare, economic and societal consequences.

In June 2021, the G7 Carbis Bay Health Declaration requested that the alliance of the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (WOAH, founded as OIE), the World Health Organization (WHO), and the United Nations Environment Programme (UNEP) (from now on referred to as the Quadripartite), conduct a One Health Intelligence Scoping Study (OHISS) and ‘identify potential opportunities for improved technical harmonization of their and other prioritized systems to strengthen One Health intelligence’.

### **2. Summary of progress**

The OHISS has been operational since December 2021. Formal agreements have been finalized with the Quadripartite alliance for One Health. A no-cost extension has been approved to the end of July 2022, recognizing and acknowledging the delayed start and complexity of the study.

The technical team, with strong support from the Quadripartite focal points, have undertaken a series of scoping and support activities including:

The OHISS has made good progress in the four months since its activation in scoping available systems and developing standardized assessment criteria to scope opportunities for a joint framework, however, the limited time available and complexity and diversity of existing activities conducted by the Quadripartite has only allowed assessment of some of their systems. The External Advisory Group (EAG) workshop, attended by a wide range of international experts, identified a large number of approaches and systems at international and national levels that should be considered to inform the future direction of the study and the development of an OHIS.

The OHISS has had initial engagement with a number of other One Health initiatives – such as the One Health High Level Expert Panel (OHHLEP), International Pathogen Surveillance Network (IPSN) and Preventing Zoonotic Diseases Emergence (PREZODE) – but, given the short period of engagement, formal collaborations have yet to be established.

**Progress of activities against OHISS outputs (March 2022)**

Best practices for effective sharing of One Health information at national level identified, for possible scaling up or integration into the new framework.	Mapping of existing information systems and platforms within the different international organizations, within the member countries, regions, and other initiatives conducted	Opportunities for greater interoperability of information systems identified	High-level framework and system design for a comprehensive early warning and real-time risk assessment developed
<ul style="list-style-type: none"> <li>• Systematic literature review to assess available knowledge and information on international and national One Health systems</li> <li>• Hosted an External Advisory Group workshop that identified current best practices (at international and national levels) of One Health intelligence systems and considered the components required and sources of information for future One Health intelligence systems</li> <li>• Identification of national best practice competencies using existing networks including the FAO/WHO International Food Safety Authorities Network (INFOSAN) and Connecting Organizations for Regional Disease Surveillance (CORDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Defined scoping criteria for the assessment of One Health intelligence and information systems</li> <li>• Briefings by the Quadripartite organizations on their core intelligence systems</li> <li>• Mapping of prioritized information systems from the Quadripartite organizations</li> <li>• Engagement with OHHLEP, PREZODE, IPSN and other One Health initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of a standardized assessment of prioritized One Health activities and systems by Quadripartite organizations, including their capabilities, limitations and opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Initial conceptual framework developed</li> </ul>



### Limitations and challenges

While OHISS has made steady progress since it became operational, progress has been slow due to several reasons:

- Adopting a One Health approach offers great opportunities and benefits in improving early warning and risk assessment systems, however, the broad scope also presents challenges in assessment and identification of the most effective and relevant systems. OHISS is seeking to address this by developing a hierarchical modular approach by first focusing on the ‘primary’ and ‘contextual’ data of the Quadripartite organizations that relate to infectious diseases (including causes, consequences and vulnerabilities) and then scoping options for the addition of further ‘contextual’ data that relate to a broader range of hazards. Assessing the full array and complexity of these contextual systems will be beyond the resources of OHISS, but concepts for future development will be provided.
- The support and participation of the Quadripartite is acknowledged, but the limited availability of key staff has resulted in some delay in the assessment of their systems and activities. Strong engagement has been provided, but the wide scope and complexity of the Quadripartite organizations has resulted in a partial assessment only being possible to date. Further review and identification of Quadripartite systems and activities is ongoing.
- The focus of the OHISS is on the Quadripartite systems and how these might be more effective for early warning and for risk assessment. However, the preliminary activities of OHISS have indicated that non-Quadripartite systems should be included to add breadth and strength to the development of an OHIS. These additional systems should be assessed in the project no-cost extension.

### 3. Workplan/activities from April to July 2022

<b>Outstanding activities against OHISS outputs as defined by initial concept note</b>			
<b>Best practices for effective sharing of One Health information at national level identified, for possible scaling up or integration into the new framework.</b>	<b>Mapping of existing information systems and platforms within the different international organizations, within the member countries, regions, and other initiatives conducted</b>	<b>Opportunities for greater interoperability of information systems identified</b>	<b>High-level framework and system design for a comprehensive early warning and real-time risk assessment developed</b>
<ul style="list-style-type: none"> <li>• Increase extent and comprehensiveness of the literature review, with external assessment</li> <li>• Increase the scope and identification of best practice national One Health and sectoral systems and describe them in order to support similar national and international initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• Increase extent of OH activities and approach of prioritized information systems from the Quadripartite organizations</li> <li>• Increase collaboration and information exchange with</li> </ul>	<ul style="list-style-type: none"> <li>• Complete the initial assessment of the Quadripartite systems and undertake more in-depth studies of key systems to strengthen the evidence for the conceptual framework and recommendations on options for future development of the OHIS</li> </ul>	<ul style="list-style-type: none"> <li>• Characterize the modular approach to One Health intelligence systems, including mapping of relevant hazards, causes and consequences in each hierarchy along with the associated definitions, data</li> </ul>

OHHLEP, PREZODE, IPSN and other One Health initiatives	<ul style="list-style-type: none"> <li>Characterize and promote the need for data and meta-data unified formats across sectors (e.g. for disease notification data, key environmental data, and specialist data such as the use of uniform DNA sequence data)</li> </ul>	<p>sources and vulnerabilities.</p> <ul style="list-style-type: none"> <li>Complete high-level framework for a One Health intelligence system at Quadripartite level</li> <li>Provide recommendations for improved system architecture and information workflow</li> <li>Engage further with the EAG, international One Health initiatives and other priority stakeholders to further review and to revise and strengthen the proposed OHIS framework</li> </ul>
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#### 4. Preliminary findings

With the evidence from initial OHISS activities (i.e. the systematic literature review, EAG workshop, rapid survey and Quadripartite assessment), preliminary findings can be identified for: i) high-level findings to inform framework development, ii) mapping of Quadripartite systems, iii) national case studies, and iv) the need for characterization of the risk landscape.

##### 4.1. High-level findings to inform framework development

###### 4.1.1. There is a need for a common understanding on which sectors, activities and threats to include for a One Health intelligence system

One Health<sup>1</sup> surveillance should not be limited to epidemic and pandemic diseases, but should include the disease burdens of endemic and neglected diseases; though broadening the scope, non-infectious

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<sup>1</sup> *One Health* is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. 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.  
<https://www.who.int/news/item/01-12-2021-tripartite-and-unep-support-ohhlep-s-definition-of-one-health>

health and environmental hazards should also be considered, including surveillance for unknown emerging diseases. The opportunity to promote global health security and well-being using information on the environment and ecosystems needs much more attention along with consideration of robust methods on how best to integrate this information. In addition, One Health outcomes are mainly focused on public health, but should also consider the broader societal issues of livelihoods, well-being and sustainability. The immediate objective of OHIS is the early detection, analysis and mitigation of endemic, epidemic and pandemic disease risk with the longer term objective of monitoring trends, emerging threats and supporting risk management; they should also seek to identify other threats to health at global and national levels by exploiting the potential to address wider One Health threats such as to ecosystem health. Intelligence systems should be designed to maximize engagement by serving the interests of all contributors and users.

#### **4.1.2. Though there has been widespread endorsement of the One Health concept, few countries have implemented comprehensive One Health surveillance or intelligence systems**

The One Health concept "Farm-to-Fork" has existed since the 1990s, but literature and other reviews indicate that only a few countries are making real progress in implementing One Health surveillance or intelligence systems. An effective global OHIS can only be achieved with the successful implementation of regional and national One Health intelligence programmes. While many countries have agreed in principle to the One Health concept, most have not developed any significant systems integrating cross-sectoral data gathering, analysis or decision-making, and typically the inclusion of environmental data is lagging. Internationally, there is an unfortunate trend towards stating a policy commitment, without supporting any real change – this issue needs to be exposed and addressed through intergovernmental initiatives.

#### **4.1.3. The sustainability of capacity, funding and political will, especially in peacetime – the period between emergencies – is a major challenge in implementing One Health surveillance systems at international and national levels**

The change from traditional, siloed surveillance to cross-sectoral One Health surveillance and intelligence has been most successfully implemented where the highest political support in a national government has been involved in defining the changes required. One Health frameworks should be maintained and continue to evolve in inter-epidemic periods, that is in the 'peace times' between emergencies. The demonstration of the economic, and societal benefits, of the improved timely detection of zoonoses and other health threats can help policy-makers understand the value of structured One Health activities that are permanently funded and active.

#### **4.1.4. Investing in One Health intelligence systems can provide a net benefit when all costs are considered**

It has been suggested that the investment needed to set-up a One Health integrated intelligence system globally would be approximately USD 800 million (World Bank, 2013), and the cost of highly contagious zoonotic diseases alone is estimated to have exceeded USD 200 billion over a decade (2000–2010). The International Monetary Fund at this stage expects the COVID-19 pandemic alone to cost the global economy USD 12.5 trillion through 2024. A recent report on antimicrobial resistance estimated that the costs due to increased illness and deaths and a subsequent fall in productivity could amount to USD 100 trillion by 2050. An effective One Health intelligence system could not be expected to eliminate all risks, but would promote early action and significantly reduce the consequences on global health. To deliver a One Health intelligence system ongoing costs would be incurred.

Relevant intergovernmental organizations, including the World Bank, other development banks and international donors and philanthropists, should initiate substantial resource mobilization efforts and stipulate a community of best practice for an international framework with real-time information sharing and analysis of One Health data and intelligence.

#### **4.1.5. There is a lack of baseline data and underlying knowledge of the human-animal-ecosystem interface and so a limited ability to rapidly detect and assess emerging events**

Risk-based surveillance should be capable of identifying emerging threats, detecting unusual events and allow assessment of the risk posed to susceptible populations or the environment. Sound understanding of baselines and thresholds is required to allow rapid detection of emerging issues and underlying trends and will also support monitoring of endemic and ongoing health issues. Intelligence systems should capture and integrate data from a wide range of sources – including for example environmental, socio-economic and security data. In addition to the collection of baseline data, analysis to better characterize interactions (such as wildlife-livestock interactions), value chains, networks and multidimensional relationships, causal pathways and critical monitoring points will help to identify priority areas in which to direct multisectoral surveillance efforts.

#### **4.1.6. A multidisciplinary cross-sectoral approach is required to assess and better understand data from a wide range of sources and to identify and assess potential One Health threats and opportunities**

Multidisciplinary cross-sectoral teams can address questions that cannot be addressed by any single discipline working in isolation by conducting integrated analysis and interpreting the analysis to enable the development of evidence-based recommendations. It is important to maintain and encourage networks of expertise as an integral part of the intelligence system to enable cross-sectoral data sharing and support risk assessment. In addition to the usual medical disciplines, ecologic, geologic, sociologic and economic disciplines should be considered. There is a need for high-level support and formal commitment to the governance and coordination across sectors to deliver effective One Health intelligence, and this must be supported by international leadership and commitment to improving competencies in health service delivery and developing a One Health workforce.

#### **4.1.7. An effective, fit for purpose OHIS must be based on openness and transparency with comprehensive data sharing, and this must address the incentives and disincentives for country authorities to report to international organizations**

There are existing international agreements that require the sharing of sanitary information. In human health, the WHO International Health Regulations (2005), require countries to promptly notify the WHO of events that may constitute a public health emergency of international concern, regardless of the underlying hazard according to defined criteria, with an ongoing obligation to inform and respond to follow-up requests. WHO will communicate to state parties and international organizations, through the Event Information Site (EIS) allowing the national focal points to inform the different concerned sectors and take appropriate national public health actions, as necessary. In animal health, the WOAHA Standards oblige WOAHA Members to notify the presence and absence of WOAHA listed diseases including zoonoses and emerging diseases. The information can be submitted through real-time alerts or six-monthly reports with a view to share for early warning and monitoring. It is important that information is shared in a timely manner in accordance with international reporting obligations of the WOAHA and WHO to ensure sensitivity of early warning systems and the reliability of risk assessments.

Despite the existence of international reporting requirements and statements that response activities should avoid unnecessary interference with trade and travel, unfair restrictions still sometimes occur and/or may be anticipated by countries. This can lead to under-reporting by country authorities to international organizations and inhibit timely sharing of One Health intelligence. Under-reporting may also result from lack of integration between sectors or privacy issues. Depending on the issue, reporting could be improved with increased country adherence to international statements (i.e. regarding political and economic disincentives such as travel bans and import restrictions), provision of greater technical or financial support to address emerging issues in poorly resourced countries, provision of information and cross-sector feedback, and agreements to address privacy.

#### **4.1.8. The many international One Health initiatives result in duplication and overlap of activities and inefficient use of resources**

The Quadripartite Alliance on One Health maintains an ongoing advocacy for coordination between international initiatives. However, advocacy is probably not sufficient alone for a real change in national and global systems set-ups towards One Health integration. A governance structure for global One Health intelligence systems could include consideration of the novel capacity of uniform pathogen characterization (next generation DNA sequencing), and support digitalization of surveillance and intelligence activities, e.g. supported by novel approaches to data management and analysis driven by data science and cloud-based computing.

#### **4.1.9. National information systems are the critical foundation for effective international One Health intelligence, but these systems have widely varying capabilities**

Surveillance capacity is uneven between sectors and between countries. Resources are generally limited and there is a lack of capacity for surveillance, especially in low- and middle-income countries (LMICs), a number of which have been identified to be at high risk from emerging infectious diseases. There is a need to develop incentives and provide support to national systems – for example improving field and community services, access to diagnostic and research laboratories, data collection, management and analytical capabilities, or resources for increased surveillance, and also to promote data sharing between sectors and between countries. There is a potential for significant improvement in integrating One Health as new systems are developed, such as the ones under development in some LMICs.

#### **4.1.10. All antimicrobial resistance (AMR) intelligence systems need a One Health conceptual basis and should record data for AMR as well as for antimicrobial use (AMU)**

Several national AMR surveillance systems apply One Health thinking. These systems have typically been initiated in collaboration between agriculture, food and public health authorities with tracking of changes in the antimicrobial susceptibility of certain enteric pathogens found in ill people, retail food and food animals. One Health AMR surveillance systems have been established in some countries to protect public health by reducing the risk of AMR. Some of these systems also include environmental and wildlife data.

#### **4.1.11. The systems within countries, including subnational and local systems play an important role in national One Health intelligence and can therefore support international OHIS**

Operationalizing One Health at national level remains challenging. Countries require mechanisms that systematically coordinate efforts at all levels, ensuring that the health and other sectors at subnational level are sufficiently supported and integrated into national programmes. Inadequate representation of local level government agencies and also community and non-governmental organizations limits progress. One Health interventions should be adapted to the local context with the need for strong community engagement emphasised. One Health can support decentralized processes, investment in subnational capacities and encourage participatory community-based health approaches.

#### **4.1.12. Data sharing requires data standards/ontology, data verification and methods flexible enough to handle the inevitable data variability**

Improving One Health intelligence will involve accessing large volumes of data, which will vary in terms of time scales and periodicity, spatial granularity, technologies and underlying definitions. Standards for data reporting, verification and quality will assist with comparisons across sectors; however, systems will also need to be flexible and scalable to handle the wide variety of One Health data.

#### **4.1.13. Integration of the use of big data methodology, artificial intelligence, mobile technologies, new monitoring methodologies and potentially remote sensing should be considered in strengthening and validating an OHIS**

Surveillance and early warning systems are compromised by the disincentives to report and this limitation can be addressed by monitoring 'external' contextual information, though integrating this type of information may pose other challenges. Examples that should be explored further include big data on topics (such as behaviour change, people and animal movements, market prices, etc.), and using additional monitoring approaches (such as social media, sewage, water and air monitoring, and other remote sensing approaches).

#### **4.1.14. A global microbial One Health surveillance network utilizing novel DNA sequencing data would ensure the detection and comparison of pathogens from environment, wildlife, production animals and humans are deposited in global databases in real time and support an OHIS**

A standardized, global pathogen sequence database could be created for i) microbial characterization and ii) real-time One Health surveillance, with relevant intergovernmental governance. Such databases would also enable the open-source use of DNA sequence tools for all countries, providing substantial assistance especially to LMICs in a build-up phase, supporting surveillance as well as research purposes in all sectors.

#### **4.2. Mapping of Quadripartite systems**

In order to support OHISS goals, we are conducting a structured high-level assessment to inform future work and provide a first set of recommendations towards a future framework of One Health intelligence collaboration between the four organizations.

The work aims to provide a harmonized description of selected One Health intelligence<sup>2</sup> relevant activities currently conducted by FAO, WOA, UNEP and WHO, including a system level assessment for each organization. In this assessment, organizational intelligence systems are presented in a simplified two-level hierarchy where the organizational system is built upon defined individual intelligence components ('activities') that are being conducted. These are defined as follows:

##### **One Health intelligence system**

*The set of One Health intelligence activities used within a single organization to generate information relevant to the organization's objectives.*

##### **One Health intelligence activity**

*Used to describe a specific One Health intelligence programme (sometimes also referred to as a tool or task) or a group of related programmes with a defined set of expected deliverables and outcomes.*

Scoping how the four organizations could potentially integrate their capacities and capabilities towards a global One Health intelligence system would then further require integration of their systems with joint objectives adding another (third) level to the proposed hierarchy (Figure 1).

The assessment was started in February 2022 and is currently partially complete. Outcomes will include mapping of all included activities, summary highlights for each organization and the proposed framework and architecture for a Quadripartite-led global OHIS, which can also inform national OHIS and capacity building.

#### **IT system approach**

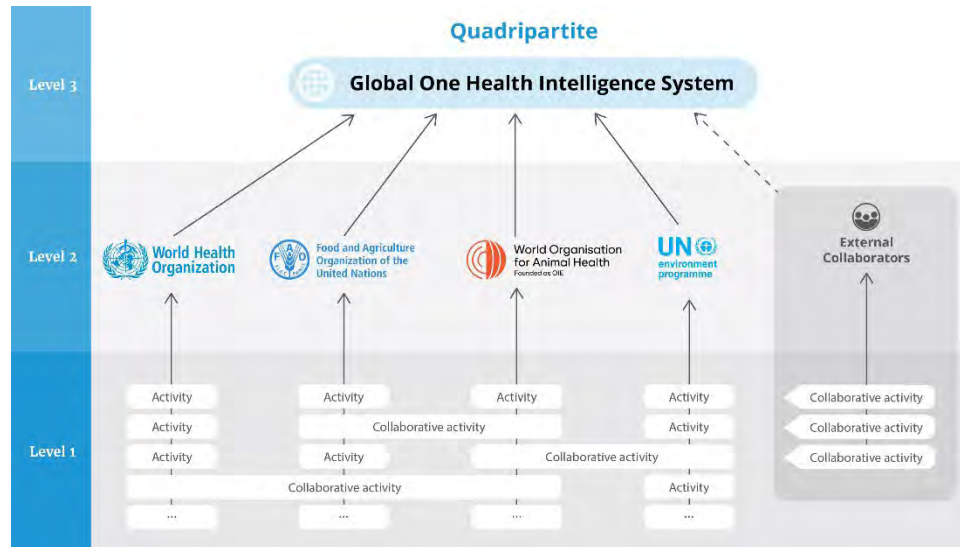
Generally, it is proposed to take a modular approach regarding the IT system architecture to allow flexibility regarding the data sources, data transformation and applications to be built on top of the

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<sup>2</sup> The term 'intelligence' is preferred here over 'surveillance', and we define surveillance as the process to gather intelligence. However, it is acknowledged that both terms are currently interchangeably used, and that many existing and well-known surveillance systems have highly functional intelligence components to them. Hence could validly be referred to as intelligence systems.

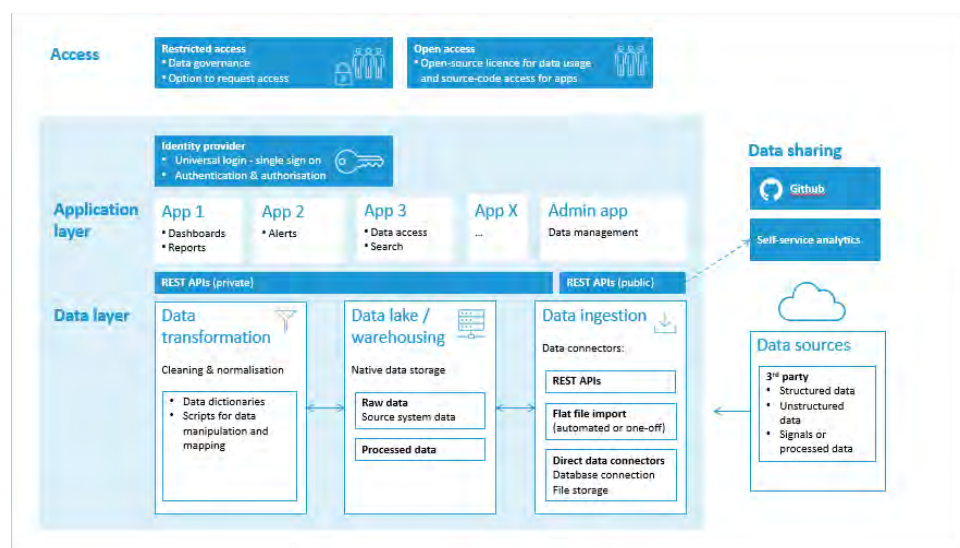
data layer and to future-proof the system. The conceptual modular approach is shown in Figure 2 and will form the basis for the development of an OHIS framework.

**Figure 1: Proposed three-level hierarchy to scope integration of One Health intelligence across the Quadripartite organizations**



- Level 3:** An integrated Quadripartite intelligence system that draws from all four Quadripartite systems
- Level 2:** The intelligence system of each individual Quadripartite organization
- Level 1:** Individual intelligence activities within an organization’s system that contribute to its function.

**Figure 2: Overview of potential architecture for a One Health intelligence system**



### 4.3. National case studies

Information about national competencies were collected through three processes: a rapid survey, outputs from the EAG meeting and the literature review.

The 'rapid survey' process utilized the WHO/FAO INFOSAN network and requested countries to share information describing their functioning One Health surveillance systems (there were 20 country replies, out of which 11 were used). At the EAG virtual workshop, participants provided examples of initiatives in place at national level defined around multisectoral data, information and intelligence sharing systems. This information allowed the description of 23 One Health national initiatives/tools. The literature review identified a heterogeneous mixture of systems, tools, networks, platforms, collaborations and frameworks.

Groups of national (and regional) systems could be described:

- Zoonoses reports: Systems for integrated zoonoses surveillance, a concept closely aligned to One Health, have been introduced in a number of countries since 1996. The main approach is to make surveillance and laboratory data more usable to support animal and public health and food safety managers and decision-makers through improved detection and response to zoonoses in animals, humans and the food chain.
- Antimicrobial resistance: A number of countries have (since 1994) introduced national (also some regional) antimicrobial resistance surveillance systems, variously including antimicrobial use monitoring, in animals, humans and in food. These systems are inherently One Health as resistant bacteria may be transmitted between animals and humans.
- Interagency networks: National One Health collaborative systems including line ministries (or relevant authorities) covering agriculture, food, human health and in some cases environment have been created in a number of countries. These include One Health interagency networks, to support ongoing collaboration between agencies and the implementation of a One Health approach to problem solving.
- Next generation sequencing: DNA fingerprinting of public health relevant bacteria was first used in 1996 and cross-sectoral sharing of genome sequences has developed further using next generation sequencing. Protocols supporting a full One Health approach are now in use in many countries, supporting integrated surveillance.
- Capacity assessment: Tools to assess the capacities, capabilities and vulnerabilities of countries or surveillance systems at the human-animal-ecosystem interface.

All details collected were organized and analysed through an internal document in order to define for each initiative described the owner/s or country/ies involved, the health sectors and the intelligence functions covered, and, where possible, any online source of information (e.g. national health authorities' websites) that provided further information. A table has been created from multiple information sources that provides a set of One Health national best practices and this will be developed further during the no-cost extension.

#### **4.4. The need for characterization of the risk landscape**

The evidence base gathered within the first phase of OHISS identified the need to use systems theory and risk-based thinking to develop a conceptual model of threats in the One Health landscape. This will allow an understanding of scope from the perspective of the different organizations involved in One Health, characterization of the hazard clusters and risk pathways within scope using a modular approach, and eventual determination of critical monitoring points and key indicators.

During the extension, a participatory process will be used to co-construct a common representation of the risk landscape and map critical monitoring points in relation to risk. This will include engagement with the EAG and other One Health partners.



## Annexes

### 5.1. External Advisory Group

More than 60 international experts participated in the OHISS EAG virtual workshop, held on 20 January 2022, with specialists in the fields of data analytics, epidemic intelligence, risk assessment and risk management. During the workshop participants provided their expert opinions on the current state of OHIS, and discussed essential components and data types for an OHIS of the future.

Participants provided more than 50 examples of multisectoral data, information or intelligence sharing systems at both national and international levels, ranging from well-established systems (e.g. The Joint FAO–WOAH–WHO Global Early Warning System for health threats and emerging risks at the human–animal–ecosystems interface [GLEWS+]) to those in development (e.g. Bangladesh’s One Health Platform). Options for the potential composition of a future OHIS were discussed and recommendations provided on how best to develop an effective OHIS framework including suggestions for scope, remit, functionality and aspirational data sources.

Using these suggestions, combined with others gathered from the literature review and wider partner engagement, the OHISS team is identifying valuable attributes of these systems that should be considered for integration into future OHIS at global and sub-global levels.

### 5.2 Literature Review

A literature review was conducted to answer the following questions:

- What cross-sectoral or One Health intelligence systems or networks are available globally to inform early warning, rapid alert, risk assessment and ultimately risk management of One Health threats?
- What are the best practices, challenges, gaps, vulnerabilities, lessons learned, and opportunities for linkages identified by these systems and networks, or by other One Health stakeholders?

It is recognized that these types of systems, networks and activities will often not be represented in the published literature. Therefore, this review was not exhaustive, but rather was intended to supplement the other OHISS activities. Following the scoping study guidelines of the Joanna Briggs Institute manual (<https://synthesismanual.jbi.global>), a three-step search strategy was used, and screening was conducted by two or more independent reviewers. The databases searched included PubMed, Web of Science and Google Scholar.

The search found 2 157 studies, of which 349 were found to be relevant at the title and abstract screening stage. Full text screening resulted in a shortlist of 67 studies determined to be most relevant for further review. Additional relevant studies were set aside for a potential second phase. Studies were excluded if they focused on a single disease, a single sector, or aspects other than surveillance, intelligence or early warning (e.g. on risk management).

Approximately half of the studies described actual initiatives (i.e. systems/networks), while the remainder just described gaps and best practices. The initiatives were categorized into those related to zoonotic diseases, antimicrobial resistance, food safety or the assessment of capacity, though the latter two categories were likely significantly under-represented by the search strategy. The described initiatives were from various global regions, and included a heterogeneous mixture of systems, tools, networks, platforms, collaborations, and frameworks. Very few of these multisector entities included environmental or ecosystem health data.

The review captured an extensive set of gaps and best practices to address question 2, including the following key findings:

- Novel genomic technologies (whole genome sequencing [WGS]) would seem to provide surveillance/intelligence systems with significant new opportunities for standardized, real-time global data sharing.
- The change from traditional, siloed surveillance to One Health surveillance/intelligence seems to be most successfully implemented if the highest political level in a national government is involved in defining change. One Health frameworks should be able to be maintained in inter-epidemic periods.
- Systems should be flexible and scalable to allow collaboration between sectors, accommodate a wide variety of data, and adapt to unknown, emerging and re-emerging diseases.
- Participatory approaches and innovative technologies may increase timeliness, sensitivity and sustainability of the system, and at the same time improve the involvement of communities in the overall process.
- The analysis of One Health data to inform risk management requires understanding of a complex, dynamic and highly contextual system. This requires multisectoral and multidisciplinary teams, increased capacity for assessment, and strong links between research, risk assessment, surveillance and decision-making.
- In addition to environmental drivers of emerging infectious diseases and pandemics, other environmental threats and health benefits were discussed in the literature, including the need for more research on these complex interrelationships.

#### **5.5. Engagement with other initiatives**

As indicated above, OHISS has engaged with OHHLEP, IPSN, PREZODE and Health Data Collaborative, but further actions are needed to identify opportunities and build synergies with these initiatives, stakeholders and professionals, and to reduce the risk of duplicating activities.

During the extension, it is considered of the highest importance to connect with other One Health relevant initiatives/entities, such as the WHO Hub for Pandemic and Epidemic Intelligence ('Berlin Hub'), Africa Centers for Disease Control and Prevention, African Union Interafrican Bureau for Animal Resources, Convention on International Trade in Endangered Species of Wild Fauna and Flora, Interpol, the Joint Nature Conservation Committee of the United Kingdom of Great Britain and Northern Ireland, etc., to explore opportunities for increased connections, data/information exchange and possible interoperability with OHIS to promote improved early warning and risk assessment.

#### **5.6. Communications**

A communications plan has been drafted, but is yet to be finalized. The plan recognizes key stakeholders and the communication tools to be considered. It identifies four key objectives:

- Communicate the scoping study activities and results to better inform policy-makers and donors of the benefits and opportunities to be gained from an effective OHIS.
- Advocate and raise awareness generally on the importance of One Health intelligence.
- Inform resource partners (current and potential) of OHISS activities.
- Highlight Quadripartite partnerships.

To date limited communications activities have taken place and this needs to be urgently addressed in the remaining period of the project. An article "The Tripartite and UNEP supports the advance of One Health intelligence" was published on FAO's website, with support from the Quadripartite counterparts. The article was also shared via FAO social media accounts.