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World Health
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World Organisation
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Quadripartite One Health Intelligence Scoping Study



Actions to develop an effective
Global One Health Intelligence System

August 2022



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Summary

- Global health security is under increasing threat from emerging infectious diseases and the impacts of environmental change.
- Global health systems must be able to predict, prevent and reduce the risk of ongoing and emerging threats using an integrated “One Health” approach to optimize the health of humans, animals, plants and ecosystems. Strengthening global One Health intelligence will support the identification and mitigation of risks to global health security.
- The One Health Intelligence Scoping Study (OHISS) identified opportunities for improved technical harmonization of Quadripartite¹ and other prioritized systems to strengthen One Health intelligence. Foundational activities were carried out to assess needs and opportunities within and outside the Quadripartite partners.
- The key recommendation of OHISS is that immediate actions are taken to develop a Global One Health Intelligence System (GOHIS). GOHIS would establish a framework to link, strengthen and further develop intelligence activities and would be led by the Quadripartite organizations.
- GOHIS would work as an umbrella framework connecting existing data and systems, adding value to them, and making specific outputs available where they are needed through dedicated applications. The system would link with, and amplify, intelligence activities, including those at the national, regional and global levels.
- GOHIS would be developed as a modular framework for the operationalization of One Health intelligence. The proposed architecture provides flexibility to ensure that the system is viable in the long term, capable of incorporating and adjusting to changing stakeholder needs, and can connect to complementary initiatives, such as the World Health Organization (WHO) Hub for Pandemic and Epidemic Intelligence.
- GOHIS would use a needs-driven approach and be developed by identifying “use cases”, involving the gathering, collating and analysis of existing data and information to produce improved One Health intelligence.
- Development cycles would build on the use cases, based on the data, data integration and IT functions available to the system, thus progressively increasing the capabilities and scope of One Health intelligence.
- Developing GOHIS, a global One Health intelligence system, will reduce threats to global health security posed by emerging infectious diseases and impacts of environmental change.

¹ The ‘Quadripartite’ refers to the alliance between the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH, founded as OIE).

The key recommendation of OHISS is that immediate actions are taken to develop a Global One Health Intelligence System (GOHIS). A joint Quadripartite approach is suggested to effectively, efficiently and sustainably improve the technical harmonization of health intelligence systems across the Quadripartite partners, delivering improved One Health intelligence to enhance early warning and risk assessment of global health threats. GOHIS is outlined as a modular framework to operationalize One Health intelligence.

Introduction

In June 2021, the G7 Carbis Bay Health Summit requested that the Quadripartite alliance² of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH, founded as OIE) conduct OHISS ‘to identify potential opportunities for improved technical harmonization of their and other prioritized systems to strengthen One Health intelligence’. OHISS was funded by the United Kingdom of Great Britain and Northern Ireland and coordinated by FAO, as the lead agency for the project. The scoping study was completed at the end of July 2022.

The study undertook a series of foundational activities, which identified a number of issues to be addressed and the need for critical guiding principles. This short report provides a summary of the OHISS findings and recommendations and sets out a plan of action – a full final OHISS report is in preparation.

2 At the time, the alliance was referred to as ‘the Tripartite and UNEP’.

The threat to global health security, and the need for a One Health approach

Global health systems must be able to predict, prevent and reduce the risk of ongoing and emerging threats, develop sensitive systems for early detection, and have the capacity and capability to respond quickly and effectively to mitigate their impact.

The capabilities of existing human, animal and environmental health systems to identify and predict risks to global health security are limited by an over-reliance on sectoral activities. Addressing this limitation requires a coordinated cross-sectoral ‘One Health’ approach.

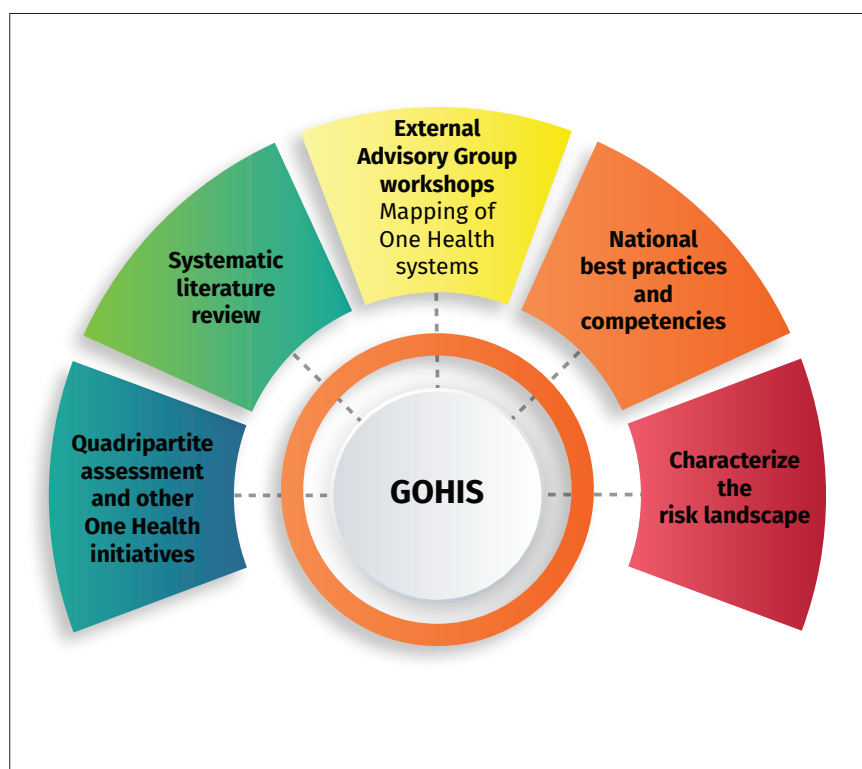
***One Health** is defined as ‘an integrated, unifying approach that aims to sustainably balance and optimize the health of humans, animals, plants and ecosystems. One Health recognizes the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent.*

One Health High-Level Expert Panel definition of One Health, 2021

To deliver One Health, cross-sectoral collective and collaborative methods are required to identify and assess threats to global health security, in order to enable prompt and effective action to reduce their potential wide-reaching impact.

Strengthening global One Health intelligence is the first step in the identification and mitigation of risks against emerging diseases, reducing the impact of endemic and epidemic diseases, and addressing threats to environmental health and food security.

Foundational activities



To develop the GOHIS framework, OHISS carried out the following foundational activities:

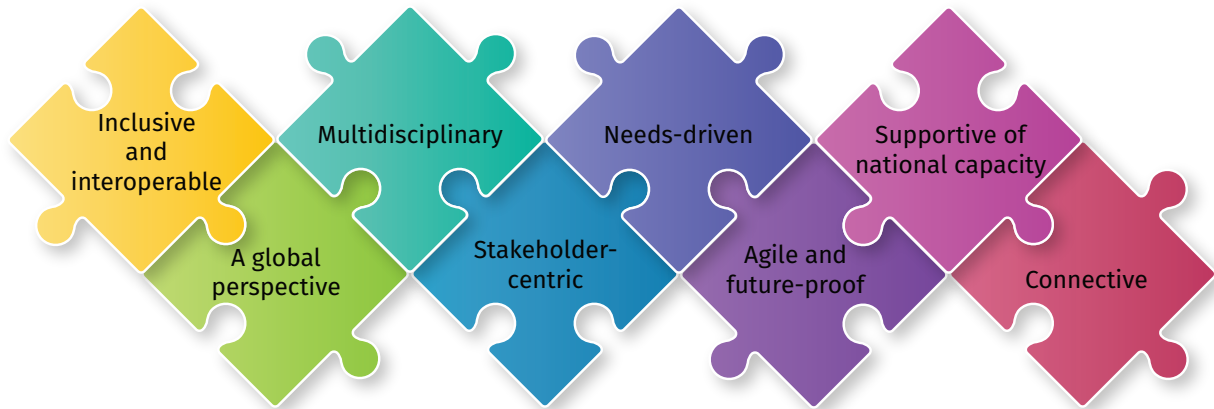
- Reviewed Quadrupartite activities and prioritized information systems selected according to their potential to contribute to One Health intelligence. A short summary of this assessment is provided in Annex I. The range and diversity of activities identified provides an excellent foundation for building the GOHIS.
- Undertook an extensive literature review, which highlighted that One Health has a broad scope, and that to be effective, a One Health intelligence system must be adaptable to multiple user needs and to the risk questions they must address.
- Engaged with international experts and diverse stakeholders through two main advisory group meetings, as well as a number of individual meetings with other relevant One Health initiatives and expert groups, to collect feedback on the study's activities and findings.
- Identified national critical competencies and 'best practice' case studies using expert workshops, established international networks and a survey. National systems were recognized as being highly variable in capacity, coverage, reliability and transparency.
- Conducted a hazard identification exercise with the Quadrupartite to define One Health scope and priorities. For the identified priority hazards, a series of workshops were conducted with international experts to assess the 'risk landscape', identifying and prioritizing multiple potential monitoring points, and highlighting needs for collaboration and risk communication.

The combined findings from these activities highlighted that the numerous international and national information systems collect a wide range of data relevant to One Health, but these are not being utilized for effective risk assessment and early warning. The study also demonstrated that incorporation of data from the environmental sector has significant potential for the identification of risk 'hotspots', which can be monitored for early detection and targeted with risk reduction interventions.

Increasing awareness and integration of the intelligence activities at national, regional and global levels would enhance global One Health early warning systems, improve efficiency and identify gaps in existing surveillance systems for current and emerging One Health hazards.

The vision

A joint, Quadripartite led approach is recommended to improve technical harmonization of their systems and strengthen One Health intelligence. Critical requirements for this are outlined below:



Inclusive and interoperable: The large number and diversity of activities currently conducted by FAO, UNEP, WHO and WOA, which provide value and bring different perspectives to One Health intelligence at the global level are summarized in Annex I. GOHIS must take advantage of this existing intelligence capacity and connect efforts that contribute to the same intelligence goals.

A joint approach should draw data from multiple sectors (**multidisciplinary**), preserving context, and respecting data confidentiality and governance. The adoption of FAIR principles (findable, accessible, interoperable and reusable) is recommended to ensure this requirement. The specific objectives and decision needs of system users must guide system design (**needs-driven**). National surveillance enhances global intelligence and vice versa, therefore the system must **support national capacity**, while integrating data, information and intelligence at different geographical levels to provide a **global perspective**. A joint Quadripartite approach should meet the needs of different sectors and **stakeholders** to ensure ongoing support and commitment. Recognizing changing threats and evolving knowledge, the system needs to **quickly adapt and evolve**.

Connective: The approach has to support cross-sectoral integration and cooperation with other initiatives. The GOHIS presented in this document is designed as an ecosystem of linked data and applications, supporting various models of connectivity. External initiatives should be able to:

- i. Consume data integrated and cleaned within the framework, respecting data governance rules for each source.
- ii. Use the applications (functionalities) made available. When governance allows, these applications will be made available in open-source formats, so that other initiatives can re-use or even improve them (suggest improvements in the code).

- iii. Contribute to the collective knowledge used in the system to improve integration and analysis of data in the multidisciplinary, One Health context. It will be important to ensure ongoing coordination and guidance from the **One Health High-Level Expert Panel (OHHLEP)**.

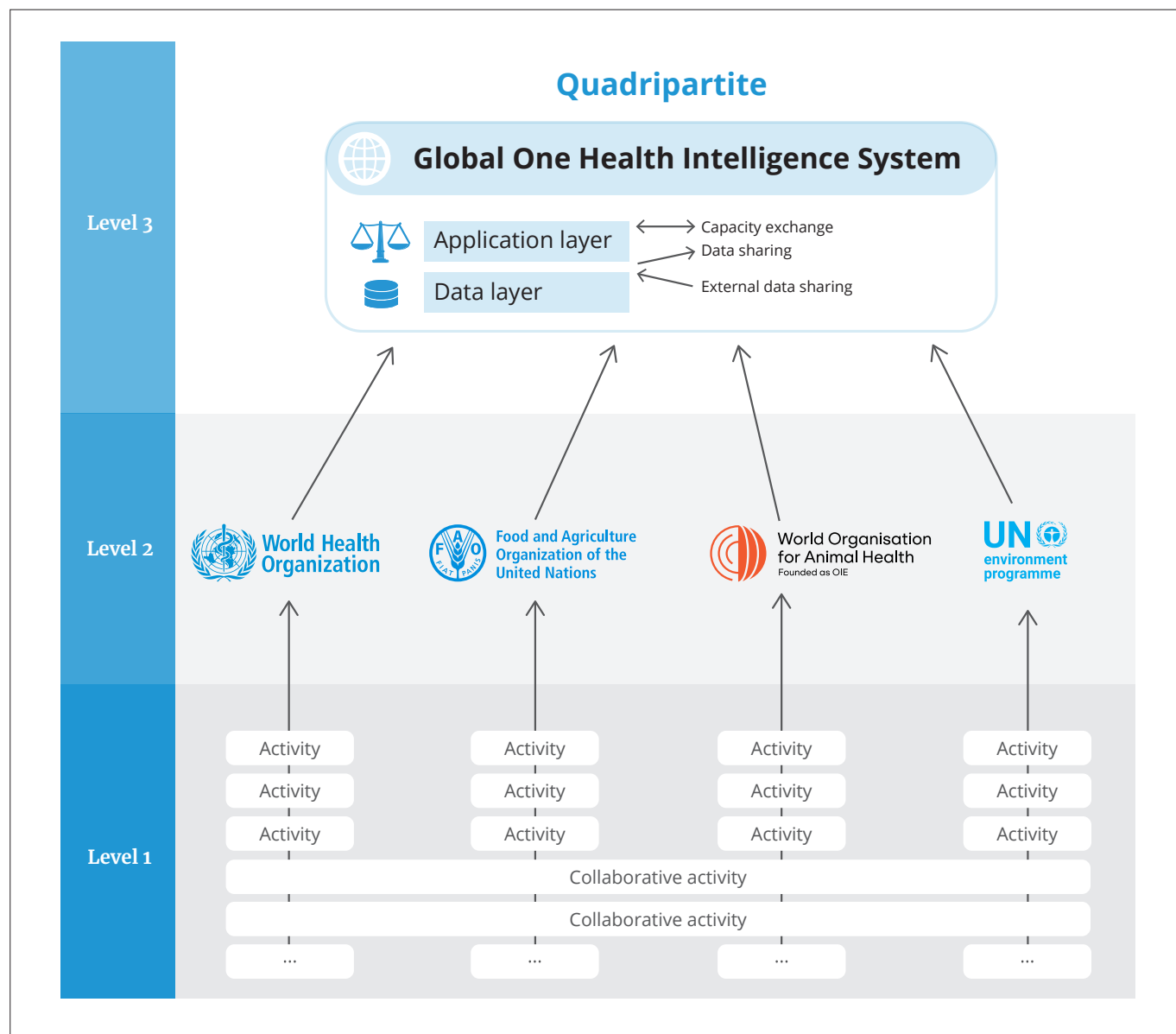
The opportunity and importance of ensuring connectivity between GOHIS, **WHO's Hub for Pandemic and Epidemic Intelligence (Pandemic Hub)** and other One Health information systems is highlighted. GOHIS will process data and information from a broad array of knowledge areas that support the early identification and management of emerging health threats. As both the Pandemic Hub and GOHIS support the linked-data approach, there is an imperative need to share and utilize the information gathered/produced to deliver improved epidemic intelligence using the One Health approach.



The proposed framework

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A joint Quadripartite led approach to operationalize One Health intelligence is proposed. The GOHIS is a framework to link, strengthen and further develop intelligence activities supported by the Quadripartite organizations.



GOHIS would work as an umbrella framework connecting existing data and systems, adding value to them, and making specific outputs available where they are needed through dedicated applications. The system would link and amplify other intelligence activities, including those at the national, regional and global level, while recognizing that existing activities and intelligence processes are currently in varying stages of digitalization.

The following characteristics are highlighted:

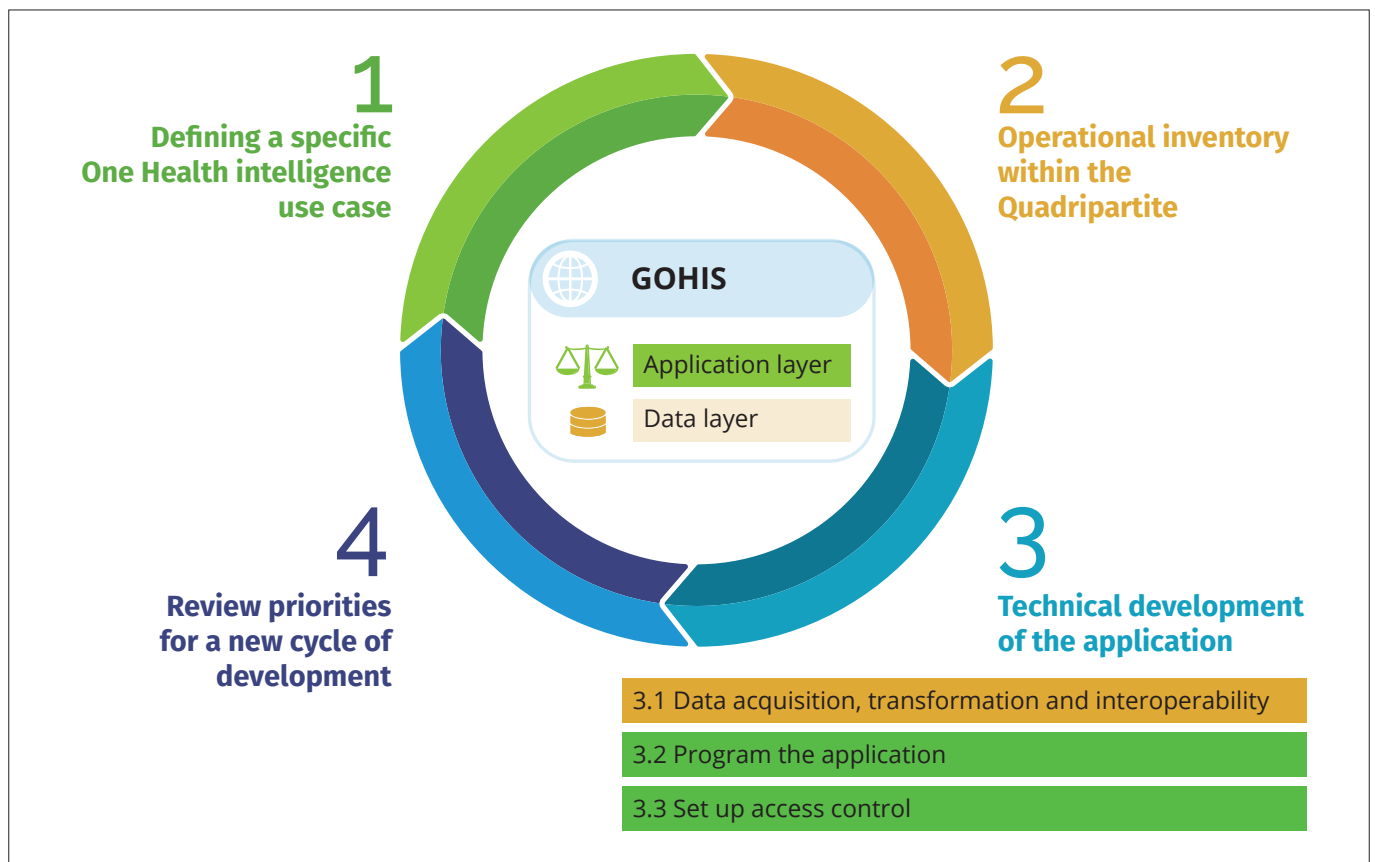
- A dedicated **data layer** operating under a linked-data model, providing alignment with the FAIR data principles. Data are cleaned and integrated once, then made available for multiple applications, propagating the value of the data within the organizations and to their stakeholders.

- A dedicated **application layer** where fit-for-purpose applications drive the connection to existing processes without creating silos, amplifying existing capabilities rather than aiming to replace them.
- **Access control** applied for individual datasets and individual applications, preserving data governance and security, and allowing multiple profiles of users to be created.
- A **modular approach** to development, which allows agile development, starting with simple applications and incorporating complexity over time. The proposed modular architecture also provides flexibility to ensure that the system is viable in the long term, capable of incorporating and adjusting to changing stakeholder needs, and can connect with complementary initiatives, such as WHO's Pandemic Hub.



Implementing GOHIS

GOHIS would be developed in the first instance by gathering, collating and analysing existing information and producing new One Health intelligence for specific objectives or use cases. It is proposed that use cases are in the first instance defined from already ongoing One Health intelligence activities in the Quadripartite. This approach will provide an opportunity to strengthen and expand the collaboration around these activities, and to identify similar activities, which could be aligned to avoid duplication. Within use cases, mapping risk pathways and associated drivers, impacts, vulnerabilities and critical monitoring points on a subset of hazard categories will be key to identifying datasets, which could inform operational prioritization and integration of data.



As more use cases/activities are brought into the operational framework provided by GOHIS, existing applications can be expanded, or new applications can be designed, starting a new cycle of development. More sources of data and more functions can be added to the framework on demand. In time, the need for new One Health intelligence activities can also be identified, allowing synergic growth between the technical framework and the Quadripartite's operational One Health intelligence priorities.

The cycles of development need to happen **within an overarching framework including system hosting and maintenance**. The following system elements need to be put in place by the Quadripartite to create the overall structure within which new development cycles can be conducted: hosting or steward organization; maintenance processes, including funding mechanisms; governance and access to data and applications; and systematic evaluation and incorporation of stakeholder needs.

Proposed action plan

To build GOHIS progressively, the following steps should be taken:

When	What	Objective	How
Immediate (6 months)	GOHIS foundation: Strengthen One Health intelligence linkage across Quadripartite organizations.	Strengthen the connection among existing intelligence systems and improve information sharing around already defined use case(s). Define the administrative framework for a shared Quadripartite system.	Develop and pilot GOHIS use case(s) building on existing activities, which provide a good base for testing and refining the modus operandi of collaboration and One Health intelligence sharing across all Quadripartite organizations. Quadripartite partners discuss and agree on a model for hosting/stewardship, maintenance, and process to define and document governance and access rules.
Medium term (6-24 months)	GOHIS framework: Establish an umbrella framework for Quadripartite One Health intelligence.	Prioritize further use cases for development. Define operational components, information flow and architecture for defined use cases, building the GOHIS system by continuously adding functional modules.	Develop GOHIS using the proposed needs-driven, sustainable development model. Priority functionalities are provided by adding applications and modules to channel the necessary data streams, designed to address the operational needs of identified priority use cases. Elaborate on relevant One Health hazard categories and risk pathways. Determine priority risk questions and specific information needs to enable early warning and risk assessments.
Longer term (2 years and ongoing)	GOHIS operational: Ongoing maintenance and development of applications.	System monitoring, evaluation and adaptation according to the intelligence needs and lessons learned in the pilots. Consolidate the development and maintenance processes.	Continue to identify gaps in operational One Health intelligence and address them under the umbrella framework, reusing modules and continually adding complexity to the system. Continuously update and specialize hazard and risk pathway assessments.

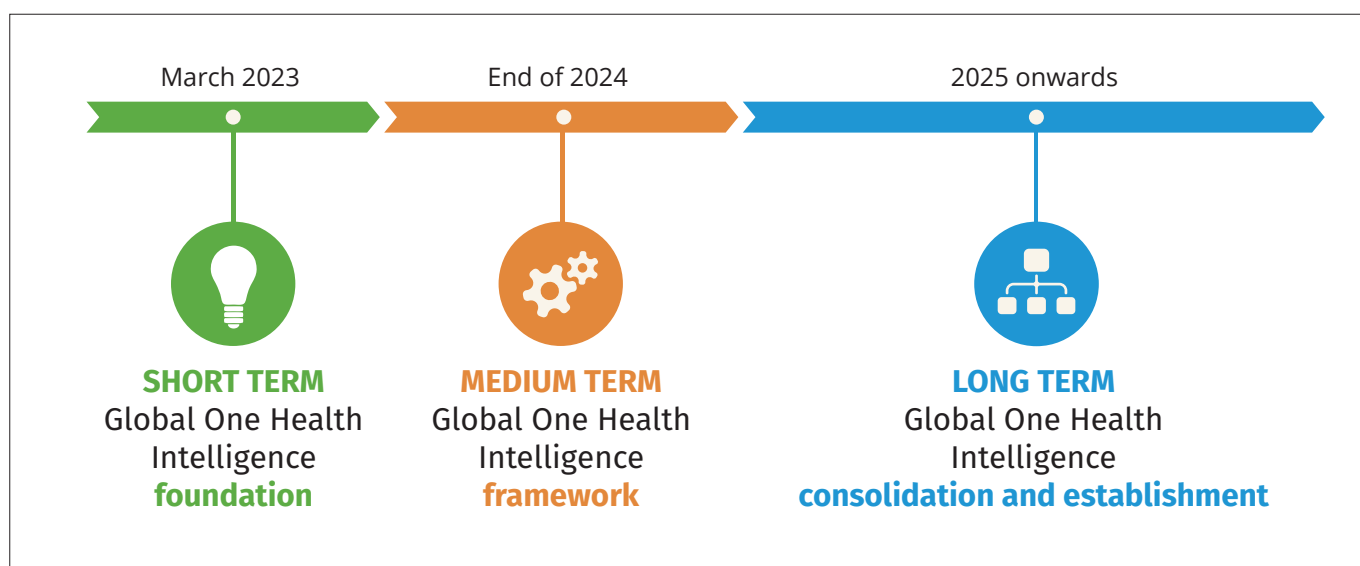


The approach proposed aims to have three main fundaments:

1. To start development, the Quadripartite organizations need to agree on the administrative framework for the development of a GOHIS (which can be hosted in a distributed manner among the organizations, as detailed below, but needs a central stewardship mechanism).
2. GOHIS is developed first to support the current intelligence within the Quadripartite organizations. In the short- and medium-term, use cases based on ongoing Quadripartite activities will be strengthened and improved by the collaborative system.
3. In the medium- and long-term, One Health intelligence itself is expanded and improved, moving towards improved early warning and risk assessment, using a risk landscaping approach for prioritized hazards.



Proposed timeline



Short term: 'Global One Health Intelligence foundation' (March 2023)

GOHIS is designed to support operational needs using a needs-driven approach. In the short-term, while the administrative framework is being finalized, **the operational needs can continue to be mapped, and the workflow defined.** In the next phase, this will inform the technical development and delivery of a truly fit-for-purpose information system.

1. Define a specific One Health intelligence use case (or multiple cases). See suggested examples below.
2. Identify the operational needs of the use case(s) – what are the information needs and decision points a GOHIS application would need to support.
3. Undertake an inventory of relevant systems/activities and data sources within the Quadripartite, which already are or can be associated with the use case(s).
4. Map the necessary collaborative workflows to allow the use case(s) to operate as a full Quadripartite collaborative initiative – what data workflows would be needed between organizations and GOHIS, what data transformation/analyses are needed, how should this information be communicated, to whom and when.

Immediate discussions are needed to establish the **governance, technical and administrative foundation** to build the Quadripartite led and managed joint GOHIS. This will also support the **Quadripartite Draft One Health Joint Plan of Action** and specifically the delivery of the “Data, Evidence and Knowledge Pathway”, which will have a cross-cutting impact across all areas. Formal agreement among the Quadripartite partners is needed regarding:

- The stewardship organization and funding mechanism. System hosting can be distributed among the Quadripartite partners, but an assigned stewardship partner needs to manage the process of development and maintenance, and a funding model must be defined.
- A steering/governance mechanism is required to jointly review, take decisions and document agreements and rules regarding governance, permitted users and access levels for each new system component.

Medium term: 'GOHIS framework' (end of 2024)

In this phase, the **technical development** of the framework is launched, following the needs-driven development cycles proposed, one priority use case at a time:

5. Establish the set of user requirements that are necessary to inform the technical development of GOHIS modules.
6. Data sources, ingestion and transformation: Identify critical and 'added-value' datasets using a riskscape approach. Determine the workflows to transfer data from organizations to GOHIS.
7. Application modules: data analyses and information communication functions are programmed.
8. The user requirements should also define users and their level of access (to both data and applications). Workflows respecting these requirements are implemented and tested.

The steps above (1-8) are repeated for prioritized use cases, focusing on building the necessary elements of the umbrella framework under which Quadripartite One Health intelligence can grow.

In parallel to the technical development of GOHIS, Quadripartite One Health intelligence in general, and early warning capabilities in particular are strengthened by further developing an operational approach based on assessing the risk landscape for the use cases. This entails identifying hazards, risk pathways and the associated position of critical monitoring points.

Long term: 'GOHIS consolidation and establishment' (2025 onwards)

As more and more use cases are addressed, the system will grow in terms of the number of operational functions it can support. At the same time, the process for development and maintenance will be consolidated. This should be accompanied by a process of monitoring and evaluation, assessment of value added, and continuous capturing of user feedback and needs.

After an initial phase of development focused on prioritized use cases, formal analyses should be performed to identify gaps in operational One Health intelligence and address them under the umbrella framework, reusing modules and continually adding complexity to the system.

Continuous strengthening of GOHIS and operational One Health intelligence should also be provided by the ongoing work of identifying prioritized hazards, building their risk landscape, and identifying critical monitoring points. The operational needs to monitor and address decisions in these critical points should be continuously incorporated into the system, informing the cycles of development.

In developing options for use cases, consideration was given to existing systems, how they might be strengthened, and the priority benefits that improved intelligence could deliver.

The Quadripartite assessments (Annex I) identified the Joint FAO/WHO/ WOAHA Global Early Warning System for health threats and emerging risks at the human–animal–ecosystems interface (GLEWS+) as a natural pilot case (see box below). GLEWS+ aims to inform prevention and control measures, through the rapid detection and risk assessment of health threats and events of potential concern at the human–animal–ecosystems interface. Strengthening GLEWS+ with the inclusion of additional information particularly from the environmental sector would be of immediate benefit.

Many other activities were also identified, which in a next step would be subjected to a prioritization exercise to select the next use cases for GOHIS development. For example, WHO's Epidemic Intelligence from Open Sources (EIOS) could become a use case, bringing in Quadripartite expertise to expand the epidemic intelligence mined by the tool using the One Health approach, which considers broad animal, plants and environmental health risks.

Proposed pilot use case: The Joint FAO/WHO/WOAHA Global Early Warning System for health threats and emerging risks at the human–animal–ecosystems interface (GLEWS+)

Background: GLEWS+ provides a use case that is already collaborative across three of the Quadripartite organizations. Involving UNEP would foster understanding of how environmental health can be included in its early warning and intelligence for better global health.

User requirements: While already strong in its One Health intelligence role, GLEWS+ as a pilot would allow development to start from an application that has simple requirements. No databases would need to be integrated, as the focal points only need to have access to their own data, from which they collaboratively exchange warnings as well as relevant epidemiological/contextual information.

Application: Initially, reflecting the current functionality, the application can be a message board where focal points can enter alerts that are then delivered to the right people in a timely manner within the collaborating agencies. All users can respond and communicate about the alert, and past alerts and messages are documented. Further development still based on this use case is then possible by improving the communication platform to also support the transfer of epidemiological/contextual data, under specific access rules.

Access control: GLEWS+ would be simple in its requirement, as application “owners” and “users” are identical. In contrast with many data analysis tools, which are developed within the organizations to serve external stakeholders, the design of a GLEWS+ functionality within GOHIS would be informed by Quadripartite representatives that are direct users of the application and can be guided by established operational processes.

Benefits: Following the proposed approach, the system is firstly built to support the current GLEWS+ network, and in time, the intelligence work performed itself is improved. New operational requirements from the GLEWS+ team can be added to the system, reflecting for instance their perception of how risk landscape data could be added to GOHIS to support even earlier signal detection. At the same time, data and functionalities added to GOHIS by other use cases can enable the GLEWS+ team to expand their browsing, analyses and/or sharing of epidemiological data.

Prioritization could also develop use cases focusing on target hazards, not only activities. Initial target hazards might include:

- **Vector-borne diseases:** The Rift Valley Fever Decision Support Tool, developed by FAO, builds capacity for early warning and forecasting at country level. The tool could serve as an example to guide the development of similar tools focusing on other vector-borne diseases, such as Zika virus. The Quadripartite collaboration would widen the data available to feed analytical models, as well as contributing expertise from the different health sectors – animal health, public health and environmental health. In the future, all the data processed, cleaned and integrated into tools such as these, along with the programmed modules, could be made available for other applications (respecting their access restrictions).
- **Antimicrobial resistance:** WOAHA reported an initiative to keep track of antimicrobial usage, which is already supported by FAO and WHO. Those organizations in turn also conduct activities monitoring antimicrobial use and resistance. This expertise could be connected and amplified by including UNEP's expertise and environmental monitoring activities.
- **Environmental health:** Environmental health hazards, such as air pollution, water scarcity, environmental degradation and land use change, pose direct and indirect risks for the emergence and spread of health hazards in plants, animals and humans. A use case could support mapping the risk landscape and establishing critical monitoring points for such health hazards, with direct inclusion of information from the environmental health monitoring activities of UNEP and its partners.





Conclusion

The COVID-19 pandemic has highlighted the pressing need for early warning and response to emerging threats to global health security. Several global, regional and national initiatives to improve One Health intelligence have been launched recently. OHISS adds value to this endeavour by defining specific One Health operational requirements to share information across multiple sectors.

Based on the OHISS findings, it is recommended that GOHIS be developed through a joint Quadripartite led approach, in collaboration and exchange with other health intelligence initiatives. The proposed approach aims to initially deliver a system that supports, connects and strengthens the One Health intelligence work the Quadripartite organizations already do, and in the medium- and long-term leads to improved One Health intelligence.

The Quadripartite calls for support from all stakeholders to ensure concerted actions are taken to establish a sustainable global One Health intelligence system.

Annex 1. Quadripartite One Health activities assessment summary

Understanding the existing intelligence systems in use among the Quadripartite partners was critical to assessing the potential for integration of their capacities and capabilities towards a GOHIS. Organizations selected the activities they felt to be the most important to include in the proposed One Health intelligence system, and these were characterized. The assessment highlighted the large number and diversity of activities currently conducted by FAO, UNEP, WHO and WOA, which provide value and bring different perspectives to One Health intelligence at the global level.

Systems assessed

WHO selected public intelligence activities covering:

- Direct disease event notification and response (Event Management Suite 2 [EMS2])
- Mining and analysis of general data (EIOS)
- Information exchange (Strategic Partnership for Health Security and Emergency Preparedness)
- Multidisciplinary networks (International Food Safety Authorities Network [INFOSAN] and the Global Antimicrobial Resistance and Use Surveillance System [GLASS]).

WOAH reported activities that contribute to animal health intelligence including:

- Global animal disease events (World Animal Health Information System [WAHIS])
- Countries' disease official status, self-declarations (Observatory)
- Capacity building (Performance of Veterinary Services Pathway [PVS])
- Screening and verification of outbreaks (Epidemic Intelligence System)
- Global Database on Antimicrobial Agents Used in Animals (with FAO and WHO)
- Global Burden of Animal Diseases

FAO's intelligence activities covered both animal and plant health:

- Emergency Prevention System (EMPRES) Global Animal Disease Information System (EMPRES-i)
- Event Mobile Application (EMA-i)
- Monitoring and early warning of Transboundary Plant Pests and Diseases (TPPDs)
- Desert Locust Information Service
- Fall Armyworm Early Warning System
- Rift Valley Fever Early Warning Decision Support Tool (RVF-DST)
- Surveillance Evaluation Tool (SET)
- Laboratory Information Management System for Africa (SILAB-FA)
- Information platform to support national veterinary diagnostic laboratories (iVETNET)
- International Antimicrobial Resistance Monitoring platform (InFARM).

UNEP reported on a wide range of databases and platforms gathering and analysing relevant environmental data, including on:

- Trends in biodiversity, ecosystem health and environmental health (UN Biodiversity Lab)
- International legal trade in wildlife (Convention on International Trade in Endangered Species of Wild Fauna and Flora [CITES] Trade Database)
- Area-based conservation measures (Protected Planet)
- Global Forest Watch
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species
- National reporting to the biodiversity-related conventions (e.g. Convention on Biological Diversity [CBD])
- Integrated Biodiversity Assessment Tool (IBAT)
- CLIMsystems Climate Insights data portal
- World Environment Situation Room (WESR)
- INFORM Risk Index (for humanitarian crises and disasters)
- Custom Climate Security Analytics (Strata)

Assessment – overview

These systems and activities collect and generate a large amount of data and information. However, currently data is distributed across a large number of mostly siloed information systems, with different technical architectures and varying accessibility. Data collection and analyses are designed to serve primary and activity specific objectives within each organization, and performed under different contexts with different methods, resulting in variable granularity in space and time and limited harmonization and standardization.

Many synergies and complementarity already exist – for instance FAO, WOA and WHO all reported initiatives related to the fight against antimicrobial resistance. Without a coordinated framework, these activities can result in unnecessary duplication of efforts. If activities with common goals are developed synergically, under the same framework, efforts can be shared, methods reused, and results amplified.

Environmental health is currently underrepresented in the set of collaborating and joint activities examined. Strengthening the environmental health perspective to One Health intelligence is essential in being able to move from hazard response to early warning and risk assessment. To address One Health hazards, it is important to conduct in-depth analysis using UNEP's expertise, and the extensive data and information systems of the environment sector to support One Health intelligence.

To advance One Health intelligence, specific decision-making needs must be identified, and data systems and integration designed to gather the required evidence from across the multiple systems most efficiently. The design and operationalization of this level of integration is addressed in the proposed GOHIS.

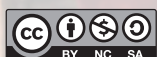
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