



November 2024

SAPEA evidence review report

One Health governance in the European Union



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to the European Commission

One Health governance in the European Union

October 2024 *

SAPEA evidence review report

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Preface

The origins of the contemporary One Health concept can be traced to the middle of the twentieth century, and the growing recognition that important linkages and interdependencies exist between the management of human and animal health, and that therefore these should not be managed in isolation (e.g. Schwabe, 1964). More recently, aspects of ecosystem health have been included, with a greater appreciation of the influence of changing landscapes, deteriorating environmental conditions and climate change on infectious and non-communicable diseases (Hulme, 2020; Jakob Zinsstag et al, 2012), and on other aspects of human physical and mental health (Jimenez et al, 2021). Interest in the One Health approach received a strong boost during the Covid-19 pandemic, which demonstrated clear links between the prevention of, and response to, disease outbreaks, tackling antimicrobial resistance, equitable access to high-quality health care, and protection of ecosystems.

But putting One Health into practice is not always straightforward. Not everyone can agree on exactly what it means, and while important progress towards a precise definition has been made through the work of the interdisciplinary One Health High Level Expert Panel (OHHLEP),¹ significant ambiguities remain. Moreover, the breadth of topics and aspects covered, ranging from human and animal health to ecosystems, landscape changes and urban infrastructures (Ramaswami, 2020), presents formidable policy, governance, and financial challenges. For One Health to achieve its goals, practitioners from different sectors with different competences and expertise must work together and be open to different forms of knowledge. New types of integrated arrangements within and beyond European Union member states are needed to overcome the barriers between separated offices and departments that traditionally pursue well-defined agendas with clearly delimited objectives (Alper & Liao, 2023).

Strengthening One Health operationalisation in the EU has complex policy implications across multiple policy areas, including:

- research and development
- human and animal health
- food safety and security
- biodiversity and sustainable ecosystems
- agriculture

¹ OHHLEP was established in 2021 by four global partners, known as the 'quadripartite': the Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), the United Nations Environment Programme (UNEP), and the World Health Organization (WHO) <https://www.who.int/groups/one-health-high-level-expert-panel>

- pandemic prevention

The ethical consequences of moving towards a new paradigm where human health and wellbeing is no longer managed in isolation, but instead considered inextricably linked to animals and environments, require contextual participatory and deliberative (Habermas, 2022) consensus processes between science and society.

The present evidence review report, requested by the European Commission, has been prepared by SAPEA as part of the Scientific Advice Mechanism to the European Commission. It has been produced by a working group of scientists proposed by the national academies of their respective countries and reflects the broad inter- and transdisciplinary nature of One Health. The report supports the Group of Chief Scientific Advisors in providing evidence-based options for policy on the operationalisation of One Health in the European Union. Specifically, the Advisors have been asked to provide scientific advice on the following overarching question:

Considering a complex policy area, i.e. One Health, what forms of management and cross-sectoral collaborations are best suited to ensure that synergies, possible trade-offs, and unintended consequences are taken into account?

To apply this overarching question, this report aims to address the following questions:

How should One Health be defined in the EU context and what are the synergies with and demarcations to other approaches such as “sustainability”, “One Planet” and “Healthy Planet”? Which EU policies could significantly benefit from the implementation of a One Health approach?

Which tools and leverage points for building capacities, planning and implementing One Health are most suitable for the EU level to maximise synergies, consistency and coherence of interventions and avoid duplication of efforts?

What are the criteria and the indicators that are most useful to assess the effectiveness of the tools and for monitoring the implementation of complex policies such as One Health? How can the progress in the EU policies which is due to the application of the One-Health approach be measured?

This report has the following chapters:

- Chapter 1: A definition of One Health in the EU context and a discussion of its ethical consequences
- Chapter 2: An analysis of institutional and governance requirements, and relevant existing EU policy areas
- Chapter 3: A proposal of qualitative and quantitative indicators of assessment of One Health policies

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- Chapter 4: A literature review of studies which examine the benefit-cost ratio of One Health initiatives, and a selection of case studies exemplifying the implementation of a One Health approach
- Chapter 5: A summary of knowledge gaps and evidence-based policy options

We are grateful for the immense engagement of all the working group members and collaborators, and to SAPEA and FEAM staff for supporting the smooth and consensual development of this report.

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Executive summary

The present evidence review report was requested by the Group of Chief Scientific Advisors to the European Commission. It has been prepared by the SAPEA consortium as part of Scientific Advice Mechanism. The evidence review report aims to address the questions raised in the scoping paper (Science Advice Mechanism, 2024):

- How should One Health be defined in the EU?
- Which tools and leverage points for building capacities, planning and implementing One Health are most suitable for the EU level?
- What are the criteria and the indicators that are most useful to assess the effectiveness of One Health?

The evidence review report has been prepared by a working group of scientists nominated by the national academies of sciences from their respective countries and the academy networks. The report is composed of the following chapters:

- Chapter 1: A definition of One Health in the EU context and a discussion of its ethical consequences
- Chapter 2: An analysis of institutional and governance requirements, and relevant existing EU policy areas
- Chapter 3: A proposal of qualitative and quantitative indicators of assessment of One Health policies
- Chapter 4: A literature review of studies which examine the benefit-cost ratio of One Health initiatives, and a selection of case studies exemplifying the implementation of a One Health approach
- Chapter 5: A summary of knowledge gaps and evidence-based policy options

Definition of One Health in the EU context

How we define One Health shapes governance structures for One Health, how we approach research, its implementation in practice, and its evaluation. It is therefore important to start from an agreed theoretical foundation.

This chapter seeks greater precision in defining One Health by clarifying ambiguities and elaborating issues that arise from the One Health High Level Expert Panel definition (OHHLEP et al, 2022), while

contextualising it in the history of the development of the One Health concept. Because of ambiguity between “environment” and “ecosystem”, a refinement to the OHHLEP definition is proposed:

One Health is an integrated, unifying approach that aims to sustainably balance and optimise the health of ecosystems. It recognizes the health of humans, domestic and wild animals, and the environment are closely linked and interdependent.

We use “environment” to mean what is part of an ecosystem, but not a human or non-human animal. A non-exhaustive list would include plants, microbes, soil, waterways, the atmosphere, manufactured materials and chemicals, and the climate.

A paradigm shift has occurred in how the One Health concept is understood, with the scope expanding from the previous anthropocentric framing, although the conditions for making practical changes are not yet present. We set out a philosophical foundation, based on One Health interconnections and interdependencies, to clearly define “ecosystem” and “environment”; and we clarify our definition of “health” itself. Three sets of concepts in the OHHLEP definition are also explored: “integrated” and “unifying”; “balanced” and “optimised”; “closely linked” and “interdependent”. Our definition of One Health requires several key issues to be considered: interdisciplinarity and transdisciplinarity; sociocultural and ethical dimensions; and economic factors. We present a brief overview of concepts adjacent to One Health, notably “Planetary Health”. We describe how evidence suggests that such adjacent concepts be approached as complementary, not competing.

EU policies benefiting from a One Health approach

One Health is formally endorsed by the ‘Quadripartite’ – Food and Agriculture Organization (FAO),² World Organization for Animal Health (WOAH),³ United Nations Environment Programme (UNEP),⁴ World Health Organization (WHO)⁵ – which works jointly to support their member states to build One Health capacities. In this chapter we identify EU policies that may benefit most from a One Health approach, based on a literature search and desktop review of institutions, agencies, and networks. We set out the policy landscape at international, European and member state level, clarifying One Health institutions, mapping stakeholders, and describing legislation, policies, guidelines and action plans. The importance of knowledge-brokering organisations, and Europe as a centre of One Health

² <https://www.fao.org/home/en>

³ <https://www.woah.org/en/?OIE>

⁴ <https://www.unep.org/>

⁵ <https://www.who.int/>

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partnerships and networks emerge as significant findings. We then assess EU policies according to their degree of alignment with key characteristics of the OHHLEP definition:

| EU Legislation, Policies, Guidelines and Action Plans | | H | An | Ag | En | C | Ec | In | S | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----|----|----|---|----|----|---|---|
| Offers a reasonably comprehensive One Health approach aligned to OHHLEP definition. | General Union Environment Action Programme (8 th EAP) | + | + | + | + | + | + | + | + | |
| | Health Security Council | + | + | + | + | + | + | + | + | |
| | Horizon Europe Action Plan | + | + | + | + | + | + | + | + | |
| | Zero Pollution Action Plan | + | + | + | + | + | + | + | + | |
| | Pharmaceutical Strategy for Europe | + | + | - | + | + | + | + | + | |
| | EU Global Health Strategy | + | + | - | + | + | + | + | + | |
| | Animal Health Law | + | + | + | + | + | + | + | - | |
| | EU4Health Programme | + | + | - | + | + | + | + | + | |
| | EU Strategy on Adaptation to Climate Change | + | + | - | + | + | + | + | + | |
| | EU One Health Action Plan on AMR | + | + | + | + | - | + | + | + | |
| | EU Wildlife Action Plan against wildlife trafficking | + | + | * | + | * | + | + | + | |
| | Common Agricultural Policy (CAP) | * | + | + | + | + | + | + | - | |
| | Invasive Alien Species Regulation (Regulation (EU) No 1143/2014) | + | + | - | + | * | + | + | + | |
| | European Consensus on Development | + | - | * | + | + | + | + | + | |
| Could potentially benefit from a greater emphasis on a One Health approach | Farm to Fork | + | + | + | + | + | + | + | - | |
| | Crisis Preparedness (reinforced role for EMA) | + | + | + | + | + | + | + | + | |
| | Action plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016 | + | * | * | + | + | + | + | + | |
| | Plant Health Law | - | * | * | + | * | + | + | + | |
| | Habitats Directive (Conservation of Natural Habitats, Wild Fauna and Flora Directive 92/43/EEC, Regulation (EC) No 398/2009) | * | + | - | + | - | + | + | + | |
| | Regulation 2017/625 Application of Food and Feed Law | + | + | + | + | - | + | + | - | |
| | Green Deal | - | + | - | + | + | + | + | - | |
| | EFSA Legislation | - | + | + | + | - | + | + | - | |
| | Bern Convention on Conservation of European wildlife and natural habitats | - | + | - | + | - | + | + | + | |
| | EU Biodiversity strategy | - | + | + | + | - | + | + | + | |
| | Marine Environmental Law | - | + | + | + | - | + | + | + | |
| | EC Veterinary Medicines | + | + | - | + | - | + | + | - | |
| | Issue-based policies focused on one or more sectors relevant to One Health. May not require a One Health approach in all instances. | Reach Legislation on Chemicals | + | * | - | + | - | * | - | + |
| | | European Health Union | - | + | + | + | + | + | + | + |
| Circular Economy Action Plan | | - | + | + | + | + | + | + | + | |
| Asylum and Migration Management (Regulation (EU) 2024/1351) | | + | - | - | - | - | + | + | + | |
| ECDC Legislation | | + | + | + | + | + | + | + | + | |
| Water Framework | | - | * | - | + | * | + | + | * | |
| EC Medicinal Products for Human Use | | + | * | + | + | + | + | + | - | |
| Community Policy on Environment | | - | + | - | + | - | - | + | + | |
| Wildlife Trade Regulations (EC No 338/97) | | + | + | - | + | - | + | + | - | |
| Asylum Procedure Regulation Crisis and Force Majeure (Regulation (EU) 2024/1359) | | + | - | - | - | - | + | - | - | |

Figure 1: EU policies benefiting from a One Health approach. + Explicitly addressed; - Does not address; * Referenced but not addressed in detail. The greener in colour the policy, the more aligned it appears to be with key characteristics aligned with the OHHLEP One Health definition. H - Human health (physical or mental); An - Animal health (domestic or wildlife); Ag - Agriculture; En - Environment, water, energy, air, biodiversity loss or land use; C - Adaptation, mitigation or just transition (climate change); Ec - Economic growth or wellbeing; In - Integrated approach, ideally specifying collaboration or responsibility sharing; S - sociocultural considerations including community or stakeholder engagement or participation.

The General Union Environment Action Programme (European Parliament, 2022a), Zero Pollution Action Plan (European Commission, 2021a), Animal Health Law (European Parliament & Council of the

EU, 2021), and EU Strategy on Climate Change (European Commission, 2021b) are among policies that are already well aligned, while those which might benefit from a greater One Health emphasis include the Farm to Fork Strategy (European Commission, 2020), Crisis Preparedness legislation (European Parliament & Council of the EU, 2022), Plant Health Law (European Parliament, 2016), the Habitats Directive (European Council, 2013) the European Green Deal,⁶ and the EU Biodiversity Strategy (European Parliament, 2021c). Issue-based policies focused on one or more sectors, such as REACH Legislation⁷ (European Parliament & European Council, 2006), Circular Economy Action Plan,⁸ Water Framework Directive (European Parliament & European Council, 2000), and Wildlife Trade Regulations (European Council, 1996), may not require a One Health approach in all instances.

We explore the benefits and constraints of different financing options for the One Health approach. While public funding at local, national, or international levels is typically the most stable and substantial investment for foundational One Health activities, the private, non-profit and philanthropy sectors can bridge any gaps, drive innovation, and address specific health challenges.

A review of strengths, weaknesses, opportunities and threats in relation to the One Health governance in Europe emphasises the importance of transdisciplinary collaboration. Equitable policy options for improving One Health governance in Europe and beyond include: establishing databases and repositories of One Health Networks worldwide; developing context-specific approaches to achieving intersectoral collaboration, significant resource and equitable political cooperation; agreeing an overarching conceptual framework for how current and future One Health tools could be categorised to strengthen One Health systems at the national level; and educating One Health practitioners on knowledge integration.

Criteria and indicators to assess the effectiveness of One Health operationalisation

Having defined One Health and outlined the policy landscape and existing governance structures for One Health, the next two chapters look at its implementation. In this Chapter, we describe the criteria needed to operationalise One Health and the available tools to evaluate its impact.

⁶ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_nl

⁷ <https://echa.europa.eu/regulations/reach/understanding-reach>

⁸ https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

We present a 'checklist' for operationalising One Health, developed from the OHHLEP Theory of Change for One Health (OHHLEP, 2022), which summarises the governance and participatory processes that lead to One Health interventions.

Box 1: One Health operationalisation checklist

1. Introduce top leadership, superior to the different sector heads, that convenes stakeholders and actors (e.g. prime minister, minister of finances, minister of planning).
2. Create a One Health coordination platform (typically top leadership of public health, animal health, agriculture and environment).
3. Identify One Health issue (typically a problem that requires a multi-sectoral approach).
4. Formulate a theory of change possibly based on a multi-criteria decision analysis and according to context.
5. Identify and map stakeholders.
6. Engage in a participatory transdisciplinary stakeholder process involving academic and non-academic stakeholders for the framing of the One Health issue and the validation of the theory of change (involve communities, authorities and technical experts together).
7. Proceed to an ex-ante process analysis of the framed One Health issue (social, economic and ecological impacts) (see Chapter 4).
8. Clarify and document institutions and their scaling (national, provincial, district levels)
9. Clarify and document roles and responsibilities.
10. Clarify and document the chain of command and communication pathways.
11. Implement One Health issue at small scale.
12. Proceed to an ex-post impact analysis of the One Health issue (social, economic and ecological impact) and supportive infrastructural 'One Health-ness'.
13. Engage in a participatory stakeholder process similar to point 3 for the reassessment of the One Health issue focus and possible scaling up.
14. Scale up the implementation One Health issue.
15. Iterate steps 9–14.

To measure and evaluate the effectiveness of implementing One Health interventions or approaches, a variety of qualitative and quantitative indicators are available. A literature review summarises the state of knowledge on how qualitative and quantitative indicators are used to evaluate One Health, such as a qualitative 'One Health index' that estimates the level of integration of a cross sector One Health approach. In terms of quantitative indicators, we describe economic indicators such as benefit-cost ratios, comparative cost-effectiveness and cumulative cost. We conclude that, while One Health assessment remains an open field, the currently available indicators are sufficient to evaluate the effectiveness of EU policies in operationalising One Health.

Together, the operationalisation 'checklist' and information attainable using the indicators described in this chapter can lead to an iterative One Health policy cycle that continuously optimises the benefits of One Health implementation.

Leverage points for One Health: evidence from a literature search and case studies

This chapter looks at how One Health has been implemented and evaluated in practice. The chapter uses both a literature review on the costs and benefits of One Health interventions, and six case studies.

Evidence of the benefits of adopting One Health interventions and policies across different domains, from humans to animals and environments, was investigated through a literature review of 245 publications identified as relevant to One Health. Most articles (70%) addressed infectious diseases, with the remaining coverage equally distributed across the topics of environmental health, sustainability, climate change, and non-communicable diseases. Almost half (47%) of publications reported positive outcomes. Of the studies where benefit-cost ratios of One Health interventions are estimated, the highest ratio can be expected from the control of "stage 2 zoonoses" (i.e. diseases like brucellosis, trichinellosis or rabies, which are transmissible from animals to humans, but almost never between humans). There is evidence for the benefits of integrated infrastructure. Reported financial benefits for integrated surveillance-response systems are small, although potential human capital benefits are not currently accounted for. We conclude that assessment of these benefits is difficult and lacks standard approaches.

Overall, the One Health-related literature is anthropocentric in focus but environmental topics such as climate change and biodiversity are gaining traction.

We also present six case studies from across Europe on the implementation of a One Health approach:

1. **Integrated AMR surveillance in Denmark (DANMAP)** monitors antimicrobial use and antimicrobial resistance (AMR) across various sources, exploring the connections between antimicrobial use and resistance development, and identifying pathways of transmission of resistant bacteria and genes. Programmatic and financial gains can be expected from cross-sector communication and the sharing of infrastructure and resources.
2. **Integrated West Nile fever surveillance in northern Italy** aims for the earliest possible detection of the virus in multiple target species (mosquitoes, wild birds, equids, humans) to inform public health managers of the risk of human exposure, and to mitigate disease

transmission via contaminated blood and solid organ donations. This integrated surveillance-response system is profitable and more rapidly prevents human exposure than does single sector disease surveillance.

3. **Trichinosis control in Europe** is a long-established routine system and an example of a cross-sectoral disease control system in the EU. It also illustrates the value of inter-institutional, transdisciplinary cooperation.
4. **Two examples of urban approaches, the Cities network (URBACT) and the city of Montpellier**, aim to pave the way for a collective and informed approach to integrating One Health practices, fostering healthier and more sustainable urban environments and communities. They address three domains of environment (air quality, water quality, climate), human health (zoonoses, vector-borne diseases, food safety) and animal health (wildlife). These initiatives are in an early phase of action planning, participatory governance, and citizen engagement aiming at reaching city-related sustainable development goals.
5. **The Statens Serum Institut (SSI)** in Copenhagen, Denmark, is an example of an integrated infrastructures and institutions approach. SSI aims to be a One Health Institute, whose mission is to be an internationally leading research and preparedness organisation that strengthens the health of humans and animals, preventing and fighting infectious diseases through research-based monitoring, diagnostics and guidance. While One Health is now an important strategic area for SSI, the programmatic and financial benefits are not yet known; however, the similarly organised Canadian Science Centre for Human and Animal Health enjoys estimated 26% savings in operational costs compared to separate institutions according to the World Bank.
6. **Non-communicable diseases in One Health** aims at understanding the public health value of the human-animal relationship and the impact animals can have on human mental health and healthcare. The goals are to identify benefits and challenges, provide best practices and protocols to ensure quality and wellbeing for all involved, and promote effective strategies such as animal-assisted interventions in society and institutions.

These case studies illustrate the focus to date on infectious diseases and the lack of assessment of the benefits of One Health approaches that was seen in the literature review. They also demonstrate the importance of political ownership, clear governance structures and dedicated funding to support the implementation of One Health interventions. The case studies indicate that One Health approaches have been pioneered already for a long time with clear beneficial effects (e.g. with trichinosis, AMR).

One Health is operationalised in different social, cultural, political, economic and ecological contexts, thus requiring different solutions to enhance equitable cross-sectoral collaboration. Costs and benefits will depend on the context, so they need to be assessed in various settings; making fair comparisons is difficult. While mainly driven by zoonosis research and argued for through monetary benefit-cost

analysis, several examples of One Health benefits exist in other contexts and look at a wider selection of outcomes. Recent initiatives with a less anthropocentric focus are now considering the environmental domain and finding synergies for considering such issues as biodiversity loss.

Evidence-based options for policy and research gaps

Operationalising One Health at EU and member state level will need governance, policies, regulations and other activities overlapping across human, animal and environmental health sectors. In the near term, evidence suggests that several existing EU policies could benefit from a greater emphasis on a One Health approach (e.g. Farm to Fork, Crisis Preparedness legislation, EU Biodiversity Strategy for 2030; see Figure 1). Coordination between local, regional and national governments and EU and intergovernmental institutions is essential for implementing One Health and depends on long-term strong leadership, political, institutional and financial will. Countries that employ intersectoral and multisectoral approaches are better placed to work collaboratively across sectors and meet cross-cutting One Health global challenges, than those which do not. One Health knowledge-brokering agencies (or 'boundary organisations') may improve transboundary knowledge mobilisation and collaboration. One Health operationalisation is hampered by significant inequity and power imbalances between different sectors. A high-level governance organisation or actor could ensure the equal distribution of data and resources, and advocate for equity between sectors as part of decision-making to ensure equitable implementation of One Health policies.

One Health, as currently defined by OHHLEP and in this report, has broader ramifications in agricultural, health and environmental policies of the European Union and its member states. We outline medium- and long-term evidence-based options for policies and argue that the broader ramifications of the operationalisation of One Health point to socioeconomic and environmental dilemmas which suggest the need for a paradigm change in some sectors. For example, the evidence review report suggests that policies around food and agriculture could benefit from a One Health approach. A shift towards more ecologically, socially and economically sustainable forms of agriculture could offer such benefits as healthier human diets, a reduction in non-communicable disease, and improved animal welfare, among other benefits.

One Health approaches can also benefit human and animal health policies through better pandemic preparedness by implementing integrated disease surveillance-response systems, improved biosecurity at the animal-human interface and zoonoses control at the source.

Evidence is growing of the benefits of a One Health approach to the management of human, animal and plant health while managing natural resources in a sustainable way. But for One Health to work

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successfully in practice, cooperation is needed between different sectors (human health, animal health, agriculture and environment) and at various levels – from communities and local government, to national and international levels. This evidence review report ends by discussing current research gaps to motivate future research and evidence-based options for One Health funding, education and capacity building. Current research questions on areas such as One Health governance, economics, AMR, integrated surveillance-response systems, biodiversity, animal welfare and ethics are outlined, which ultimately will support One Health operationalisation in the EU.

One Health definition in the EU context

Summary

This chapter seeks greater precision in defining One Health by clarifying ambiguities and elaborating issues that arise from the One Health High-Level Expert Panel (OHHLEP) definition, and by examining One Health in the context of similar approaches. We start by explaining why a clearer definition is needed, contextualising it in the history of the development of the One Health concept. We note an expanding scope and a paradigm shift from the previous anthropocentric framing, while recognising that the conditions for making practical changes are not yet able to accommodate these. Therefore, the definition is a flexible approach. Next, starting from the OHHLEP definition, we set out a philosophical foundation based on One Health interconnections and interdependencies, which allows us to clearly define “ecosystem” and “environment”; and we briefly clarify our definition of “health” itself. We then explore three sets of concepts in the definition: “integrated” and “unifying”; “balanced” and “optimised”; “closely linked” and “interdependent”; and discuss several key issues that our definition of One Health requires us to consider: interdisciplinarity and transdisciplinarity; sociocultural and ethical dimensions; and economic factors. We present a brief history of concepts adjacent to One Health, notably “planetary health”, explaining that we aim to find synergies and complementarity with them. This chapter closes with a proposed adaptation of the OHHLEP definition informed by our analysis.

Why we need a definition of One Health

Over the past two decades, as the One Health concept has evolved, the ways in which human health, animal health and the health of environments are intertwined have become more broadly recognised across society. But confusion about One Health is still evident worldwide, threatening its potential. Clarity is needed about the theoretical foundations of One Health, with attention to the way knowledge is framed, generated, and evaluated (our epistemology), specifically in a multi-cultural context (Bischoff, Ulrike & Pelluchon, 2021).⁹ This has implications for our understanding of reality (our

⁹ Academic work on how this can be done describes epistemological modesty (e.g. Gabriel 2022, Pickersgill 2016) and epistemic humility (e.g. Ho 2011), as well as epistemic justice (e.g. Almassi 2018) and epistemic injustice (e.g. Fricker 2007). These frames influence our approach.

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ontology), shifting from a focus on humans (anthropocentrism)¹⁰ to one of social-ecological systems (Bischoff, Ulrike & Pelluchon, 2021). The way we theoretically define One Health shapes our governance structures, methods, research approaches and topics, and the indicators we use to monitor One Health operationalisation.

Integrated approaches to health, like One Health, address the complex (or 'wicked') social, economic, and ecological problems (Harris, Brown, & Russell, 2010) affecting human, animal, and plant health that are embedded in the United Nations Sustainable Development Goals. The table below summarises the development of contemporary and twentieth century integrated approaches to health.¹¹

| Year | Paradigm | Author / Source |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 1949 | Veterinary Public Health: Contribution of veterinary medicine to public health | Steele, 1949 |
| 1950s | Study of Ecology emphasises interactions and networks in human and non-human aspects of nature; interdisciplinary in its origins | diverse sources; see Kingsland, 2004 |
| 1960s | One Medicine: Human and animal health are paradigmatically similar | Schwabe, 1964 |
| 1990s | Ecosystem approaches to Health (EcoHealth): Humans, animals and the environment are inextricably connected | Rapport et al, 1998 |
| 2005 | Wildlife Conservation Society: (One World One Health™) Manhattan principles: Humans, animals and the environment are inextricably connected for sustaining wildlife populations; extended to the Berlin Principles in 2019 | Osofsky et al, 2005; Gruetzmacher et al, 2021 |
| 2005 | One Health: Cooperation in the management of human and animal health and other sectors should lead to an incremental benefit | Zinsstag et al, 2005 |
| 2014 | Planetary Health: Human health is influenced by planetary phenomena, such as climate change and biodiversity loss | Horton et al, 2014 |
| 2022 | OHHLEP One Health: Health between humans, animals, plants, and the environment should be optimised | OHHLEP et al, 2022 |
| 2023 | One Rights: A normative ethical response to the increasingly delicate interdependence of human and nonhuman animals and their shared environments | Stucki, 2023 |

¹⁰ While there are different definitions of anthropocentrism, it generally refers to prioritising human interests. According to extreme ethical anthropocentrism, "only human beings have intrinsic moral value or worth, and humans only deserve ethical protection" (Coghlan et al 2021, 2).

¹¹ Note that we do not describe the longer history of integrated approaches which would go 3000 years back in the Chinese and Indian cultural space. See Woods et al (2017).

Table 1: *Paradigms of integrated approaches to health*

James Steele introduced the idea of veterinary public health (Steele, 1949), showing how veterinary medicine supports public health, although not the contribution of public health to veterinary medicine, indicating anthropocentricity. Around this time in the 1950s, the study of ecology was emerging, focusing on interactions, networks, contexts, and systems in a way that challenged traditional reductionist and universalist ways of pursuing scientific knowledge (Kingsland, 2004). The term 'One Medicine' was coined by Calvin Schwabe, emphasising that there was no paradigmatic difference between veterinary and human medicine (Schwabe, 1964). During the 1990s, ecosystem approaches to health ('ecohealth') extended integrated health approaches to the ecosystem, thereby attributing a 'health' status to ecosystems and all species living within that ecosystem. Soon afterwards, the Wildlife Conservation Society coined the term 'One World One Health'TM, placing paramount importance on the health of humans and animals around conservation areas, and reflecting long standing concerns regarding the protection of wildlife (Cook, Karesh, & Osofsky, 2004; Karesh, Osofsky, Rocke, & Barrows, 2002; Osofsky et al, 2003).

Almost at the same time, 'One Health' was introduced to describe interventions with closer cooperation between human and animal health and any other sector that, when compared to single-sector approaches, provide an incremental benefit (i.e. added value through more economically and logistically efficient ways of safeguarding and promoting health) (Zinsstag et al, 2005). 'Planetary health' appeared from 2014 in the biomedical literature, focusing on the effects of climate warming, biodiversity loss and other global changes on human health, but not explicitly on animal health. 'One Rights' (Stucki, 2023) is a recent approach to human and animal rights which builds on and accompanies a One Health perspective.

One Health has evolved over the past twenty years and continues to do so. Paradigms like 'environmental health' and 'planetary health' still focus on human health; in theory at least, One Health is distinguished by its potential to move away from such anthropocentrism. Therefore, a story of what One Health *is* and what it *can be* underlies this report. Throughout the report, we engage with concepts that de-centre humans and point towards interconnection and interdependence, and others that point towards operationalisation and optimisation. This is because we appreciate that the institutional structures required for interdependent action are not yet in place. We are on the cusp of a paradigm shift.

The care we take below to clarify the terms of the definition indicates our theoretical foundation. But it is important to note that the definition itself is an approach, needing sufficient flexibility for One Health to be operationalised in practice. The definition allows for us to be strategic, to prioritise, and to move in the right direction as efficiently as possible, away from anthropocentrism and towards

ecological health. This contrasts with many initiatives labelled as 'One Health', which have tended to implement programmes with a desired outcome, such as cost-benefit optimisation, but without a rigorous underpinning theoretical framework (though we acknowledge that theoretical frameworks can be challenging to implement).

The term 'One Health' has been used widely and sometimes rather loosely. A precise and all-encompassing definition allows us to identify which element of the complex problem-scape is being addressed and provides a common language that facilitates interdisciplinary and transdisciplinary collaboration. For example, differences in terminology between social and life sciences can hinder interdisciplinary work; a common set of definitions can help.

Although we have taken care to develop a clear definition of our terms, it is worth emphasising that a readiness to be flexible with language is often beneficial. When engaging with policymakers or legislators, for example, terminology consistent with existing frameworks and policies may be needed to effectively communicate the relevance and importance of One Health principles; other terms may be more appropriate when engaging with the general public or a small-scale farming community. Similarly, when there is low-hanging fruit in terms of problems likely to benefit from a One Health approach, it makes sense to implement changes or programmes even if they do not align perfectly with the theoretical foundation.

We recognise the need to specify a One Health platform for the EU context, while also considering interconnections and interdependencies from a global perspective. While operationalising European policy, we must build capacity in other regions, maintaining a global lens on what is both a global issue and local concern. One Health is all encompassing – and yet choices need to be made, including through regional prioritisation. By doing so, the EU can contribute to addressing global health challenges and promoting sustainability beyond its borders.

Starting from OHHLEP and clarifying our terms

A useful place to start when defining One Health in the EU context is the definition given by the One Health High-Level Expert Panel (OHHLEP). This is currently the leading definition, and working from it facilitates adaptation to the One Health Joint Plan of Action from the Quadripartite Organisations (FAO, UNEP, WHO and WOA) (OHHLEP et al, 2022). 'Acquired language' is an accepted best practice for professional working groups; it entails adopting language used in the past, unless it is uncomfortable for some reason, to acknowledge that ideas have been previously discussed and consensualised.

One Health is an integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals, and ecosystems. It recognises the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent (OHHLEP et al, 2022).

This is a usefully expansive and all-encompassing definition. To develop a theoretical foundation, its exact meaning requires some scrutiny. For instance, the difference between “environments” and “ecosystems” needs to be elaborated. The definition also lacks clarity on the adopted definition for “health” and whether this differs for people, animals, environments, and ecosystems. Furthermore, important philosophical elements remain unclear, namely:

- “integrated” and “unifying”
- “balanced” and “optimised”
- “closely linked” and “interdependent”

By shedding light on these elements, we intend to enhance the acceptability, impact and operability of the definition, and ensure sustainability.

Shifting the focus from anthropocentrism

We begin with a philosophical grounding that also reflects the expertise of the working group that wrote this report. Our approach can be contrasted with traditional approaches to studying and promoting health, in which humans have a central and independent role. In medicine, including veterinary medicine, the health of a patient has been considered in isolation from the health and wellbeing of other living organisms, and a dichotomy between a human or non-human animal organism and the environment is implicit. Public health has maintained this anthropocentric focus, despite broadening the scope of the analysis from an individual organism to group and population levels. Epistemologically, our approach differs by positing that the conditions for the health of a living being cannot be properly analysed and understood without considering the health and wellbeing of other living beings and the ecosystems they constitute (e.g. Friedman, 2022; Zinsstag, Schelling, Waltner-Toews, & Tanner, 2011). Ontologically, our approach questions the assumption that the health of an organism is independent of the health of other beings and the proper functioning of the ecosystem.

This is consistent with general, historical One Health principles that human health requires a holistic approach, and that by taking a comprehensive view, encompassing the health and wellbeing of all living organisms and their habitats, we can better understand and address the complex interactions that contribute to overall ecosystem health and therefore to human wellbeing. But because this is an unconventional way of understanding the world and our existing terms encourage more conventional

thinking about entities instead of wholes or relationships, we are taking this opportunity to be precise about our concepts and clarify some of the ambiguities implicit in the way One Health is often discussed. We recognise that epistemology (how things are known) and ontology (what things are) are inextricable and co-constituted, and therefore how we describe and frame the problem is of great importance.

“Ecosystem” and “environment”

By “ecosystem”, we mean a holistic system comprising living and non-living entities that are both interconnected and interdependent. Humans and non-human animals are part of ecosystems. Ecosystems are plural and localised, but also interconnected with, and interdependent on, each other, so that our planet can also be described as an ecosystem. We use “ecology” to describe the practice of producing and organising knowledge about ecosystems. A related conceptual term is “social-ecological systems” (SES), which explicitly includes human actors in a systemic interaction with environments (or what are sometimes called “natural resources”) within ecosystems (McGinnis & Ostrom, 2014).

By “environment”, we mean what is part of an ecosystem but not a human or non-human animal. A non-exhaustive list would include plants, microbes, fungi, soil, waterways, the atmosphere, manufactured materials and chemicals, and the climate.¹² Where possible, we avoid the term “environment”, as it perpetuates the idea that an organism (or sometimes a species) is the ‘figure’ on an environmental ‘background’ or surrounded by an environmental ‘context’, that the environment is a place instead of an entity or collective of entities in its own right.¹³ By contrast, an ecological view emphasises complex connections and dependencies between multiple living and non-living entities. We also avoid the term “environmental health”, as this refers to a specific, established field within public health dealing with aspects of human health, including quality of life, determined by physical, chemical, biological, social and psychosocial factors in the environment. This is another reason we emphasise ecosystems rather than environments, although we do refer to “health of environments” when necessary.

It is important to note that our definitions of “ecosystem” and “environment” are not necessarily implied in the OHHLEP definition of One Health, which lists “ecosystems” as a third element after humans and animals, which could be read as suggesting that humans and animals are not part of

¹² There is inherent and inevitable imprecision in such a list because we can’t separate some of these aspects (e.g. microbes living on/in animals, chemicals being part of materials) but naming them notes that the conversations being had about these entities are relevant to One Health ‘environment’.

¹³ We also avoid the term “nature” for similar reasons: it usually implies places and processes that are separated out from human activity, and this is an untenable premise given the ubiquity of human influence and the ways non-humans are present and influential even in densely populated urban areas.

ecosystems (OHHLEP et al, 2022). The OHHLEP definition also mentions ecosystems as “included in” wider environments, whereas “ecosystem” is the more inclusive term, as we define it. These are not contradictions but points where clarity is needed.

Divergence among disciplines on the use of these terms makes consensus complicated. In particular, the concept of “environment” is inconsistently defined and operationalised (e.g. Canali & Leonelli, 2022; Fábregas-Tejeda, 2024; Malsch, Killin, & Kaiser, 2024). There are also many ambiguities in the use of “environment” which we wish to avoid. For example, humans and other animals are “environments” for microbial life (microbiome One Health is a burgeoning field) (Tomasulo, Simionati, & Facchin, 2024). Also, we can speak about “social environments” to describe the way infrastructures, institutions, and interactions with other humans condition a given person’s experience and possibilities for action. Indeed, sometimes “environment” is used *because* of its ambiguity. We also sometimes see modifications to the term “ecosystem”, such as “anthropo-ecosystem” or “socio-ecosystem”.

In the final analysis, “ecosystem” is more scientifically accurate than “environment”, and this is of key importance. Although “environment” is the more common term, policymakers will already be familiar with “ecosystem”, not least as it features in the OHHLEP definition.

For pragmatic reasons, there are circumstances where it nevertheless makes sense to use “environment” (or “nature”) instead of “ecosystem”, while recognising that they are not ideal terms. “Environment” is used in other chapters of this report, for instance, reflecting the fact that existing governance structures separate human and veterinary health (whereby “environment” becomes the residual of the whole ecosystem). Entities like human-made structures and geological features are more readily understood as “environments” since they are places, even though they might well be part of ecosystems: consider how chemicals in manufactured homes and furnishings can cause human and animal illness, or the different microclimates encountered as one climbs a mountain, which allow different plants and animals to thrive and fulfil roles in food chains. As noted above, we navigate between speaking carefully for precise thought, and speaking pragmatically in familiar language to communicate and persuade – and indeed, this navigation is necessary to implement One Health.

The underlying One Health philosophy and movement away from anthropocentrism means that we try to use the expansive concept of “ecosystem” when possible, instead of the common ‘three components’ framing. This emphasises the complex web of relationships that exist between different kinds of living and non-living entities. It encourages a more holistic approach to understanding and managing ecosystems, and by extension the components of, or contributing factors within, ecosystems (including humans). We take inspiration from transhumanist and posthumanist philosophy, and more radical framings; these include that of biologist and feminist science studies

scholar, Donna Haraway, whose philosophy of what the world is and how it can be known emphasises sympoiesis (becoming together); her creative terminology includes “humusities” instead of “humanities,” to emphasise how humans are part of the earth, the humus, the cycles of compost and constant collaboration with the “more-than-human” (Haraway, 2016). We emphasise that such an “ecosystem philosophy” is original to many Indigenous perspectives around the world, and that going forward, One Health theory will benefit enormously from sustained and receptive conversations with Indigenous communities.

What do we mean by “health”?

Defining One Health calls for a secondary definition of “health” itself, allowing us to be clear about the ends, and not just the process by which we hope to achieve them. Although we cannot devote much space to this important issue, we work from the World Health Organization definition of health as a state of complete physical, mental, social, emotional and spiritual wellbeing, not merely the absence of disease or infirmity. This definition is included in the Sundsvall statement on supportive environments for Health (Buse et al, 2023; WHO, 1991). We interpret this definition as consistent across humans, non-human animals, and ecosystems, while also recognising that different beings’ health may sometimes conflict. (The Sociocultural considerations section below includes a discussion of health as a ‘right’ for these different categories.) Mindful of this, we emphasise that a systems approach is necessary to manage the complexities. We also note that this definition is Western-centric, and in the ethics section elaborate on the need for integrating low- and middle-income countries and Indigenous perspectives in defining and operationalising health.

“Integrated” and “unifying”

The way we have defined “ecosystem” emphasises unification – that is, wholeness – instead of the integration of essentially separate entities. However, we also recognise that it makes pragmatic sense to identify components of the whole and work to integrate them in the way they are studied and managed, given the legacies of having separated humans, animals, and environments in science, policy, infrastructure, and so on.

In terms of implementation, ambiguity is possible between integrating and unifying activities versus outcomes. As discussed below with regards to transdisciplinarity, we think both are important. As with the philosophical framing of ecosystems, it will make pragmatic sense to work towards unification by first practising integration.

“Balanced” and “optimised”

The way we have defined “ecosystem” moves One Health away from the presumption of humans at the top of a pyramid of importance. This is key to operationalising One Health and contrasts with approaches to date. Ideally, resources would be more equally distributed among initiatives and institutions for the health of humans, animals, and environments. For example, the environment has been called “the neglected component” of the triad and consequently described as a “threat multiplier” (Essack, 2018). However, we recognise that an ecosystem has many components (more than three) which are not separable and should not necessarily be considered equal in order to achieve a more holistic, dynamic version of balance; this is a complex issue for future attention.

In general, we understand “optimisation” to mean the most efficient route to the best possible (ecosystemic) health. At present, optimisation is closely linked with a capitalist growth economy, which is at odds with One Health, as we discuss more below. Yet we recognise the short-term importance of framing things in this way and seeking optimisation in the shape of “incremental benefits” meaning added value through more economically and logistically efficient ways of safeguarding and promoting health (i.e. cost minimisation).

“Closely linked” and “interdependent”

Close linkage, which we call “interconnection” for simplicity, is a way of integrating entities presumed to be distinct. Interconnection implies causal interaction (for instance, that plants/phytopathology and the related use of pesticides may result in biodiversity loss, in turn favouring the emergence of animal and human disease). “Interdependence” is more extreme because it implies that humans, animals, plants, microbes, soil, climates and so on, are not separable and have a closer relationship of mutual constitution (for example, an animal and its microbiome). We understand these two concepts as existing on a spectrum. The way we define and understand an “ecosystem” includes both, though it is more fundamentally aligned with interdependence.¹⁴

Interconnection “entails that the universe is organised into discrete units, which interact with one another and, consequently... affirms a particular ontology of the individual as internally structured and autonomously motivated” (Beever & Morar, 2019). The ontology of the individual is deeply embedded in conventional ways of approaching health. Our view of an ecosystem is more aligned with process philosophy, which speaks about the biological world as a web of mutual dependencies and “an ecological view of reality” as a “highly integrated and dynamic pattern of interdependent events”

¹⁴ Friedman 2022 offers a model encompassing both interconnection and interdependence, which they posit as existing on different scales: while the relation between, e.g. a human/wild boar and its microbes is dynamic (interdependent), the relation between a human/wild boar *population* and a forest is interactive (interconnected).

(Barbour, 1997). Such interdependence, however, could have some radical ethical implications: for example, Sironi and colleagues argue that it implies ecological egalitarianism, “that we should not give precedence to any element of the natural world”, including humans (Sironi, Inglese, & Lavazza, 2022). This is in line with the ultimate goals of unifying, balancing, and optimising, but may be difficult to put into practice as it conflicts with conventional anthropocentric ethical beliefs (public perception is often weighted towards human considerations) and current infrastructures.

Interconnection has been called “a prudential approach” (Sironi et al, 2022) or a “moderate approach” (Beever & Morar, 2019), while interdependence has been called “a radical approach” (Sironi et al, 2022) and “a strong approach” (Beever & Morar, 2019). We recognise that sometimes it will be more realistic to emphasise interconnection rather than interdependence and we claim the ability to move between these moderate and strong approaches as needed to interact pragmatically with different stakeholders and move towards an ecological paradigm.¹⁵ This prudent approach is currently necessary given the lack of institutions designed around interdependence; we anticipate that this situation will gradually shift as One Health, in the way we define it here, is implemented.

Issues to consider

The next three sections elaborate issues we identified in the OHHLEP Key Underlying Principles. The principles enumerated by OHHLEP include:

- **equity** between sectors and disciplines
- sociopolitical and multicultural **parity** (the doctrine that all people are equal and deserve equal rights and opportunities) and inclusion and engagement of communities and marginalised voices
- socio-ecological **equilibrium** that seeks a harmonious balance between human– animal– environment interaction and acknowledging the importance of biodiversity, access to sufficient natural space and resources, and the intrinsic value of all living things within the ecosystem
- **stewardship** and the responsibility of humans to change behaviour and adopt sustainable solutions that recognise the importance of animal welfare and the integrity of the whole ecosystem, thus securing the wellbeing of current and future generations

¹⁵ We note that the language around this philosophical distinction is inconsistent throughout the literature and across disciplines. For example, describing “inextricable linkages” as part of “ecosystem approaches to health” implies both separation and unity, both interconnection and interdependence (Rapport et al 1998, 1999).

- **transdisciplinarity** and multisectoral collaboration, which includes all relevant disciplines, both modern and traditional forms of knowledge and a broad representative array of perspectives

We do not address these principles one by one but consider three overarching issues. They are:

- the need to move towards **interdisciplinary and transdisciplinary** collaboration in research, policy, and implementation (per principles 1 and 5)
- the importance of **sociocultural considerations**
- the importance of **economic considerations** (per points 2, 3, and 4)

We discuss these issues below.

Interdisciplinary and transdisciplinary collaboration

To put the principles laid out here into practice, to understand how health and disease arise in a dynamic system in which organisms and their environments are interdependent, requires interdisciplinarity and transdisciplinarity in research, policy, and implementation (e.g. Zinsstag et al, 2011; 2023). Indeed, the working group preparing this current report itself serves as an example of interdisciplinary collaboration, bringing together experts from diverse fields to address health issues in a comprehensive way. By integrating perspectives from human medicine and veterinary medicine, from agricultural, pharmaceutical, and social sciences, and from the humanities, a more holistic understanding of complex health challenges can be achieved.

Interdisciplinary collaboration needs to transcend European institutions, paying attention to and learning from colleagues developing One Health strategies, particularly in low- and middle-income countries where less infrastructural development and stability means both greater risk of health emergencies (like zoonoses) and greater innovation in finding solutions that do not repeat the anthropocentric issues in European development. Challenges such as the need to develop a shared language, and differing opinions on the relative value of quantitative and qualitative research, will need to be overcome.

By “transdisciplinarity”, we mean working closely with non-academics. Ideally, research teams need to include practical ‘local’ expertise and those specialised in liaising with and learning from non-academics, including community health workers, anthropologists, and participatory research experts (Zinsstag, Hediger, et al, 2022). Collaborative, inclusive, and transdisciplinary approaches are maximally effective at addressing the interconnected health challenges faced by diverse communities and sectors. One sector alone cannot solve the problems arising from cultures (or subcultures) in different sectors (see, for example, the dilemma of animal agriculture, highlighted in the Ethical considerations discussion below).

Consideration must be given to barriers to, and enablers of, transdisciplinarity. There may be implementation challenges at an institutional level or conflicts of cultural values, while enablers may include equity by design across sectors in how problems are approached, or consideration of what equitable outcomes would look like. We must avoid using a deficit model in working with non-academic groups, in which 'recipients' of knowledge are characterised as ignorant or lacking in some way. Indeed, underrepresented knowledges, such as those of children or animals, can help us sidestep tensions within existing power structures (Rautio et al, 2022).

To make use of transdisciplinary insights, we must address questions of scaling. Sustainable environmental management works well in small scale communities; how can it be done at the EU level? There are large-scale problems of (inter)cultural change, such as how to remediate damage and reduce consumption. Given the need for cooperation not only across human, animal, and ecological sciences but also among various sectors and regions, we must develop collaborative strategies that transcend disciplinary and geographical boundaries: see, for example, work on "systems for health" and "health in all policies" (Buse et al, 2023).

Thinking in terms of One Health systems can help recruit and integrate the necessarily diverse range of participants in a transdisciplinary initiative (Ferrinho, Daniel-Ribeiro, Ferrinho, & Fronteira, 2023). Involving citizens in these initiatives can enhance community engagement and empower individuals to contribute to decision-making processes related to health and environmental issues. Citizen participation can bring valuable perspectives, local knowledge and priorities to the table, ensuring that initiatives respond to the needs and concerns of communities (Hitziger et al, 2021). Collaboration works best when attention is paid to integrating both activities (such as citizen science initiatives for monitoring and identifying local concerns or working with usually marginalised communities in a vaccination roll-out) and outcomes (such as generating new datasets for health research or seeing a measurable decrease in disease incidence).

Transdisciplinary collaboration is recognised by the Organisation for Economic Cooperation and Development (OECD, 2020), yet there is a lack of institutions designed around inter- and transdisciplinary collaboration. This situation will be gradually improved over the process of implementing One Health. Because of this, we do not consider it necessary that a contribution be collaborative for it to be considered part of One Health (for example, a research team of life scientists focused on a zoonotic virus) – but we do consider it necessary that such contributors apply effort towards becoming collaborative (such as bringing on a staff member for outreach and applying for multidisciplinary grants), in line with a pragmatic approach to a non-ideal situation.

Sociocultural considerations

To date, One Health interventions have often centred on the management of infectious disease. For One Health to be comprehensive and achieve its aims, the focus must expand to include chronic and social pathologies. This supports what some call a “triple burden” perspective that encompasses communicable disease, non-communicable disease, and injuries (Karn & Sharma, 2021), while going beyond it towards wellbeing. Equity is key in this endeavour, with particular attention to gender and youth; women bear the greater burden of disease in many cases (Patwardhan et al, 2024; Taylor, 2024) and are much more likely than men to have to care for those in poor health (Eurocarers, 2021; Seedat & Rondon, 2021). Intergenerational equity, meanwhile, is visible in the imperative to ensure not only a liveable but a healthy planet for young people and future generations.

Social pathologies, like malnutrition, violence, adverse childhood experiences, and neglect, as well as their positive corollaries, such as healthy ageing and community resilience, are human health concepts that could benefit from, and perhaps be transformed by, a One Health approach. Violence, for example, can encompass harms done not only between and among humans but to animals and ecosystems, as with factory farming and forest fires caused or made more damaging by human activity. Similarly, awareness of mental health impacts is increasing, notably in the wake of COVID-19. Engagement with ‘nature’ and animals is highly beneficial for mental health, and among those living in or affected by degraded ecosystems, negative physical and mental health impacts exacerbate each other. These expansive concerns are aspects to consider in developing and implementing a One Health approach, and allow us to link the EU health, sustainability, and security agendas, as described in Chapter 2. This wider perspective will also promote equity and address health disparities across human populations, as well as among species.

Towards this end, One Health requires us not only to consider the tacit and traditional knowledge of people beyond governments, academic research and even European settings, but to prioritise it in order to rectify the longstanding devaluation and exclusion of such knowledge. Often, these groups understand ecological interdependence in intimate, surprising and valuable ways (Coté, 2019). Much can be learned by thinking outside the typical boxes.

Ethical considerations

Engaging with sociocultural issues begs for a discussion of ethics which can be challenging given One Health’s potentially radical and transformative aspects. One Health invites expanding the moral circle (Coghlan, Coghlan, Capon, & Singer, 2021). Most readily, this extends ethical concern to animals, and there have recently been robust exchanges about One Health dilemmas like animal agriculture (e.g. Zinsstag et al, 2022). However, there have also been calls for further work on a more rigorous

framework; this would not merely assimilate the problematic balancing of interests found in rights-based discourse of public health ethics, but account for the inevitable conflicts that arise between diverse interests and obligations owed to all who share the burden of disease and participate in the creation of ecological health, introducing justice into the conversation (Lysaght et al, 2017). Combating zoonoses, addressing food insecurity, and many other situations in which the One Health approach is applied often entail conflicts not only between the interests of different stakeholders (e.g. public health institutions and farmers), but also between values.

In line with the transdisciplinarity discussed above, this problem requires engagement not only with academic work on ethics and justice but, most importantly, with social movements and practical theorisations of social justice: environmental justice (e.g. Gay-Antaki, 2023; Hoover, 2017; Nixon, 2011; Zinsstag et al, 2023), environmental reproductive justice (e.g. Dow & Chaparro-Buitrago, 2023; LaDuke, 1999; Sasser, 2018), and epistemic justice (e.g. Almassi, 2018; Iengo, 2022). The people at the forefront of this work are often Indigenous communities, disadvantaged communities, those experiencing disabilities or neurodivergence, and Black, Brown, and ethnically and geographically minoritised peoples – in short, the majority of the world's population and those who suffer disproportionately from injustices. Crucially, ethical reasoning and addressing 'vulnerabilities' should not be done out of context, in a top-down or universalising way (Ford et al, 2024) – rather, the complex ethical issues raised by One Health need to be addressed in partnership with, and perhaps led by, marginalised groups. One Health is well placed in this respect due to its practice of engaging with local communities. Existing frameworks for integrating diverse perspectives could be usefully adopted; for example, the concept of 'Two-Eyed Seeing' (Wright, Gabel, Ballantyne, Jack, & Wahoush, 2019). Additionally, such collaboration requires both a priori informed consent and a nuanced view of epistemological ethics, including who owns knowledge and how downstream benefits are distributed (Galasso, 2024; Reardon & TallBear, 2012).

Given that ethical judgments must be context dependent, One Health ethics will need to develop ways to negotiate consensus between diverging norms and strategies for livelihood, animal welfare, ecosystem protection and health of all species (MacKillop, Connell, Downe, & Durrant, 2023).

To convey the complexity of the ethical issues at stake, the following case study illustrates increasingly profound challenges to anthropocentric ethics through the lens of human relations with our food animals, demonstrating how new positions can emerge which are themselves in conflict.

Box 2: Complex issues in One Health ethics: example of animal agriculture

Within conventional animal agriculture, a dilemma often framed as 'balancing interests' arises from the practice of culling animals in danger of being infected in zoonotic outbreaks (e.g. Lysaght et al,

2017; Sironi et al, 2022); this also applies in wildlife management (Warwick, Hugh, 2024). Although it is a common method to prevent the spread of infectious pathogens, culling raises questions about how human safety should be balanced with animal welfare (Harris et al, 2010; Lederman, Magalhães-Sant'Ana, & Voo, 2021).

The justification of this and other measures to prevent diseases depends on normative assumptions: from a traditional anthropocentric position, such a strategy can be ethically justified. However, our position is that such anthropocentrism needs to be questioned. In the ethical framework of One Health, non-human beings and our environments (indeed, socio-ecological systems at large) have more than an instrumental value and harm to them has ethical bearing (e.g. Coghlan et al, 2021; Lysaght et al, 2017). For example, rights could be extended to animals (Stucki, 2023). This leads to a more comprehensive critique: the case for abolishing animal agriculture entirely, which can be defended on both animal rights and environmental grounds, and indeed has been articulated within a One Health approach (Zinsstag, Bonfoh, et al, 2022).

However, normative positions either prioritising humans or elevating the status of animals cannot be posited by philosophical ethics alone. They must be submitted to societal scrutiny in a given context. Socio-ecological systems, and therefore social-ecological normative frameworks, are contextual, and in many cases, constitute their governance themselves (Ostrom, 2009, 2015; Popken, Griffin, Coté, & Angel, 2023). Imposing an external framework may be inappropriate, and indeed might compromise the opportunity to learn from alternative ethical arrangements.

For example, abolishing animal agriculture is an out-of-context argument when it comes to Indigenous foodways. Consider the North American example of the Suquamish people's relationship with salmon-fishing and whale-hunting, which is based on interdependence (Coté, 2019, 2022). Encouraging vegetarianism or veganism can have neo-colonial overtones, enforcing ethical norms where they may not belong, promoting food hegemony instead of supporting food sovereignty. Different ways to consider ethical/moral relations and behaviour towards animals may be overlooked, for instance, the view that "leaving them alone" is abandonment, not autonomy and respect (Coté, 2019, 2022).

While the language of rights is useful to recognise oppressions and articulate what individual flourishing should look like, we hesitate to rely on it to frame the sociocultural aspects of One Health ethics. This is because it evolved from an individualising epistemology and ontology also called, and is difficult to practically integrate with a recognition of interdependence among humans and other entities, in which rights conflict with each other and responsibilities must be equally central (a focus on relationships instead of rights) (LaDuke, 1999).

There have been efforts to establish legal protections for animals and to advocate for the rights of nature, including recent documents from the European Court of Human Rights on climate protection and the right to a clean environment. One Rights has been developed as a complementary approach to One Health (Stucki, 2023) and a legal framework for 'One Health: the human-animal relationship' has been proposed, based on the analysis of existing European laws (Wettlaufer, Hafner, Zinsstag, & Farnese, 2021). In certain contexts, such as legal dealings and advocacy initiatives, this language can prove pragmatic and effective.

We do not offer a solution to these complex issues here; rather, we note that they will continue to be a pressing part of addressing health challenges from a One Health perspective.

Economic considerations

Currently, what it means to "optimise" and "operationalise" something is inherently capitalist (Szocik, 2024). However, economic growth is often at odds with healthy ecosystems (Almassi, 2018; Asdal et al, 2023; Raworth, 2017; Stuart, Gunderson, & Petersen, 2020). In our view, a (de)growth or wellbeing economy is integral to a One Health approach. Furthermore, we must operate from the premise that health is an asset and not a cost.

"Sustainability" is an imprecise term that encompasses health paradoxes (Richie, 2023); it can rely more on a vision of a future than attention to "sustainable" practices in the present, which are often in service of capitalist goals (Greenberg, 2013; Pergetti, 2023). But as with Planetary Health work, we use the term "sustainability", alongside advocating for a degrowth economy, to emphasise the extent to which the current economic model will soon outstrip the planetary resources needed to sustain not only the economy but life as we know it (Wanyenze et al, 2023). To ignore the risk of a failing planetary ecosystem and focus only on other health and wellbeing considerations is short-sighted. Those implementing a One Health approach should be aware of the fundamental tension between a growth economy and a wellbeing economy, but as stated above it is necessary to clearly articulate a goal and vision, and then take pragmatic steps in present contexts.

In the short term, successful operationalisation of One Health can be shown by incremental benefits in both economic and social indicators, including saving governance actors and institutions money, but also non-monetary gains, enabling a move towards a wellbeing economy based on the principle of interdependence. As has been robustly demonstrated, and as we explore in the remaining chapters, there is added value from close cooperation instead of working on health in separate corners. This allows for resources to be combined and reduces the need to spend time and money 'translating' or 'disseminating' across groups. The literal return on investments deriving from cooperation has been demonstrated using game theoretical methodology (Bucher et al, 2023; Zinsstag et al, 2024), as

described in Chapter 3. Furthermore, despite healthcare being a common good, insufficient public resources have led to a growing role for the private sector, adding to the utility of demonstrating incremental economic benefits.

The case studies in [Chapter 4] provide examples of changes that have yielded undoubted economic, social, and ecological gains from the One Health approach. For instance, the coordination of mass vaccination of dogs between all African countries can lead to the elimination of rabies and almost \$10 billion in additional welfare gains for the continent in comparison to restricting interventions to human post-exposure prophylaxis (Bucher et al, 2023). We advocate for our pragmatic approach to making use of existing infrastructures and incentives to gradually effect a paradigm shift.

Synergies with other terms

As presented in Why we need a definition of One Health, other terms have developed before and circulated alongside One Health to describe similar approaches. More generally, discussions about food systems and a sustainable environment are also adjacent to One Health's approach and goals. We see these not as competing, but synergistic and complementary. Attempts have been made to identify similarities, for example with 'sustainable health' (Wanyenze et al, 2023) and 'global and planetary health' (Correia et al, 2021). Complementary operationalising theories have developed, such as 'One Health Systems', which aims to avoid blind spots in the approaches adopted by acknowledging 'building blocks' (Ferrinho et al, 2023). The One Health literature tends to focus on certain building blocks (e.g. information, surveillance, intelligence, governance, etc.) and neglect others (e.g. human resources).

Given that planetary health (also called 'One Planet' and 'Healthy Planet') has attracted recent attention and investment, more must be said about synergies with this approach. Planetary Health discourses tend to prioritise and start from human health (Zinsstag et al, 2023) which is counter to our emphasis on moving away from anthropocentrism and towards interdependence. The report of the Rockefeller Foundation-Lancet Commission for Planetary Health states that "Put simply, planetary health is the health of *human civilisation* and the state of the natural systems on which it depends" (Whitmee et al, 2015, italics added). Although oriented towards a somewhat different audience (one that often features physicians), common ground may exist between the planetary health paradigm and One Health, given our earlier explanation that the planet can be considered an ecosystem.

Planetary Health uses key performance indicators to measure where human existence itself is called into question based on exceeding planetary boundaries. We hope to integrate and shift this view on planetary resources – which describe the planet's basic habitability for humans – into an expansive,

non-anthropocentric definition of health which recognises that the planetary ecosystem as a whole is both essential for human health and wellbeing but of value in its own right. In a sign that such an expansion is already taking place, social justice was recently incorporated into Planetary Health definitions, a promising move that nonetheless urges us to think carefully about the potentially totalitarian implications of operationalising health at the planetary level (S. Roth & Valentinov, 2023).

We want to be careful not to trivialise the issues at stake by becoming stuck in terminological differences. Rather, we acknowledge these other terms as instances of similarly concerned parties pulling on the same rope from a slightly different direction. As noted above, One Health approaches should be tailored to the relevant audience in order to maximise receptivity and effectiveness.

Conclusion

One Health is a powerful, paradigm-shifting approach that promises not only to improve health but solve the most pressing issues of our time. But to realise its potential, we must take pragmatic steps from within imperfect systems. This chapter has set out the all-encompassing scope of One Health, articulated clear definitions of the terms we use and their theoretical implications, and argued for flexibility in the approach so we can achieve the potential of One Health in efficient and collaborative ways.

We note that One Health ethics will require further consideration in the future, given its paradigm-shifting character. We also accept that each EU member state will have its particular context and constraints, and need to independently find solutions, yet the European Commission will nevertheless play a key role in coordinating efforts and regulations among countries.

With all the above under consideration, we propose to follow and work from this adaptation of the OHHLEP 2022 definition:

One Health is an integrated, unifying approach that aims to sustainably balance and optimise the health of ~~people, animals, and~~ ecosystems. It recognises the health of humans, domestic and wild animals, ~~plants,~~ and the ~~wider~~ environment are closely linked and interdependent.

The OHHLEP definition, which is quite general, has found consensus in many existing documents, yet struggles to hold up to practical analysis. We hope our analytical clarifications assist it in being relevant and useful in practice. The OHHLEP definition paper calls for mobilising “multiple sectors, disciplines, and communities at varying levels of society to work together to foster wellbeing and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, taking action on climate change and contributing to sustainable development”

One Health definition in the EU context

(OHHLEP et al, 2022). To describe how we might actually do so, the remainder of this evidence review report focuses on practical implementation.

EU policies benefiting from a One Health approach

Summary

This chapter seeks to identify EU policies that may benefit most from a One Health approach, based on a literature search and desktop review of institutions, agencies, and networks. We set out the policy landscape at international, European and member state level, clarifying One Health institutions, mapping stakeholders, and describing legislation, policies, guidelines and action plans. The importance of knowledge-brokering organisations and Europe as a centre of One Health partnerships and networks emerge as significant findings. We then assess EU policies according to their degree of alignment with key characteristics of the OHHLEP definition (OHHLEP et al, 2022), identifying those that could benefit from a greater One Health emphasis, such as the Farm to Fork Strategy, Crisis Preparedness, and the EU Biodiversity Strategy. Next, we explore the benefits and constraints of different financing options for the One Health approach, including public, EU, private, third sector and philanthropic funding. A review of strengths, weaknesses, opportunities and threats (SWOT analysis) in relation to the One Health governance in Europe is presented, emphasising the importance of transdisciplinary collaboration. We close with policy options for improving One Health governance in Europe and beyond, such as establishing databases and repositories of One Health Networks worldwide; developing context-specific approaches to achieving intersectoral collaboration, significant resource and political cooperation; agreeing an overarching conceptual framework for how current and future One Health tools could be categorised to strengthen One Health systems at the national level; and educating One Health practitioners on knowledge integration.

Our key findings are as follows:

- Europe is a centre of gravity for the development of One Health governance, partnerships and networks. Coordination between local, regional, and national governments and EU and intergovernmental institutions is essential and depends on strong leadership, political, institutional and financial will.
- One Health governance is complex and requires intersectoral and multisectoral approaches to address the potential for overlapping regulation across human, animal, and environmental health sectors. In the EU, policies such as Farm to Fork, the Crisis Preparedness legislation, and the EU Biodiversity Strategy, among others, could benefit from a greater emphasis on a One Health approach.

- Litigation on the basis of the right to One Health (and specifically a healthy environment) may be a game-changer in the future, offering new opportunities for access to justice and to protect against gaps in existing legislation (see ECtHR Verein KlimaSeniorinnen v. Switzerland, 2024). Furthermore, there is potential for One Health (“earth”) jurisprudence, which recognises that legal frameworks need to extend beyond Western legal ideals to embed diverse cultural, Indigenous and philosophical perspectives. This may offer an alternative to traditionally anthropocentric legal frameworks, extending legal rights to natural, non-human and even non-sentient entities such as rivers. Attention will need to be paid to balancing these rights of human, animal, and non-sentient beings.
- One Health knowledge-brokering agencies or “boundary organisations” may improve transboundary knowledge mobilisation and collaboration (see the European Observatory on Health Systems and Policies¹⁶ as a model). A cross-agency One Health taskforce has been convened by the EU agencies to discern how best to work together to move transdisciplinary research and scientific advice on One Health issues forward. The influence and agency of these agencies depends on political, financial, and institutional will for knowledge to be mobilised across sectors. Knowledge-brokering skills can be acquired experientially, but there are also formal and informal training programmes and exemplars of science-policy organisations within Europe (see ECVPH,¹⁷ EPIC Scotland,¹⁸ Una Europa,¹⁹ and UNITAR²⁰) that offer opportunities for individuals to undertake research, training and experience in knowledge-brokering for One Health.

Future options to improve One Health governance include:

- agree an overarching One Health conceptual framework
- develop formal monitoring and evaluation systems for One Health, supported by standardised metrics
- provide access to training and education on transdisciplinary approaches
- invest in an online One Health database and repository
- launch stakeholder collaboration platforms, and encourage context-specific intersectoral collaboration
- develop flexible funding for One Health interventions
- capitalise on One Health ‘leverage points’

¹⁶ <https://eurohealthobservatory.who.int/>

¹⁷ <https://ecvph.org/>

¹⁸ <https://epicscotland.org/>

¹⁹ <https://www.una-europa.eu/>

²⁰ <https://www.unitar.org/>

Approach

A literature search was conducted for relevant policies at an EU-level using EUR-LEX, the EU's main database for legislative information. That search, carried out using the term "One Health", returned 569 documents, of which 45 were legal acts, 26 were Resolutions of the European Parliament, six were conclusions from the Council of the European Union, six were international agreements and 13 included "One Health" in the title.

We undertook a separate desktop review of institutions, agencies, and networks to identify relevant legislation, policy, and guidelines as well as other stakeholder networks, organisations, and individuals and their links to EU legislation or policy. We started with intergovernmental agencies, European Commission Directorates-General for Health, Environment, Climate Change and Energy, and EU decentralised agencies. That search returned eight intergovernmental organisations, three Directorates-General within the European Commission (focusing on health, environment and climate), seven decentralised EU agencies, two knowledge-brokering organisations/working groups, and 12 partnerships, committees or networks from public, private, or third sector. A number of these networks included extensive lists of networks of networks, some with time-sensitive lifespans, so this should not be considered a comprehensive list. The full review methods and search strategies are available in Annex 4 and Annex 5.

The international One Health policy landscape

The table printed on the foldout page overleaf summarises intergovernmental stakeholders in One Health.

| Intergovernmental stakeholders | Sectors involved | Roles and Responsibilities | Examples of relevant legislation, policy, guidelines and action plans |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| United Nations member states | <ul style="list-style-type: none"> 193 member states | Diplomatic and political organisation to maintain peace and security | <ul style="list-style-type: none"> Universal Declaration of Human Rights International Covenant on Economic, Social and Cultural Rights United Nations Declaration on the Rights of Indigenous Peoples Transforming our world: the 2030 Agenda for Sustainable Development — the outcome document of the United Nations summit for the adoption of the post-2015 development agenda. The Global Action Plan for Healthy Lives and Wellbeing for All falls under SDG 3 Health and Well-being; UN Department of Economic and Social Affairs (DESA) in their 2023 “Study on SDG Accelerators: Observations and Insights from SDG Acceleration Actions Platform” report or the WHO 2024 Progress report on the Global Action Plan for Healthy Lives and Well-being for All Paris Agreement Sendai Framework for Disaster Risk Reduction 2015-2030- mentions the prevention and reduction of new and existing disaster risk through the implementation of integrated [...] health, environmental, [...] measures Political declaration of the high-level meeting on universal health coverage Convention on Biological Diversity- reference to human health and its relationship to ecosystems Convention to Combat Desertification- focus on environmental and eco-health Convention on International Trade of Endangered Species of Wild Flora and Fauna Political declaration of the high-level political forum on sustainable development convened under the auspices of the General Assembly |
| World Trade Organisation (Geneva, Switzerland) | | Regulation of international trade between nations | <ul style="list-style-type: none"> Uruguay Round Agreements Marrakesh Declaration Agreement on Agriculture – long-term reform of agricultural trade and domestic policies Sanitary Phytosanitary Measures- Discusses the desire to improve the human health, animal health and phytosanitary situation in all members but no explicit mention of One Health |
| Organisation for Economic Cooperation and Development (Paris, France) (observer to UN) | <ul style="list-style-type: none"> 38 member countries (majority of these are considered high income) Human health (non-communicable diseases) and health inequalities Environmental challenge health systems AMR | International standards and solutions to economic, social and environmental challenges | <ul style="list-style-type: none"> Convention on the Organisation for Economic Co-operation and Development Embracing a One Health Framework to Fight Antimicrobial Resistance |
| World Health Organisation (Geneva, Switzerland) | <ul style="list-style-type: none"> Human health | Promote health, healthier lives and universal health coverage; respond to emergencies | <ul style="list-style-type: none"> Convention on the Organisation for Economic Co-operation and Development Embracing a One Health Framework to Fight Antimicrobial Resistance International Health Regulations and related Monitoring and Evaluation Frameworks National Action Planning for Health Security Joint external evaluations Pandemic Treaty Intergovernmental Negotiating Body to draft and negotiate a WHO convention, agreement or other international instrument on pandemic prevention, preparedness and response States Parties Self-Assessment Annual Report National Planning/Capacity Strengthening The latter includes One Health Operational Tools including a One Health Joint Risk Assessment (JRA-OT) Other One Health capabilities including: Multisectoral, One Health, Coordination Mechanism Operational Tool (MCM OT) , One Health Surveillance and Information Sharing Operational Tool (SIS OT), Workforce Development Operation Tool (WFD OT), Response Preparedness (REPREP) (forthcoming) and Monitoring and Evaluation Operation Tool (ME-OT) are all forthcoming. |
| World Organisation for Animal Health (Paris, France) <ul style="list-style-type: none"> 6 technical regional offices including WHO Europe | <ul style="list-style-type: none"> Animal health | Animal health information; international standards for trade of animal and animal standards; prevention and response to animal diseases | <ul style="list-style-type: none"> Self-declaration of disease status through the Terrestrial Animal Health Code and Aquatic Animal Health Code which reference the importance of a One Health approach PVS Pathway for sustainable improvement of national veterinary services and aquatic animal health services recommends solutions for member countries |
| Food and Agriculture Organisation of the United Nations (Rome, Italy) | <ul style="list-style-type: none"> Animal production and health Forestry Agriculture Fisheries | Food security, increase agricultural productivity, and sustainable livelihoods | <ul style="list-style-type: none"> Codex Alimentarius to protect health and facilitate trade- adopted by the Codex Alimentarius Commission which is the central part of the Joint FAO/WHO Food Standards Programme . Includes reference to animal feed, AMR, contaminants, nutrition and pesticides |
| United Nations Environment Programme, located in Nairobi, Kenya | <ul style="list-style-type: none"> Environment | Solutions to the triple planetary crisis of climate change, nature and biodiversity loss, and pollution and waste. | <ul style="list-style-type: none"> The General Assembly, by resolution 2997 (XXVII) of 15 December 1972, established the Governing Council of the United Nations Environment Programme. Rules of Procedure of the UN Environment Assembly of the UN Environment Programme UNEP and Indigenous Peoples: A Partnership for Caring about the Environment Gender equality and the environment |
| World Bank (Washington DC, USA) | <ul style="list-style-type: none"> Economy and finance | Long-term economic development and poverty reduction by providing technical and financial support to help countries implement reforms or projects | <ul style="list-style-type: none"> Assisting developing and transition economies Specialised help for export promotion Cooperation in global economic policy-making Routine notification when members introduce new trade measures or alter old ones. |

Table 2: Intergovernmental stakeholders in One Health

The Quadripartite and OHHLEP

The collaborative work of Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the World Organisation for Animal Health (WOAH, founded as Office International des Epizooties or OIE) to address risks at the human-animal-environment interface was formally laid down in 2010 in the WHO Tripartite Concept Note²¹ (FAO, OIE, & WHO, 2010), and is increasingly gaining traction with the global community. In 2022, the Directors-General of FAO, WHO and WOAH and the Executive Director of the United Nations Environment Programme (UNEP) signed a Memorandum of Understanding²² for collaborative One Health work, renaming the group the “Quadripartite”, reflecting equal participation of all four partners. Together, the four organisations developed a One Health Joint Plan of Action (JPA),²³ to guide the four organisations to collaborate on One Health with the aim of supporting their member states to build One Health capacities (FAO, UNEP, WHO, & WHOA, 2022). Through six ‘action tracks’ (ATs), the JPA seeks to address:

- AT1 — Enhancing One Health Capacities to strengthen health systems
- AT2 — Reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
- AT3 — Controlling and eliminating endemic zoonotic diseases, neglected tropical and vector-borne diseases
- AT4 — Strengthening the assessment, management and communication of food safety risks
- AT5 — Curbing the silent pandemic of antimicrobial resistance
- AT6 — Integrating the environment into One Health

Related to this JPA are policies on biodiversity, zoonotic diseases including rabies and tuberculosis among others, transboundary diseases, and the global action plan on health, environment and climate change (WHO, 2020).

The Quadripartite is supported in its task by the [One Health High-Level Expert Panel](#) (OHHLEP)²⁴. In addition to its critical advisory functions, the OHHLEP has been mandated to produce several guiding references on various related topics such as prevention of zoonotic spillover (OHHLEP, 2023a) or One Health preparedness and prevention against panzootic spread of highly pathogenic avian influenza (OHHLEP, 2023). Although One Health has historically focused on infectious diseases, OHHLEP’s

²¹ <https://www.who.int/publications/m/item/the-fao-oie-who-collaboration>

²² Memorandum of understanding between FAO and OIE and WHO regarding the health risks at the animal-human-ecosystems interface in the context of the “One Health” approach and including antimicrobial resistance. <https://www.fao.org/3/cb9403en/cb9403en.pdf>

²³ <https://www.who.int/publications/i/item/9789240059139>

²⁴ One Health High Level Expert Panel. Available at <https://www.who.int/groups/one-health-high-level-expert-panel>

definition²⁵ of One Health recalls the importance of linking health and wellbeing when seeking to leverage additional policy support. It goes beyond the presence or absence of disease to encompass:

quality of life and the ability of people and societies to contribute to the world with a sense of meaning and purpose. Focusing on wellbeing supports the tracking of the equitable distribution of resources, overall thriving and sustainability. A society's wellbeing can be determined by the extent to which it is resilient, builds capacity for action, and is prepared to transcend challenges.²⁶

This transcends physical health to include action to improve mental health, women's health, cancer and other aspects of public health.

A One Health approach thus becomes an implicit prerequisite, if the global community is to achieve the United Nations 2030 Sustainable Development Goals (SDGs), for example SDG 3 (good health and wellbeing), SDG 1 (no poverty), SDG 6 (clean water and sanitation), SDG 13 (climate action), SDG 14 (life below water), and SDG 15 (life on land). The health of all living systems relies on the achievement of the SDGs tied to adequate services and resources, including SDG 2 (food security and agricultural production) and SDG 11 (sustainable cities and communities). The effective implementation of a One Health approach is thus contingent on implementation of SDG 17 (partnerships for the goals).

As with One Health, the goals themselves are interlinked and interdependent; understanding the relationships between the goals is therefore essential to understand where the goals work in concert and in conflict (Singh et al, 2018; Xing et al, 2024) to inform important decisions about trade-offs and co-benefits. Xing et al (2024) argue that "selective implementation of the goals", without understanding these aforementioned complexities, is the reason for the limited transformation seen so far. A One Health approach offers an important entry point for this discussion of trade-offs and synergies to determine policy priorities.

SDG3 GAP Accelerators

The UN 2030 SDGs themselves make no explicit mention of One Health. Subsequent efforts to adopt a One Health process to identify the Global Action Plan (GAP) for SDG 3 (healthy lives and wellbeing for all)²⁷ 'Accelerators' failed. There is no explicit reference to a One Health approach by the UN Department of Economic and Social Affairs (DESA) in their 2023 *Study on SDG Accelerators*:

²⁵ OHHLEP Definition of One Health: "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 inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels

²⁶ WHO: Promoting wellbeing. Available at <https://www.who.int/activities/promoting-wellbeing>

²⁷ SDG3 Global Action Plan for Healthy Lives and Wellbeing for All <https://www.who.int/initiatives/sdg3-global-action-plan>

EU policies benefiting from a One Health approach

Observations and Insights from SDG Acceleration Actions Platform (DESA, 2023) or in the *2024 progress report on the Global Action Plan for Healthy Lives and Wellbeing for All* (WHO, 2024).

The SDG3 GAP is a set of commitments by 13 agencies that play significant roles in health, development, and humanitarian responses to help countries accelerate progress on the health-related targets of the SDGs through stronger collaboration. The SDG3 GAP describes how the 13 signatory agencies are adopting new ways of working, building on existing successful collaborations in countries, and jointly aligning their support around national plans and strategies that are country-owned and led. Although referred to as a “global” plan, the added value of the SDG3 GAP lies in coordinated support, action and progress in countries.²⁸

The Accelerators drive progress towards the health-related SDGs. The following SDG3 GAP Accelerator themes were advanced with a health focus and included sustainable financing, primary healthcare, community and civil society engagement, determinants of health, research and development, innovation and access, data and digital health, and innovative programming in fragile and vulnerable states and for disease outbreak response.

We believe that the lack of an explicit One Health approach in the SDG3 GAP process may be a missed opportunity to enhance opportunities and mitigate bottlenecks around coordination, roles and responsibilities of relevant organisations and initial frameworks for joint action.

UN high-level political forum on sustainable development

In 2023, a high-level political forum²⁹ was convened by the UN General Assembly, which reaffirmed the position of the countries that have signed up to the SDGs. The forum articulated One Health principles, without explicitly referencing One Health. For example:

- It recommended the importance of a universal and integrated approach to achieving sustainable development which must be balanced with respect to economic, social and environmental concerns (Item 4).
- It reaffirmed the principles of the Rio Declaration on Environment and Development³⁰ (Item 11) and acknowledged the critical need for multilateral and international cooperation for developing countries, particularly those that are the poorest and most vulnerable, to help them recover from the ongoing effects of the COVID-19 pandemic and strengthen resilience including through pandemic prevention, preparedness and response (Items 12, 25).

²⁸ <https://www.who.int/initiatives/sdg3-global-action-plan/frequently-asked-questions>

²⁹ [High level political forum for sustainable development](#)

³⁰ UN Rio Declaration on Environment and Development. <https://www.cbd.int/doc/ref/rio-declaration.shtml>

- It recognised the impacts of interlinked crises, including climate change, persistent drought, extreme weather events, land loss and degradation, coastal erosion, biodiversity loss, desertification, pollution, forced displacement, food water and energy insecurity which threaten planet and people, and which inhibit progress towards the SDGs.

“One Health principles thus remain insufficiently integrated in existing multilateral treaties and global institutions [...] preventing efficient international cooperation”. Efforts to improve coordination through regional “multidisciplinary and multisectoral One Health taskforces, technical committees, working groups, and appoint Focal Points for specific activities may strengthen One Health initiatives”. The inclusion of stakeholders including religious groups, “rural communities, as well as indigenous peoples residing within natural areas is fundamental to implementing the One Health as they are both users and components of the complex matrix of interactions which maintain functionality of the natural world” (UN Economic and Social Commission for Asia and the Pacific, 2022).

Key messages

- One Health is formally endorsed by the Quadripartite, which works jointly to support member states to build One Health capacities.
- Although One Health has historically focused on infectious diseases, OHHLEP’s definition recalls the importance of linking health and wellbeing to leverage additional policy support (i.e. going beyond the presence of absence of disease to encompass, what the WHO refers to as “quality of life and the ability of people and societies to contribute to the world with a sense of meaning and purpose. Focusing on wellbeing supports the tracking of the equitable distribution of resources, overall thriving and sustainability. A society’s wellbeing can be determined by the extent to which it is resilient, builds capacity for action, and is prepared to transcend challenges”.
- A One Health approach is thus implicit if the global community is to achieve the 2030 UN Sustainable Development Goals. The lack of an explicit One Health approach in the SDG3 GAP and in the SDG accelerators for health was a missed opportunity to enhance opportunities and mitigate bottlenecks around coordination, roles and responsibilities of relevant organisations and initial frameworks for joint action.
- International coordination and inclusion of rural, indigenous and religious stakeholder communities remains challenging.
- The integration of the One Health approach into the future pandemic treaty is firmly supported by the EU, as specified in the European Council’s negotiating mandate, where it is cited as an objective and general principle to be integrated. The EU has also emphasised the importance of including prevention of pandemics at source through the One Health approach.

The Europea One Health policy landscape

The role of DG-SANTE and other DGs

EU legal acts define One Health as a “multisectoral approach which recognises human health is connected to animal health and to the environment, and that actions to tackle threats to health must take into account those three dimensions”.³¹ The European Commission Directorate-General for Health (DG-SANTE) is responsible for EU policy on food safety and sustainability, public health, animal health and welfare, and health of crops and forests:

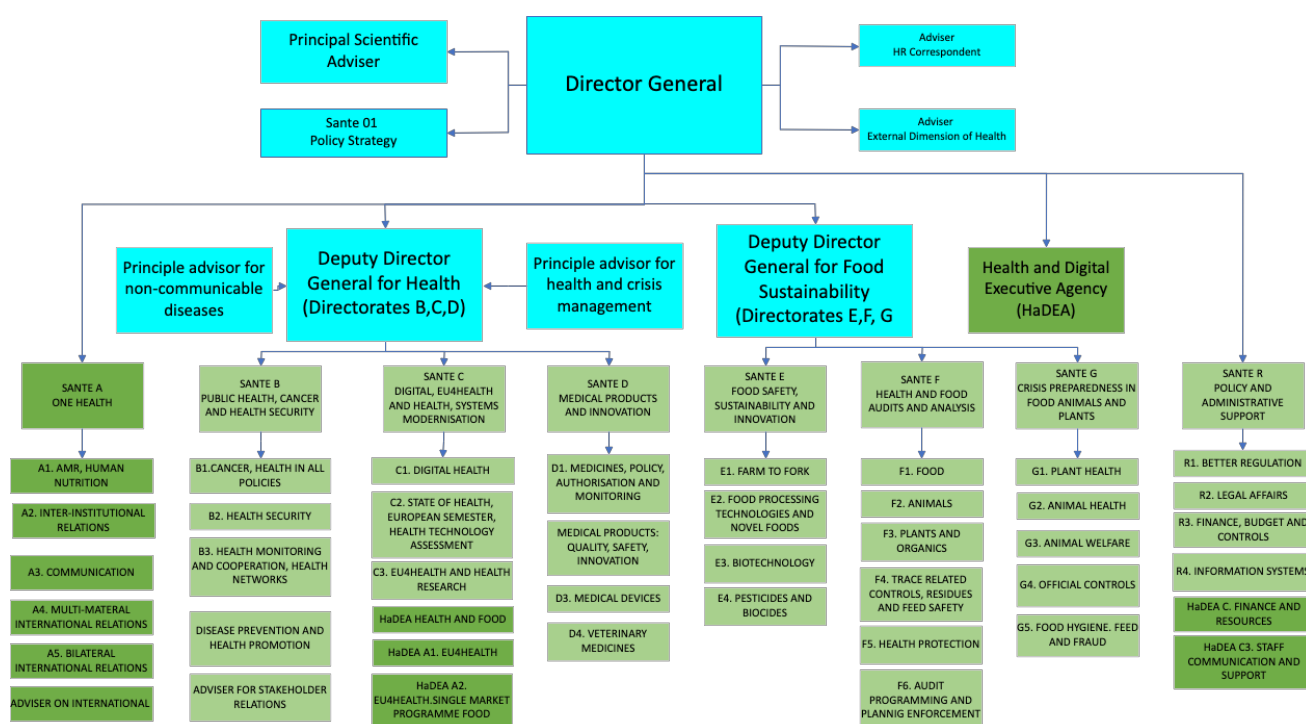


Figure 2: Organisational chart of DG SANTE: Health and Food Safety (adapted from European Commission Departments and Agencies website). The dark green boxes highlight SANTE A One Health and the Health and Digital Executive Agency.

DG-SANTE supports national and regional authorities in the implementation of related laws at national level.³² It has explicit responsibility for decision-making about One Health policy (SANTE A). It partners with five EU decentralised agencies:

- European Medical Agency (EMA)
- European Centre for Disease Control (ECDC)
- European Chemical Agency (ECHA)

³¹ SAPEA Literature Review Team, One Health Policy Landscape

³² https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/health-and-food-safety_en

EU policies benefiting from a One Health approach

- European Food Standards Agency (EFSA)
- Community Plant Variety Office (CPVO, not shown in Table 3 on the following foldout page)

| Intergovernmental stakeholders | Sectors involved | Roles and responsibilities | Examples of relevant legislation, policy, guidelines and action plans |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| European Court of Human Rights (Strasbourg, France) | Law Human Rights | Interprets the law on human rights See Swiss climate justice case (2024) | • European Convention on Human Rights |
| European Court of Justice | Law | Interprets EU law and ensures uniform application across Member States | • Article 263 of the Treaty of the Functioning of the European Union |
| European Commission Directorate-General for Health, DG SANTE • Directorates A, C, D, E, G and R are located in Brussels • Directorate B is in Luxembourg • Directorate F is in Ireland | Human health and food safety | EU decision-making institution – on EU policy on food safety and health and for monitoring the implementation of related laws at national, regional and local levels. Partners with 5 decentralised EU Agencies: EMA, EFSA, ECDC, CPVO and ECHA, DG Sante A is responsible for One Health and has functions which cover inter-institutional and international relations DG Sante works with non-EU countries to prevent sanitary and phytosanitary (SPS) measures being used as trade barrier See Chapter 2 for an organogram describing roles and responsibilities | linked to Articles 168 (public health), 43 (agricultural policy), 114 (internal market), 207 (trade in goods) and 13 (animal welfare). Other relevant policies (not a comprehensive list): • EU Global Health Strategy • Horizon Europe Strategic Plan • Future of Food and Farming • Animal Health Law on transmissible animal diseases is a key output of Animal Health Strategy 2007-2013, "Prevention is better than cure" • EU4Health is the response to COVID-19's impact on medical and healthcare staff, patients and health systems in Europe. • Farm to Fork Strategy: The farm to fork strategy is a cornerstone of the EGD and underpins the proposal for a new legislative framework to move towards food system sustainability • Health Security Committee • Pharmaceutical Strategy for Europe • Animal Health Law • EU One Health Action Plan on AMR • EC Medicinal Products for Human Use • Action plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016 • Farm to Fork • Crisis Preparedness (reinforced role for EMA) • Regulation 2017/625 Application of Food and Feed Law • EC Veterinary Medicines • European Health Union |
| European Commission Directorate-General for Agriculture and Rural Development, DG AGRI | Agriculture and rural development | EU decision-making institution – on EU policy on agriculture and rural development | Common Agricultural Policy (CAP) |
| European Commission Directorate-General for the Environment, DG ENV | Environment Biodiversity Water and coastal areas | EU decision-making institution – on EU policy for the environment | • Green Deal - aims to make Europe the first climate-neutral continent by 2050. It is the EU basis for achieving the SDGs. • General Union Environment Action Programme – recognises human well-being and prosperity depends on healthy ecosystems. • Circular economy including Circular Economy Action Plan • Marine environment • Nature and biodiversity • Water • Bern Convention on the conservation of European wildlife and natural habitats • EU Biodiversity strategy • EU Wildlife Action Plan against wildlife trafficking • Habitats Directive (Conservation of Natural Habitats, Wild Fauna and Flora Directive Invasive Alien Species Regulation (Regulation (EU) No 1143/2014) • 92/43/EEC, Regulation (EC) No 398/2009) • Plant Health Law • Wildlife Trade Regulations (EC No 338/97 • Invasive Alien Species • Water Framework • Zero Pollution Action Plan |
| European Commission Directorate-General for Climate Action, DG CLIMA | Climate change | EU decision-making institution on climate change. Closely linked to DG-ENV | • Guidance to Member States in improving the contribution of land-use, forestry and agriculture to enhance climate, energy and environment ambition • EU Strategy on Adaptation to Climate Change |
| European Commission Directorate-General for Health Emergency Preparedness and Response, DG HERA | Health emergency preparedness and response | Prevent, detect, and rapidly respond to cross-border health emergencies, by ensuring the development, manufacturing, procurement and equitable distribution of key medical countermeasures • health security coordination • address vulnerabilities and dependencies • reinforcing global health preparedness It will have a strong anticipatory, forward looking and response function so strengthens links with ECDC (no mandate beyond contagious diseases) and EMA (which have no mandate in medical countermeasures | • Communication from the Commission on HERA • Commission decision to establish HERA |
| European Commission Directorate-General for Migration and Home Affairs | Human health | Migration, internal and external security, borders | • Asylum Procedure Regulation • Asylum and Migration Management (Regulation (EU) 2024/1351) • Crisis and Force Majeure (Regulation (EU) 2024/1359) |
| European Food Safety Authority (Parma, Italy) | Human, environmental and animal health | Food and feed safety, nutrition, animal health and welfare, plant protection and plant health | • Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 - general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedure in matter of food safety; Article 26(2)(g) thereof, regarding the role of the Executive Director of the European Food Safety Authority • Health, Safety, Environmental and Security policy defines the framework for setting Health, Safety, Environmental and Security objectives and roles and responsibilities |
| European Medicines Agency (Amsterdam, Netherlands) | Human and animal health | Evaluation and supervision of new medicines for human and veterinary use | • Regulation (EU) No 2019/6, Regulation (EC) No 726/2004 and Directive 2001/83/EC provide the legal framework for the authorisation, manufacture, and distribution of medicines in the EU. Marketing authorisation is set out by Regulation (EC) No 726/2004 (as amended), which enabled the establishment of EMA, and Regulation (EU) No 2019/6. • Other areas of relevance include: • Crisis preparedness • European Commission: medicinal products for human use • European Commission: safe and effective veterinary medicinal products • Authorisation procedures: centralised procedure for medicinal products for human use • Authorisation procedures: national authorisation procedures |
| European Chemicals Agency (Helsinki, Finland) | Human and environment health | Implementation of key EU chemicals regulations | • Regulation (EC) No 1907/2006 – concerning the registration, evaluation, authorisation and restriction of chemicals and establishing a European Chemicals Agency • REACH regulation protects human health and the environment against the harmful effects of chemical substances. REACH stands for registration, evaluation, authorisation and restriction of chemicals. REACH regulation has been assessed twice; the latest review in 2018 indicated the need to revise some elements. IN 2020, the EU published a chemicals strategy for sustainability towards a toxic free environment. It is part of the EU's zero pollution ambition, which is a key commitment of the European Green Deal. The strategy announced the need for a target revision of REACH (see the communication) |
| European Centre for Disease Prevention and Control (Stockholm, Sweden) | Human health | Infectious diseases | • Regulation (EC) No 851/2004 establishing a European Centre for disease prevention and control. In 2022, the ECDC's mandate was extended to allow it to provide the required scientific expertise, and to support measures in preparedness for and fight against serious cross-border threats to health. • At European level, this organisation coordinates the European networking of bodies operating in the fields covered by its mission. |
| European Environment Agency (Copenhagen, Denmark) | Environmental health policy | Partnered with DG-ENV Develop and achieve in Europe's environment The EEA Management Board is the main decision-making body and consists of: • one representative from each member country; • two representatives of the European Commission; • two scientific experts designated by the European Parliament | • 38 members and cooperating countries. • Founding Regulation (EC) No 401/2009 for the development of a Community policy on the environment |
| European Fisheries Control Agency (Vigo Pontevedra, Spain) | Fisheries policy | Partnered with DG-ENV Promotes common standards for control, inspection and surveillance under the EU's common fisheries policy | |
| European Food Safety Authority | Food chain | Provide the scientific basis for laws and regulations around food related risks. | |
| One Health Cross-Agency Taskforce | Intersectoral One Health coordinating mechanism | EU Agencies including: ECDC, ECHA, EFSA, EMA, and EEA 4 Aims: 1. Facilitate strategic coordination of agencies on One Health implementation; 2. promote research coordination and One Health-driven agenda setting; 3. Forum for the coordination of activities and scientific advice to update, inform and support EU policymakers and other relevant stakeholders in their goal to prioritise One Health. 4. Strengthen joint activities and the sharing of information on One Health aspects among the agencies, including by identifying interlinkages, interdependencies and fields of cooperation and providing a platform for the exchange of good practices within individual agencies | • Proposed at the EFSA-led conference on One Health-Environment and Society Conference |
| WHO EU Public Health Observatory | Health | Identifies and generates the evidence on health systems – acting as a knowledge-broker and bridging the gap between academia and policy - Country monitoring - Analysis - Performance Assessment - Knowledge-brokering | |
| EU Health Security Committee (Austria) | Human health security | Coordinates the EU's rapid response to serious cross-border threats to health | • Regulation (EU) 2022/2371 strengthened the role of the HSC by empowering it to adopt: • opinions and guidance, including on specific response measures, to allow for the better coordination of EU response to health emergencies. • communications and recommendations on surveillance addressed to the Member States, the ECDC and the Commission. |
| European Technology Platform for Global Animal Health | Human and animal health Food safety and quality Animal welfare Market access | An industry-driven initiative (led by veterinary pharmaceutical industry) this group "aims to develop and deliver the most effective tools for controlling animal diseases of major importance to Europe and the rest of the world" | • Launched by the European Commission in partnership with industry. Supported by Development Commissioner Louis Michel, Science and Research Commissioner Janez Potocnik and Health and Consumer Protection Commissioner Markos Kyprianou |
| International Federation of Animal Health, Europe | Animal health Veterinary medicines, vaccines and other products | Public-Private partnership representing corporate members and national animal health associations in Europe. IFAH-Europe's membership covers 90% of the European market for veterinary products | • DISCONTOLS- a joint project which aims to "deliver new and improved vaccines, pharmaceuticals and diagnostic tests and is actively encouraged and funded by the European Commission service". |
| European Partnership on Alternative Approaches to Animal Testing | Animal testing | Public Private partnership which is based on collaboration between the European Commission and major companies from seven industry sectors. The aim is to pool knowledge, research and resources to accelerate the development, validation and acceptance of alternative approaches to animal testing | • Created by European Commissioners and the then Vice President of the European Parliament |
| European Partnership for the Responsible Use of Medicines in Animals | Responsible use of medicines in animals in the EU | Includes farmers and cooperatives, European Initiative for Sustainable Development in Agriculture, small animal veterinarians, feed manufacturers, animal-health farmer organisations, veterinary surgeons and IFAH Europe | |
| European Partnership on One Health Antimicrobial Resistance (2023–2025) | AMR Clinical trials Pandemic preparedness Animal health and welfare | Public Private Partnership focused on research and innovation, capacity strengthening, data, impact and knowledge mobilisation. | • Led by European Commission DG Research and Innovation – Combating Diseases • EU One Health Action Plan against AMR See also a communication from DG Sante about EU One Health Action Plan |
| European Public Health Alliance | Public health in Europe | Established as an NGO in 1993. Civil society platform advocating for better health in Europe – governed by a board of trustees. It includes 89 non-profit organisations active in public health in 21 European countries. | • References the Amsterdam Treaty |
| EPHA AMR Stakeholder Network within the EU Policy Platform | AMR at national, regional and European level, covering all dimensions of the 'One Health' approach | A network of 60 leading organisations and individuals committed to tackling Antimicrobial Resistance (AMR) and coordinating resources at EU level and within Member States aligned with WHO, UN Agencies and others. Promotes a cross-border One Health approach. | • Led by European Public Health Alliance |
| The CORDS network (Connecting Organisations for Regional Disease Surveillance) | Infectious disease surveillance | CORDS comprises six regional networks across Asia, East Africa, Mekong Basin, Middle East, South East Europe, plus SACIDS Foundation for One Health surveillance (academic-research institute partnership) across DR Congo, Mozambique, South Africa, Tanzania, Zambia and London (RVC, University of London and LSHTM) | • Funded by the Bill & Melinda Gates Foundation, the Skoll Global Threats Fund, the Rockefeller Foundation, the Nuclear Threat Initiative and the Peter G. Peterson Foundation |
| European College of Veterinary Public Health (ECVPH) | Veterinary public health and population medicine One Health | Aims to advance veterinary public health and its subspecialties, population medicine and food science in Europe and to increase the competence of those who are active in these fields. This includes One Health expertise. | • Policies of the European Board of Veterinary Specialists • ECVPH Constitution |
| Med-Vet-Net-Association | Zoonoses AMR Food security | Non-profit association comprising 22 institutions/14 countries which promotes global exchanges of best practices, tools, strategies, training courses, innovations, case studies and technical data to improve disease surveillance worldwide | |
| Una Europa | One Health | Alliance of 11 universities across UK and Europe which have committed to creating an inter European University of the Future. The One Health focus area emphasises research, teaching and innovation. | • European Commission's European Universities Initiative |

Table 3: European stakeholders and partnerships that (may) benefit from a One Health approach

EU policies benefiting from a One Health approach

The cross-links between SANTE A–G with respect to knowledge mobilisation and finance responsibility sharing are not explicit from the literature. Long-form interviews may be needed to assess where there are real existing gaps and vulnerabilities in the system.

In 2020, the Council of the EU and member state representatives committed to strengthening WHO's capacity to respond to global health threats and agreed to taking a proactive role to strengthen global health security.³³ These conclusions also recognise the importance of One Health for "preventing and addressing health emergencies and encourages reflection on the institutional and organisational anchoring of the One Health approach at global level."³⁴

The Directorate-General for Health Emergency, Preparedness and Response (DG-HERA) was established as a consequence of the lessons learned from COVID-19. It aims to "ensure that the EU and member states are ready to act in the face of cross-border health threats, and its mandate covers both the strengthening of preparedness in advance of future emergencies and the implementation of a swift and efficient response once crisis hits".³⁵ Separate Directorates-General are responsible for the environment (DG-ENV), climate action (DG-CLIMA), agriculture (DG-AGRI), and energy (DG-ENER), however, communication, coordination and collaboration pathways between them, and between DG-SANTE and DG-HERA are not explicit in the literature. Figure 3 below shows the relationship between these Directorates-General and other One health governance stakeholders at international, supranational and national scales.

³³ Conclusions of the Council and the Representatives of the Governments of the member states on the role of the EU in strengthening the World Health Organisation 2020/C 400/01.

³⁴ Conclusions of the Council and the Representatives of the Governments of the member states on the role of the EU in strengthening the World Health Organisation 2020/C 400/01.

³⁵ HERA Available at https://health.ec.europa.eu/health-emergency-preparedness-and-response-hera/overview_en#governance

EU policies benefiting from a One Health approach

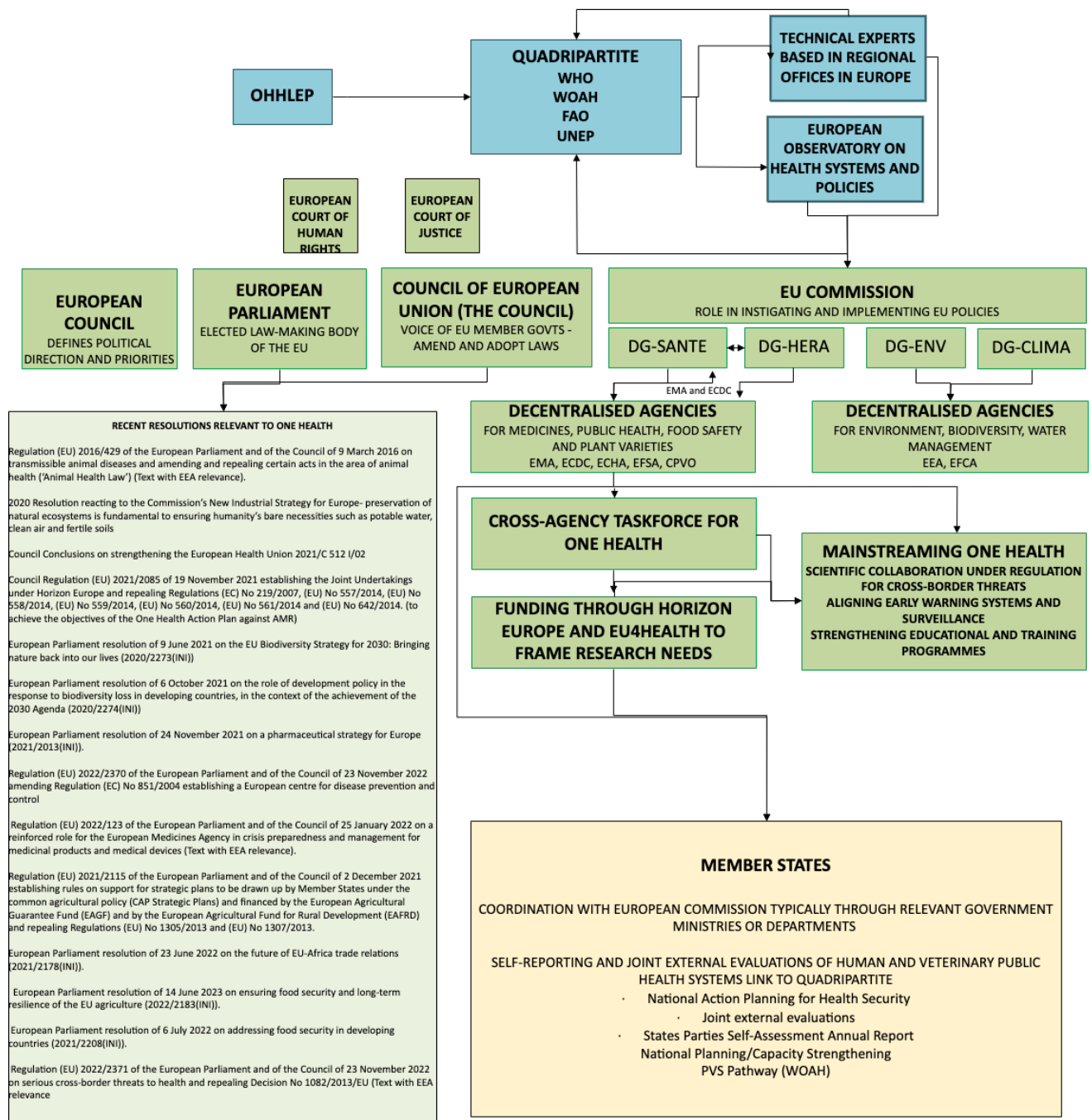


Figure 3: One Health governance stakeholders at international, supranational, and national scales.

One Health taskforce and the 2023 EU Joint Statement

In 2022, the 'ONE Health, Environment and Society Conference' was held by the European Food Safety Authority (EFSA) and its partner agencies³⁶ (Bronzwaer et al, 2022; ECDC et al, 2022). The conference highlighted the urgency of implementing a "One Health, One Environment" approach to scientific

³⁶ EFSA's partner agencies include the European Environment Agency (EEA), the European Centre for Disease Prevention and Control (ECDC), the European Chemicals Agency (ECHA), and the European Medicines Agency (EMA).

advice on topics including public health, food safety and nutrition, and environmental protection, recognising the growing risks originating at the interface of human, animal, plant and ecosystem health" (ECDC et al, 2022). This conference led to the establishment of a cross-agency One Health taskforce, to identify ways of working that are inclusive and advance transdisciplinary research and scientific advice on One Health issues.³⁷

The cross-agency taskforce aims are to:

facilitate strategic coordination of agencies on One Health implementation; promote research coordination and One Health-driven agenda setting; provide a forum for the coordination of activities and scientific advice to update, inform and support EU policymakers and other relevant stakeholders in their goal to prioritise One Health and strengthen joint activities and the sharing of information on One Health aspects among the agencies, including by identifying interlinkages, interdependencies and fields of cooperation and providing a platform for the exchange of good practices within individual agencies. (ECDC et al, 2022)

In 2023, EU Agencies released a joint statement indicating their commitment to One Health and the importance of including land-change and biodiversity loss, climate change mitigation and adaptation, and chemical pollution within the scope of One Health governance. Examples of relevant policies include the New Industrial Strategy for Europe (European Parliament, 2020), EU Biodiversity Strategy (European Parliament, 2021c), Resolution on biodiversity loss in developing countries, (European Parliament, 2021a), Common Agricultural Policy (CAP) (European Parliament & European Council, 2021), the Resolution on the Future of EU Africa Trade Relations (which includes ambitious biodiversity-related provisions inspired by One Health when modernising Economic Partnership Agreements (EPAs) (European Parliament, 2022c), and the Resolution on food security and the long-term resilience of agriculture in the EU (European Parliament, 2023). EU Agencies also highlighted the success and importance of previous EU-funded programmes, including the Med-Vet-Net Network of Excellence³⁸ and the One Health European Joint Programme for transdisciplinary approaches,³⁹ and the success of the 2017 One Health Action Plan against Antimicrobial Resistance (European Commission, 2017), which bridges the gap between science and policy.

Knowledge-brokering organisations

As noted in Chapter 1, transdisciplinarity is a hallmark of the One Health approach. We therefore believe that effective collaboration at the science-policy-industry interface is critical to the success of any One Health intervention. This challenging task can be facilitated by "knowledge-brokering

³⁷ One Health cross-agency taskforce. Available at <https://www.eea.europa.eu/en/about/who-we-are/projects-and-cooperation-agreements/cross-agency-one-health-task-force>

³⁸ <http://www.medvetnet.org/>

³⁹ <https://onehealthejp.eu/>

organisations” which sit at such interfaces (MacKillop et al, 2023). Also known as ‘boundary organisations’, these are critical investments for integration and mobilisation of One Health knowledge and expertise. Existing examples include not only the cross-agency One Health taskforce discussed above, but also the European Observatory on Health Systems and Policies, a partnership between WHO and the EU that connects European policymakers to scientific advice. In addition, the European Climate and Health Observatory⁴⁰ is a partnership between the European Commission, the EEA and several other organisations including the WHO Regional Office for Europe which contributes to both the EU4Health programme and the European Green Deal.

The WHO-FAO-WOAH IHR-PVS National Bridging Workshops also help in sharing perspectives and joint planning for improved coordination for the management of zoonotic diseases at the human-animal-environment interface. Many countries have found these workshops useful. However, this programme has so far only been implemented in one country of the union (Romania, see later in this chapter). Likewise, initiatives such as [Scottish Government’s Centre of Expertise on Animal Disease Outbreaks](https://epicscotland.org/) (EPIC),⁴¹ [the European College of Veterinary Public Health](https://ecvph.org/) (ECVPH),⁴² [Una Europa One Health](https://www.una-europa.eu/),⁴³ and the [United Nations Institute for Training and Research](https://www.unitar.org/) (UNITAR),⁴⁴ offer formal and informal education and training pathways to individuals in academia, industry and policy, who need to develop knowledge-brokering skills such as: timely evidence gathering, synthesis and appraisal, mediation, communication and active listening. More detail on transdisciplinary educational approaches is presented in Chapter 3.

The effectiveness of knowledge-brokering organisations depends on the context, financial investment, and political will to create opportunities to generate and share knowledge or to play a role in the formulation of policy questions (MacKillop et al, 2023). However, in the absence of ethical governance processes and a commitment to transparency, accountability and clarity around remit, knowledge-brokering organisations could also inadvertently play a role in the exclusion of some forms of evidence.

Europe One Health partnerships and networks

The evidence we have reviewed indicates Europe to be a centre of gravity for science-policy partnerships and networks and is ideally placed to improve data availability, accessibility,

⁴⁰ <https://climate-adapt.eea.europa.eu/en/observatory>

⁴¹ <https://epicscotland.org/>

⁴² <https://ecvph.org/>

⁴³ <https://www.una-europa.eu/>

⁴⁴ <https://www.unitar.org/>

interoperability and reusability (see EU4Health ⁴⁵), as well as offering knowledge-brokering to operationalise One Health activities within and beyond Europe. The EU recognises the importance of low- and middle-income countries as key partners in the achievement of the UN 2030 SDGs and objectives of the 2015 Paris Climate Agreement (Council of the EU, 2021b). In particular, efforts to engage with actors from the private sector and civil society have been encouraged, in line with the New European Consensus on Development (ECD) (Council of the EU et al, 2017). The latter “reaffirms poverty eradication as (the) primary development objective, but it also integrates the economic, social, and environmental dimensions of sustainable development and underlines the links between development and other European policies, including peace and security and humanitarian aid”⁴⁶ (Council of the EU et al, 2017). The ECD showcases the importance of cross-cutting elements including: youth, gender, equality, mobility, immigration, sustainable energy and climate change, investment, trade, governance, the rule of law, innovative engagement and financing to combine aid from separate places, build tailored partnerships and create coherent policies.

As funding for One Health has increased, so has the number of global One Health Networks (OHN), with more OHNs “headquartered or operational in Europe” than in any other region worldwide, according to an important recent analysis (Mwatondo et al, 2023). The study authors note that most OHNs have historically focused on “emerging infections with pandemic potential and novel pathogens” but are concerned that OHNs may not reflect a sufficiently diverse set of stakeholders and sectors, potentially impeding “effective and equitable OHN formation” and contributing to “other imbalances in OHN distribution and priorities.” They add that there “are still self-identified OHNs that have little involvement with environment or ecosystems stakeholders, which restricts the extent to which a multisectoral One Health approach is done in reality”, and that “OHNs are engaging fewer community stakeholders in the design and agenda-setting phases of implementation than other types of stakeholders (e.g. academic institutions and government bodies)” (Mwatondo et al, 2023). For example, a third of those OHNs identified, covered animal and human health while still neglecting the environment. The majority of OHNs studied, involved collaboration between policy and academia, with fewer including not for profit organisations or community groups. Few networks were exclusively forged in the developing world (4 out of 100 unique OHNs). Only 15 OHNs included monitoring and evaluation activities to assess their effectiveness (Mwatondo et al, 2023). There may be considerable areas of duplication without added value, limitations in stakeholder involvement and representation, and a lack of evidence of the impact of activities in OHNs (Khan et al, 2018).

⁴⁵ https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union_en

⁴⁶ https://international-partnerships.ec.europa.eu/policies/european-development-policy/european-consensus-development_en

EU policies benefiting from a One Health approach

EU policies that may benefit from a One Health Approach

The current EU approach to One Health is complex, overlapping and disjointed. In Figure 4, we explore the alignment of selected policies on health, agriculture and food, biodiversity, environment and climate with One Health principles and values.

| EU Legislation, Policies, Guidelines and Action Plans | | H | An | Ag | En | C | Ec | In | S |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----|----|----|---|----|----|---|
| Offers a reasonably comprehensive One Health approach aligned to OHHLEP definition. | General Union Environment Action Programme (8 th EAP) | + | + | + | + | + | + | + | + |
| | Health Security Council | + | + | + | + | + | + | + | + |
| | Horizon Europe Action Plan | + | + | + | + | + | + | + | + |
| | Zero Pollution Action Plan | + | + | + | + | + | + | + | + |
| | Pharmaceutical Strategy for Europe | + | + | - | + | + | + | + | + |
| | EU Global Health Strategy | + | + | - | + | + | + | + | + |
| | Animal Health Law | + | + | + | + | + | + | + | - |
| | EU4Health Programme | + | + | - | + | + | + | + | + |
| | EU Strategy on Adaptation to Climate Change | + | + | - | + | + | + | + | + |
| | EU One Health Action Plan on AMR | + | + | + | + | - | + | + | + |
| | EU Wildlife Action Plan against wildlife trafficking | + | + | * | + | * | + | + | + |
| | Common Agricultural Policy (CAP) | * | + | + | + | + | + | - | + |
| | Invasive Alien Species Regulation (Regulation (EU) No 1143/2014) | + | + | - | + | * | + | + | + |
| European Consensus on Development | + | - | * | + | + | + | + | + | |
| Could potentially benefit from a greater emphasis on a One Health approach | Farm to Fork | + | + | + | + | + | - | - | - |
| | Crisis Preparedness (reinforced role for EMA) | + | + | + | + | + | - | - | + |
| | Action plan for implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012-2016 | + | * | * | + | + | + | + | + |
| | Plant Health Law | - | * | * | + | * | + | + | + |
| | Habitats Directive (Conservation of Natural Habitats, Wild Fauna and Flora Directive 92/43/EEC, Regulation (EC) No 398/2009) | * | + | - | + | - | * | + | + |
| | Regulation 2017/625 Application of Food and Feed Law | + | + | + | * | - | * | + | - |
| | Green Deal | - | + | - | + | + | + | - | - |
| | EFSA Legislation | + | + | + | + | + | * | - | * |
| | Bern Convention on Conservation of European wildlife and natural habitats | - | + | - | + | - | + | - | + |
| | EU Biodiversity strategy | - | - | + | + | + | - | - | + |
| | Marine Environmental Law | - | - | - | + | - | + | + | + |
| | EC Veterinary Medicines | + | + | - | + | - | - | - | - |
| | Issue-based policies focused on one or more sectors relevant to One Health. May not require a One Health approach in all instances. | Reach Legislation on Chemicals | + | * | - | + | + | * | - |
| European Health Union | | + | + | - | + | + | - | - | + |
| Circular Economy Action Plan | | - | - | - | + | - | + | * | + |
| Asylum and Migration Management (Regulation (EU) 2024/1351) | | + | - | - | - | - | + | + | + |
| ECDC Legislation | | + | + | - | + | + | - | + | * |
| Water Framework | | - | * | - | + | + | + | + | + |
| EC Medicinal Products for Human Use | | + | + | - | + | + | - | - | - |
| Community Policy on Environment | | - | + | - | + | - | - | - | + |
| Wildlife Trade Regulations (EC No 338/97) | | + | - | - | * | - | - | - | - |
| Asylum Procedure Regulation | | + | - | - | - | - | * | - | - |
| Crisis and Force Majeure (Regulation (EU) 2024/1359) | | + | - | - | - | - | * | - | - |

EU policies benefiting from a One Health approach

Figure 4: EU policies benefiting from a One Health approach. + Explicitly addressed; - Does not address; * Referenced but not addressed in detail. The greener in colour the policy, the more aligned it appears to be with key characteristics aligned with the OHHLEP One Health definition. H - Human health (physical or mental); An - Animal health (domestic or wildlife); Ag - Agriculture; En - Environment, water, energy, air, biodiversity loss or land use; C - Adaptation, mitigation or just transition (climate change); Ec - Economic growth or wellbeing; In - Integrated approach, ideally specifying collaboration or responsibility sharing; S - sociocultural considerations including community or stakeholder engagement or participation.

The figure is colour-coded to highlight the alignment of each policy with key characteristics set out in the OHHLEP definition, such as human and animal health, agriculture, environmental and climate aspects, economic growth, and integrated approaches.

We believe that the institutional shift towards greater recognition of the need for integrated approaches to human, animal, and environmental health – along with the impact of the COVID-19 pandemic on both health security and sustainability – is translating into a greater emphasis in recent EU policies on a One Health approach broadly corresponding to the OHHLEP definition.

These closely aligned policies (represented as entirely green in Figure 4) include:

- General Union Environment Action Programme or 8th Environmental Action Programme-EAP (European Parliament, 2022a)
- Health Security (European Parliament, 2022d)
- Zero Pollution Action Plan (European Commission, 2021a)
- Animal Health Law⁴⁷ (European Parliament & Council of the EU, 2021)
- EU Strategy on Climate Change (European Commission, 2021b)

We note that policies with a strong emphasis on health appear to neglect environmental or climate change considerations, while those focused on the environment and climate change seemingly overlook health impacts. The set of policies shaded mostly in grey in the bottom section of Figure 4 are issue-based policies focused on one or more sectors, such as REACH Legislation⁴⁸ (European Parliament & European Council, 2006), Circular Economy Action Plan⁴⁹, Water Framework [(European Parliament & European Council, 2000)], and Wildlife Trade Regulations [(European Council, 1996)], and may not require a One Health approach in all instances. The greatest opportunity for benefits may in fact lie with those policies represented in the middle of the figure.

⁴⁷ Animal Health Law. Implemented in 2021 Information available at https://food.ec.europa.eu/animals/animal-health/animal-health-law_en

⁴⁸ <https://echa.europa.eu/regulations/reach/understanding-reach>

⁴⁹ https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

EU policies benefiting from a One Health approach

The EU4Health Programme⁵⁰ is poised to extend its impact by incorporating environmental health factors that influence disease outbreaks, for example through its funding of the European Climate and Health Observatory.⁵¹ Expanding its scope to address habitat destruction and climate change as drivers of health crises could ensure better preparedness and response strategies, underpinned by the One Health approach. The One Health model is indispensable in fortifying the EU's capabilities in infectious disease surveillance and response. By aligning strategies and pooling resources, the EU can enhance its responsiveness and effectiveness in managing outbreaks of zoonotic diseases.

Antimicrobial resistance is another critical area where One Health principles are particularly relevant. The EU's Action Plan against Antimicrobial Resistance (European Commission, 2017) recognises the necessity of a unified (i.e. One Health) approach, integrating human, animal, and environmental health strategies to combat the misuse and overuse of antibiotics.

The Horizon Europe Strategic Programme (European Commission, Directorate-General for Research and Innovation, 2024) also exemplifies how One Health can drive innovation in research. By directing funds to projects that explore intersections of environment health, ecosystem health, animal health, and human health, Horizon Europe could catalyse innovations that address such complex health challenges as the role of environmental factors on infectious disease outbreaks, the indispensability of One Health in surveillance and response, antimicrobial resistance and zoonotic diseases. Requiring inclusion of a One Health approach in EU grant applications, would ensure that the EU develops solutions that are both effective and sustainable, addressing complex health challenges at their roots.

As discussed in the section on Europe One Health partnerships and networks, the European Consensus on Development (Council of the EU et al, 2017) showcases the importance of working with low- and middle-income countries, and emphasises critical cross-cutting elements with relevance to One Health, including youth, gender, equality, mobility, immigration, sustainable energy and climate change, investment, trade, governance, the rule of law, innovative engagement, and financing to combine aid from separate places, build tailored partnerships and create coherent policies.

Many other policy areas, such as the EU Farm to Fork Strategy (European Commission, 2020), Crisis Preparedness legislation (European Parliament & Council of the EU, 2022), the Action Plan for the Prevention and Control of Non-Communicable Diseases (WHO, 2013),⁵² Plant Health Law (European Parliament, 2016), the Habitats Directive (European Council, 2013), Food and Feed Law,⁵³ the Green

⁵⁰ EU4Health Programme 2021–2027. Available at https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/eu4health_en

⁵¹ <https://www.eea.europa.eu/en/about/who-we-are/projects-and-cooperation-agreements/european-climate-and-health-observatory>

⁵² https://health.ec.europa.eu/non-communicable-diseases/healthier-together-eu-non-communicable-diseases-initiative_en

⁵³ https://food.ec.europa.eu/horizontal-topics/general-food-law_en

EU policies benefiting from a One Health approach

Deal,⁵⁴ EFSA legislation,⁵⁵ the EU Biodiversity Strategy (European Parliament, 2021c), Marine Environmental Law (European Parliament & European Council, 2008), and strengthening the role of the European Medicines Agency (EMA) (European Parliament & Council of the EU, 2022) may benefit from more attention to a One Health approach (Figure 3). These policies currently lack detail about integration and coordination of activities across disciplines and sectors and would be strengthened by a more explicit approach to socioeconomic impact and engagement and participation with stakeholders.

The EU Farm to Fork Strategy's focus on sustainable food systems also aligns closely with One Health by emphasising the link between healthy ecosystems, animal welfare, and human nutrition, although it may still be considered inherently anthropocentric in its focus (European Commission, 2020). One Health facilitates the integration of veterinary and food safety standards with public health measures. By overseeing the entire food production process – from farm to table – the EU can prevent foodborne illnesses and ensure that food products are free from harmful residues of veterinary medicines. The Commission and member states have been urged to combine efforts with the international community to address food sustainability and security in Europe and with developing countries (European Parliament, 2022b). The Farm to Fork Strategy is a cornerstone of the Green Deal,⁵⁶ does not refer explicitly to One Health, but as noted offers a critical link between animal and human health and environmental policy. A proposal for a legislative framework for sustainable food systems is one of the flagship initiatives of the Farm to Fork Strategy. "In terms of a complementary EU humanitarian and development policy response, it calls for the link between public health and biodiversity to be taken into account, in line with the One Health approach" (European Parliament, 2022b). DG SANTE's Strategic Plan 2020–2024 (DG SANTE, 2020) refers to One Health narrowly in the context of the Europea One Health Action Plan against Antimicrobial Resistance (European Commission, 2017). However, it outlines an approach which addresses social, environmental and

⁵⁴ <https://www.consilium.europa.eu/nl/policies/green-deal/>

⁵⁵ <https://www.efsa.europa.eu/en>

⁵⁶ European Green Deal. Available at https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

EU policies benefiting from a One Health approach

economic drivers and outcomes for sustainability which map onto One Health priorities (as articulated in the OHHLEP definition in Chapter 1:



Figure 5: Replicated from the Strategic Plan 2020–2024 DG Health and Food Safety (SANTE) at p.12.

In addition, given that changes in human-wildlife interactions and ecosystems have been shown to influence human exposure to existing and emerging pathogens, obvious synergies exist with both the EU's Biodiversity Strategy (European Parliament, 2021c) and Invasive Alien Species Regulation (European Parliament, 2014). As the EU aims to protect and restore its biodiversity, the application of One Health can provide a more nuanced understanding of how biodiversity loss affects human and animal health. It is also true that a One Health approach could benefit from a greater emphasis on biodiversity related legislation. By reinforcing nature protection and habitat restoration initiatives, it is possible to mitigate the risk of zoonoses incursion, with a clear benefit for the One Health approach. Likewise, biological invasions are usually neglected within One Health policymaking. Invasive alien species may directly or indirectly impact the environment, by introducing new pathogens or altering the epidemiology of existing pathogens changing vector-host-parasite relationships. They may also act as reservoir hosts, increasing the disease risk for native populations of wild animals and plants (Chinchio et al, 2020). Common pathways and mechanisms of spread between invasive alien species and existing or emerging pathogens, suggest opportunities for co-benefits between shared approaches, tools and resources to mitigate their threats. Given limited funds for infectious disease management, control or mitigate biodiversity loss, particularly introduced species and climate change, may play a significant role (Mahon et al, 2024). The results from Mahon et al suggest that managing ecosystem health and preventing biodiversity loss are crucial components of effective infectious disease control strategies. Health impact assessments could be explicitly incorporated to evaluate how preserving ecosystems can improve the resilience of the environment, prevent the emergence of

zoonotic diseases, mitigate the introduction of invasive alien species and support overall health resilience. Strengthening green infrastructures in urban areas could also mitigate health issues related to air quality and urban heat islands, demonstrating the interconnected benefits of ecological and public health.

Legal right to One Health?

In 2024, the European Court of Human Rights, *Verein Klima Seniorinnen Schweiz and Others v. Switzerland*,⁵⁷ offered a landmark ruling that the Swiss Confederation, by its inaction on climate change, had failed to comply with its duties to uphold human rights to a healthy environment, and highlighted the direct impact of climate change on personal health and wellbeing, particularly for vulnerable populations. Litigation on the basis of the right to a healthy environment, may therefore prove a potential game-changer, offering new opportunities for access to justice and to protect against gaps in existing legislation (de Vilchez Moragues & Savaresi, 2022). Jurisprudence (“earth jurisprudence”) which seeks to extend legal frameworks beyond typical Western legal ideals (Edirisinghe & Suchet-Pearson, 2024) may become more important in the EU, if existing One Health legislation and policies do not embed diverse cultural, Indigenous and philosophical perspectives.

Elsewhere in the world, alternative approaches to traditionally anthropocentric legal frameworks have resulted in the extension of legal rights to natural, non-human and even non-sentient entities such as rivers (Edirisinghe & Suchet-Pearson, 2024). For example, the Whanganui River in New Zealand was granted legal personhood in 2017, obliging both governmental and local guardians to manage the river’s health in a way that considers its ecological, cultural, and social importance (Ministry of Justice, 2017). “Wider recognition of Indigenous worldviews and customary legal systems in determining the legal personhood of more-than-human beings [...] is essential to safeguard against the pitfalls of categorisation, homogenisation, and the imposition of dominant norms” (Edirisinghe & Suchet-Pearson, 2024).

EU support for the Pandemic Agreement

COVID-19 and antimicrobial resistance (AMR) have been identified as important case studies where a One Health approach is needed (IPBES, 2020). Most EU policies referring to One Health relate primarily to AMR, and recognise the need for a multisectoral approach (Council of the EU, 2021a; European Commission, 2017).⁵⁸ A non-binding Recommendation seeking to strengthen national action plans to tackle AMR using a One Health approach was adopted in 2023 (Council of the EU,

⁵⁷ [<https://www.bbc.co.uk/news/science-environment-68768598>]

⁵⁸ SAPEA literature review team, One Health Policy

2023). The One Health approach has also been included in wider agreements between the EU and third parties to promote cooperation on the threat of AMR (Council of the EU, 2021a), and strengthening national and regional capacities to detect and respond to outbreaks of communicable diseases and other health emergencies of national and international concern (e.g. EU-UK Trade and Cooperation Agreement,⁵⁹ OACPS Partnership Agreement,⁶⁰ the EU-Thailand Framework Agreement,⁶¹ and the EU-New Zealand Free Trade Agreement⁶²).

The importance of a One Health approach has been emphasised (particularly after COVID-19) in cross-border preparedness (European Parliament, 2022d) and response to animal and human disease threats (European Parliament & Council of the EU, 2021), and the use of medicines in the context of crisis preparedness (European Parliament, 2021b; European Parliament & Council of the EU, 2022). Links between early warning and response systems and other information systems at EU level would enhance a One Health approach:

The underlying causes of pandemics are the same global environmental changes that drive biodiversity loss and climate change. In this context, the cost of inaction vastly outweighs the cost of implementing global strategies to prevent pandemics based on reducing wildlife trade and land-use change and on increasing One Health surveillance. (IPBES, 2019)⁶³

In December 2021, at its second ever special session, the World Health Assembly established an intergovernmental negotiating body⁶⁴ to draft and negotiate a convention, agreement or other international instrument under its Constitution which would reflect international consensus on measures for improved prevention, preparedness and response to such threats. The EU is strong promoter of the initiative (Ruiz Cairó, 2022), and the Council of the EU adopted a decision to support the launch of negotiations, with the objective to ensure the EU's participation on matters falling within its competence. The EU sees the proposed pandemic treaty as part of its international efforts to reinforce global health security, preparedness, and response to health emergencies based on lessons from the COVID-19 pandemic. The initial objective was to propose the resulting document at the 77th World Health Assembly, 27 May to 1 June 2024 (IPBES, 2020).

⁵⁹ Trade and Cooperation Agreement between the European Union and the European Atomic Energy Community, of the one part, and the United Kingdom of Great Britain and Northern Ireland, of the other part (OJ L149, 30.4.2021).

⁶⁰ Partnership Agreement between the European Union and its member states, of the one part, and the Members of the Organisation of African, Caribbean and Pacific States, of the other part (OJ L, 2023/2862, 28.12.2023).

⁶¹ Framework Agreement on Comprehensive Partnership and Cooperation between the European Union and its member states, of the one part, and the Kingdom of Thailand, of the other part (OJ L330, 23.12.2022)

⁶² Free Trade Agreement between the European Union and New Zealand (OJ L, 2024/866, 25.3.2024).

⁶³ pandemics-climate-nature-biodiversity-crisis-meat-wildlife-land-b1403878(<https://www.independent.co.uk/climate-change/news/pandemics-climate-nature-biodiversity-crisis-meat-wildlife-land-b1403878.html>), article discussing IPBES Global Assessment report 2019

⁶⁴ Intergovernmental Negotiating body index(<https://apps.who.int/gb/inb/index.html>)

In 2023, scientists called for this treaty to incorporate an appropriate and overarching One Health framework (Hayman & Woolaston, 2023). The integration of the One Health approach into the future pandemic treaty is firmly supported by the EU, as specified in the European Council's negotiating mandate, where it is cited as an objective and general principle to be integrated. The EU has also emphasised the importance of including prevention at source through the One Health approach. In the last iteration of the revised draft of this Pandemic Agreement (version 9), One Health is mentioned in a dedicated chapter of the draft document, in which countries are called upon to promote the approach for pandemic prevention, preparedness and response, with more references on intra alias drivers of pandemic emergence and re-emergence of diseases, review of countries' strategies and policies, engagement of communities, training and continuing programmes. The opportunity to set up an international instrument for further defining modalities, terms and conditions and operational dimensions, taking into consideration the provisions of the IHR (2005), is also being discussed.⁶⁵

The negotiating body conceded that multiple elements of agreement and convergence were met during the negotiation. However, remaining divergence of views on some aspects of the text, in particular those parts relating to that sharing of pathogens and the sharing of benefits, prevented the adoption of the Treaty during the World Health Assembly 77, and the negotiating body agreed to continue negotiations on the Pandemic Agreement with the goal of reaching consensus by the next World Health Assembly in May 2025 (European Commission, 2024).

Key messages

- One Health governance is complex, with potential for overlapping regulation across human, animal and environmental health sectors. A cross-agency One Health taskforce has been convened by the EU agencies to discern how best to work together to move transdisciplinary research and scientific advice on One Health issues forward. This includes the EU agencies in both DG-SANTE and DG-ENVI, reflecting the recognition that the environment, biodiversity and climate change are important considerations for both human and animal health. It also highlights the importance of knowledge-brokering activities and expertise for integration and mobilisation of One Health knowledge.
- Knowledge-brokering organisations vary depending on context and opportunity and their influence and agency depends on political, financial and institutional will for knowledge to be mobilised across sectors. The skills required of individuals include evidence gathering and synthesis, mediation, communication and active listening. These can be acquired experientially, but there are also formal and informal training programmes and exemplars of science-policy organisations within Europe (ECVPH, EPIC Scotland, Una Europa and UNITAR)

⁶⁵ Intergovernmental Negotiating Body to draft and negotiate a WHO convention, agreement or other international instrument on pandemic prevention, preparedness and response, found at <https://apps.who.int/gb/inb/index.html>

that offer opportunities for individuals to undertake research, training and experience in knowledge-brokering for One Health.

- In the EU, policies such as: the Farm to Fork Strategy, the Crisis Preparedness legislation, and the EU Biodiversity Strategy, among others, could benefit from a greater emphasis on a One Health approach.
- A One Health approach could also benefit from a greater emphasis on biodiversity related legislation. By reinforcing nature protection and habitat restoration initiatives, it is possible to mitigate the risk of zoonoses incursion. Furthermore, introduction of invasive alien species, is usually neglected within One Health. But common pathways and mechanisms of spread between invasive alien species and existing or emerging pathogens, suggest opportunities for co-benefits between shared approaches, tools and resources to mitigate their threats.
- “Earth” jurisprudence, which recognises that legal frameworks need to extend beyond Western legal ideals to embed diverse cultural, indigenous and philosophical perspectives, may offer an alternative to traditionally anthropocentric legal frameworks. Attention will need to be paid to balancing these rights of human, animal and non-sentient beings.
- Europe is a centre of gravity for the development of One Health partnerships and networks. This may be associated with the strength of financial will within the EU and sources of funding to promote transdisciplinary activities. However, there are emerging biases in the nature of these networks in terms of their scope, geographical reach and engagement with local, indigenous and rural communities that may have unintended consequences on the achievement and equitability of positive One Health outcomes.
- The integration of the One Health approach into the future pandemic treaty is firmly supported by the EU, as specified in the European Council’s negotiating mandate, where it is cited as an objective and general principle to be integrated. The EU has also emphasised the importance of including prevention of pandemics at source through the One Health approach.

One Health policy landscape in member states

Political, institutional and financial will are key enablers of a One Health approach within member states. Strong leadership and clear pathways of communication and coordination are needed between local, regional and national governments and EU and intergovernmental institutions. Countries that employ intersectoral and multisectoral approaches are better placed to work collaboratively across sectors and achieve cross-cutting One Health global challenges, than those that do not (Amri et al, 2022).

multisectoral approaches require coordination across stakeholders and a shared vision and understanding of stakeholder roles and responsibilities and the diversity of disciplinary, organisational, political and geographical domains involved in addressing the challenge. Although transdisciplinary approaches are a pillar of One Health (Zinsstag, Pelikan, et al, 2023) and recognised by the OECD (2020) for societal problem solving, they remain under-used, under-investigated and limited to case study approaches (Ortenzi, Marten, Valentine, Kwamie, & Rasanathan, 2022). In some countries, knowledge and awareness of the scope of One Health still remains an important constraint (Chiesa et al, 2021; Ortenzi et al, 2022).

Countries with integrated approaches to disease outbreak preparedness for human and animal health, and National Action Plans for AMR, are more likely to have key governance structures in place for successful implementation of a One Health approach. AMR National Action Plans almost universally address the three key sectors of One Health, namely, human, animal, and environmental health although the level of attention to One Health measures in sanitation, aquaculture, waste management, and water governance is generally low and mainly present in NAPs from low-income countries (Munkholm, Rubin, Bækkeskov, & Humboldt-Dachroeden, 2021) (see Case study 1).

In countries that prioritise One Health, collaboration is desirable, but in practice may still be limited by the design of governance structures and coordinating bodies (or absence thereof). Institutional and administrative problems, legal or other structural barriers to cooperation, rivalries over budget allocations, and diverse cultural and perception issues may hamper collaboration between sectors and across various Ministries (Nuttall, Miyagishima, Roth, & de La Rocque, 2014). For a One Health approach to work, there may need to be significant cultural shifts within agencies and changes in attitudes and relationships between professions (Nuttall et al, 2014). In Sweden, for example, barriers persist regarding "the understanding of One Health, the integration of the environment sector and awareness of the different terminologies employed within the disciplines" (Humboldt-Dachroeden, 2023). In the absence of formalised and consistent approaches, coherent One Health collaboration will remain challenging. In this instance, explicit investment in knowledge-brokers with interdisciplinary expertise and fluency in different disciplinary and institutional languages and ways of working, may be necessary to improve knowledge translation (Humboldt-Dachroeden, 2023). As discussed in the related section on Knowledge-brokering organisations, the creation of national level One Health knowledge-brokering organisations would improve transboundary knowledge mobilisation and collaboration across different sectors. The interdisciplinary One Health workforce that would populate such agencies and organisations needs to be underpinned by holistic education programmes which integrate One Health in the curricula" (Humboldt-Dachroeden, 2023). Furthermore, when it comes to governance of the approach in countries, breaking down silos in interventions and motivating actors for multisectoral collaboration are conditioned by the respect for respective mandates and prerogatives as well as frameworks and processes, which is a sine qua non condition for constructive

discussion on possible synergies and shared objectives. For example, in the area of health security, the International Health Regulations (IHR, 2005), the IHR monitoring and evaluation framework, and the performance of veterinary service pathway allow staff in human health, animal health and environmental sectors to evaluate and discuss their collaborative work and outline strategic steps inserted in a joint, consensual and operational road map for improved coordination capacities. These national bridging workshops, which have since 2017 been conducted in 56 countries, were formalised as a programme, which was launched in 2020, that allowed One Health consultants and mentors to be hired as critical links in government systems and coordinating mechanisms (WHO, 2021). This programme has so far only been implemented in one country of the union (Romania), and could be extended, with adjustments as necessary.

Key messages

- Coordination between local, regional and national governments and EU and intergovernmental institutions is essential and depends on strong leadership, political, institutional and financial will.
- Countries that employ intersectoral and multisectoral approaches are better placed to work collaboratively across sectors and achieve cross-cutting One Health global challenges, than those which don't.
- The creation of One Health knowledge-brokering agencies may improve transboundary knowledge mobilisation and collaboration. The creation of an interdisciplinary One Health workforce to populate such agencies and organisations needs to be underpinned by holistic education programmes which integrate One Health in their curricula.

One Health financing

One Health initiatives, by definition, should lead to an incremental benefit or added value from closer cooperation between sectors (see Chapter 3), and should therefore be assessed for their benefits ahead of their implementation (Roth et al, 2003). Financing these initiatives involves a diverse array of funding sources, each characterised by unique mechanisms, benefits, and challenges. To ensure that One Health initiatives are equitable, it is crucial to prioritise the fair distribution of data and grant resources. Policies should be designed to address these equity challenges, especially in today's world where local problems often have global implications.

Effective One Health strategies often employ a blended financing model that capitalises on the stability and cross-cutting scope of public funds, and the agility of private and third sector investment, ensuring a comprehensive response to health challenges. One Health initiatives may also be funded

through Development Impact Bonds (Anyiam et al, 2017). Philanthropy is also growing in significance in One Health, with its own opportunities and risks. Each funding source is characterised by unique mechanisms, benefits, and challenges, which we explore in this section, proposing policy recommendations for enhancing One Health financing.

Public funding

Governmental agencies at all levels, from local to international, play a crucial role in funding One Health initiatives, being uniquely positioned to address the overlapping requirements of public health, environmental conservation, and animal welfare policies. Public funding is typically the most stable and substantial investment for foundational One Health activities, such as disease surveillance networks, public health training programmes, and emergency response capabilities. Public funding forms the backbone of One Health financing. Governmental agencies at local, national, and international levels play crucial roles in addressing the overlapping requirements of public health, environmental conservation, and animal welfare policies. While generally stable and predictable, public funds are subject to the vicissitudes of political and economic conditions. Public funding mechanisms should include provisions to ensure equitable distribution of resources across regions and sectors. This can be achieved by implementing policies that support underfunded areas and mitigate the brain drain effect, ensuring that all regions have access to the necessary resources for effective One Health implementation.

Funding from governmental bodies may originate at local, national, or international levels. Locally and nationally, funds are commonly allocated through health departments, environmental agencies, and agricultural departments. Internationally, entities such as the World Health Organisation, FAO, WOA, and regional bodies like the European Union facilitate cross-border One Health initiatives, supporting research, surveillance, and control measures that exceed the capacity of individual countries.

To effectively channel research entities such as university research centres, it is important to integrate fragmented but valuable projects into a cohesive One Health strategy. This can be achieved through sustainable funding models that extend beyond specific grants and periods. The EU Research Infrastructure system offers a model for well-funded, sustainable platforms, though inclusivity remains a challenge. Efforts must be made to ensure broader participation, particularly from widening countries, to avoid exclusion based on political or economic factors. The capacity-building strategy of the EU, exemplified by the Erasmus+ CBHE structure,⁶⁶ provides a framework for efforts to build

⁶⁶ <https://erasmus-plus.ec.europa.eu/programme-guide/part-b/key-action-2/capacity-building-higher-education>

sustainable and inclusive One Health resources. However, it is important to address the deprivation cost of resources post-grant to maintain long-term sustainability.

EU funding

Programmes like 'Emerging diseases in a changing European environment',⁶⁷ Med-Vet-Net Network of Excellence⁶⁸ and the One Health European Joint Programme⁶⁹ have been instrumental in enhancing research cooperation on One Health topics. The 2017 One Health Action Plan against AMR serves as a prime example of how EU-funded initiatives can bridge the gap between scientific research and policy implementation (European Commission, 2017). A significant challenge remains in the integration of funding from various EU agencies involved in One Health. Fostering interoperability at both the EU and member state levels is essential for effective One Health implementation; it can be advanced, for example, by creating standardised protocols for data sharing and common reporting systems that enhance coordination between funding entities. The ECDC provides a strong basis for shared reporting practices. However, more robust implementation phases are required to fully realise its potential in facilitating interoperability.

As noted above, DG-SANTE, responsible for policies on food safety, public health, and animal and plant health, plays a central role in coordinating One Health policy, with decentralised agencies contributing to the One Health framework. Despite their critical roles, the need for more streamlined collaboration and funding mechanisms is evident, as highlighted in 2023's 'Cross-agency knowledge for One Health action', a joint statement by the EU Agencies.

EU funding in the food chain area is governed by the Common Financial Framework 2014–2020 (CFF, Regulation (EU) No 652/2014).⁷⁰ Expenditure covers animal health and plant health measures, emergency measures linked to animal and plant disease outbreaks, official controls and relations with relevant international organisations. The total budget of the CFF is €1.892 billion euros (around €270 million per year). The CFF finances actions under the specific objective 1.1 in relation to food and feed safety. Recent initiatives under Horizon Europe and EU4Health have demonstrated the EU's commitment to advancing the One Health approach. Horizon funding, with its robust framework for supporting research and innovation, plays a pivotal role in fostering transdisciplinary cooperation. The integration of Horizon funds with EU4Health, a programme dedicated to bolstering health systems

⁶⁷ <https://cordis.europa.eu/project/id/10284>

⁶⁸ <https://cordis.europa.eu/project/id/506122>

⁶⁹ <https://onehealthjep.eu/>

⁷⁰ https://commission.europa.eu/system/files/2022-02/management-plan-sante-2020_en.pdf at p.4

and responding to cross-sector health threats, illustrates the potential for funding to facilitate science-policy interface collaboration.

DG-HERA receives a multi-source budget (about €30 billion coming from different financial instruments, including NextGenerationEU, EU4Health, Horizon Europe, The Union Civil Protection Mechanism, the European Defence Fund, the Recovery and Resilience Facility, REACT-EU, the Neighbourhood, Development and International Cooperation Instrument and support from Cohesion Funds. It also benefits from national budgets, “the mobilisation of private funding (in the form of loans, guarantees, equity or quasi-equity), supported by budgetary guarantees under InvestEU and the European Fund for Sustainable Development for external actions, in cooperation with the European Investment Bank Group and other financial actors”. Emergency funding can be triggered through the Council via the Emergency Support Instrument (ESI).⁷¹

To address these challenges, several policy options could be considered, including options to:

- enhance the mechanisms of funding distribution between EU agencies to promote cooperation and avoid duplication of efforts. This involves streamlining collaboration between decentralised agencies and the European Commission Directorates-General involved in One Health policy
- encourage ongoing EU-funded R&I programmes to focus on transdisciplinary projects that can directly influence policy decisions, fostering a more integrated approach to health. Programmes like Horizon Europe play a pivotal role in fostering such cooperation
- continue to expand the scope of EU4Health to fully integrate One Health strategies, ensuring a balanced approach to human, animal, and environmental health. This involves expanding the scope of EU4Health to include more comprehensive One Health strategies

Non-public funding

Private sector

Private investments and contributions from nonprofits and NGOs collectively play a pivotal role in advancing One Health initiatives. Although motivations and mechanisms may differ, both sectors contribute to bridging the gaps left by public funding, driving innovation, and addressing specific health challenges. Private investments are crucial for advancing specific health outcomes within the One Health framework. These investments are mainly project-based and often target areas of direct commercial interest. For instance, pharmaceutical companies might invest in the development of dual-

⁷¹ DG-HERA available at https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/health-emergency-preparedness-and-response-authority_en#responsibilities

use antibiotics for both human and veterinary medicine, while agribusinesses could promote sustainable agricultural practices that enhance soil health and reduce disease spread (Pretty et al, 2018; Van Boeckel et al, 2015). Such investments are essential for driving innovation and addressing specific health challenges. Private sector involvement often brings in significant financial resources, advanced technologies, and expertise that can accelerate the development and implementation of One Health solutions. While these investments frequently focus on projects with clear commercial benefits, we believe they also have the potential to contribute to broader public health needs. With careful alignment of corporate goals and public health priorities, private sector investments can be leveraged to support comprehensive health initiatives that benefit society as a whole.

Third sector

Nonprofits and NGOs, including international health organisations, environmental groups, and animal welfare organisations, add a layer of agility and specialised expertise to One Health financing. These organisations often address funding gaps left by the private and public sectors, particularly in under-resourced areas or regions with insufficient governmental infrastructure. The third sector is primarily funded through donations, grants, fundraising campaigns, and partnerships with other entities (see the table on the following foldout page). NGOs frequently support initiatives less attractive to private investors but essential for public welfare, such as disease prevention in low-income countries, conservation efforts, and educational programmes. Although NGO funding is flexible and targeted, it may fluctuate based on fundraising success and donor interests.

| Organisation | Activities | Research |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bill & Melinda Gates Foundation | This foundation is heavily involved in global health initiatives, including those that adopt a One Health approach, especially in areas related to infectious diseases and vaccine development | <ul style="list-style-type: none"> • It is one of the largest private foundations in the world and operates globally, with a vast network of grant programmes spanning multiple continents. • Its endowment is approximately \$50 billion, allowing for extensive funding across its various health, development, and education initiatives. |
| The Rockefeller Foundation | The Rockefeller Foundation supports initiatives that link human, animal, and ecosystem health, with a focus on sustainable development and resilience against health threats | <ul style="list-style-type: none"> • It has a long history of global health and development projects around the world, influencing policy and practice in numerous countries. • The foundation's assets are around \$4 billion, supporting initiatives in health, food security, power, and cities. |
| Wellcome Trust | A global charitable foundation dedicated to improving health by supporting projects that integrate human and animal health research, particularly in the fight against infectious diseases | <ul style="list-style-type: none"> • Based in the UK, Wellcome Trust has a significant impact worldwide, particularly in scientific research and health. • It has an endowment of approximately £29 billion (about \$36 billion), focusing heavily on biomedical research, infectious diseases, and mental health. |
| The Gordon and Betty Moore Foundation | This foundation supports environmental conservation, science, and patient care projects that often have a One Health perspective, particularly those that intersect with ecosystem management and wildlife conservation | <ul style="list-style-type: none"> • While it primarily focuses on the U.S., its environmental conservation efforts are global, especially in marine ecosystems and scientific research. • The foundation's assets are about \$6.4 billion, with environmental conservation, science, and patient care as its main areas of focus. |
| The Walton Family Foundation | While primarily focused on environmental conservation, the foundation supports efforts that also impact human health and livelihoods, aligning with One Health principles especially in marine and freshwater management | <ul style="list-style-type: none"> • It primarily focuses on the United States but also supports sustainable fisheries and ocean initiatives worldwide. • With an endowment of approximately \$5 billion, the foundation invests in K-12 education, environmental conservation, and home region initiatives. |

Table 4: One Health donor funding landscape.

Philanthropy

Philanthropy and philanthropic foundations play a pivotal role in the integration and implementation of the One Health approach. They can bridge funding gaps and introduce innovative health solutions that encompass human, animal, and environmental health. While the contributions of these donors are invaluable, their influence also introduces complex dynamics into the governance of One Health. Philanthropic foundations provide substantial benefits to global health initiatives by offering financial resources that are crucial for the research and development of health interventions (Moran et al, 2009). Their ability to rapidly mobilise funds allows for the swift implementation of innovative health solutions, particularly in regions where public sector funding may be inadequate (Schäferhoff et al, 2015; Yamey et al, 2020). Moreover, these organisations often set high standards for health interventions, elevating practices globally and promoting the dissemination of best practices (McCoy, Kembhavi, Patel, & Luintel, 2009).

The influence exerted by philanthropic donors does, however, raise several concerns. First, the capacity of philanthropies to direct public health discourse and prioritise certain health issues can lead to a disproportionate focus that may not align with the broader health needs of the population (agenda-setting) (Spencer et al, 2019). Second, philanthropic donors are not typically bound by the same standards of transparency that govern public sector funding (accountability). Third, the significant role of philanthropic funding can influence policymaking within sovereign nations, potentially overriding local priorities and expertise (national interests). Fourth, the dependency on philanthropic funding for certain health initiatives creates long-term risks (sustainability). Without adequate integration into national health systems or alignment with government priorities, the long-term success and maintenance of these initiatives remain at risk.

The intersection of philanthropy and global health is thus characterised by both opportunity and oversight challenges. As the European Union and its member states continue to collaborate with philanthropic entities, it is essential to critically assess and manage the influence of these donors. By fostering partnerships that are equitable, transparent, and aligned with the long-term health goals of all nations involved, Europe can create sustainable and resilient health systems under the One Health framework. Policy options might include:

- ensuring transparency in decision-making processes and maintaining rigorous standards of accountability to bolster public trust and support
- promoting the development of local capacities to foster sustainability and reduce reliance on external funding
- advocating for culturally and contextually appropriate health solutions that are developed in collaboration with local stakeholders

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- prioritising respect for partner nations, ensuring that initiatives align with and support local health priorities

By combining the strengths of private and third sector contributions, One Health initiatives can benefit from a more cohesive and comprehensive funding strategy. Private investments bring in capital and innovation, while nonprofits and NGOs offer flexibility, targeted expertise, and the ability to address under-resourced areas.

Key messages

- One Health initiatives should be economically profitable or have other qualitative societal or ecological benefits, justifying the investment. Otherwise, a One Health approach is not necessary. Investors should clearly see a benefit to engage in One Health initiatives.
- Effective One Health initiatives typically integrate public, private, and third sector funding sources to leverage their distinct advantages and offset their limitations. This blended financing approach facilitates the development of resilient health systems that are better equipped to prevent, detect, and respond to health threats.
- Collaborative efforts among these sectors are essential to address the complex challenges of today's global health landscape. To maximise the joint impact of all types of funding, the following strategies could be considered:
 - **Collaborative projects:** Encourage joint ventures and partnerships between private companies, nonprofits, and governmental agencies to leverage diverse expertise and resources. This collaboration can enhance the reach and impact of One Health initiatives.
 - **Transparency and accountability:** Establish clear guidelines and standards for transparency and accountability in philanthropic and private sector funding to build trust and ensure alignment with broader public health goals. This approach can mitigate the challenges of agenda setting and accountability.
 - **Sustainable funding models:** Develop funding models that integrate private and third sector contributions with public funding, ensuring long-term sustainability and reducing dependency on any single source. These models can promote a balanced and resilient funding structure.

SWOT analysis

A desktop review of strengths, weaknesses, opportunities and threats (SWOT analysis) of One Health and its governance suggests great opportunities for improved inclusion of diverse perspectives in One Health research (social, cultural, political, anthropological) which can translate into improved policy

design and implementation. Early involvement of stakeholders in the decision-making process improves commitment to implementation and impact. This demands stronger engagement between academic scholars and those working and researching policy, particularly in areas of management, implementation and monitoring and evaluation. Stronger collaboration, communication and coordination for improved knowledge sharing requires approaches which by design, transcend disciplinary, institutional and organisational and political boundaries (linking academics, decision-makers, and practitioners). By promoting deeper integration of diverse knowledge and fostering genuine collaborations across various sectors, transdisciplinarity can enhance our capacity to respond to health crises in a more coordinated, effective, and sustainable manner.

Strengths

- A formalised definition of One Health (OHHLEP) endorsed by the Quadripartite
- Global Action Plans for health security and sustainability and specific One Health case studies (e.g., AMR, Rabies)
- Strong commitment from EU Directorates and Decentralised Agencies
- Commitment to EU funding (Horizon and EU4Health)
- Existing indicators (SPAR, PVS etc.) which could be adapted to evaluate One Health policy readiness in member states

Weaknesses

- Domination of the policy-cluster by international organisations (disconnect with national policy, academia and local practitioners)
- Lack of consistent application of One Health definition (OHHLEP) and terminology and absence of a coherent shared understanding of what One Health entails in practice
- Separation between sectors and lack of collaboration between disciplines of animal, human and environmental health – disciplinary, institutional silos
- Wide variety of stakeholders and difficulty implementing efforts across stakeholders with different values, cultures and interests leading to poor coordination
- Dearth of investment into monitoring and evaluation

Opportunities

- Greater inclusion of diverse perspectives in One Health research (social, cultural, political, anthropological)
- Early involvement of stakeholders in the decision-making process to ensure their commitment in the implementation process

- Tools for improving multi-sectoral collaboration across systems in One Health:
 - Taking a Multisectoral One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries and its operational tools (WHO/FAO/OiE)
 - The One Health Zoonotic Disease Prioritisation Tool (CDC)
- Stronger engagement of academic scholars with those working and researching policy management, implementation and monitoring and evaluation.
- Promoting stronger collaboration, communication as well as knowledge sharing by encouraging a cross-sectoral and interdisciplinary and transdisciplinary approaches to One Health.

Threats

- Lack of political and institutional leadership and/or funding for multi-sectoral engagement, research and development and education
- Lack of shared vision, common goals and/or language
- Limited transdisciplinary within One Health research and lack of transdisciplinary expertise to evaluate/review projects
- Structural differences across countries (federal structures in Austria, Belgium, Germany and Switzerland/lack of local and regional agencies, such as in France and Czech Republic)
- Lack of sustainable investment in less formal networks that are built to manage events and activities, such as epidemics which is followed by an extensive surveillance follow-up for diseases
- Insufficient access to data and data sharing across different institutions and communities
- Weak representation and marginalisation of stakeholders from the ecosystem/environment sector
- Changing national political systems and their interests and differential resource availability hindering recommended policies by networks being implemented
- Siloed approaches when conducting assessments and research on One Health topics

A perceived absence of political and institutional leadership and/or funding for multisectoral engagement, research and development and education will present important challenges for the successful operationalisation of One Health in Europe. Lack of sustainable investment in informal networks has resulted in short-term projects which may inadvertently result in extractive approaches to experiential knowledge acquisition from stakeholders, especially if the latter are not fully included in decision-making processes about the design and implementation of policies which may directly or indirectly affect them. This may have important consequences for data access and sharing across different institutions and communities. Changing national political systems, differential resource capabilities and structural differences associated with governance across countries (federal structures

in Austria, Belgium, Germany and Switzerland and lack of local and regional agencies, such as in France and Czech Republic) may result in a failure to find a common vision, goals and/or language around One Health. As such any existing or new One Health initiatives may fail if these are not addressed and there is not a workforce which is adequately trained in transdisciplinary expertise to review, monitor and evaluate new proposals and translate them across diverse policy landscapes.

Conclusion

Our research suggests the following as potential policy options to improve One Health governance in Europe and beyond:

- Agree an **overarching conceptual framework** to categorise, standardise and harmonise current and future tools and approaches to strengthen One Health systems and tools development within member states (Pelican et al, 2019).
- Develop **formal monitoring and evaluation systems** of EU and international One Health policies, currently absent for the most part, to support the case for future funding (dos S. Ribeiro, van de Burgwal, & Regeer, 2019).
- Agree standardised **evaluation metrics** to assess the effectiveness of transdisciplinary projects in advancing One Health goals [(see Chapter 3)]. A dearth of investment into and delivery of monitoring and evaluation activities points to the need for future research on evaluation methods and tools specific for the One Health approach (Cediel Becerra, Olaya Medellin, Tomassone, Chiesa, & De Meneghi, 2021; Cediel Becerra et al, 2021; dos S. Ribeiro et al, 2019)
- Provide **access to training and education on transdisciplinary approaches** for One Health practitioners for knowledge integration, mobilisation and translation. Practitioners must feel part of a culture that encourages transparent and safe discussion of new ideas with established governance actors, ideally in programmes supported by permanent professional associations or organisations (Hitziger et al, 2018). Integrated education and training programmes are essential to encourage and prepare scientists, health professionals, and policymakers to think and operate across the traditional boundaries of their disciplines. Indeed, a joint statement by the European Union agencies on cross-agency knowledge for One Health action (ECDC et al 2024) emphasised the importance of strengthening One Health educational and training programmes to enable successful design and implementation of One Health initiatives and policies (dos S. Ribeiro et al, 2019; FAO et al, 2022); these should be supported and promoted through the development of training taskforces. Education programmes should focus not only on integrated health sciences but also on expertise from veterinary, agriculture and environmental sectors alongside skills in communication,

negotiation, and conflict resolution, which are vital for effective transdisciplinary collaboration. Systems thinking and associated practices for One Health require not only specific education in One Health core competencies, but also methodological and institutional measures to endorse broad participation (Hitziger et al, 2021). "Providing educational programmes to increase understanding of One Health and its terminology, and the process of knowledge translation" is among key facilitators for developing One Health governance identified by the SANTE JP67 report.⁷²

- Invest in an **online One Health database and repository** of European and global One Health networks to collect, integrate and share data across different health domains and geographical borders. This would aid and improve prioritisation and equitable distribution of existing resource allocation and help establish more egalitarian networks that encompass the breadth of One Health issues, and serve communities most affected by emerging, re-emerging, or endemic threats at the human- animal-environment interface" (Mwatondo et al, 2023).
- Launch **stakeholder collaboration platforms** to create formal and informal networks; these can facilitate ongoing cooperation and dialogue among researchers, health practitioners, industry leaders, and community representatives. The SANTE JP67 report referenced above also highlights 'Enhancing multisectoral communication and networking opportunities' as an enabler of One Health governance, along with systems for liaising and engaged communication, political leadership, shared vision or common goals (win-win strategies) and funding (Amri et al, 2022).
- Lack of commitment of policymakers, resources, and budget for One Health and the "silosed approach" of sectors and disciplines (Cediell Becerra et al, 2021) remain important barriers. This is compounded by difficulties in "promoting meaningful and equal participation from diverse actors [...] beyond their own professional and cultural silos" (Amri et al, 2022; Hitziger et al, 2021).
- Develop approaches, underpinned by financial and political cooperation, to achieve **context-specific intersectoral collaboration**, significant resource and political cooperation. Individual country requirements cannot be underestimated, dismissed or prescribed in a top-down manner" (Okello, Bardosh, Smith, & Welburn, 2014).
- Develop **flexible funding mechanisms** with the agility to respond to unanticipated One Health threats.
- To increase the influence of the One Health approach on EU policy, the following '**leverage points**' should also be considered:
 - greater attention to the role of environmental factors on infectious disease outbreaks

⁷² Drees S, Green L, Ille L. Operationalisation of the One Health approach across the European Commission. Final report of the Junior Professionals Programme project. Project sponsor: DG SANTE F2. Brussels: European Commission, [2022]

EU policies benefiting from a One Health approach

- the indispensability of One Health in surveillance and response
- antimicrobial resistance
- the inclusion of One Health approaches as a requirement in EU grant applications

Criteria and indicators to assess effectiveness

Summary

Referring to the One Health definition of OHHLEP reviewed for the EU context in Chapter 1, here we set out the need for robust indicators and measures to assess the effectiveness of One Health operationalisation. We then formulate a theory of change and checklist for the operationalisation of One Health. The outputs and outcomes of the theory of change provide context-specific requirements for quantitative and qualitative indicators, which can inform an iterative One Health policy cycle to continuously optimise the benefits. A literature review follows, summarising the state of knowledge on the evaluation of One Health in terms of economic and financial, human and animal health, social, environmental, institutional, and operational benefits. Qualitative approaches include the “One Health-ness” index and the Integrated Surveillance System Evaluation framework, while linear and dynamic assessments, economic analyses and game theoretical approaches, are among quantitative indicators. We provide examples of cross-sector evidence of benefits of One Health operationalisation. Other indexes and tools are discussed, including the One Health Systems Mapping and Analysis Resource Toolkit. Based on the state of the knowledge and examples providing evidence of an incremental benefit, we present an open toolbox of criteria and indicators for assessing the effectiveness of One Health institutionalisation and operationalisation. We introduce evidence-based options for a One Health iterative policy cycle that continuously optimises the benefits from One Health operationalisation. We conclude that, while One Health assessment remains an open field, the currently available indicators are sufficient to evaluate the effectiveness of EU policies in operationalising One Health.

Why do we need indicators? Human, animal and plant health status

There is growing evidence of the benefits of a One Health approach to the management of human, animal and plant health, while simultaneously managing natural resources in a sustainable way. To put One Health into practice and make it operational requires cooperation between sectors (human health, animal health, agriculture, environment) at various levels, from communities to districts to provinces to nations to international levels. Different institutions have different definitions, norms,

agendas and goals. Hence, harvesting the benefits of effective institutional cooperation requires bridge-building and systemic thinking on interconnected processes. Essentially, cooperation should lead to benefits that can be recognised and measured in terms of biological, environmental, social and economic indicators (Table 5).

The environmental dimension of One Health operations requires a deep understanding of the environmental components of a given context (plants, microbes, fungi, soil, waterways, the atmosphere, manufactured materials and chemicals, and the climate) as well as how these work with humans and animals to constitute ecosystems. Subsequently, the health status of vertebrates, including humans, and plant populations, including aquaculture, are assessed. Further dimensions are the level of antimicrobial resistance and the status of environmental contamination or sanitation. Of critical importance too is the level of animal welfare and protection, which is highly relevant for pandemic prevention (Zinsstag et al, 2020). As we discussed in Chapter 1, we should re-examine animal welfare in common agricultural practices like mass animal production, transport over long distances, marketing and slaughter in the light of the One Health High-Level Expert Panel (OHHLEP) definition of One Health. Europe should contribute to the promotion of a United Nations convention on animal welfare and protection. Along with securing the animal-human biosecurity interfaces, integrated environment-animal-human surveillance-response systems may reduce time to detection of emerging diseases and accelerate time to response (Zinsstag et al, 2023).

A theory of change of One Health operationalisation

In Chapter 1, we explored the different paradigms of integrated approaches to health.

Firstly, we can distinguish paradigms that emphasise the interconnection between humans, animals and environments like One Medicine, Ecosystem Health, One World One Health™, and Planetary Health. At a second level are paradigms that emphasise the incremental benefit of a closer cooperation (One Health) and their optimisation (OHHLEP). Together, the group of paradigms emphasising the interconnectivity of humans, animals and the environment are important to recognise that interdisciplinary work is needed to solve contemporary complex problems. Paradigms that emphasis incremental benefit of One Health and its optimisation can be used to develop methods to assess benefits of an integrated approach to health of all species for governments and society at large that would not be achieved if the problems are addressed in silos. In particular, the aspiration of optimisation is fruitful, as it can be approached with game theoretical multi-criteria decision making (Bucher et al, 2023; Zinsstag et al, 2024).

OHHLEP developed a theory of change to guide their work and provide a conceptual framework for organisations working towards One Health goals (OHHLEP, 2022). Here, we adapt the OHHLEP theory of change to the European context and to align it to a formal concept of strategy analysis in a multi-stakeholder context of social-ecological systems.

The aspiration of One Health to reach an optimal equilibrium between the health of humans, animals, and environments (together constituting ecosystems) requires a process of societal change that evolves towards this equilibrium. An optimisation of health of all species and the sustainable management of natural and human resources is only possible if actors cooperate with each other and adhere to commonly accepted norms and rules, known as “governance systems” (Zinsstag et al, 2024). This is an explicit theoretical pillar of a One Health approach as a transdisciplinary participatory process, seeking consensus on societal problem solving (Zinsstag et al, 2023). It builds and expands on the principles of New Institutional Economics of governing common pool resources proposed by Elinor Ostrom (2009; 2015). Thinking of the health of all species partially as a common pool resource and partially as a public good provides the conceptual foundation for considering the health of all species and the sustainable use of natural resources within one framework (Zinsstag et al, 2020). Although initially oriented to the management of common pool resources among smaller communities, the Ostromian concept can be applied in principle to higher scales of provinces, nations, and international cooperation.

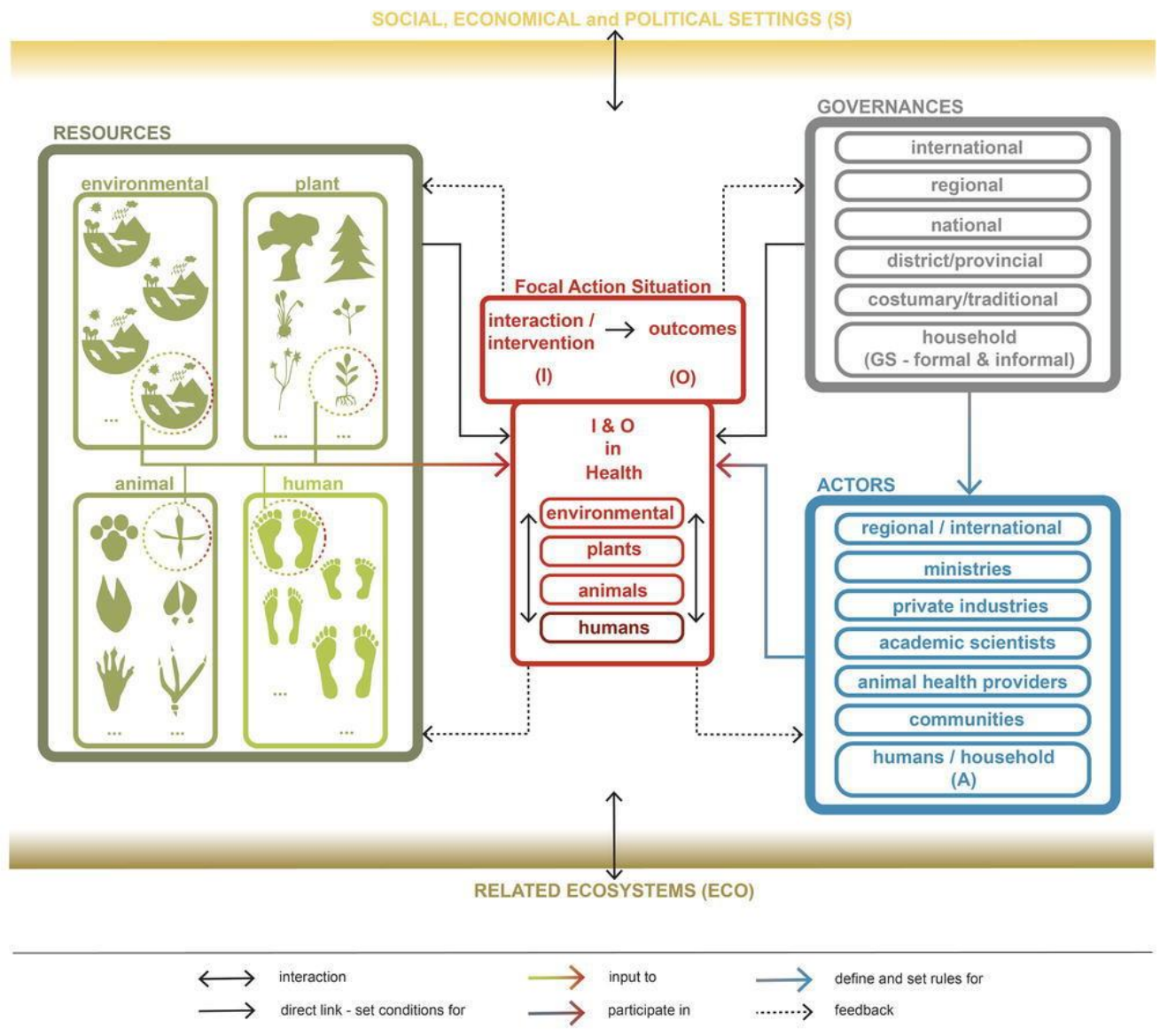


Figure 6: Theory of change of One Health in social-ecological systems (Jakob Zinsstag et al, 2024).

In a theory of change of One Health operationalisation, actors at all levels of society, including communities, authorities, and technical experts, commit to collaboration and set the norms and rules of One Health governance at every level of constituency. They commit to identifying dilemmas of diverging strategies as Focal Action Situations (see [Figure 5][]), define the interactions, and agree on interventions and expected outcomes. These expected outcomes determine the indicators of effectiveness of One Health operationalisation which are elaborated below. In the aftermath of the Covid-19 pandemic the German philosopher Jürgen Habermas calls for a “desirable policy change towards a socio-ecological agenda with a course towards greater integration of core Europe” (Habermas, 2022).

The theory of change of One Health operationalisation for the European context (adapted from the OHHLEP theory and the Ostromian concept of One Health in social-ecological systems) can be

translated into a checklist (Box 1), summarising the governance and participatory processes that lead to One Health interventions. Jointly agreed indicators assessing the effectiveness of One Health interventions lead to iterations of participatory processes towards the optimisation of the health of humans, animals, plants and the sustainable use of natural resources.

Box 4: One Health operationalisation checklist

- Introduce top leadership, superior to the different sector heads, that convenes stakeholders and actors (e.g. prime minister, minister of finances, minister of planning).
- Create a One Health coordination platform (typically top leadership of public health, animal health, agriculture and environment).
- Identify One Health issue (typically a problem that requires a multi-sectoral approach).
- Formulate a theory of change possibly based on a multi-criteria decision analysis and according to context.
- Identify and map stakeholders.
- Engage in a participatory transdisciplinary stakeholder process involving academic and non-academic stakeholders for the framing of the One Health issue and the validation of the theory of change (involve communities, authorities and technical experts together).
- Proceed to an ex-ante process analysis of the framed One Health issue (social, economic and ecological impacts) (see Chapter 4).
- Clarify and document institutions and their scaling (national, provincial, district levels)
- Clarify and document roles and responsibilities.
- Clarify and document the chain of command and communication pathways.
- Implement One Health issue at small scale.
- Proceed to an ex-post impact analysis of the One Health issue (social, economic and ecological impact) and supportive infrastructural 'One Health-ness'.
- Engage in a participatory stakeholder process similar to point 3 for the reassessment of the One Health issue focus and possible scaling up.
- Scale up the implementation One Health issue.
- Iterate steps 9–14.

To assess benefits from One Health interventions in Focal Action Situations, we need methods to measure the respective contributions of the cooperation between sectors, specifically public and animal health, agriculture, and the environment. Further, institutions of these sectors have to work between different levels of scale, from communities to district to province to nations to international levels. For example, farming households must protect themselves from exposure to zoonoses like brucellosis, but at the same time national veterinary services have to organise mass vaccination

campaigns to which farmers should adhere. Different institutions have different definitions, norms, agenda, and goals that are often not aligned. This requires bridge building and diplomatic efforts (Ruiz De Castaneda et al, 2022) to find consensus and foster cooperation across sectors and scales (multilateral–nation–province–community).

Transdisciplinary participatory approaches, the co-production of transformational knowledge between academic and non-academic actors, across sectors and scales of governance are a pillar of One Health (Hadorn et al, 2008; Zinsstag et al, 2023). The level, scope and quality of transdisciplinary cross-sector cooperation is thus itself an important indicator and criterion for the quality of One Health operationalisation. Timely impact analyses (12 in the One Health operationalisation checklist, Box 4) may indicate unintended consequences of One Health interventions that can be addressed in subsequent participatory processes (13, Box 4).

Literature review on indicators of One Health operationalisation

Indicators for the evaluation of One Health operationalisation are qualitative and quantitative. Firstly, they assess the level and quality of cooperation and integration of institutions and actors. Secondly, the indicators measure quantitatively the benefits and optimisation of One Health approaches. Here, we review the existing literature and set out principles for the development of One Health indicators in the context of the EU.

Qualitative indicators

One Health operationalisation entails engagement in new paradigms of thinking, planning and putting into practice cross-sector cooperation, primarily between public and animal health, agriculture, and the environment. All these sectors have further technical ramifications that need to be included as equally as possible. For example, farmers contribute to the environmental sector by sustaining a highly biodiverse ecosystem, which reduces the risk of emerging diseases; hence, farming practices have an indirect effect on public and animal health. In particular, the social sciences and humanities play a crucial, but often overlooked, role in providing insights into how societies work, how policies are developed, and how behaviours are determined culturally. Cultural practices determine the use of health services or the human-animal relationship. Thus, a deep understanding of cultural and spiritual contexts contributes to the understanding of human and animal health.

Criteria and indicators to assess effectiveness

The European Union COST Action Network for the Evaluation of One Health brought together over 250 scientists from 30 European countries in an effort to review the theoretical foundations and a novel evaluation framework. It addressed social sustainability, the ecological dimension and the economic evaluation of One Health (Rüegg et al, 2017; 2018). An indicator has been developed, estimating the level of integration of cross-sector One Health cooperation, the so-called “One Health-ness” index. It assesses semi-quantitatively the level of operational (thinking, planning, working) and infrastructural (systemic organisation, sharing and joint learning) integration between sectors. It can be used to follow up the progress of governance at state or provincial level. It is probably less useful for comparison between constituencies.

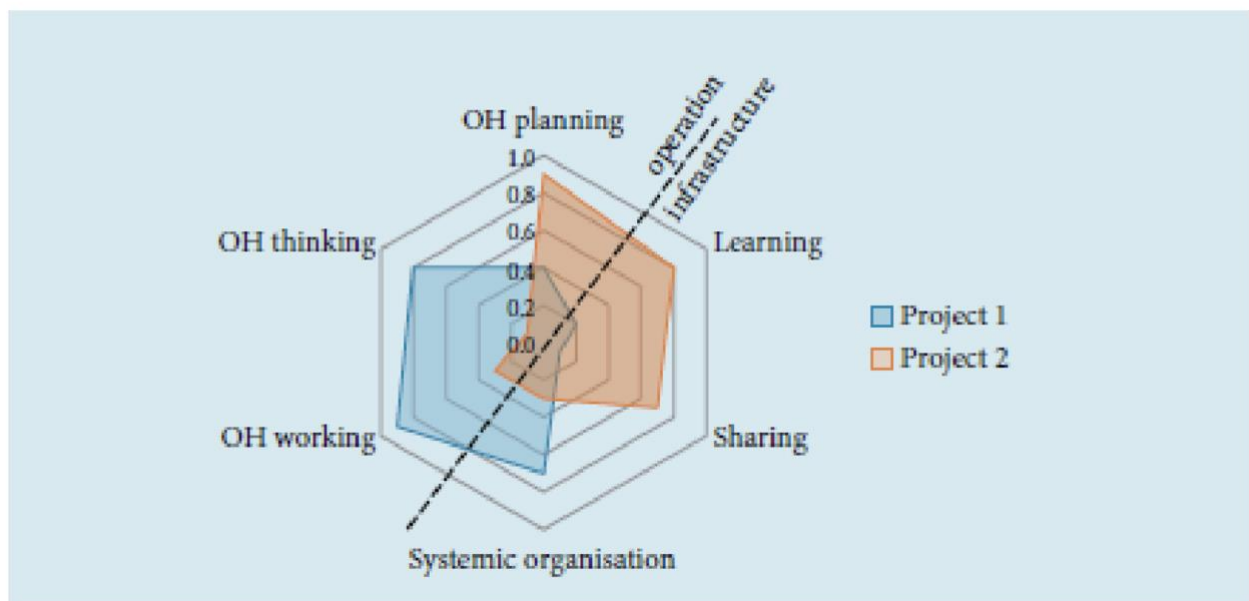


Figure 7: The “One Health-ness” index addressing planning, thinking, working, learning, sharing and systemic organisation (Rüegg et al, 2018).

Hitziger et al (2018) argue that a policy cycle for One Health governance should include coordination mechanisms, multicriteria analysis, systems thinking, and transdisciplinarity, and provide case examples for knowledge integration in One Health policy formulation, implementation, and evaluation.

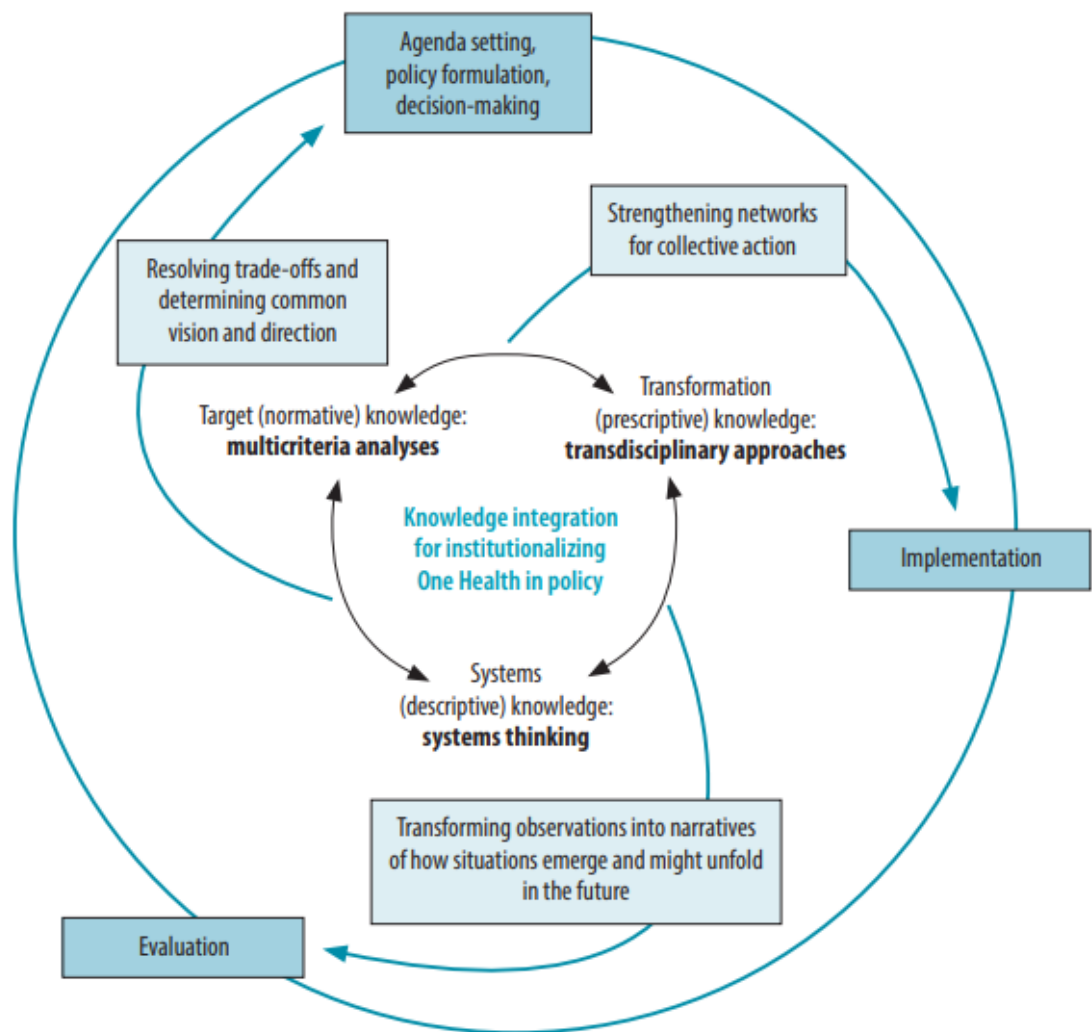


Figure 8: The One Health policy cycle in a diagrammatic representation (Hitziger et al, 2018).

According to Zinsstag, Pelikan, et al (2023), One Health research and problem-solving emphasises value-adding transdisciplinary processes, engaging science and society. They write:

Transdisciplinary approaches are an essential theoretical and methodological component of One Health research. The complex societal problems for which One Health solutions may be applied cannot be understood and addressed without engagement between scientists and non-academic actors in society and government. One Health inherently integrates inter- and transdisciplinary practical knowledge. This integrative function of One Health has important epistemological challenges with ontological and broader philosophy of science consequences. It is limited only by the willingness of the different academic and non-academic actors to cooperate.

Effective transdisciplinary processes are therefore an important qualitative indicator of One Health. Reports on transdisciplinary participatory processes have well-formulated criteria indicating the quality of stakeholder mapping and involvement and assess the content and quality of the co-production of transformational knowledge. A toolbox on quality criteria of transdisciplinary processes is available on <http://www.transdisciplinarity.ch>, the platform of the transdisciplinarity network (TD-net) of the Swiss Academies of Arts and Sciences.

Geographical approaches, like the Global Database for Tracking AMR – Country Self-Assessment Survey (TrACSS) – provide an option to view multi-section and One Health collaboration/coordination in which countries are scored for their levels of cross-sector cooperation.⁷³ The Integrated Surveillance System Evaluation framework considers the capacity of the system to integrate a One Health approach, produce One Health information and expertise, generate actionable knowledge, influence decision-making, and positively impact outcomes (Aenishaenslin et al, 2021).

Quantitative indicators

Literature on measurable benefits of One Health approaches is scarce. The Checklist for One Health Epidemiological Reporting of Evidence (COHERE) guidelines aim to improve the quality of reporting of observational or interventional epidemiological studies that collect and integrate data from humans, animals and/or vectors, and their environments; and to promote the concept that One Health studies should integrate knowledge from these three domains. The 19 standards in the COHERE checklist address descriptions of human populations, animal populations, environmental assessment, spatial and temporal relationships of data from the three domains, integration of analyses and interpretation, and inclusion of expertise in the research team from disciplines related to human health, animal health, and environmental health (Davis et al, 2017).

The most recent systematic review on current evidence of the economic value of One Health initiatives finds a “growing body of evidence of the value of One Health initiatives, although a substantial part of the evidence still focuses on “traditional” One Health topics, particularly zoonoses. Developing a standardised and practical approach for One Health economic evaluation will facilitate assessment of the added value and gather evidence for One Health to be invested in and endorsed by multiple sectors” (Auplish et al, 2024).

Our literature review of quantitative indicators suggests the following distinct methodologies are used for assessing the value of the One Health approach:

- linear statistical assessments

⁷³ see: map-view(<https://www.amrcountryprogress.org/#/map-view>)

Criteria and indicators to assess effectiveness

- mathematical dynamic assessments
- economic analyses of profitability (benefit-cost ratio) and cost-effectiveness (cost per life saved, or cost saved per disability-adjusted life year)
- comparisons of cumulative cost
- multi-criteria analysis of multiple strategies using game theoretical approaches

The following sections discuss each in turn.

Linear statistical assessments

Linear One Health assessments address how human and animal health and other sectors are statistically related. For example, human brucellosis sero-prevalence in Kyrgyzstan is statistically related to the sero-prevalence in sheep but not to those in cattle or goats (Bonfoh et al, 2012). Similarly, human vitamin A status of pastoralist women in Chad depends on the vitamin A level in the milk of cattle and camels. However, an ecological link of livestock milk vitamin A to the beta-carotene content of grasses on pasture was not statistically significant (Zinsstag et al, 2002).

Mathematical dynamic assessments

Dynamic One Health assessments relate people, livestock, and environments in a dynamic way using mathematical methods such as coupled differential equations. Earliest animal-human disease transmission models addressed the transmission of brucellosis in Mongolia (Zinsstag et al, 2005) and dog-human rabies transmission in Chad (Zinsstag et al, 2009). These models allow the simulation of intervention strategies in a comparative way and assessment of the economic effect.

Economic analyses and cost-effectiveness

One Health economic analyses are inherently cross-sector, including public health, animal health, agriculture and the environment. Analyses of profitability explicitly work out the incremental benefit of a closer cooperation between human and animal health and other sectors (Chapter 3) when compared to separated approaches. For example, mass vaccination of livestock against brucellosis is profitable at a benefit-cost ration of 3.2 if public and private health and livestock productivity benefits are included, and may lead to the elimination of the disease. A strategy focusing solely on humans is not profitable because it does not interrupt transmission in animals. The cost-effectiveness of a shared cost approach (separable cost method) is estimated at \$20 (US dollars) per disability-adjusted life year saved. A strategy concentrating on human treatment alone would be over \$100 per disability-adjusted life year saved (Roth et al, 2003).

Joint animal and human service provision to pastoralists in Chad has a benefit-cost ratio of 1.15, by sharing transport and cold chain between public and animal health services (Schelling et al, 2007). An

Criteria and indicators to assess effectiveness

integrated mosquito, wild bird, horse and human surveillance response system in Emilia Romagna in Italy has a ratio of 1.03 and ensures that the communication pathways are kept short, avoiding the use of contaminated blood conserves during outbreaks (Paternoster, Martins, et al, 2017).

Both qualitative and quantitative indicators have been used to show the benefits of integrated infrastructure. For example, the World Bank describes the Canadian Science Centre for Human and Animal Health in Winnipeg “as one of the few institutes worldwide that has effectively sought to integrate animal and human health to promote efficiency and effectiveness. It is the first organisation in the world to house, in one facility, the laboratories for human (Public Health Agency of Canada’s National Microbiology Laboratory) and animal (Canadian Food Inspection Agency’s National Centre for Foreign Animal Disease) disease research at the highest level of bio-containment”.⁷⁴

The facility is separated in blocks for animal and human high-level containment. The remainder of the laboratory is designed for collaboration of scientists in the human and animal health sectors. The World Bank estimates savings of 26% in the operations cost of the Centre ([Box 6]). The greatest programmatic efficiency gains are from a closer collaboration for surveillance activities (facilities, field staff, and communication). The facility was the first laboratory to identify SARS COV-1 in 2003.



⁷⁴ World Bank, 2010. People, pathogens and our planet: Volume 1: Towards a One Health approach for controlling zoonotic diseases. Report No. 50833-GLB, 56.

Figure 9: The Canadian Science Centre for Human and Animal Health in Winnipeg, Canada.

Financial savings of the CSC, compared to two separate laboratories:⁷⁵

- Establishing one facility for animal and human health diagnostics. Significant savings are made through sharing the costs of common services. These include sample reception/dispatch, library, information technology, emergency response, operation and maintenance of the facility (wash-up, cleaning, air filtration, disposal of bio-waste, hydro power and generators), common area staff, safety, training, quality assurance, communication, media, and so forth. More specifically, the operational (recurrent) costs of two separate diagnostic facilities (one for the animal health sector and one for the human health sector) would amount to \$19.55 million per year (\$12.3 million for the human health facility and \$7.25 million for the animal health facility).
- The operational costs of a joint facility amount to \$14.5 million per year, a saving of about \$5 million, or 26% (with about 6% coming from the human health services and 20% from the veterinary services). These data do not include costs and their respective savings on investments, nor on surveillance, control, communication, and other joint activities.
- Further efficiency gains can be made through sharing one electronic software system across animal and human health sectors and across national, provincial, and local levels. This improves communication flow and knowledge sharing.⁷⁶

Comparisons of cumulative cost

Comparative cost analyses typically compare cost between different strategies in humans, animals or the environment. For example, the cumulative cost of dog mass vaccination and human post-exposure

⁷⁵ <https://danskelove.dk/sundhedsloven/2221>

⁷⁶ Directive 98/8/EC concerning the placing of biocidal products on the market. Available at: <https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A31998L0008>

prophylaxis (PEP) against rabies breaks even after 6 years compared to human PEP alone and is less costly on a time horizon of 10 years (Mindekem et al, 2017; Zinsstag et al, 2009):

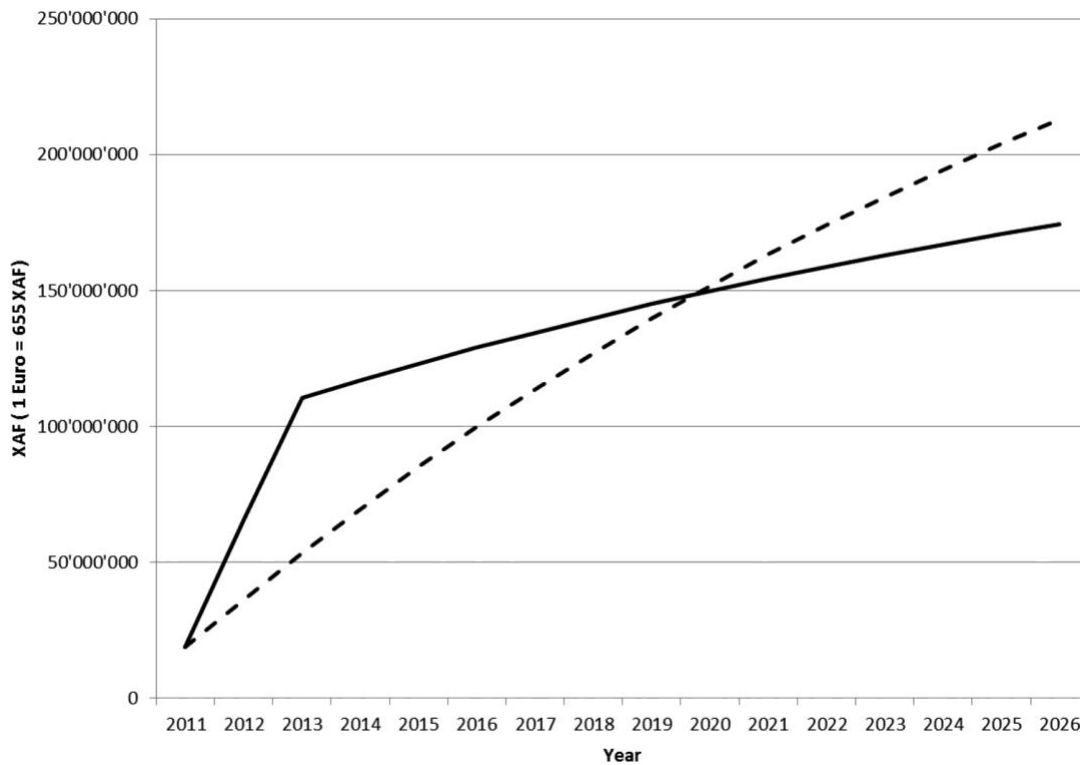


Figure 10: Comparative cost assessment of human PEP and dog vaccination and PEP (Mindekem et al, 2017; J. Zinsstag et al, 2009).

The COST action on Network for Evaluation of One Health includes a chapter on economic valuation of One Health approaches (Rüegg et al, 2018).

One Health indexes and tools to support implementation

Several One Health indexes have been proposed using multicriteria assessments. The One Health Index by de Moura et al (2022) uses principal component analysis of human, animal and environmental parameters. However, the respective weighting and practical consequence is unclear. Similarly, a Global One Health-Intrinsic driver index evaluates human, animal and environmental health development process globally using fuzzy logic, although the practical meaning of a 'high' index value is not clear (Feng et al, 2022). A global One Health index which uses fuzzy logic to analyse a large number of human and animal health and environmental parameters, has also been proposed; however, its practical use remains doubtful because of the unclear comparative valuing of health and environmental parameters, and their respective weighting (Zhang et al, 2022).

Based on the International Health Regulations of the World Health Organization and the Performance of Veterinary Services, National Bridging Workshop methods were developed and refined to guide the operationalisation of One Health (Belot et al, 2021).

Another tool, the One Health Systems Mapping and Analysis Resource Toolkit (Errecaborde et al, 2017), enhances multi-agency collaboration around infectious disease outbreaks and proved to be an adaptable, scalable process requiring minimal resources. The authors present this as a potential tool to help countries analyse their existing health system and create relevant action steps to improve cross-sectoral collaborations. A summary of the evidence of One Health for Global health security adds further examples of the benefit of a One Health approach for pandemic prevention (Zinsstag, Kaiser-Grolimund, et al, 2023).

Multi-criteria analysis of multiple strategies using game theoretical approaches

Social-ecological system approaches have been used for strategic analyses of sustainable use of natural resources like rangelands, fishing grounds, livestock or forests. Elinor Ostrom's concept of "governing the commons" contradicts the so-called "tragedy of the commons" idea that assumes that common pool resources are inevitably overused and irreversibly destroyed (Ostrom, 2007, 2009, 2015). One Health can be included into the social-ecological system approach as 'One Health in Social-Ecological Systems' (OHSES) by including humans as a resource system that contributes to the human capital of a nation's gross domestic product. Ill health leads to a reduction of health and wellbeing benefits through premature death, disability or temporary reduction of work capacity. The OHSES analysis framework uses game theory and mathematical modelling for strategy evaluation and comparison. It enables us to analyse the system's current situation and find possible Nash equilibria, Pareto-optimal solutions, and best resource management strategies, while also maintaining sustainable ecosystem services (Zinsstag et al, 2024).

A first example on the elimination of dog rabies in Africa shows that, when compared to human post-exposure vaccination, coordinated mass dog vaccination is the best strategy for all countries. This approach led to human capital benefits of \$10 billion (US dollars) over a period of 30 years, with the possible elimination of the disease, while inaction and all other strategies have lower welfare benefits and would ultimately fail to eliminate dog rabies. Further case studies relating human and animal health and sustainable natural resource use are needed to show how human and animal health can be related to the sustainable use of natural resources to address the broader impact of the contemporary threats, such as AMR, biodiversity loss and climate change (Bucher et al, 2023; Zinsstag et al, 2024).

A recommended toolbox of indicators

One Health operationalisation is a dynamic process, involving qualitative and quantitative dimensions, as represented below (without dogmatically holding to the proposed steps):

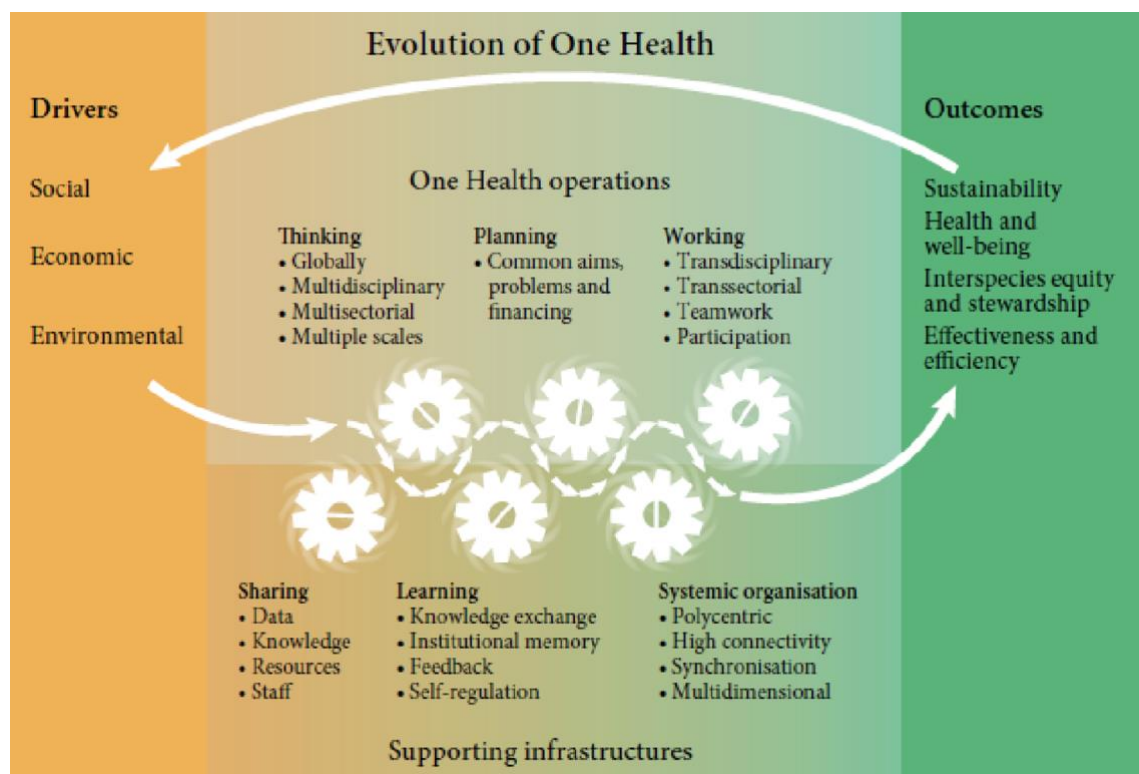


Figure 11: Processes of One Health operations (Rüegg et al, 2018).

Qualitative indicators

Qualitative processes like integrative cross-sector thinking, planning, sharing and learning, leading to cross-sector cooperation, are fundamental to One Health operations, and may translate into policies, legislations, and sharing of institutions. These qualitative processes can be assessed through adequate sets of indicators lined out under One Health processes and institutions.

Qualitative indicators for the assessment of One Health operationalisation can be derived from the checklist in Box 4. A non-exhaustive set is provided below:

- evidence of One Health top leadership
- evidence of One Health institutional setups like One Health platforms or coordination bodies
- documentation of One Health coordination processes
- documentation of One Health governance documents, legislations and decrees

Criteria and indicators to assess effectiveness

- documentation of national diseases control programmes, integrated surveillance-response systems or AMR surveillances as examples of One Health interventions
- documented roles and responsibilities of coordinated One Health interventions
- documented chain of command and communication pathways in One Health interventions

Quantitative indicators

One Health operations can be analysed using benefit-cost analysis, with cumulative cost and cost-effectiveness assessments compared to those for separate services. Game theoretical approaches for multi-criteria decision-making can also be used. These are discussed in turn below. The proposed indicators are summarised in Table 5.

Benefit-cost assessments

Benefit-cost assessments are intended in general for internal progress evaluation at the societal level (societal cost). Outcomes of these analyses for One Health can be compared with uni-sectoral approaches; address specifically the levels of communication, collaboration, coordination and capacity-building (the so-called 'four Cs' of One Health); and examine the benefits for one sector when intervening in another that can be used to justify investment and cost-sharing (Auplish et al, 2024). One Health operations can thus be analysed for their financial and economic benefits from empirical or counterfactual scenarios to estimate their incremental benefit. Typically, in quantitative assessments of One Health operations, we compare standard sectoral approaches with intersectoral approaches working together. In Formula 1, the benefit-cost ratio of a One Health intervention is compared to a sectoral intervention (Roth et al, 2003).

$$\frac{\textit{Public health and animal benefits}}{\textit{Intervention cost in livestock and humans}} \gg \frac{\textit{Public health benefits}}{\textit{Intervention cost in humans}}$$

Formula 1

Cumulative cost assessments

A cumulative cost comparison is shown in Figure 10 above, showing that the cumulative cost of a dog rabies control and human post-exposure prophylaxis is less costly than human post-exposure prophylaxis alone over a time horizon of ten years. We can use cumulative cost assessments for payoff calculations of different strategies. This is presented in more detail in the section on multi-criteria decision making and game theoretical approaches below.

Criteria and indicators to assess effectiveness

Cost-effectiveness assessments

In Formula 2, we present a comparative cost-effectiveness analysis of brucellosis control using livestock mass vaccination against treating humans with antibiotics only (Roth et al, 2003).

$$\text{Cost effectiveness} = \frac{20 \text{ USD}}{\text{DALY averted}} \text{ (Shared cost of livestock vaccination)}$$

$$\text{Cost effectiveness} = \frac{>100 \text{ USD}}{\text{DALY averted}} \text{ (Human treatment alone)}$$

Formula 2

Multi-criteria decision-making and game theory

Multi-criteria decision-making may be used for game theoretical strategy analyses. Depending on the problem to be addressed, constraints on resource use can be specified ahead of a strategy analysis to sustain, for example, the use of natural resources (Zinsstag et al, 2024). Human resources should be included by assessing their contribution to the human capital benefit in terms of the cumulative per capita contribution to the GDP of a nation (Bucher et al, 2023). Recently, a novel stringent mathematical and economic method to assess the optimisation of One Health strategy equilibria, linking health and environmental resources has been proposed (Zinsstag et al, 2024).

Tables 5a and 5b propose appropriate indicators for different types of biomedical and economic assessments:

| Type of assessment | Proposed indicator |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Cross-section comparison of sectors | Linear statistical methods like regression or risk analysis (i.e. cross-sector regression slope) |
| Longitudinal dynamic comparison of sectors | Mathematical models like coupled differential equations, stochastic models or contact network models (i.e. animal-human transmission constant) |

Table 5a: Biomedical and environmental assessments

| Type of assessment | Proposed indicator |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Return on investment | Benefit-cost ratio; cost-effectiveness analysis |
| Multi-criteria decision making and social-ecological systems analysis | Mixed quantitative and qualitative indicators; game-theoretical analysis (Nash equilibria) |

Table 5b: Economic and financial assessments

Conclusions

In this chapter we have described qualitative and quantitative indicators for assessing One Health operationalisation. Which indicators are to be used depends on the specific One Health issue to be assessed. The assessment of One Health operationalisation remains clearly an open field to which new qualitative and quantitative indicators can be added and adapted to the respective context. However, we believe that the currently available indicators are already sufficient to assess the effectiveness of EU policies in operationalising One Health.

Leverage points for One Health: evidence from a literature review and case studies

Summary

This chapter aims to identify leverage points for building capacities, planning, and implementing One Health policies across EU policies and institutions. We start with a literature review, providing evidence that adopting One Health interventions and policies can provide benefits, across different domains from humans to animals and environments but that assessment of these benefits is difficult and lacks standard approaches. Of a total of 245 publications relevant to One Health, most (70%) addressed infectious diseases, with the remaining coverage equally distributed across the topics of environmental health, sustainability, climate change, and non-communicable diseases. Almost half (47%) of publications reported positive outcomes. Of the studies where benefit-cost ratios of One Health interventions are estimated, the highest ratio can be expected from zoonoses transmitted from animals to humans but almost never between humans. There was some evidence of benefits of integrated infrastructures. The One Health-related literature is anthropocentric in focus; however, environmental topics such as climate change and biodiversity are increasingly considered in One Health approaches.

We also present six case studies from across Europe on the implementation of a One Health approach. These illustrate the focus to date on infectious diseases, the lack of assessment of the benefits of One Health approaches, and the importance of political ownership, clear governance structures and dedicated funding to support the One Health implementation interventions. The case studies indicate that One Health approaches have been pioneered already for a long time with clear beneficial effects (e.g. with trichinosis, AMR). One Health is operationalised in different social, cultural, political, economic and ecological contexts, thus requiring different solutions to enhance cross-sectoral collaboration. Costs and benefits will depend on the context, so need to be assessed in various settings; making fair comparisons is difficult. While mainly driven by zoonoses research and argued for through monetary cost-benefit analysis, a number of examples of One Health benefits exist in other contexts and which look at a wider selection of outcomes. Recent initiatives with a less

anthropocentric focus and are now considering the environmental domain and finding synergies for considering such issues as biodiversity loss.

Literature review

Approach

Our literature review examined reports of One Health interventions across the globe and the documented effects of these interventions and benefit-cost ratios wherever possible. A literature search on “Cross-sectoral evidence-based governance for One Health in the EU: studies assessing the cost-benefit ratio of One Health initiatives” was conducted by the SAPEA literature review team (European information hub, Cardiff University). To identify the relevant academic literature, the Web of Science and Ovid MEDLINE databases were searched (see Annex 4 for details on the search strategies used).

The diversity of the definitions of One Health (as noted in Chapter 1) was evident in the literature we reviewed, as were its perceived shortcomings and lost opportunities (Cañada et al, 2022; Coghlan et al, 2021; Hermesh et al, 2019; Traore et al, 2023). Thus, the scope of our literature searches inevitably failed to match precisely the OHHLEP definition (or our own modification of it). Furthermore, not all One Health approaches are explicitly called “One Health”. Therefore, we were closely attentive to which domains of One Health were usually considered and which were not.

Results

Previous systematic reviews

The search yielded several relevant systematic reviews. For instance, Baum et al (2017) carried out a systematic review of the benefits of a One Health approach, defined as “increasing public health efficiency and cost effectiveness through a better understanding of disease risk—through shared control and detection efforts, and results that benefit human, animal and ecosystem health”. This review included 1839 unique papers, of which only seven reported quantitative outcomes. The authors conclude that, despite widely cited benefits of One Health approaches, few studies have actually measured effects based on implementation studies. They also noted a lack of uniformity in methodologies used, therefore compromising the ability to compare results.

Similarly, Falzon et al (2018) reviewed a vast amount of literature (42 167 references) for quantitative evidence of the benefit of One Health initiatives. Based on their criteria, 85 publications were selected

for final analysis, including publications on rabies and malaria interventions (vector control or vaccination) and air pollution. When applying the inclusive One Health definition described in Chapter 1, this was rarely employed. Instead, only two of the domains were typically involved: either human and animal health (42 instances), or human and environmental disciplines (41 instances). As with the work by Baum et al (2017), there was no agreed methodology for the cost benefit estimates. Monetary outcomes were commonly expressed as cost-benefit or cost-utility ratios; non-monetary outcomes were described using disease frequency or disease burden measurements. Despite these limitations, the authors conclude that the majority of studies found positive or partially positive outcomes, and that quantitative measures can be further developed to evaluate implementation of One Health approaches.

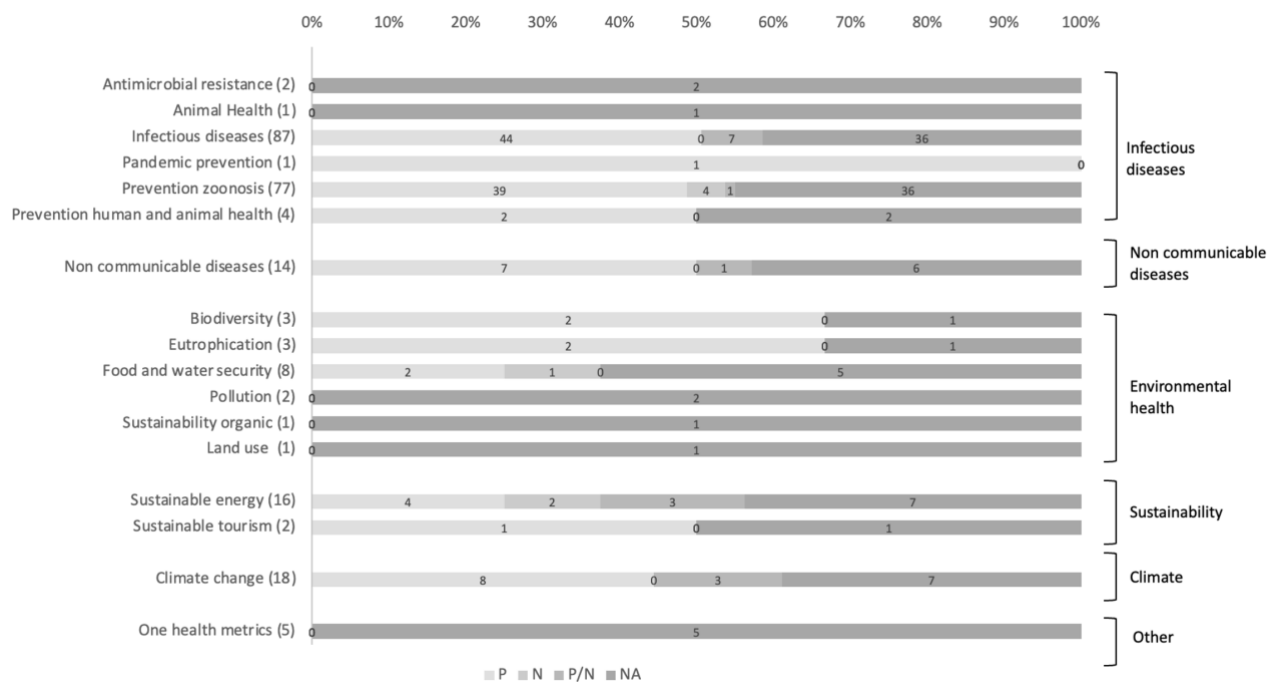
Two additional systematic reviews addressed a more targeted question, namely the cost-benefit ratio of veterinary interventions in controlling infectious livestock diseases, including zoonotic diseases. The central premise here is that such strategies improve animal health with the added benefit of reducing risk of zoonotic spillover. Nuvey et al (2022) reviewed literature on such approaches in sub-Saharan Africa, yielding 84 publications out of an initially selected 2748. The search included a range of livestock-only diseases such as blackleg, contagious bovine pleuropneumonia, contagious caprine pleuropneumonia, foot-and-mouth disease, goat pox, lumpy skin disease, pasteurellosis, and peste des petits ruminants. Livestock diseases with associated zoonotic disease risk included anthrax, bovine tuberculosis, brucellosis, and sheep pox. Of the intervention strategies addressed in these studies, vaccination was largely found both to be effective and to have a positive return on investment. The study included an analysis of possible factors impacting successful implementation, mentioning cold-chain failures, inaccessibility of livestock due to weather and road conditions, and mismatches between the pathogens targeted and the composition of the vaccines. This shows the importance of embedding potentially cost beneficial interventions in a health system that has adequate laboratory, epidemiology and veterinary capacity for surveillance, and in adaptable vaccine production and distribution chains.

The second systematic review analysed literature on economic evaluation of the cost-effectiveness of single or combined interventions to reduce the burden of rabies virus transmitted through dogs (Nujum et al, 2024). The review concluded that mass dog vaccination alone has a positive cost-benefit ratio provided the coverage reached is sufficiently high and programmes are managed properly. However, evidence for additional interventions is more limited, as integrated One Health studies are less common. The authors conclude that there was conflicting evidence regarding the cost-effectiveness of combining improved access to post-exposure prophylaxis with mass dog vaccination and integrated bite management programmes.

Leverage points for One Health: evidence from a literature review and case studies

Our analysis

After de-duplication, 298 articles identified in the initial search were screened for relevance, of which 33 were included. In addition, we extracted individual studies included in systematic reviews to reach a total of 245 articles, of which 70% addressed infectious diseases, 7% addressed environmental health, 7% sustainability, 7% climate change, 6% non-communicable diseases, and 2% were generic method descriptions. A further breakdown into categories is given below:



Summary statistics of literature search, showing number of publications by category (communicable diseases, non-communicable diseases, environmental health, sustainability, climate change, other) and the subcategories indicated in the left text panel. Bars represent numbers of publications reporting positive cost-benefit analysis outcome (P), negative (N), variable (P/N) or no data on cost benefit (NA).

Overall, 240 out of the 245 papers we extracted assessed some type of costs and impacts. Of these, 47% reported positive outcomes (range per main category 28%–50%), 3% negative outcomes (range 0%–11%), and 6% variable outcomes (range 0%–17%). In addition, 45% of papers did not describe binary outcomes but instead, for example, compared different interventions to reach a set goal (39%–61%). The remaining five publications described One Health metrics but did not provide assessments.

Reported benefit-cost ratios

In the table below, we showcase some studies identified in our literature review that estimated benefit-cost ratios of One Health interventions. In general, the highest ratio can be expected from the control of stage 2 zoonoses like brucellosis, trichinosis or rabies that are always transmitted from animals to humans but almost never between humans. There is some evidence of benefits of

Leverage points for One Health: evidence from a literature review and case studies

integrated infrastructures. Similarly, the benefits of integrated surveillance-response systems are small, but they currently don't include human capital benefits.

Benefit-cost analyses are one of the important quantitative indicators described in Chapter 3 on indicators of effectiveness. Currently, the evidence is limited and it underlines the need for more case-studies on the benefit-cost ratios of One Health interventions to be able to execute proper meta-analysis on the effects.

| Intervention | Estimated costs | Estimated benefits | Benefit-cost ratio for 1 invested currency unit | Source |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------|-------------------------|
| Coordinated strategies for control of rabies in Africa | Cost of human post exposure prophylaxis (PEP) and dog vaccines. | Human capital benefits | 14.00 | (Bucher et al., 2023) |
| The business case for One Health (sharing health resources between sectors, controlling zoonoses in reservoirs, early detection and response, prevention of pandemics) | Cost of interventions in humans and animals | Incremental livestock productivity and averted human health cost. | 5.00 | (Grace, 2014) |
| Mass vaccination of brucellosis of livestock in Mongolia | Cost of mass vaccination of livestock | Incremental livestock productivity and averted human health cost. | 3.20 | (Roth et al., 2003) |
| Converting New York state energy infrastructure to non-fossil | Building infrastructure | Reduced air pollution disease | payback time of 17 years | (Jacobson et al., 2013) |

Leverage points for One Health: evidence from a literature review and case studies

| Intervention | Estimated costs | Estimated benefits | Benefit-cost ratio for 1 invested currency unit | Source |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|
| Constructing urban greenway in Ireland | Building infrastructure and maintenance | Direct saved care costs and indirect DALYs | 1.1–6.8 | (Dallat et al., 2014) |
| Integrated laboratory for human and animal diseases (Canadian Science Centre, Winnipeg) | Counterfactual cost of two separate laboratories | Incremental savings from a joint laboratory | 1.25 | (World Bank, 2012) |
| Joint human and animal vaccination services for mobile pastoralists in Chad | Counterfactual cost of separate human and animal vaccination | Incremental savings from sharing transport and cold-chain of vaccination teams | 1.15 | (Schelling et al., 2007) |
| Global strategy to address the pandemic threat. | | | ≤1.05 | (Pike et al. 2014) |
| Integrated West Nile Virus Surveillances - Response System in Italy (excluding human capital benefits) | Costs of surveillance | Reduction in the costs of surveillance | 1.03 | (Paternoster, Martins, et al., 2017) |
| Soil remediation in the Netherlands | Costs of soil remediation | Cumulatively over 100 years: increased human health, higher value of real estate, better drinking water supply withing | 0.9–0.98 (uncertainty: 0.1–1.2) | (van Wezel, Franken, Drissen, Versluijs, & van den Berg, 2008) |
| Bovine tuberculosis control in Zambia | Testing, cattle slaughtering and human treatment | Averted treatment costs in humans and reduced loss of milk supply | 0.75–0.83 | (Mwacalimba, Mumba, & Munyeme, 2013) |

| Intervention | Estimated costs | Estimated benefits | Benefit-cost ratio for 1 invested currency unit | Source |
|---------------------------------------------------------|--------------------|--------------------|-------------------------------------------------|-----------------------------------|
| Integrated surveillance of campylobacter in Switzerland | Surveillance costs | Averted DALYs | -0.5 – -20 | (Martins, Rushton, & Stärk, 2017) |

Table 6: Showcase of economic benefit-cost ratio of One Health interventions

Literature review synthesis

Variation in definitions and assumed costs and benefits

For a successful and sustainable policy, it is vital that the policy is beneficial when taking into account its diverse costs. Thus, we also highlighted different understandings of benefits and costs in relation to the One Health policies and interventions. The scoping paper (Science Advice Mechanism, 2024) underlined the need to consider “the synergies, possible trade-offs, and unintended consequences” of One Health policies and how different tools have been evaluated in relation to foreseen and unforeseen costs and benefits. The literature (and case studies) presented in this chapter also highlight in which context a One Health approach has been operationalised.

The operationalisation of One Health for local, regional, national, or international policy would benefit from clear definitions and finding new ways of approaching health. The different reviews conclude that there is a need for properly designed and powered implementation research, including agreed methodologies to ensure that proposed interventions are feasible. They should adopt a wider societal perspective taking into account costs and outcomes across both the human health and animal welfare sectors.

Focus on humans and infectious diseases

The distribution of topics reported in the literature search corroborates the common critique of One Health conceptualisation, policy and interventions, that interventions are human-centred and mostly related to infectious diseases: as noted, 70% of the studies concerned communicable diseases. This trend is also reflected in our case studies. Not only is the One Health approach mostly used in the field of infectious diseases, but specifically at the interface of humans and domestic animals used for food production. This is seen in both the different cases that are studied and the length of different interventions and surveillance systems. Indeed, this is not a surprise as One Health originally emerged as a heuristic to think through how to prevent zoonosis and the food production (especially when in

industrial scale) in a context where a number of factors have increased the risk of zoonoses. Similarly, while the surveillance or interventions might cover human and production animal or wildlife domains, the outcomes are often measured only in the human domain and positive or negative animal health outcomes are defined in terms of human economic profit or loss. The explanation for this emphasis in existing studies is obvious: the economic assessment of human health interventions and animal production-related decisions are both well-established. The results of this emphasis suggest a two-fold development: firstly, there is ever broader consensus of the efficiency of many interventions as mentioned before, but secondly, there is also a lack of operationalisation of non-human-centric assessment.

The evidence seems to be strong on some of the established integrated surveillance systems and some of the interventions in the zoonosis context, such as rabies control through vaccines. Setting up integrated infrastructures is not easy, but some scientific articles identified in the literature review outline relatively straightforward operational solutions to start on a small scale. For example, in the Global South it has been proved efficient to use resources to reach difficult to reach villages for vaccination and health check-ups with both physicians and veterinarians, to consider both domains of zoonotic pathogen and parasite occurrence (Marcotty et al, 2013). Indeed, potential also exists for considering the health of humans and animals in the context of non-communicable diseases: for example, Bartges et al (2017) report success in reducing obesity in both humans and their pet dogs simultaneously through deploying a synergic intervention. We provide more detail in [Case study 6][].

Growing importance of environments

Although the literature is dominated by a focus on disease-related One Health interventions and human-centric outcomes, a broadening of approaches to encompass the health of the environment, sustainability, and climate deserves to be highlighted. Environments can be approached from many viewpoints, some of which are anthropocentric (e.g. availability of clean drinking water), but some less so (e.g. biodiversity gains or losses). Here, the limitations of the literature review might make it more difficult to see how the broader field of research on environmental pollution is, or is not, One Health-connected. For example, the use of biocides has been regulated and assessed ever since the advent of industrially produced biocides from the 1930s across different domains such as human health, animal health or environmental retention (Sundh & Goettel, 2013). Indeed, the current assessment and authorisation procedure⁷⁷ in the EU requires considering that there are no unacceptable effects on humans or other organisms or environments and to the target organism, including unnecessary suffering as part of the authorisation process. We would argue that there are many fields that actively work on One Health issues without these being explicitly considered as such (Benedetti et al, 2022).

⁷⁷ <https://www.danmap.org/>

How useful it would be to extend the One Health lens to chemicals regulation, for instance, remains an open question.

We would also highlight two active policy areas linked to One Health that are usually considered separately: climate change and biodiversity loss. Climate change is among the greatest challenges not only to humanity but to the biosphere in general. The literature included studies on both short timeframe interventions, such as heat warning systems, and long-term interventions, like new plant varieties or more resilient agricultural practices. Biodiversity loss has been recently linked to human health, both by increasing the risk of zoonotic infections and through non-communicable diseases through, for example, human microbiota diversity. The interventions that relate to biodiversity and health are still rather rare in the literature, and, as seen in our case studies on urban biodiversity (Case study 4), are also rather new and have not yet progressed far.

Costs and benefits are rarely assessed in One Health-related projects. Indeed, the complexity introduced by the framework makes it difficult to perform a satisfactory assessment in different domains. When assessed, costs and benefits are often seen from a human-centric point of view, such as money or human health, due to a narrow operationalisation of outcomes. The unintended consequences or costs not considered remain invisible in the assessment. Nevertheless, there are a lot of examples from broader quantitative outcomes, such as biodiversity change (Sandom et al 2013), animal welfare (Radeski et al, 2018) and emissions (Hospido & Sonesson, 2005) and qualitative outcomes such as learning (Buttigieg et al, 2018), change in crop variety (Essenfelder et al, 2018) or social capital (Gilioli & Baumgärtner, 2007).

Case studies

Approach

The case studies we present here were drawn after thorough discussions including the expertise and knowledge of our working group members, and include both old, established systems (e.g. trichinosis surveillance) and more recent (e.g. urban biodiversity cases). The scale of the cases ranges from regions to EU-wide networks, and most focus on infectious diseases. Themes the case studies should cover were discussed over several meetings of the working group and were selected to cover as wide a variety of domains, issues and administrative levels as possible. Individual case studies within these themes were then chosen, ensuring we had sufficient expertise and resources to describe and interpret them accurately. An additional case study was added following suggestions from external reviewers. Thus, the case studies are not representative of the full diversity of One Health projects and infrastructures within Europe. In their current state, they may not be aligned with the OHHLEP

definition in terms of balancing the health of people, animals and ecosystems and their subjects reflect the finding in the Literature Review that many interventions currently remain focussed on human-centred outcomes and dominated by infectious disease. However, the case studies presented here can be used to compare and contrast different challenges and opportunities in implementing One Health approaches based on current experience.

We collected the data for the case studies through personal experience, personal communications with the responsible persons, consulting project documentation, websites, databases, and literature searches. The studies are classified in terms of their level of readiness and how they fit into the action tracks formulated in the One Health Joint Action Plan of the Quadripartite (FAO et al, 2022).

Table 7 on the foldout page (overleaf) provides an overview of the case studies, including their level of readiness, how they fit into the action tracks formulated in the One Health Joint Action Plan of the Quadripartite (see Chapter 2), their alignment to the OHHLEP definition, their potential relevance to the EU policy landscape, and whether or not they have been formally evaluated.

| Case study | Which action tracks in the One Health Action Plan are covered in the case study? | How aligned is the case study with the OHHLEP definition? | | | | | | | | Notes on domains covered and alignment to the OHHLEP definition | Examples of EU policies that are potentially relevant to this case study (for illustrative purposes, non-exhaustive). | What is the case study's level of readiness? | Has the case study been formally evaluated? |
|------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------|----|----|----|---|----|----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------|
| | | H | An | Ag | En | C | Ec | In | S | | | | |
| 1. DANMAP — AMR surveillance | 1, 2, 3, 4 | + | + | + | | | + | + | + | <ul style="list-style-type: none"> Environment not included Reduction of AMR promotes both human and animal health | <ul style="list-style-type: none"> Animal Health Law EU4Health Programme EU Action Plan against AMR European Medicines Agency Pharmaceutical Strategy for Europe EC Veterinary Medicines | Well established routine system | Yes: qualitative evaluation with OH-EpiCap tool |
| 2. WNF surveillance in Italy | 1, 2, 3 | + | + | + | | + | + | + | | <ul style="list-style-type: none"> Environment not included Anthropocentric view | <ul style="list-style-type: none"> Animal Health Law EU4Health Programme EC Veterinary Medicines | Well established routine system | Yes: qualitative and quantitative evaluation |
| 3. Trichinosis control in Europe | 1, 2, 3, 4, 6 | + | + | + | | | + | + | | <ul style="list-style-type: none"> Well aligned | <ul style="list-style-type: none"> Regulation (EU) No 2015/1375 Zoonoses Directive 2003/99/EC Food and Feed Law EC Veterinary Medicines | Well established routine system | Yes: qualitative evaluation by indicator-based surveillance |
| 4. One Health in cities | 1, 6 | + | + | + | + | + | | + | + | <ul style="list-style-type: none"> Well aligned | <ul style="list-style-type: none"> URBACT programme EU Cohesion Policy General Union Environment Action Programme (8th EAP) Zero Pollution Action Plan EU Strategy on Climate Change EU4Health Programme EU Biodiversity Strategy Action Plan for the Prevention and Control of Non-Communicable Diseases | Newly started projects | No |
| 5. Integrated laboratory infrastructures | 1, 2, 3, 4 | + | + | + | * | | | + | | <ul style="list-style-type: none"> Environment only partially included in the laboratory infrastructure by inclusion of the wastewater surveillance system Environmental authorities are included in the governance structure | <ul style="list-style-type: none"> EU4Health Programme Water Framework Directive | Well established routine system | No |
| 6. Companion animals and mental health | 1 | + | + | | | | | | + | <ul style="list-style-type: none"> Environment not included Anthropocentric view | <ul style="list-style-type: none"> EU Mental Health Strategy Animal Health Law Action Plan for the Prevention and Control of Non-Communicable Diseases | Research collaboration | Yes: qualitatively and quantitatively evaluated |

Table 7: Overview of the case studies, including their level of readiness, how they fit into the action tracks formulated in the One Health JPA of the Quadripartite, their alignment to the OHHLEP definition, their potential relevance to the EU policy landscape, and whether or not they have been formally evaluated.

Domains: **H:** Human health (physical or mental); **An:** Animal health (domestic or wildlife); **Ag:** Agriculture; **En:** Environment, water, energy, air, biodiversity loss or land use; **C:** Adaptation, mitigation or just transition (climate change); **Ec:** Economic growth or wellbeing; **In:** Integrated approach, ideally specifying collaboration or responsibility sharing; **S:** Socio-cultural considerations including community or stakeholder engagement or participation. These domains are expanded from Human/Animal/Environment to reflect key characteristics of the definition as in Chapter 2.

Green +: Explicitly addressed. **Yellow *:** Partially addressed.

Case study 1: DANMAP: integrated AMR surveillance in Denmark

Background

Antimicrobial resistance (AMR) presents a critical global and public health hazard, necessitating immediate, concerted and sustained action (McEwen & Collignon, 2018; OECD, 2023; Velazquez-Meza et al, 2022). AMR refers to the ability of microbes to withstand treatment by antimicrobial medicines, especially bacteria resisting antibiotics. This will complicate the treatment of infections, undermine our ability to control infectious diseases, and elevate the risk of morbidity and mortality. AMR commonly emerges from natural sources as many organisms produce natural antimicrobials and microbes have evolved resistance for these, but it becomes common through lax use of antimicrobials, when relevant genes are easily exchanged between, for example, bacteria. AMR poses a multifaceted challenge that extends beyond the confines of any single sector, impacting both animal and human populations, and posing a significant transmission risk between and within these domains. Likewise, the environment serves as an important nexus, providing a fertile ground for the dissemination of antibiotic-resistant bacteria and their genetic elements. The exchange of resistant strains occurs intermittently, leading to the gradual accumulation of AMR over time, often complicating the identification of underlying causes for observed increases of AMR. To compound this challenge, the administration of antimicrobials in one sector can inadvertently foster resistance in another – a phenomenon underscored by manifold research endeavours and collaborative reports, including from the EU.

Economically, AMR burdens healthcare systems with increased costs due to extended hospital stays, heightened demand for expensive treatments, and the need for supplementary diagnostic approaches in addition to expenditures for infection and prevention control programmes (Barmpouni et al, 2023; Dadgostar, 2019). The environmental and agricultural costs from additional biosafety measures at farms compound the economic burden. Therefore, addressing this issue necessitates a collaborative One Health approach that identifies the interdependence of human, animal and environmental health.

Description of the case

Established in 1995, the Danish Integrated Antimicrobial Resistance Monitoring and Research Programme (DANMAP)⁷⁸ is a comprehensive surveillance resource focusing on antimicrobial use and bacterial AMR, not only in humans, but also in food animals/products. It was founded upon initiatives from the Ministry of Food and Fisheries and has received governmental support from day one. DANMAP's surveillance scope encompasses a range of bacterial agents, including those originating from patients, pathogenic/indicator bacterial agents from food-production animals and their

⁷⁸ <https://onehealthjp.eu/projects/integrative/jip-matrix/>

associated products, but also specific zoonotic pathogenic bacterial species like *Campylobacter* and *Salmonella*.

- **Aims and objectives:** The primary objectives of DANMAP include monitoring AMU and AMR across various domains, exploring the connections between AMU and resistance development, and identifying pathways of transmission of resistant bacteria and genes – all aimed at generating data to inform risk mitigation strategies concerning AMR hazards impacting both human and animal health.
- **Covered domains (human, animal, environment):** DANMAP covers surveillance across human and animal domains, with the subsequent data management, analysis and communications. However, the programme does not include surveillance activities related to the environment.

Action tracks in the One Health action plan: This case study contributes to the following four action tracks of the One Health joint action plan of the Quadripartite:

- enhancing One Health capacities to strengthen One Health systems
 - reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
 - strengthening the assessment, management and communication of food safety risks
 - curbing the silent pandemic of AMR
- **Level of readiness:** Integrated AMR surveillance in Denmark is a well-established routine system covering the systematic collection of surveillance data for human and (production) animals. When applying the One Health definition as outlined in Chapter 1, inclusion of environmental surveillance of AMR could be considered.

Data sharing

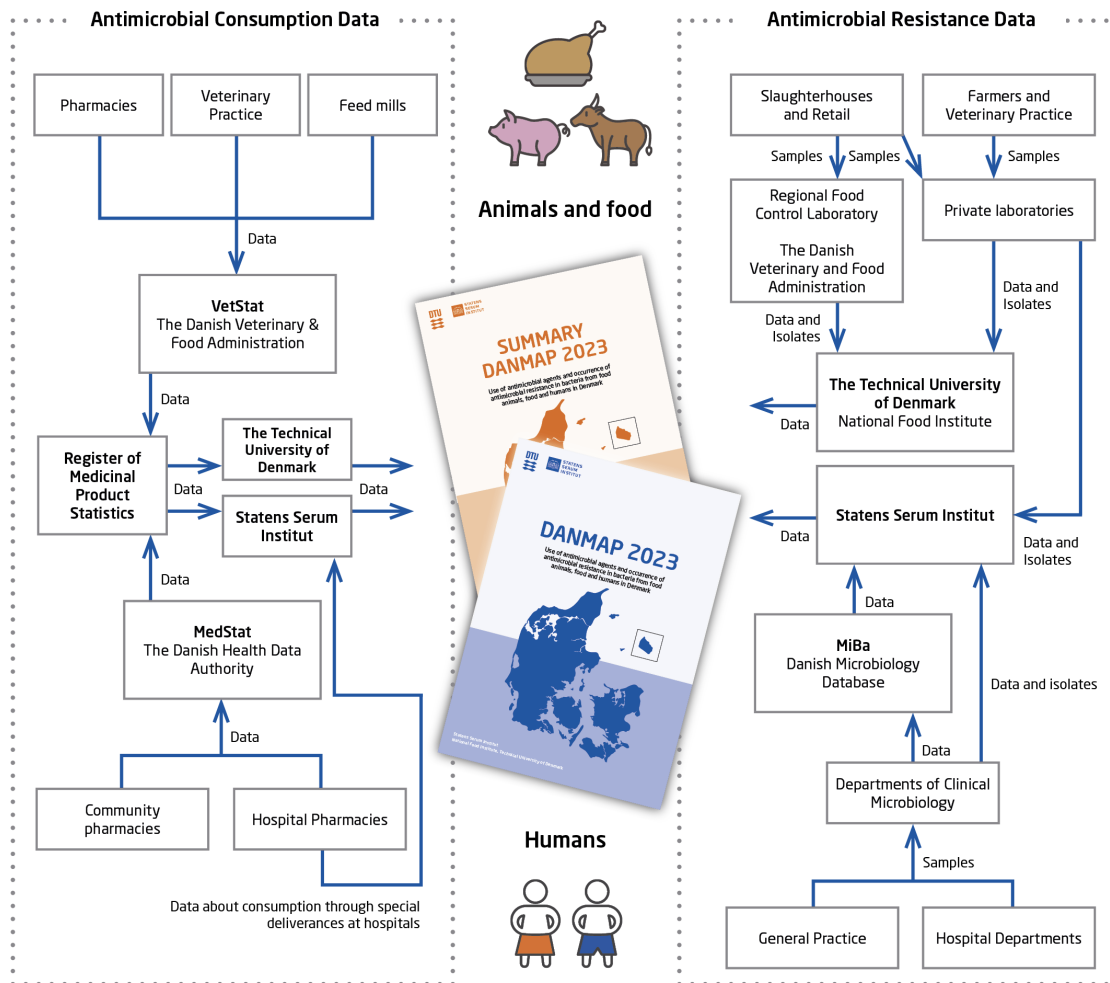


Figure 13: Data flow in DANMAP.

- Data collection:** DANMAP collects data on AMR and antimicrobial use from various sources, including animals, humans and food products. In addition, data on AMR in wildlife, imported foods (greens) and in healthy humans are collected periodically or as part of research studies (Figure 13). More specifically, the collected data encompass bacterial isolates from patients, pathogens of bacterial origin that can cause zoonoses (such as *Campylobacter* spp. and *Salmonella* spp.), as well as pathogenic/indicator bacteria from domestic animals such as pets and horses and animals raised for food (broilers, cattle, pigs) and from systematically sampled food products. The data are managed and kept in separate databanks by the human and animal sectors, but the interpretation of findings is conducted collaboratively. The association between antimicrobial use and AMR is also assessed.
- Gaps:** DANMAP currently lacks environmental data related to AMR, such as AMR prevalence in soil bacteria and in the wastewater. Risk assessment of the environment was performed twice during DANMAP's lifespan, but thus far it has not been included. Such a lack in

environmental surveillance means that potential reservoirs and transmission routes of AMR in the environment are not being systematically monitored and that the systems is not fully aligned with the OHHLEP One Health definition.

- **Organisation:** Sharing of data within DANMAP is organised through a collaborative framework involving multiple stakeholders/institutions and facilitated through shared digital platforms and repositories, enabling dissemination of information to relevant stakeholders. Annual stakeholder meetings provide opportunities for presenting surveillance results and engaging in discussions about findings and potential actions.

Governance

- **Political/legal level:** Governance of the initiative is guided by strategic frameworks, legislative mandates, and EU regulations aimed at observing AMR within a One Health approach. The strategic outline involves collaboration between the Ministry of Health, the Ministry of Food, Agriculture and Environment, and other relevant governmental bodies. These ministries issue strategic plans and policies that allocate the resources, set the responsibilities for different agencies, overarching goals and objectives for AMR surveillance and mitigation efforts, providing the legal mandate for the DANMAP initiative. Additional oversight comes from governmental bodies such as the Danish Health Authority and the Danish Veterinary and Food Administration. Legal framework includes regulations related to antimicrobial usage in animals, food safety standards and reporting requirements for antimicrobial resistance data. Stakeholder engagement is a central aspect of DANMAP's governance, with input and recommendations solicited from veterinary and medical associations, livestock producers, food regulators, and researchers through annual stakeholder meetings.
- **Institutional level:** The programme is operated by a collaborative group consisting of experts from the National Food Institute at the Danish Technical University and the AMR reference laboratory at Statens Serum Institut. These serve as the core entities responsible for overseeing DANMAP's activities, coordinating data collection and analysis, and disseminating findings to relevant stakeholders.
- **Operational level:** DANMAP is guided by standard operating procedures that outline protocols for data collection, analysis, and reporting, to ensure consistency and quality in surveillance activities. Data sharing within DANMAP is facilitated through digital platforms and repositories. Quality control measures are implemented to ensure the accuracy and reliability of surveillance data, with periodic evaluations conducted to assess data completeness and integrity. DANMAP maintains transparency in its operations by making surveillance results publicly accessible through annual reports and scientific publications, contributing to evidence-based decision-making and policy development in trying to solve the issue of AMR.

Interventions

- **Interventions per domain:** DANMAP is guided by operating procedures that outline protocols for data collection, analysis, and reporting. These procedures ensure consistency and quality in surveillance activities across different sectors and geographic regions. Data sharing within DANMAP is facilitated through digital platforms and repositories, allowing for the exchange of information among participating institutions and stakeholders. SOPs dictate the methods for collecting antimicrobial usage data from both animal and human sectors, as well as on the food side the protocols for isolating and testing bacteria for resistance. Quality control measures are implemented to ensure the accuracy and reliability of surveillance data, with periodic evaluations conducted to assess data completeness and integrity. In addition, DANMAP maintains transparency in its operations by making surveillance results publicly accessible through annual reports and scientific publications, contributing to evidence-based decision-making and policy development in trying to solve the issue of AMR.
- **Financing:** The financial responsibility for DANMAP lies with the Danish government, which is also the primary source of financing.
- **Compensation mechanisms:** None identified.

Evaluation

The initiative has been evaluated using the OH-EpiCap tool, which was funded by the One Health European Joint Programme and developed by the MATRIX consortium⁷⁹. The evaluation aimed to assess the One Health-ness of DANMAP and comprised three key themes (with four objectives or targets each), which were additionally divided into four questions, resulting in 48 indicators. The OH-EpiCap instrument proved valuable, facilitating the identification of areas for improvement. However, it has to be noted that the tool provides an overview and feasibility assessment rather than technical evaluation.

- **Costs:** Due to the comprehensive scope of the DANMAP programme and its involvement of numerous stakeholders, precise figures regarding the operational costs are not readily available. Still, the OH-EpiCap evaluation found both financial and human resources adequate and sustainable, and it was evident that the initiative has responded to past critical situations, supplementing expertise as needed. However, evolving issues such as including environmental monitoring and adapting to the continuing growth of molecular-based surveillance approaches, as well as facilitating a shift towards real-time surveillance methods could increase costs.

⁷⁹ [Ministero della Salute. Piano Nazionale di prevenzione, sorveglianza e risposta alle Arbovirosi (PNA) 2020–2025. Regional Surveillance Plan.

- **Benefits:** DANMAP has been built on integrated surveillance principles; consequently, the assessment of the potential benefits of transitioning to the One Health approach were not considered relevant by the OH-EpiCap evaluation. However, significant benefits are evident, as the programme has not only informed sector-specific interventions and policy adjustments but has also played a pivotal role in achieving the objectives outlined in the national action plan. For instance, the Danish pig industry is currently witnessing minimal utilisation of fluoroquinolones and third/fourth generation cephalosporins (and ultimately not at all) (Statens Serum Institut & Technical University of Denmark, 2022).
- **Indicators:** The indicators used to assess costs included financial resources (i.e. funding sources, expenditure on equipment, personnel and other operational costs) and human resources (i.e. the staffing resources available, including the number of personnel dedicated to surveillance activities, their expertise and their capacity to address emerging issues in the field of AMR).

Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** The financial implications of expanding surveillance to include environmental monitoring, the cost-effectiveness of incorporating new surveillance components, and the potential benefits of enhanced data sharing and communication strategies. Additionally, evaluating the economic and health-related impacts of various interventions and policy changes stemming from DANMAP findings could provide valuable insights into the programme's overall effectiveness and efficiency.
- **Are there gaps in governance that should be taken into consideration in future?** Data collection in human, animal and food sectors can vary due to diverse legislation practices and different strategies for sampling. There are opportunities to enhance cross-sectoral collaboration and data sharing agreements to improve the integration of surveillance efforts across different domains. The discussion on the missing sector primarily pertains to the absence of environmental stakeholders in the program's governance structure. There might be a need to clarify and formalise the roles and responsibilities of different stakeholders to ensure comprehensive coverage and coordination across sectors.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** Within the context of DANMAP, there are valuable learning/leverage points that could inform future EU policy. These include lessons learned from the programme's collaborative and integrated approach to surveillance, identification of effective strategies for data collection, analysis and dissemination, as well as understanding the impact of policy interventions on antimicrobial use and resistance trends.

Case study 2: Integrated West Nile Fever surveillance in Northern Italy

Background

West Nile Virus (WNV) is a vector-borne zoonosis transmitted primarily by infected mosquitoes that acquire the virus by feeding on infected birds (Gossner et al, 2017). WNV was first detected in Europe in Albania in 1958. Since then, an increasing number of WNV outbreaks among birds, equines and humans have been reported in Southeast and Central Europe, with recent evidence of northbound expansion including Germany and the Netherlands. WNV emergence is influenced by climate change. From 2010 onwards, the European Centre for Disease Prevention and Control started reporting WNV cases. The intensity of transmission to humans is dependent on abundance and feeding patterns of infected mosquitoes and on local ecology and behaviour that influence human exposure to mosquitoes (Gossner et al, 2017). West Nile Virus is also transmitted to horses with clinical similarities to humans. Horses are not a reservoir because their viremia is too low for re-transmission to mosquitoes, but can be sentinels for the risk of transmission to humans (Schwarz & Long, 2023).

Description of the case

In 2012, the World Bank recommended systemic approaches for zoonoses control, considering integrated surveillance-response systems and control of human and animal diseases for primarily economic reasons². Despite numerous examples of existing integrated surveillance and response systems, contemporary SRS remain mostly separated for humans and animals (Bordier, Uea-Anuwong, Binot, Hendrikx, & Goutard, 2020). Integrated surveillance-response systems have been recommended to mitigate the effects of climate change (Zinsstag et al, 2018) and a schematic proposed by the World Bank has been extended to include the environmental dimension, wildlife and waterbodies as potential reservoirs for zoonotic pathogens. The conclusion remains that the earlier a zoonotic pathogen is detected in the environment, wildlife or domestic animals and the better human, animal and environmental surveillance communicate with each other to prevent an outbreak, then the lower are the resulting cumulative costs.

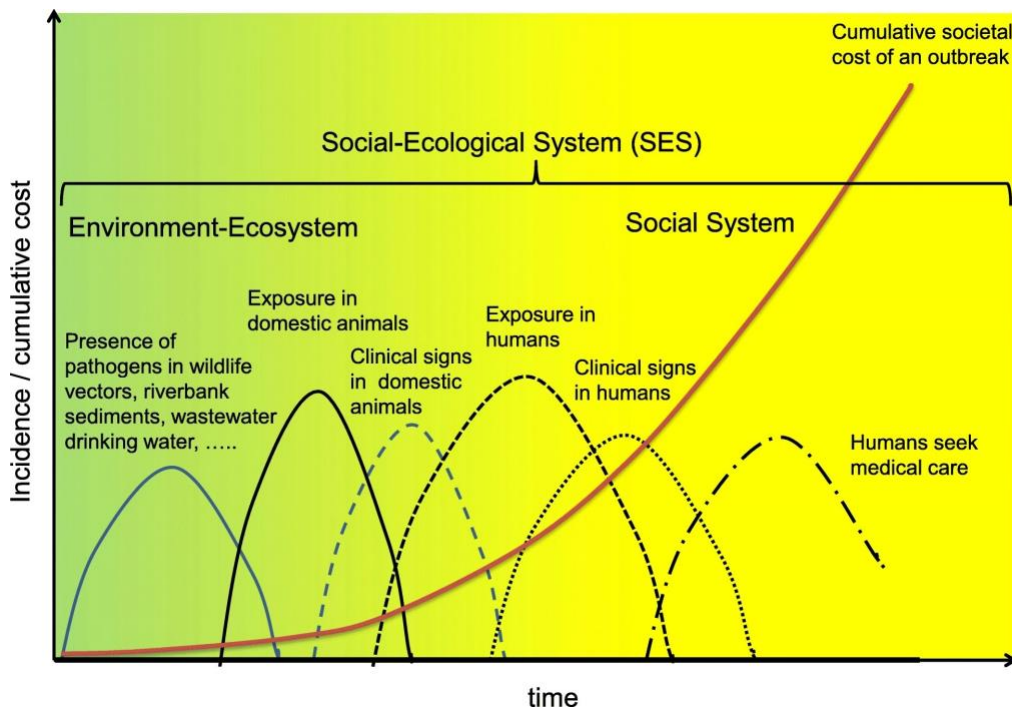


Figure 14: Schematic relationship of time to detection of an emerging pathogen and its cumulative cost of control. Adapted and expanded from Zinsstag et al (2020).

In Italy's Emilia Romagna region, an integrated WNV surveillance-response system in mosquitos, wild birds, horses and humans showed financial savings, when compared to single species surveillance between 2009 and 2015 (Paternoster, Martins, et al, 2017).

- Aims and objectives:** The aim of the WNV system in Emilia Romagna is the earliest possible detection of the virus in any species targeted (mosquitoes, wild birds, equids, humans) to inform public health on the risk of human exposure and to mitigate disease transmission via contaminated blood and solid organ donations.

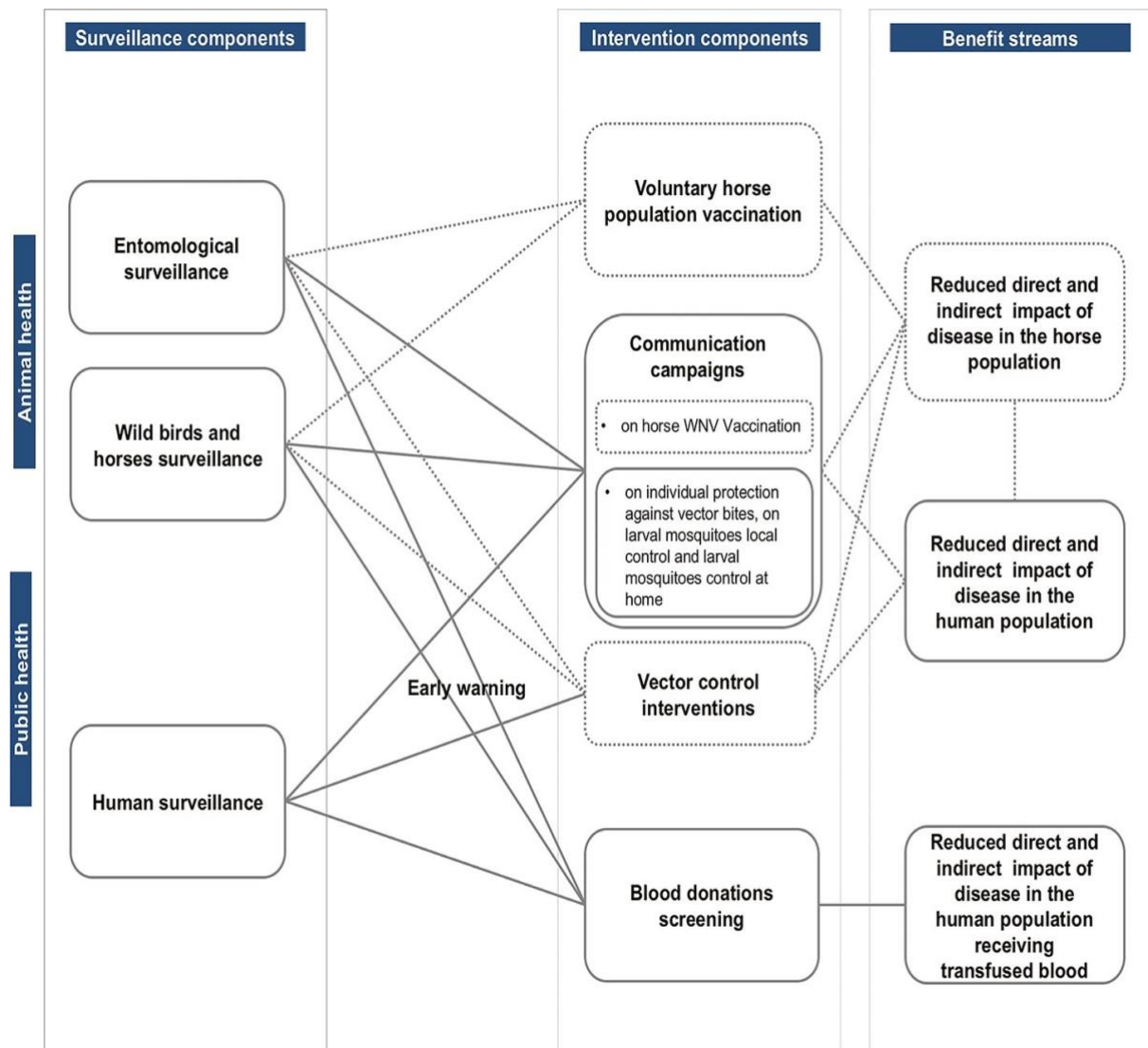


Figure 15: Flow chart and integrated communication of the WNV iSRS in Emilia Romagna, Italy (Paternoster, Tomassone, et al, 2017).

- Covered domains (human, animal, environment):** Surveillance covers animals (active surveillance on trapped mosquitoes and target bird species, passive surveillance on dead birds and equids) and humans (passive surveillance of clinical cases), but not environment.
- Action tracks in the One Health action plan:** This case study contributes to the following three action tracks of the One Health joint action plan of the Quadripartite:
 - enhancing One Health capacities to strengthen One Health systems
 - reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
 - controlling and elimination zoonotic, neglected tropical and vector-borne diseases
- Level of readiness:** Routine system.

Data sharing

- **Data collection:** Data is collected on notifications of human clinical cases (WN neuroinvasive disease and WN fever) and asymptomatic blood donors (blood screening), notification of clinical cases in equids, virus detection in target bird species and birds found dead and virus detection in mosquitoes. Sequence data is generated from all confirmed cases in all surveillance components.
- **Gaps:** There is sufficient information to support that the system serves as an early warning tool and likely reduces human exposure via contaminated blood and solid organ donations. However, there are no common databases for data sharing between partners. Across European countries, almost all surveillance-response systems are separated for humans, animals, and the environment.
- **Organisation:** The data are shared from whichever partner first detects it. Information is discussed through meetings and informal communication (telephone, email) among actors involved in the regional working group on vector-borne diseases. An epidemiological bulletin is periodically published during the vector season. Communication campaigns are disseminated for the public (informative brochures, websites). All data collected at the regional level are confirmed at national level and national health authorities are informed.

Governance

- **Political/legal level:** Surveillance is coordinated by the Ministry of Health, which, in Italy, includes both public health and animal health services, and by regional authorities, which govern health protection according to the local risk. There is a national plan for prevention, surveillance and response to arboviruses, including WNV.⁸⁰
- **Institutional level:** Government of Emilia Romagna Region - Regional Health Services (Veterinary and Public Health Services), Istituto Zooprofilattico della Lombardia e dell'Emilia-Romagna (IZSLER), and regional blood centre coordinate all surveillance activities.
- **Operational level:** The regional working group on arboviruses includes representatives of the health authorities and of animal, public and environmental health sectors and coordinates activities and data sharing. Regional and local actors involved are the Prevention Department of Local Health Services (Public Health and Veterinary Service) and Collective Prevention and Public Health Service of the Region. Surveillance in humans and testing of human samples happens through hospitals, general practitioners, Regional Blood Centre, and the reference laboratory for human cases (CREEM Regional Reference Centre for Microbiological Emergencies), whereas domestic animal surveillance and testing happens through veterinary practitioners, and the reference laboratory for entomological and veterinary surveillance, IZSLER. IZSLER also tests wildlife and mosquito samples; the entomology centre (Agriculture

⁸⁰ <https://www.iso.org/standard/85355.html>

and Environment Centre G. Nicoli) is in charge of mosquito collection, while hunters with specific permits and rangers collect the birds during culling of birds considered as agricultural pests.

Interventions

- **Types of interventions per domain:** The initiative is comprised of:
 - active surveillance of avian target species, and passive surveillance of wild birds found dead
 - active surveillance of mosquito target species
 - syndromic surveillance of horses with neurological disease
 - syndromic surveillance of human patients with neurological disease
- **Funding:** Public funds allocated to the Regional Health Service.
- **Compensation mechanisms:** None.

Evaluation

The initiative has been evaluated qualitatively (Marchino et al, 2021; Paternoster, Tomassone, et al, 2017) and quantitatively (Paternoster, Martins, et al, 2017). The reduction in blood testing costs covers surveillance costs in insects, birds and horses and information sharing costs.

- **Costs:** There were annual costs for both surveillance and public health interventions: blood donation screening was clearly the main cost associated with WNV surveillance.
- **Benefits:** Benefits of the WNV iSRS were quantified as the averted costs of potential human cases of WNV neuroinvasive disease associated with infected blood transfusion that would not have been detected with the uni-sectoral approach. Additionally, further benefits were quantified for the iSRS in terms of avoided tests on blood units due to the timely and early detection of WNV circulation on the territory in any species under surveillance.
- **Indicators:** Estimated monetary costs of surveillance and estimated health benefits of the iSRS compared between One Health and a uni-sectoral scenario.

Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** Intangible costs that could be better assessed are long term cost of illness⁸¹ (e.g. home care, rehabilitation, durable medical equipment, medication, medical appointments), costs associated with the death of patients (compensation paid to the family, additional possible compensation

⁸¹ Cited from <https://urbact.eu/who-we-are>

requests within instances of transfusion associated diseases, private insurance claims) could be addressed using human capital benefits.

- **Are there gaps in governance that should be taken into consideration in future?** As the environment is currently not included, the system is not fully aligned with the OHHLEP definition. The aim of the system is to improve public health and may in that sense be considered to have an anthropocentric view.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** It is important to provide stable, multi-year funding – even for seasonal diseases such as WNV – to facilitate surveillance planning and to allow local authorities to adapt national surveillance plans to the local context/disease epidemiology to improve surveillance flexibility. Promoting collaboration and sharing of solutions among different territorial units (e.g. regions, countries) enhances efficiency of surveillance. It is important to invest in public health literacy through communication and education campaigns to involve actors, stakeholders as well as citizens.

Case study 3: Trichinosis control in Europe

Background

Trichinosis (also known as trichinellosis) is a disease caused by infection with the nematode parasite *Trichinella*. Various species of *Trichinella* are infectious to humans; *T. spiralis* is associated particularly with pigs (domestic cycle) and people become infected by eating insufficiently cooked pork from infected pigs. Other species of *Trichinella* are associated with a range of other animals. These are often, but not exclusively, game or wildlife (sylvatic cycle), particularly those that are either carnivorous or omnivorous, and people can be infected by eating the undercooked meat of these animals. The spread of trichinosis is therefore also affected by infection of animals in the wider environment, as well as infection of pigs.

Trichinosis is an unpleasant, potentially fatal disease. In humans, it has a range of symptoms that vary according to the nematode's lifecycle stage. The symptoms caused by muscle tissue invasion by larvae usually start a few weeks after infection and can be severe, restricting movement, speaking and breathing, and may last for several months. Symptom severity depends on the number of larvae ingested. Trichinosis in animals probably has similar symptoms. Infected animals that are also prey for other animals may be more likely to be caught and eaten due to the pathology from larval invasion of muscle tissue, thus favouring continuation of the parasite lifecycle.

Description of the case

Here we describe how trichinosis has been eliminated from most countries in Europe by a One Health approach, an initiative beginning more than a century ago. Control of trichinosis has been an aim in Europe since the 1860s, when details of the parasite's lifecycle were elucidated, and it was realised that the major route of infection was consumption of undercooked pork. It was immediately clear that surveillance of infection in pigs was necessary for infection control in people, and prevention of trichinosis infection in pigs was an obvious next step.

- **Aims and objectives:** Control of trichinosis in the European food-chain; the most recent quantification of the burden of foodborne disease effort from WHO indicated that almost 70% of the burden of trichinosis globally was in the WHO European region (Devleeschauwer et al, 2015).
- **Covered domains (human, animal, environment):** The domains covered are human (human infection, human behaviour to avoid infection risk in both people and animals), animal (animal infection, how to survey and minimise risk), and environment (which environmental factors affect animal infection).
- **Action tracks in the One Health action plan:** This case study contributes to the following five action tracks of the One Health joint action plan of the Quadripartite (i.e. all action tracks apart from Action track 5, which is concerned with AMR):
 - enhancing One Health capacities to strengthen One Health systems
 - reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
 - controlling and elimination zoonotic, neglected tropical and vector-borne diseases
 - strengthening the assessment, management and communication of food safety risks
 - integrating the environment into One Health
- **Level of readiness:** Trichinella and trichinosis control in Europe is a well-established routine system. However, this does not mean that it cannot be improved.

Data sharing

- **Data collection:** Data collection and sharing is organised throughout Europe on a national basis. Human domain: number of human cases of trichinosis (usually small outbreaks), source of infection (if known), species of infecting Trichinella. Animal domain: number and species of animals tested as part of routine control system (not including research projects on wildlife); number and species of animals found positive (and negative); origin of wildlife found positive; species of infecting Trichinella (if known). Ecosystem domain: housing of domestic animals; related factors.

- **Gaps:** Potentially more information could be collected and shared regarding factors associated with wildlife infection, if relevant.
- **Sharing:** A common data platform is used. Countries report data to the European Centre for Disease Prevention and Control (ECDC) and the European Food Safety Authority (EFSA) as part of the annually published zoonosis report.

Governance

- **Political/legal level:** Routines and methodologies for testing animals for *Trichinella* infection are included in EU legislation. Rules include the requirement for systematic tests for *Trichinella* in all slaughtered pigs, wild boar, and horses, except in pigs from holdings or compartments officially recognised as applying controlled housing conditions. Specific rules on official controls for *Trichinella* are laid down in Regulation (EU) No 2015/1375 (European Commission, 2015).

Data collection on *Trichinella* in Europe is based on Zoonoses Directive 2003/99/EC (European Parliament & Council of the EU, 2003), which obliges EU member states to collect relevant data on zoonoses (including trichinosis) and zoonotic agents (including *Trichinella* spp.). An annual report must be submitted to the European Commission (EC), from where it is forwarded to EFSA, which examines and publishes an Annual EU Summary Report. From 2004, EFSA established an electronic reporting system and database for monitoring zoonoses (EFSA Mandate No 2004–0178, prolonged by M–2015–02312). Regarding human disease, a network for the surveillance and control of communicable diseases in the EU and data are reported to ECDC as described in Decision 2018/945/EU.4. Since 2008, data on human cases have been received via The European Surveillance System (TESSy), maintained by ECDC. These data have been included in the EU Summary Reports since 2005.

- **Institutional level:** Laboratories carrying out official *Trichinella* control might be derogated from accreditation under certain conditions in accordance with EU Regulation No 2016/1843. This derogation was made permanent from December 2019, but there are agreed guidelines on minimum recommendations for (derogated) official laboratories. In addition, some countries or regions may apply derogation from *Trichinella* testing in domestic pigs, depending on specific conditions. One of these is pigs from a unit officially recognised as applying controlled housing conditions.
- **Operational level:** Guidelines and analytical methods are available from the European Reference Laboratory for Parasitology (currently Istituto Superiore di Sanità in Rome), along

with information on sampling methods. An ISO method (ISO 18743; ISO, 2015)⁸² is available. Data sharing is at the political/legal level (see above).

Interventions

- **Interventions per domain:** Human domain: diagnostics and treatment are direct interventions. Other interventions include education, particularly for smallholders who may use backyard slaughter and for hunters. For consumers who wish for extra intervention processes, then the International Commission on Trichinellosis recognises three acceptable means of treatment to render potentially *Trichinella*-infected meats safe for consumption: adequate cooking; adequate freezing (for meat from domestic pigs; some *Trichinella* species are more robust against freezing); and irradiation. As infection transmission is only from ingestion of another infected animal or person, transmission from one person to another person or animal is unlikely to occur. Animal domain: intervention is based upon compulsory testing of particular species of animal (both wild and domestic) for the parasite using a prescribed method. Over 130 years ago, at the end of the nineteenth century, when trichinosis surveillance from pork-exporting countries was considered unsatisfactory, importing countries partially or completely prohibited import (e.g. import of American pork was prohibited between 1879 and 1889 by various European countries including Austria, France, Germany, Greece, Hungary, Italy, Portugal, Spain, Denmark, and Romania) at different times. [Ecosystem domain]: intervention is based on controlled housing conditions, particularly for pigs; general control of feed (such as bans on feeding of pigs with scraps of pork), and rodent control). Reduction of *Trichinella* in pig farms is likely to reduce spillover to wild animals.
- **Financing:** Human domain: payment for medical diagnostics and treatment may vary according to national regulations and how health services are financed in different countries. Educational initiatives (e.g. those aimed at hunters) are likely to be paid at the governmental level, but this may vary on a national basis. Animal domain: *Trichinella* control at the slaughterhouse, also for home-slaughtered or hunted animals, is likely paid for by the farmer, the meat industry, or the individual hunter/owner depending on specific national regulations which may vary between countries. It is also likely that this cost is passed on to the consumer. Ecosystem domain: controlled housing conditions are at cost to the owner, but financial support mechanisms may be available depending on national guidelines which may vary by country and over time. Changing the focus from testing pig carcasses to auditing on-farm biosecurity should result in substantial savings and a movement towards more cost-effective risk-based control strategies has been noted.
- **Compensation mechanisms:** None identified.

⁸² <https://urbact.eu/unifying-efforts-bringing-one-health-cities>

Evaluation

It is clear that the European focus on surveillance for infection in animals, particularly pigs but also wildlife, and controlled housing of livestock, caused the incidence of *Trichinella* infection in people and animals (including wildlife) to decrease substantially. The success is reflected in that, for example, in Germany several thousands of patients were diagnosed with trichinosis between 1860 and 1880, with over 500 deaths. Currently, very few human cases of trichinosis occur in Germany, no more than a couple every other year, with infection predominantly in immigrants. More recently, continuous reporting via ECDC and EFSA means that trends can be followed at a granular level. However, although now a rare disease in Europe, trichinosis is not yet eliminated. Data from Serbia indicate that the number of human cases and the number of infected domestic pigs decreased significantly between 2011 and 2020, although [a large outbreak, caused by consumption of uninspected wild boar meat containing *T. britovi*, occurred in 2016 (Vasilev et al, 2023)]. Data from Serbia are not included in the EU summary report.

- **Costs:** Although prescribed testing costs less than €1 per test of 100 carcasses – not including labour, facilities, or shipping, given the large number of pigs slaughtered in Europe (over 200 million annually), overall costs are substantial. More cost-effective, risk-based control strategies are being introduced within Europe and should significantly reduce the number of tests in certified pigs herds but increase controls of other pig populations and susceptible wildlife.
- **Benefits:** Most recent estimates) for morbidity, mortality, and disability adjusted life years (DALYs) rates associated with trichinosis in Europe indicate the burden is low compared with that of other foodborne parasitic infections (Develesschauwer et al, 2015). Comparison with historical data indicates that the measures implemented have had a significant impact.
- **Indicators:** Figures used include rates of: incidence, morbidity, mortality, and DALYs. Incidence of infection in wildlife is sporadically recorded in publications, but long-term temporal alterations are seldom investigated. Economically, costs per test have been calculated, but detailed information on savings from risk-based control are scarce. In addition, despite EU legislation permitting lack of *Trichinella* testing for pigs raised under controlled housing conditions, extensive testing still occurs, even in high biosecurity holdings.

Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** Measures implemented almost 150 years ago have been effective at reducing trichinosis in Europe. The burden is now much lower than for many other foodborne diseases. Although costs involved with mass testing of pigs at slaughter can be reduced by on-farm biosecurity audits, considerable testing continues in Europe and could or should be reduced.

- **Are there gaps in governance (i.e. responsibilities, missing sectors) that should be taken into consideration in future?** Circumstances may affect transmission dynamics of trichinosis, and these should be considered when downscaling routine testing of pigs at slaughter. These include: conflict situations and political turmoil could affect farm biosecurity and thus pigs may become infected (this has been previously documented in south-east Europe: Barruet et al, 2020; Cuperlovic et al, 2005; Despotović et al, 2023); wild boar spread across Europe may (re)introduce *Trichinella* spp. to areas where it is currently considered absent; the rise in organic (outdoor) farming in pig husbandry for welfare reasons may expose pigs to *Trichinella* infection (Bilska-Zajac et al, 2021; Papatsiros et al, 2020; Pozio et al, 2021). Thus, a One Health approach should also be used in scaling-down testing of pigs at slaughter, and education of hunters or small-scale farms should be maintained.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** The long period of implementing measures to control trichinosis provides learning points that should be considered when changes are introduced for economic or other reasons. For example, it should be borne in mind that outdoor or organic farming of pigs may expose them to *Trichinella*-infected rodents, and, as omnivores, pigs may become infected.

Case study 4: One Health in cities

Background

The global human population is increasing, with an ever-larger proportion of humans living in cities. With an ever-greater proportions of the planet's surface now urbanised, urban areas are not only relevant for human health but also our companion animals and to wildlife. Indeed, cities, humans and other species living cities encounter a number of overlapping and synergistic ecological problems such as increased spread of respiratory viruses, impoverished microbiota, chemical exposure, noise pollution and so on (Douglas, 2012; Ramirez-Rubio et al, 2019). The implementation of the One Health approach in cities is currently most often part of two urban policy agendas: public health and biodiversity. Two current projects arose from these urban policy agendas: one, One Health 4 Cities within URBACT, is led by cities as part of their political mandate; the second, Montpellier Ecology and Evolution of Disease Network, by the local scientific community that intends to improve urban health and biodiversity policies.

URBACT: Description of the case

- **URBACT programme,**⁸³ overseen by the European Commission, stresses the importance of One Health as “imperative for cities, given the unique challenges they face – dense populations, pollution, close human-animal interaction, shared environmental spaces, heat waves, invasive species – and their role in the biodiversity crisis and their adaptation to climate change impacts”. One Health 4 Cities is a network within URBACT that wishes to make meaningful actions locally, but also to develop knowledge to attract more cities to integrate One Health in their local contexts.
- **Aims and objectives:** the Network aims to “pave the way for a collective and informed approach to integrating One Health practices, fostering healthier and more sustainable urban environments and communities. The Network will work on how to integrate One Health horizontally into different disciplines experimenting its implementation including: healthy lifestyles, active ageing, green prescribing, and nature connectedness, healthy urban planning, and biodiversity”.⁸⁴ The Network will also study stakeholder engagement, monitoring, funding and policy integration. The overarching goal is for each city to develop a specific Integrated Action Plan, with a unique focus on implementing a One Health approach. Some specific objectives of the Network are, among others, to integrate One Health on the health impact assessment methodology, particularly to develop some easy-to-use tools and guidance, and to pilot and compare different methods to identify working solutions and potential synergies between topics.
- **Covered domains (human, animal, environment):** All domains of the One Health approach, adding wellbeing linked to green infrastructures, and nature connectedness.
- **Action tracks in the One Health action plan:** This case study contributes mainly to the Action tracks 1 “Enhancing One Health capacities to strengthen One Health systems” and 6 “Integrating the environment into One Health”.
- **Level of readiness:** The initiative is quite recent but based on case studies of the different cities in the network.

URBACT: Data sharing

- **Data collection:** The initiative is not to collect data or to implement data platforms, but to share knowledge and experience. For example, a series of tools and resources are proposed in the URBACT Toolbox: guidance, tools, templates and prompts. The Toolbox is organised into the five stages of the action-planning cycle and the crosscutting actions of engaging stakeholders and sharing knowledge: analysing problems, action planning, resourcing, implementing, measuring results.

⁸³ [\[https://urbact.eu/\]](https://urbact.eu/)

⁸⁴ <https://urbact.eu/who-we-are>

- **Gaps:** The case is in its early phases, and it is too early to analyse potential gaps.
- **Sharing:** The sharing of knowledge and tools is through a website and designed activities.⁸⁵

URBACT: Governance

- **Political/legal level:** URBACT is overseen by the Directorate-General for Regional and Urban Policy which ensures activities play a key role in the EU Cohesion Policy. “The Monitoring Committee, which is represented by the EU Member and Partner States, the European Commission, Instrument for Pre-Accession Assistance (IPA) Countries, the European Committee of the Regions and the Council of European Municipalities and Regions, defines the strategic direction of the URBACT programme and takes decisions about activities to be implemented. The members of the Monitoring Committee also exchange on the needs of cities, thematic priorities, programme links with European Urban Initiative and cohesion policy at national and European level. The Managing Authority, hosted by the French National Agency for Territorial Cohesion (Agence nationale de la cohésion des territoires), is in charge of the management of the URBACT programme”.⁸⁶
- **Institutional level:** The URBACT Joint Secretariat, based in Paris, designs and delivers activities related to the objectives of the URBACT Programme. Decisions by the Monitoring Committee are implemented by the Secretariat.
- **Operational level:** The operational level is dependent on the individual level; the central project planning provides only guidelines of case studies and tools.

URBACT: Interventions

- **Interventions per domain:** Action Planning Networks, Participative governance, Citizen engagement in health and Sustainable Development Goals.
- **Financing:** The initiative is funded by the European Commission through Interreg Europe funds.
- **Compensation mechanisms:** None.

URBACT: Evaluation

To date no evaluation has been done. The initiative will be evaluated at the end of the project in December 2025.

⁸⁵ <https://science.gc.ca/site/science/en/blogs/science-health/lab-101-what-does-it-take-house-worlds-deadliest-diseases>

⁸⁶ <https://www.helmholtz-hioh.de/en/>

URBACT: Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** There has been no economic assessment of the implementation of a One Health approach in relation to greening infrastructures.
- **Are there gaps in governance (i.e. responsibilities, missing sectors) that should be taken into consideration in future?** URBACT is premised on the idea of engaging with as many sectors as possible and wide participation of citizens, which is obviously not in place yet.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** This novel initiative encourages strong engagement of cities and their citizens to implement a One Health approach together with urban development, nature-based solutions and green infrastructures based on efficient collaboration and coordination.

Montpellier: Description of the case

The data and knowledge produced by scientific research in health ecology are poorly known and rarely mobilised by local authorities and decision-makers. The scientific community of Montpellier, by joining an initiative supported by the City and Metropolis of Montpellier, wishes to contribute to enhance the necessary acculturation and training of decision-makers and public administrations by committing to the creation of the science-decision consortium Montpellier Ecology and Evolution of Disease Network.

Growing collaborations in urban ecology with local scientific research teams, together with the One Health approach promoted nationally and regionally, led to the development of an urban health ecology. The initiative therefore originated from collaborations with scientific research rather than from a political request to structure and environmental urban health policy.

The local authorities are well placed to play a key role to link and operationalise the One Health approach. However, local authorities suffer from:

- lack of expertise in health (reduced to hygiene and sanitation) and veterinary health
- centralised and hierarchical structuring of health, leading to low human health competence at the local scale (often reduced to hygiene and sanitation) despite the existence of local health contracts ('contrats locaux de santé')
- fragmentation of environmental health: air quality, water management, sanitation, etc.
- **Aims and objectives:** The main aim is to develop the Montpellier Observatory on Ecology and Evolution of Health. The main objective is to develop a new governance that identifies and trains One Health ambassadors within all departments of local authority administration and reinvents the modes of governance of projects supported by public policies through the

participation of scientific partners in all phases: initial diagnosis, decision-making, and experimentation.

- **Covered domains (human, animal, environment):** environment (including plants, microbes, fungi, soil, waterways, the atmosphere, manufactured materials and chemicals, and the climate), human (zoonoses, vector-borne diseases, food safety) and animal (wildlife).
- **Action tracks in the One Health action plan:** This case study contributes mainly to the Action track 6 'Integrating the environment into One Health', but also to Action tracks 1 'Enhancing One Health capacities to strengthen One Health systems', Action track 5 'Curbing the silent pandemic of AMR', and Action track 4 'Strengthening the assessment, management and communication of food safety risks' by the contributions of research in agroecology and food system.
- **Level of readiness:** The initiative is quite recent and based on recent and ongoing scientific projects, as well as the surveillance done by local and regional agencies (environment, health).

Montpellier: Data sharing

- **Data collection:** Environmental data (land use, infrastructure, agriculture, climate), geographical and socioeconomic data, public health data, biodiversity data, vectors, pathogens data.
- **Gaps:** The project is still seeking ways to implement a geographic data infrastructure, which would allow for example (citizen) real-time updating, interactive visualisations, acculturation of the political authorities and decision-makers.
- **Sharing:** By different sectoral platforms (Montpellier city, environment, science, surveillance) that are continuously updated and curated with rules of access and sharing. There is no single common platform.

Montpellier: Governance

- **Political/legal level:** The initiative is still young, and the governance between the different actors (municipality, science, agencies) is not yet established.
- **Institutional level:** See above.
- **Operational level:** Guidelines of data collection, data curation, data access and sharing (ethics) are already developed for each platform (resources, data science, surveillance data).

Montpellier: Interventions

- **Interventions per domain:** Training of One Health ambassadors, evidence-based decision-making.
- **Financing:** The initiative aims to enhance collaboration and coordination between sectors, which may avoid duplications / redundance between sector activities (such as surveillance)

and improve urban development, planning and optimal financial investment by implementing prevention at the source.

- **Compensation mechanisms:** None.

Montpellier: Evaluation

- **Costs:** Not yet assessed.
- **Benefits:** Not yet assessed.
- **Indicators have been used?** No economic indicators have yet been used, but indicators of process, among others, include: collection of environmental data for prototyping collaborative research projects; organisation of dialogue and alert instances; training of researchers in public administration practices; training of decision-makers and public administrators in health ecology; creation of a flow server between data platforms; deployment and updating of geographic data infrastructure; biological resource centre; open databases; identification and training of One Health ambassadors; and creation of the Montpellier Observatory on Ecology and Evolution of Health.

Montpellier: Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** There is no economic assessment of the implementation of One Health at the local level (municipality), specifically based on a strong science-policy dialogue and collaboration.
- **Are there gaps in governance (i.e. responsibilities, missing sectors) that should be taken into consideration in future?** Citizen engagement is clearly absent in this initiative. Support and engagement of citizens will decide the long-term impacts of the initiative.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** This novel initiative, which encourages strong engagement of local scientific researchers and their institutions with the local authorities and different agencies (health, environment), provides insights for a local urban One Health governance based on efficient collaboration between sectors and disciplines.

Case study 5: Integrated Laboratory Infrastructures: the example of the Statens Serum Institut, Copenhagen, Denmark

Background

Historically, human medicine was integrated into the mediaeval universities, whereas veterinary medicine remained largely in the hands of equerries until the eighteenth century. However, in the 1800s, pioneers of the microbiological and cell biological revolution were interested in connecting human and veterinary medicine as comparative medicine. Nevertheless, during the twentieth century,

human and animal disease laboratories developed from specific needs of human or animal diseases in the first place (Woods et al 2017), with a few exceptions that covered human and animal diseases at the same time as in the case of rabies and salmonella. With the emergence of the One Health idea, it has been recognised that the laboratory and data infrastructures needed to support surveillance of infectious diseases in humans and animals are similar (but not identical), giving an opportunity for synergies by integrating these activities at the institutional level.

In many countries, the medical regulatory authorities already cover both human, animal and plant medicines and drugs. In essence, these authorities are already integrated One Health institutions, possibly saving resources when compared to separate authorities for humans, animals, and plants. The Canadian Science Centre (CSC) for Human and Animal Health in Winnipeg (see Chapter 3: Criteria and indicators to assess effectiveness) exemplifies integrated infrastructure of this kind. CSC is the first organisation in the world to house, in one facility, the laboratories for human (Public Health Agency of Canada's National Microbiology Laboratory) and animal (Canadian Food Inspection Agency's National Centre for Foreign Animal Disease) disease research at the highest level of bio-containment.⁸⁷ There are also several examples of well-established One Health research collaborations in the field of infectious diseases where institutes work together across human, animal, and environmental domains without integrated laboratory infrastructures, such as the Helmholtz Institute for One Health in Greifswald.⁸⁸

Description of the case

In Europe, parallels with the CSC model can be found in the Danish Veterinary Consortium (DK-VET).⁸⁹ Established in 2019, DK-VET is a collaboration between the University of Copenhagen (UCPH) and the Statens Serum Institut (SSI) for the performance of the veterinary public service agreement for the Danish Veterinary and Food Administration. DK-VET provides research, consultancy services, diagnosis and laboratory analyses in connection with the monitoring and control of approximately 80 different livestock diseases. Public sector consultancy covers disease surveillance and handling of specific emergency tasks, including investigation of suspected disease outbreaks, risk assessments and research activities. The main role of SSI in DK-VET is to perform the microbiological analyses of the veterinary samples as the national reference laboratory. However, SSI also contributes to veterinary surveillance activities, consultancy services and risk assessments together with the University of Copenhagen. The SSI has for decades been responsible for the human infectious disease preparedness, including surveillance, research and counselling, and serves as the national

⁸⁷ <https://dkvet.dk/>

⁸⁸ [Eurosurveillance | Preliminary report of an outbreak of SARS-CoV-2 in mink and mink farmers associated with community spread, Denmark, June to November 2020](#)

⁸⁹ <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>

microbiology reference laboratory for the human infectious diseases. Therefore, SSI already had expertise and a laboratory infrastructure in place before joining DK-VET.

- **Aims and objectives:** SSI has revised its mission and now aims to be a One Health Institute with the mission to be an internationally leading research and preparedness organisation that strengthens the health of humans and animals. Its aim is to prevent and fight infectious diseases through research-based monitoring, diagnostics and guidance. Therefore, One Health has become an important strategic area of the institute.
- **Covered domains (human, animal, ecosystem):** Mainly human and animal, but at the governance level the environmental authorities are included.
- **Action tracks in the One Health action plan:** This case study contributes to the following five action tracks of the One Health joint action plan of the Quadripartite:
 - enhancing One Health capacities to strengthen One Health systems
 - reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics
 - controlling and elimination zoonotic, neglected tropical and vector-borne diseases
 - strengthening the assessment, management and communication of food safety risks.
 - integrating the environment into One Health
- **Level of readiness:** Routine system, as SSI does the infectious disease preparedness diagnostics in both humans and animals and contributes to both human and veterinary risk assessments.

Data sharing

- **Data collection:** Samples from both animals and humans are received at the same institute, and analyses for similar pathogens (e.g. influenza viruses) are performed at the same laboratory facilities with the same staff. A new high-level containment laboratory building, specifically for the analysis of certain veterinary pathogens such as African Swine Fever virus, has been built at SSI. Analysis, such as whole genome sequencing can be performed using the same platforms and pipelines for samples from both humans and animals. When relevant, the data for zoonotic threats are combined for shared epidemiologic analysis and risk assessments covering both veterinary and human aspects.
- **Gaps:** There are separate laboratory information management systems, as the unique identifier in the human system is at the individual level whereas the identifier in the veterinary system is at the herd/owner level that can have several samples connected. It would be an advantage to have an integrated laboratory information management system covering the different needs. SSI is strategically working on expanding the wastewater surveillance of selected pathogens in collaboration with relevant veterinary and environmental authorities.

The environmental authorities are not a part of the laboratory infrastructure but are included in the institutional governance structure and the system is thereby considered partially aligned with the OHHLEP One Health definition.

- **Sharing:** Data is shared within SSI and DK-VET and the relevant authorities.

Governance

- **Political/legal level:** It is stated in the national law of health that SSI has tasks with respect to both the human and veterinary infectious disease preparedness. DK-VET is contracted by the Veterinary Authorities, whereas the human infectious disease preparedness is funded and regulated by the Ministry of Health.
- **Institutional level:** When SSI performs tasks within DK-VET they refer to the Danish Veterinary and Food Administration and when they do tasks related to humans, they refer to the National Health Authority. A coordinating forum for zoonotic threats has been established including both SSI, Copenhagen University, The Danish Veterinary and Food Administration, The National Health Authority, The Danish Patient Safety Authority, and most recently also including the Danish Environmental Protection Agency. Representatives from KOZO meet regularly to share experiences and coordinate activities and communication regarding zoonotic threats.
- **Operational level:** There are several standard operating procedures developed within DK-VET for how to share data and perform risk assessments and other counselling activities to the veterinary authorities.

Interventions

- **Financing:** Human and veterinary preparedness activities are funded by both the Ministry of Health and The Danish Veterinary and Food Administration, respectively.
- **Compensation mechanism:** As above.

Evaluation

The SSI has not yet been evaluated qualitatively (processes) or quantitatively (economically) for its incremental benefit as a One Health infrastructure. As noted in Chapter 3, however, the similarly-organised CSC enjoys estimated 26% savings in operational costs compared to separate institutions.

The DK-VET collaboration proved extremely valuable in 2020 when outbreaks of SARS-CoV-2 occurred in mink farms. Veterinarians and public health medical doctors in DK-VET and SSI could work side by side to study transmission patterns at the human-animal interface by linking data sources and

performing joint laboratory and epidemiological analyses to support both human and veterinarian risk assessments.⁹⁰

Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** A qualitatively (processes) or quantitatively (economically) evaluation is needed to address gaps. For SSI it has sometimes been challenging to serve two different ministries with different priorities. This underlines the importance of a strong collaboration and alignment at the ministerial level to optimise the institutional collaboration and efficiency in One Health matters.
- **Is there any information on learning and leverage points that could have relevance for future EU policy?** Overall, there are benefits from integrating infrastructures related to diagnostic infectious disease preparedness, research and counselling across the veterinary and human sector. One Health structures must be implemented at all levels, also at ministerial level.

Case study 6: Research into the role of companion animals in improving mental health and preventing non-communicable diseases

Background

Non-communicable diseases are responsible for 42 million human deaths annually, accounting for 74% of all deaths globally. Approximately 80% of these deaths are caused by cardiovascular diseases (17.3 million), cancers (7.6 million), respiratory diseases (4.2 million), and diabetes (1.3 million).⁹¹ Some risk factors include insufficient physical activity (accounting for 830 000 deaths annually) and metabolic risks such as raised blood pressure, raised blood glucose, overweight, and obesity.

Mental health conditions contribute substantially to the global burden of disease (WHO, 2022). In 2019, it was estimated that approximately 970 million people worldwide were living with a mental disorder, with anxiety and depressive disorders being the most common. Depression is the leading cause of disability globally and a major contributor to the overall burden of disease. Over the last decades, research has shown that companion animals as important social partners for many humans can be of great value in addressing these public health challenges. In the EU, around 46% of households have at least one companion animal. Owners often regard their pets as family members and companion animals can be effective in providing social support, companionship, reducing feelings of loneliness, and acting as a buffer in stressful situations. Animals help to build and maintain social

⁹⁰ Health care cost savings associated with pet ownership 2023 available from <https://habri.org/>

⁹¹ WHO Ageing and health factsheet, 2022 <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>.

networks, as research has shown that companion animals stimulate social interaction between people, especially dogs that are walked outdoors.

Studies have confirmed a positive relationship between companion animal ownership and human health: for example, companion animal owners report fewer doctor visits, and better cardiovascular health compared to non-pet owners (Headey et al, 2008; Mein & Grant, 2018), dog owners have a 24% lower mortality rate and a reduced risk of cardiovascular disease (Kramer, Mehmood, & Suen, 2019; Mubanga et al, 2017) and pet owners reported greater psychological wellbeing and lower levels of anxiety, stress reactivity, loneliness, and depression (Janssens et al, 2021; Saunders et al, 2017). However, some studies found no association between pet ownership and human wellbeing and health, or mixed results, while others found associations with poorer mental health (Smith et al, 2023). This shows that the relationship between pet ownership and human physical and mental health is not yet clear.

The practice of 'using' animals for therapeutic purposes has a long tradition in mental health care. This is referred to as animal-assisted interventions, which include animal-assisted therapy, animal-assisted education, and animal-assisted activities. These interventions are effective in reducing depression and symptoms of post-traumatic stress disorder and it can be a relevant treatment for hard-to-reach patients with mental health problems (Hediger et al, 2021; Künzi et al, 2022).

Although research into animal-assisted interventions is still a young scientific field, evidence of their effectiveness is growing. Systematic reviews and meta-analyses show that these interventions can lead to reductions in depression, anxiety, loneliness, autistic spectrum symptoms, post-traumatic stress disorder symptoms, medical difficulties, and behavioural problems, with the effects appearing to be stronger for patients with psychiatric conditions (Babka et al, 2021; Chang et al, 2021; Droboniku & Mychailyszyn, 2021; Hediger et al, 2021; Nieforth et al, 2023; Virués-Ortega et al, 2012). However, pet ownership can be an emotional and financial challenge, especially for older adults (Enders-Slegers & Hediger, 2019). The loss of a companion animal can lead to complicated grief. For older adults, the thought of rehoming a companion animal is sometimes a reason to delay a transition to assisted living (Enders-Slegers & Hediger, 2019).

Description of the case

This case study describes the activities and findings of an interdisciplinary research group on human-animal relationships and animal-assisted therapy in Switzerland. The group is led by a psychologist at the Department of Psychology of the University of Basel in collaboration with the Centre for Neurorehabilitation in Basel and the Swiss Tropical and Public Health Institute.

- **Aims and objectives:** The main aim is to understand the public health value of the human-animal relationship and the impact animals can have on human mental health and healthcare. The goals are to identify benefits and challenges, provide best practices and protocols to ensure quality and wellbeing for all involved and promote effective strategies such as AAls in society and institutions.
- **Covered domains (human, animal, environment) and how:** Human domain: Health and wellbeing are assessed. Animal domain: Early studies are looking into the effects on animals' health and wellbeing.
- Action tracks in the One Health Action:
 - enhancing One Health capacities to strengthen One Health systems
- **Level of readiness:** Scientific evidence is accumulating. Its practical implications for quality assurance have been established as standards and protocols by several international organisations such as the [International Association of Human-Animal Interaction Organizations](#) or the [International Association of Animal Assisted Interventions](#). In some countries, such as Italy or Austria, standards for animal-assisted interventions have been taken up at the government level.

Data sharing

- **Data collection:** Data collection is undertaken by research groups in the form of scientific studies. There is no coordinated data collection at an institutional or governmental level, apart from some local initiatives by private organisations to map, for example, the amount and type of intervention provided in some regions and special sectors.
- **Gaps:** There is a clear need for more structured data, and policy and decision-makers should be aware of the scientific evidence that is accumulating.
- **Organisation:** To date, data collection is organised through research groups and private initiatives.

Governance of the initiative

- **Political/legal level:** In some European countries such as Austria or Italy, animal-assisted intervention has been picked up at the political and legal level. In some places, pet-friendly housing initiatives have emerged. Otherwise, there is a clear lack of legislation and initiatives within the EU that foster relationships between humans and their companion animals and help to foster such interventions within the healthcare system.
- **Institutional level:** Health, rehabilitation, and educational institutions play the most important role for non-communicable One Health interventions.

Interventions

- **Interventions per domain:** To make full use of the potential of One Health interventions in non-communicable diseases, educational and preventive approaches are at the forefront and have to be defined on a case-by-case basis.
- **Financing:** To date, most animal-assisted interventions are paid privately, whereas the overhead costs for the animals are mostly covered by foundations or donations. In some cases, social services cover the costs, and in rare cases the insurance companies (e.g. hippotherapy in Switzerland) or supplementary insurance.
- **Compensation mechanisms:** None at present.

Evaluation

In 2023, HABRI concluded that pet ownership saves the US healthcare system \$22.7 billion every year⁹². In Austria, researchers have calculated the socioeconomic value of dog ownership (Kotrschal et al, 2004). However, cost-benefit analyses of pet ownership and animal-assisted interventions are still lacking and highly warranted.

- **Costs:** Cost of keeping animals, possible negative impacts of animals, and the cost of the preventive or therapeutic set-up.
- **Benefits:** See outlined above.
- **Indicators:** Human health and wellbeing benefits (such as visits to doctors, obesity, child anxiety) and related savings and human costs (such as dog bites, allergic reactions and cost to upkeep animal shelters).

Looking forward

- **Are there foreseen costs and benefits that should be better assessed?** The full potential of companion animals for human health is not yet fully understood, and possible negative aspects for both humans and animals involved should be better investigated to ensure that appropriate counter-measures are taken. Environmental considerations are currently totally lacking: for example, the role of pets in zoonotic diseases, pet owners' use of natural resources and as invasive species and/or predators on wildlife is well-known (Marra, 2019).
- **Are there gaps in governance that should be taken into consideration in future?** Institutions and authorities often lack the knowledge that animal-assisted interventions should be promoted and allowed in health care. To ensure high quality, international standards and protocols such as IAHAIO and ISAAT should be supported and further

⁹² <https://eurohealthobservatory.who.int/>

developed concerning the training of professionals, the training and requirements of the animals involved, and the concrete implementation in therapy.

The environment is not covered by the research. It remains to be discussed whether the research has an anthropocentric view and the case study may, in that sense, not be fully aligned with the OHHLEP One Health definition.

- **Is there any information on learning and leverage points that could have relevance for future EU policy?** Policies supporting pet ownership should be considered, allowing pets in rental apartments and houses, and designing cities with enough space for safe dog walking to ensure the health and wellbeing for the owners and the dogs. Policies should support the bond between older adults and their pets, to maintain the quality of life, daily routines, physical activity, and prevent loneliness. Companion animals are often not allowed in health institutions like rehabilitation centres or nursing homes, where the benefits of human-animal bonds are significant. Additionally, fostering animal-assisted interventions is important. These suggestions are in line with WHO strategies to promote healthy ageing,⁹³ the UN Decade of Healthy Ageing, and the EU's Mental Health Strategy. Zoetis and the Federation of European Companion Animal Veterinary Associations highlighted the lack of legislation and initiatives in their Human-Animal Bond Report (Zoetis et al, 2024) at the EU Companion Animals Stakeholder Summit. Regulations should ensure ethical practices and the wellbeing and health of the involved animals, be they companion animals or working in animal-assisted therapy. Companion animals and their owners should be able to engage in a mutually reinforcing relationship that enhances both parties' health and wellbeing.

Case studies synthesis

These case studies highlight several examples of One Health implementation across the EU. As was seen in the literature review in the first half of this chapter, the emphasis is commonly on infectious diseases, with the environmental domain less commonly considered than the human and domestic animal domains. More recent examples, such as the urban networks (Case study 4), are now prioritising the environment in One Health initiatives. As shown by animal-assisted interventions (Case study 6), even in the case where One Health viewpoint seems sensible, integration of the animal viewpoint is just taking its first steps and while environmental impact of pet ownership has been discussed for a long time, it has not yet been integrated into the equation.

⁹³ Our definition of One Health "One Health is an integrated, unifying approach that aims to sustainably balance and optimise the health of ecosystems. It recognises the health of humans, domestic and wild animals, and the environment." We clarify that "environment" means what is part of an ecosystem but not a human or non-human animal. A non-exhaustive list would include plants, microbes, soil, waterways, the atmosphere, manufactured materials and chemicals, and the climate.

Drawing widely applicable conclusions from the case studies is difficult since each has unique cultural, historical and political contexts leading to different institutional arrangements to facilitate cross-sectoral collaboration. Different policy areas are politically prioritised in different ways, and this also can be seen, for example, in the financial resources allocated to One Health interventions. In any case, sustained support from political, institutional and operational level is required to keep One Health initiatives running.

As shown in the case studies on DANMAP (Case study 1) and trichinosis control (Case study 3), some One Health interventions and systems predate the EU-level One Health initiatives. This makes assessment of costs and benefits challenging since the benefits of moving from unisectoral to multisectoral approaches cannot be retrospectively understood. Also, without broader evaluation of the system as a whole, the assessments of costs and benefits might be based on the effects of small modifications to the systems. This does not mean that there is no evidence that these systems work: few would dispute that trichinosis surveillance is at least partially responsible for very low disease incidence in Europe and DANMAP for the minimal reliance on antibiotics of “last resort”.

The underlying rationale of the integrated surveillance cases (AMR in Case study 1 and WNV in Case study 2) is to target the whole lifecycle of parasites and pathogens and their transmission routes, assuming that this is the optimal approach allowing early interventions whether it relates to epidemic or pandemic scenarios. These early socio-ecological interventions also reduce the need for later, more expensive interventions, which can massively exceed costs of preventive actions. The challenge here is that successful surveillance systems are a product of long and intensive processes, and they need both extensive political, legal, institutional and initial economic support to function. When these systems are successful, elimination or eradication of some pathogens can be achieved, but this also raises questions about the sustainability when the apparent risks seem low due to low incidence. Indeed, solutions can be found from looking at DANMAP, as among the cases it has a unique dual focus on cause (antimicrobial usage) and effect (antimicrobial resistance), which allows for different synergies. Comprehensive data links antimicrobial use practices with observed resistance patterns, which allows for addressing the identified drivers of resistance while at the same time managing its consequences. The synergy can be linked to the creation of a robust policy framework that is both preventative and reactive, ensuring long-term sustainability in AMR management. Nevertheless, integrated surveillance and similarly integrated infrastructures (Case study 5) illustrate the challenges of serving two or more ministries which may have different priorities and underlines the need for One Health coordination at both institutional and ministerial level.

The case studies on urban biodiversity highlight the early stages of One Health projects but are notable for their cross-sectoral and multidisciplinary collaboration and wide understanding of One Health. They also represent different approaches as one had grown from grassroots and from

scientists' activity whereas the other is driven by higher-level initiatives. These cases suggest that the integration of biodiversity and health is in its early stages, but they represent a drive to find synergies in investments on both urban health and urban biodiversity. Indeed, citizens' understanding of One Health is also highlighted in WNV surveillance infrastructures, where the surveillance gives important information to the citizens to avoid infection risks.

Key messages from the case studies include:

- One Health approaches have been pioneered already for a long time with clear effects, such as with trichinosis or antimicrobial resistance control.
- One Health assessments are variable and consider different aspects, thus making comparisons difficult.
- One Health approaches work in different cultural, political and societal contexts, thus requiring different solutions to enhance cross-sectoral collaboration.
- Emerging initiatives are also considering environmental domain and finding synergies for considering issues such as a biodiversity loss.

Conclusion

The literature search and case studies provide evidence that adopting One Health-minded interventions and policies can provide a plethora of benefits across different domains, from humans to animals and environment. However, assessment and comparison of these benefits is difficult and lacks standard approaches, as was also demonstrated in a recent review (Auplish et al, 2024).

Costs and benefits are highly dependent on social, cultural, economic, political and ecological contexts, and need to be assessed in various settings. While mainly driven by zoonosis research and argued for through monetary cost-benefit analysis, One Health benefits have been shown to exist in other contexts and encompass a wider set of less necessarily anthropocentric outcomes in keeping with the current OHHLEP definition.

Evidence-based options for policy and research gaps

Summary

We start by presenting several short-term policy options related to the operationalisation of One Health at EU and member state level. These show that One Health governance would benefit from overlapping policies, regulations and other activities across human, animal and environmental health sectors (e.g. Farm to Fork, Crisis Preparedness legislation, EU Biodiversity Strategy). Coordination between local, regional and national governments and EU and intergovernmental institutions is essential and depends on strong leadership and long-term political, institutional and financial will. Countries that employ intersectoral and multisectoral approaches are better placed to work collaboratively across sectors and achieve cross-cutting One Health global challenges, than those which do not. One Health knowledge-brokering agencies (or “boundary organisations”) may improve transboundary knowledge mobilisation and collaboration. We reproduce the checklist from Chapter 3 for the operationalisation of One Health. We next outline medium-term and long-term evidence-based options for policies and argue that the broader ramifications of the operationalisation point to socioeconomic and environmental dilemmas. These suggest the need for a paradigm change towards more ecologically, socially and economically sustainable forms of agriculture that offer such benefits as healthier human diets, a reduction in non-communicable disease, and improved animal welfare. One Health approaches can also benefit human and animal health policies through better pandemic preparedness by implementing integrated disease surveillance-response systems, improved biosecurity at the animal-human interface and zoonoses control at the source. Research gaps motivate future research on One Health governance, economics, antimicrobial resistance, integrated surveillance-response systems, biodiversity, animal welfare and ethics, through the Horizon processes. Finally, the need for One Health funding, education and capacity-building is addressed.

Introduction

This Evidence Review Report points to several short- and medium-term policy options related to the operationalisation of One Health at EU and member state level. We structure this chapter by pointing to:

- **short-term** evidence-based options for policy

- **medium- and long-term** evidence-based options for policies and broader ramifications of the operationalisation of One Health
- **research gaps** to motivate future research through the Horizon processes and capacity-building

Each section is structured according to the overall sequence of the evidence review report: definition of One Health in the European context, governance of One Health, and evidence from the literature reviews and case studies on One Health implementation.

Specific and short-term evidence-based options for policy

Definition and meaning of One Health

One Health is the broadest operationalised integrated concept of health and has the widest recognition worldwide. Adopting the OHHLEP definition (OHHLEP et al, 2022) leads to short-term benefits and a medium-term paradigm change. Balancing and optimising the health of humans, domestic and wild animals, and the environment (including plants, microbes, soil, fungi, waterways, the atmosphere, manufactured materials and chemicals, and the climate), calls for a shift: from the perspective of humans as the centre of attention to a view of interdependent humans, animals and environments, together comprising in ecosystems. We believe this widened perspective is needed to sustain the health of all species and prevent the destruction of ecosystems.

This view encourages us to see how a health perspective can be included in what are typically considered 'environmental' issues. Such issues include: mitigating against climate change; maintaining and enhancing biodiversity; improving animal welfare; reducing water pollution, and protecting watersheds from pollution, including chemical contamination, nitrogen and phosphorus; and tackling plastic waste. This list is non-exhaustive. A more detailed analysis is needed for a comprehensive list of 'environmental' issues with human, animal and plant health.

One Health governance

Implementing One Health in practice requires leadership, coordination, participation, and follow up. A practical process checklist is provided below and is adapted from Rüegg et al (2018). This process demands investments and resources before the benefits of a One Health approach can be obtained.

Box 5: One Health operationalisation checklist

- Introduce top leadership, superior to the different sector heads, that convenes stakeholders and actors (e.g. prime minister, minister of finances, minister of planning).
- Create a One Health coordination platform (typically top leadership of public health, animal health, agriculture and environment).
- Identify One Health issue (typically a problem that requires a multi-sectoral approach).
- Formulate a theory of change possibly based on a multi-criteria decision analysis and according to context.
- Identify and map stakeholders.
- Engage in a participatory transdisciplinary stakeholder process involving academic and non-academic stakeholders for the framing of the One Health issue and the validation of the theory of change (involve communities, authorities and technical experts together).
- Proceed to an ex-ante process analysis of the framed One Health issue (social, economic and ecological impacts) (see Chapter 4).
- Clarify and document institutions and their scaling (national, provincial, district levels)
- Clarify and document roles and responsibilities.
- Clarify and document the chain of command and communication pathways.
- Implement One Health issue at small scale.
- Proceed to an ex-post impact analysis of the One Health issue (social, economic and ecological impact) and supportive infrastructural 'One Health-ness'.
- Engage in a participatory stakeholder process similar to point 3 for the reassessment of the One Health issue focus and possible scaling up.
- Scale up the implementation One Health issue.
- Iterate steps 9–14.

One Health governance is complex, with potential for overlapping regulation across human, animal and environmental/ecosystem health sectors. In the EU, policies such as the Farm to Fork Strategy, the Crisis Preparedness legislation, and the EU Biodiversity Strategy, among others, could benefit from a greater emphasis on a One Health approach.

Litigation on the basis of the right to One Health (and specifically a healthy environment) may, in future, be a game-changer which offers new opportunities for access to justice and to protect against gaps in existing legislation. There is potential for new jurisprudence which recognises the importance of legal frameworks that extend beyond Western legal ideals to embed diverse cultural, Indigenous and philosophical perspectives. This may offer an alternative to traditionally anthropocentric legal frameworks, extending legal rights to natural, non-human and even non-sentient entities.

Europe has been a centre of gravity for the development of One Health partnerships and networks. Acknowledgement of biases in the nature of these networks and associated funding, in terms of their scope, geographical reach and engagement with local, indigenous and rural communities is important if we are to unearth and mitigate unintended consequences on the achievement and equitability of positive One Health outcomes. As noted, many EU regulations, directives, policies and action plans refer to animal and human health, health of ecosystems, and climate change. Policies such as: the Farm to Fork Strategy and the Crisis Preparedness legislation, among others, could benefit from a greater emphasis on a One Health approach.

Coordination between local, regional and national governments and EU and intergovernmental institutions is essential and depends on strong leadership and political, institutional and financial will, which may be susceptible to short-termism. Countries which employ intersectoral and multisectoral approaches are better placed to work collaboratively across sectors and achieve cross-cutting One Health global challenges, than those which do not. One Health knowledge-brokering agencies or “boundary organisations” may improve transboundary knowledge mobilisation and collaboration (see European Observatory on Health Systems and Policies⁹⁴ as a model).

Options to improve future One Health governance could include:

- developing an **online repository of global and European One Health networks**. This would aid and improve prioritisation and equitable distribution of existing resource allocation and help establish more egalitarian networks that encompass the breadth of One Health issues, and serve communities most affected by emerging, re-emerging, or endemic threats at the human-animal-environment interface (Mwatondo et al, 2023)
- ensuring **financial and political support and cooperation for context-specific approaches** to realise a One Health approach. Individual country requirements cannot be underestimated, dismissed or prescribed in a top-down manner (Okello et al, 2014)
- approaching emerging issues from a One Health perspective **at the very outset when working groups and taskforces are formed**, by inviting experts from different disciplines and sectors. Potential issues could include emerging infectious diseases, such as avian influenza, but also non-communicable diseases, such as obesity or autoimmune diseases. Conversely, some issues that have been primarily approached from perspectives other than health should also be approached as One Health issues, such as biodiversity or learning problems in schools

⁹⁴ cross-agency-one-health-task-force-framework-action(<https://www.ecdc.europa.eu/en/publications-data/cross-agency-one-health-task-force-framework-action>) .

- agreeing an **overarching conceptual framework** to standardise and harmonise approaches to strengthening One Health systems and tools development within member states (Pelican et al, 2019)
- providing One Health practitioners with **training and education on transdisciplinary approaches to knowledge integration, mobilisation and translation**. They also need to be part of a culture which encourages transparent and safe discussion of new ideas with established governance actors, ideally in programmes supported by permanent professional associations or organisations (Hitziger et al, 2018)
- introducing **formal monitoring and evaluation systems of EU and international One Health policies** to support the case for future funding (dos S. Ribeiro et al, 2019)

Literature review and case-studies

Our literature review on the effectiveness of One Health interventions provides evidence that adopting One Health minded interventions and policies can provide benefits across different domains but that assessment of these benefits is difficult and lacks standard approaches.

Most of the case studies focused on infectious diseases and the added value of integrated surveillance of zoonoses (trichinellosis, West Nile Fever) and antimicrobial resistance across human, veterinary and environmental domains to inform prevention and mitigation of risks. In general, they illustrated the importance of political ownership, clear governance structures and dedicated funding to support the One Health implementation interventions. Only a few of the cases had been evaluated and only one for the benefit cost ratio, underpinning the need for more research in evaluation and benefits of One Health initiatives. An early case study on the greening of cities illustrated how an ecosystemic view can be included in One Health interventions by establishing interdisciplinary and transdisciplinary networks to inform relevant authorities.

Evidence-based policy options include:

- **Implementing integrated AMR and zoonoses surveillance including human, animal and environmental domains.** Evidence shows the benefit of an integrated human and animal surveillance-response system for zoonoses and AMR (Figure 16, below, illustrates the case for AMR) that cross-communicates all findings between the different sectors to identify distribution and spread of zoonotic pathogens and AMR in the social-ecological system. This is fundamental to control spread at the source and to detect and respond to emerging pathogens at the human animal interface. The environmental domain needs to be better integrated in existing systems and further evidence collected to understand in which context environmental monitoring is most beneficial.

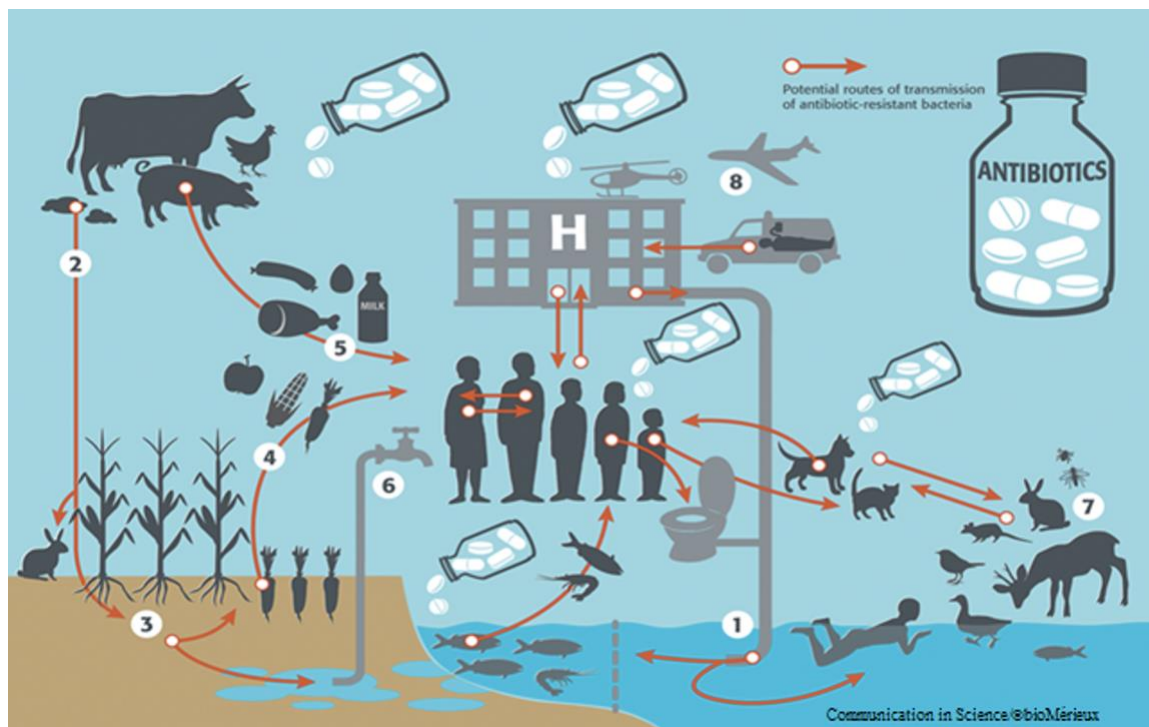


Figure 16: Schematic diagram of an integrated AMR surveillance-response system.

- **Establishing an integrated laboratory and surveillance-response infrastructure.**

Integrated laboratory and surveillance infrastructures across the human and veterinary domains like the Statens Serum Institut in Denmark or the Canadian Sciences Centre can save financial resources by sharing management costs and make programmatic savings related to accelerated communication and the harmonisation of workflows. Evidence shows benefit for EU member states to consider integrated human and animal health infrastructures to save financial resources and benefit from programmatic gains as well as strengthened response to microbial threats at the human-animal interface. The World Bank (2012) stated that the earlier an emerging pathogen is detected in the environment or in animals and the observation is communicated across the animal and human health sectors the lower are the subsequent costs. Hence, the establishment of EU-wide integrated surveillance - response systems could be considered, that expand beyond the existing human-animal interfaces to include overlooked animals such as insects and environmental vectors such as waterways. This could reduce time to detection, supporting pandemic prevention and reducing cross-border transmission risk. This would include a shared data repository for combined analyses and visualisation of data. Cross-sector work, risk communication and joint risk assessment should thereby be included systematically.

- **Supporting improved evaluation of and research in the benefits of One Health**

operationalisation. This need was apparent from both the literature review and the case-studies.

Medium- and long-term evidence-based options for policy and broader ramifications of the operationalisation of One Health

Definition and governance of One Health

The definition of One Health, refined from the OHHLEP definition as described and elaborated in Chapter 1,⁹⁵ will have broader ramifications in agricultural, health and environmental policies of the EU and its member states. Non-exclusively, One Health has consequences for the Common Agricultural Policy (CAP), the Green Deal, the Farm to Fork Strategy, the Biodiversity Strategy and the cross-agency (ECDC, ECHA, EEA, EFSA, EMA) frameworks for action.⁹⁶ Operationalising One Health mobilises multiple sectors, disciplines, and communities at varying levels of society to work together to foster wellbeing and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, taking action on climate change and contributing to sustainable development.

One Health operationalisation is faced with huge inequity and power imbalances between different sectors. For example, the public health sector has much more power and resources than the veterinary or environmental sectors. A governance body at a higher level should oversee the equitable implementation of One Health policies and strengthen the interoperability of institutions and programmes. One Health policies and decision-making processes should ensure the equal distribution of data and grant resources, and advocate equity between sectors as a major topic.

Agricultural policies

The Common Agricultural Policy, the Farm to Fork Strategy and the European Green Deal policy initiatives should be re-examined from a One Health perspective. Currently, agriculture in the EU is not sustainable in an ecological, social or economic sense, all of which result in poor health in humans, animals, and environments.

The current farmer protests in many European countries reflect a deep-seated unhappiness within the agricultural sector: with a few exceptions, farming of any type provides a livelihood below the average income. Farmers' physical and mental health is affected by concerns over income (Zinsstag & Weiss,

⁹⁵ <https://www.healthdata.org/research-analysis/health-risks-issues/diet>

⁹⁶ EU4Health Programme 2021–2027. Available at https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/eu4health_en

2001). Intensive animal production requires extensive use of pharmaceuticals, including antibiotics, which increase risks related to antimicrobial resistance. Dense animal housing and the lack of genetic diversity increases the risks of infectious disease outbreaks which are often tackled in ways, such as culling, that cause emotional and financial distress to farmers. Recent examples include outbreaks of COVID-19 in mink and avian influenza, both controlled through mass culling of livestock.

A One Health approach also sheds light on the role of healthy diets on the burden of disease in humans. High animal-source food diets have well known consequences on human cardio-vascular diseases and other conditions (Najjar, 2023).⁹⁷ Human diet is highly determined by sociocultural practices and income. Animal source food consumption rises wherever livelihoods increase, paralleled by an increase of cardio-vascular diseases as one of the leading causes of death.

The first scholarly paper introducing the One Health concept in 2005 recommended modifications to smallholder livestock systems and live-animal markets to prevent or reduce interactions between wildlife and livestock, which might be reservoirs for future human pandemics (Zinsstag et al, 2005). However, these implementations should be handled carefully to avoid impeding poverty. This warning, published 15 years ago in *The Lancet*, foreshadowed the COVID-19 pandemic. Biosecurity of live animal markets, intensively farmed chickens or pigs, and other interfaces of multiple animals (wildlife and domestic species) needs urgent attention (Zinsstag, Kaiser-Grolimund, et al, 2023). To improve biosecurity in live animal markets and on farms, animal welfare needs must be fundamentally changed, as animals are often kept under unacceptable conditions (Zhang et al, 2022).

Domestic animal husbandry, meanwhile, contributes to the livelihoods of hundreds of millions of small farmers. Drastic measures may lead to the loss of income and advancing poverty and hunger for large numbers of small-scale farmers, and all stakeholders (e.g. farmers, traders, butchers, consumers, administrators and scientists) must engage to identify locally adapted biosecurity and animal welfare measures, while preserving economic gains. Multidisciplinary funding should actively contribute to solving these issues, such as cross-cluster funding in the Horizon Europe programme, specifically clusters 1 (health) and 6 (food safety, animal health) (European Commission, Directorate-General for Research and Innovation, 2024).

There are profound environmental implications too. Conventional agriculture entails extensive inputs in fertilisers, pesticides and land changes that exacerbate habitat loss, eutrophication, invasive species spread and biocide impacts – all key factors threatening millions of plants and animals with extinction

⁹⁷ EU Adaptation Strategy 2021- Available at https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy_en

worldwide (IPBES, 2019). This further questions the sustainability of current agricultural practices and the ethics of farming animals in high quantities.

Given these socioeconomic and environmental dilemmas, a paradigm change is long overdue. We need new, more sustainable multifunctional agricultural systems that provide economic, social, environmental, and territorial benefits for health and wellbeing.

Key elements of multifunctional agricultural systems include:

- **economic:** income, food security, local (rural) development, trade balance
- **social:** employment (salaried and non-salaried), opportunities for young people, women
- **environmental:** climate (greenhouse gases), biodiversity, fire prevention, nutrient balance
- **territorial:** space management, landscape, rural life, food sovereignty, identities

How can future agriculture simultaneously provide healthy food and clean water, while preserving ecosystem biodiversity and aiming towards carbon neutrality? This requires an extensive, participatory, transdisciplinary consensus-finding process between all involved stakeholders ranging from farmers, consumers, traders, and governmental authorities to academic experts. At the same time key questions on sustainable farming practices require research into the nexus of sustainable natural resource management, livelihoods, health, and the sociocultural factors associated with food and eating.

Health policies

Based on the existing institutions as shown in Chapter 2, the European Commission Directorate-General for Health (DG-SANTE) is responsible for EU policy on food safety and sustainability, public health, animal health and welfare and health of crops and forests. It supports national and regional authorities in the implementation of related laws at national level. It has explicit responsibility for decision-making about One Health policy (SANTE A). It partners with five EU decentralised agencies (see Table 3): European Medical Agency (EMA), European Centre for Disease Control (ECDC), European Chemical Agency (ECHA), European Food Standards Agency (EFSA) and Community Plant Variety Office (CPV).

Operationalising One Health would necessarily mean that the above EU health departments, institutions and agencies interconnect more closely with those focussed on agriculture and environment to strengthen European and global health security. All clusters operate within legal frameworks and budgets that are well established. To achieve this, existing legal frameworks will need to be revised and new ones may need to be developed to secure cross-cluster cooperation.

Environmental policies

Many indicators for the state of our environments show decline, particularly those measuring biodiversity loss, encompassing losses at the level of both ecosystems and individual species, as well as in overall biomass. Thus, to achieve One Health's aim of balancing and optimising the health of ecosystems, including humans, animals, and environments, preventing destruction of ecosystems and habitats is a top priority. Indeed, multiple interlinked ecological crises (e.g. climate change, persistent drought, extreme weather events, land loss and degradation, coastal erosion, biodiversity loss, desertification, pollution) are tackled by various EU environmental policies. These include:

- The General Union Environment Action Programme or 8th Environmental Action Programme - EAP (European Parliament, 2022a)
- Health Security
- Horizon Europe Strategic Plan (European Commission, 2024b)
- Zero Pollution Action Plan (European Commission, 2021a)
- Animal Health Law (European Parliament & Council of the EU, 2021)
- EU4Health programme⁹⁸
- EU Strategy on Climate Change⁹⁹
- EU One Health Action Plan against AMR (European Commission, 2017)
- Invasive Alien Species Regulation (European Parliament, 2014)
- European Consensus on Development (Council of the EU et al, 2017)

These policies should take into account a One Health perspective and consider increased human and animal health in addition to strengthening the broader ecosystems of which humans and animals are a part.

International cooperation, social development and migration

International cooperation at the interface between Europe and other areas of the world can also benefit from a One Health approach. One Health approaches are very closely linked to sustainable development issues, where multilateral and international cooperation are vital. This report shows that the EU is not only a centre of gravity for the development of One Health partnerships and networks, but we also recognise the importance of lower and middle-income countries as key partners in the achievement of the UN 2030 SDGs and objectives of the 2015 Paris Climate Agreement. For example, the EU is a major contributor to global control of cholera and poliomyelitis. The European Developing Countries Clinical Trial Partnership¹⁰⁰ is a successful example of fostering public health interventions

⁹⁸ <https://www.edctp.org/>

⁹⁹ <https://www.au-ibar.org/au-ibar-projects/parc>

¹⁰⁰ <https://www.au-ibar.org/node/261>

and has started to engage in One Health approaches. A master example of this is the Pan-African Rinderpest Campaign¹⁰¹ that led to the eradication of rinderpest worldwide and the Pan-African Programme for the Control of Epizootics,¹⁰² including African Swine Fever, which are heavily supported by the EU.

However, evidence shows that for international cooperation on One Health to be truly successful, it must also be equitable and alongside the successful programmes described above, there remains global inequity relating to economic, social and ecological conditions. As few One Health networks are exclusively forged in low- and middle-income countries, cooperation financed from the Global North must reflect a sufficiently diverse set of partners and sectors for joint design, agenda-setting, implementation, training, monitoring and evaluation, to avoid biases in terms of scope, geographical reach and engagement.

Although not covered in detail in this evidence review report, but closely related to international cooperation issues, One Health has important ramifications in other critical policy areas such as migration (ECDC, 2024; Sutradhar & Zaman, 2021).

Research gaps for the operationalisation of One Health in the European Union

Despite the growing evidence of the benefits of a One Health approach, substantial knowledge gaps still exist. Here we propose a series of questions aimed at addressing these gaps. Our agenda is incomplete and warrants an iterative interaction with ongoing One Health operationalisation activities for which research can provide targeted information. Currently, the general topics of the research agenda include One Health governance, economics, antimicrobial resistance, integrated surveillance-response systems, biodiversity, climate change, animal welfare and ethics.

Governance

- How can we successfully establish a One Health governance repository for One Health best governance practices?
- How can we best establish One Health research funding mechanisms?
- What is the optimal way to harmonise One Health indicators? A European Commission-funded working group could be tasked to propose a consensualised set of European One

Health Core Indicators that would serve in a Europea One Health monitoring system. These indicators should derive their data from a variety of sources, including the EU's statistical office (Eurostat), and the quadripartite institutions - FAO/UNEP/WHO/WOAH.

- How can we expand Health Impact Assessment to become One Health Impact Assessment, including impacts on humans, animals and environments?

Economics

- What is the return of investment of One Health interventions, particularly integrated antimicrobial resistance surveillance?
- What is the profitability of joint infrastructures and institutions, such as medicines administrations?
- What are the best tools for decision-making on One Health optimisation, i.e. identifying and valuing trade-off between different domains, such as humans, animals and environments?
- What should be the agreed protocols for the economic assessment of One Health interventions?

Antimicrobial resistance surveillance

- What are the major pathways for antimicrobial resistance acquisition, distribution and spread? These need systemic environmental-animal-human studies for their elucidation (Meier et al, 2023).
- What is the effectiveness and profitability of integrated surveillance for major global health problems, such as antimicrobial resistance?
- How can we strengthen the social science and water-related aspects of AMR research?

Integrated surveillance-response systems

- How can we design Innovative surveillance systems with sensitivity to identify emerging threats to One Health, with emphasis on zoonoses (e.g. animal influenza, specifically avian influenza and porcine influenza; tuberculosis, specifically zoonotic tuberculosis)?
- What are the best markers for virulence and host range that can predict spillover potential from genomic data?
- What kinds of evidence-based risk assessment framework and tools can be used for novel potential pandemic threats found in animals?
- What further intervention research, including non-medical interventions, do we need to reduce spillover potential readiness to address emerging threats?
- How can we deliver insights in transformative change potential with the long-term goal to reduce risk and impact of emerging epidemics?

- What is the effectiveness and profitability of integrated One Health surveillance with systems capable of dialogue across sectors and across national borders?
- What is the added value and profitability of integrated environmental-animal-human risk assessment of emerging threats?
- What is the profitability of integrated environmental-animal-human surveillance-response systems?

Biodiversity

- How can we best understand and value nature's contributions to people, particularly from the health perspective?
- What are the situations where interventions have dual benefits for both environmental and human health?
- How can biodiversity of animals and plants be sustained and increased while maintaining rural income?
- What are the best tools for decision-making on trade-offs, such as species, population and individual level interventions, or between invasive and endemic species?
- How can we increase beneficial microbes (e.g. diverse gut microbiotas), while reducing harmful ones (e.g. respiratory viruses)? What are the zoonotic or anthroponotic risks related to the more biodiverse urban areas?
- How do we balance biosecurity, industrial-scale animal production, animal welfare, and biodiversity?
- How can we nurture human-nature connectedness, facilitating biodiversity-positive actions and empowering citizens on decision-making?
- How can we best mainstream non-human perspectives in international, national and local decision-making?
- How can we safeguard Indigenous and local knowledge about ecosystems and promote citizen science to create knowledge on local environments?
- How can native pollinator populations be safeguarded at the same as non-native species are used for pollinating services in agriculture or food production?

Climate change

- How can we identify and mitigate specific disease risks in relation to changing climate?
- How can we strengthen tools to predict extreme weather events and mitigate their impacts on humans, non-humans, and environments?
- What is the best way to identify the viability of different global regions and mitigate changes wherever possible?

- What are the possibilities of assisted migration in relation to animals, plants and other species?
- What are the risks of green transition in relation to energy and food production, and how can we prevent perverse outcomes which could threaten human health or biodiversity?
- How can we identify and implement cost-effective measures that benefit both climate and biodiversity?

Water management

- Even without climate change, environmental disturbances and changing population distributions may lead to too much water in some regions (resulting in floods), while too little water in other regions may lead to drought. How can we strengthen tools to ensure that water distribution is not adversely impacted by environmental and population changes, affecting human, animal, and plant populations, as well as the wider ecosystem?
- Water supplies must not only be in the correct quantities, but also of adequate quality; how can we strengthen tools to predict and mitigate against events that may result in water quality affecting human drinking water supply, agriculture and food supply (crop irrigation and domestic animals), as well as wild plants, animals and their environments?
- What are the risks of the green transition in relation to water supply, and how might these threaten human, animal and plant health and biodiversity?
- How can we identify and implement cost-effective measures that provide sufficient, but not too much water, of appropriate quality?

Animal welfare

- How can ongoing work on improving animal welfare, including on fish, be leveraged to prevent pandemic risks while maintaining rural income?
- What are the impacts of pets on local ecosystems, human wellbeing and the welfare of other animals?

Ethics

- How should conflicts between interests and values (e.g. anthropocentric vs. ecocentric) be resolved? This will involve robust social and cultural research alongside ethical theorising.

Funding policy options

To implement our proposed research agenda, funding mechanisms must be in place that support cross-sectoral and multidisciplinary collaborations. One Health operationalisation also demands resources and economic investments before benefits can be obtained. We suggest the following policy options:

- Enhance the mechanisms of funding distribution between EU agencies to promote cooperation.
- Encourage ongoing EU-funded R&I programmes to focus on transdisciplinary projects that can directly influence policy decisions.
- Continue to expand the scope of EU4Health to fully integrate One Health strategies, ensuring a balanced approach to the health of humans, animals, and environments.

One Health education and capacity-building

Competence in the One Health approach requires education and training from primary school to occupational training, university degrees and continuous professional education. Consensus is growing in the academic community on the core competencies of the One Health approach (Frankson et al, 2016). However, many of the proposed competencies relate to general management, leadership and research capacities, rather than building capacity specific to One Health. We emphasise here the competencies that we consider essential to address One Health issues following the definition of Chapter 1.

- recognition of the complexity of social - ecological systems and the inextricable linkage of humans, animals and their environments
- basic understanding of systems thinking and complexity theory for addressing complex real-world problems (Rüegg et al, 2017)
- competence in interdisciplinary work, particularly between natural sciences, social sciences and the humanities
- competence in transdisciplinarity to address complex societal problems by engaging scientists and non-academic actors in society and government (Jakob Zinsstag, Pelikan, et al, 2023)
- competence in One Health assessing quantitative and qualitative indicators and tools to evaluate the One Health approach
- quantitative methods competence to assess benefits of integrated One Health approaches to health for governments and society at large that would not be achieved if the problems are

addressed in silos. Game theoretical multi criteria decision making is useful for 'optimising' health.

These core competencies should be acquired to a grade appropriate to the level of education and professional engagement. We do not suggest specific One Health degrees, nor do we expect physicians to treat animals or veterinarians to treat humans. The One Health approach makes no concession on disciplinary excellence but requires all involved academic fields to collaborate at the level of disciplinary excellence. Above all, One Health approach needs top disciplinary specialists to be willing to work together and remain epistemologically modest.

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Annex 1: Large tables available separately

The following large tables are available to download separately from [the SAM website](#):

- Table 2: Intergovernmental stakeholders in One Health
- Table 3: European stakeholders and partnerships that (may) benefit from a One Health approach
- Table 4: One Health donor funding landscape
- Table 7: Overview of the case studies

Annex 2: List of abbreviations

| Abbreviation | Full text |
|---------------------|----------------------------------------------------------------------------------|
| AMR | Antimicrobial resistance |
| CAP | Common Agricultural Policy |
| CFF | Common Financial Framework |
| COHERE | Checklist for One Health Epidemiological Reporting of Evidence |
| CPVO | Community Plant Variety Office |
| CSC | Canadian Science Centre |
| DANMAP | Danish integrated antimicrobial resistance monitoring and research programme |
| DG-AGRI | Directorate-General for Agriculture |
| DG-CLIMA | Directorate-General for Climate Action |
| DG-ENER | Directorate-General for Energy |
| DG-ENV | Directorate-General for Environment |
| DG-HERA | Directorate-General for Health Emergency, Preparedness and Response |
| DG-RTD | Directorate-General for Research and Innovation |
| DG-SANTE | Directorate-General for Health |
| DK-VET | Danish veterinary consortium |
| EAP | Environmental Action Programme |
| ECD | European Consensus on Development |
| ECDC | European Centre for Disease Control |
| ECHA | European Chemical Agency |
| ECVPH | European College of Veterinary Public Health |
| EDCTP | European Developing Clinical Trial Partnership |
| EDEN | Emerging Diseases in a changing European Environment |
| EEA | European Environment Agency |
| EFSA | European Food Standards Agency |
| EMA | European Medicines Agency |
| EPIC Scotland | Expertise on Animal Disease Outbreaks (Scotland) |
| EU | European Union |
| FEAM | Federation of European Academies of Medicine |
| GAP | Global Action Plan |
| IAHAIO | International Association of Human-Animal Interaction Organisations |
| IPBES | Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services |

Annex 2: List of abbreviations

| | |
|-----------|----------------------------------------------------------------|
| ISAAT | International Association of Animal-Assisted Interventions |
| ISO | International Organisation for Standardization |
| IZLER | Istituto Zooprofilattico della Lombardia e dell'Emilia-Romagna |
| JPA | Joint Plan of Action |
| NAPs | National Action Plans |
| NGO | non-governmental organisation |
| OACPS | Organisation of African, Caribbean and Pacific States |
| OECD | Organisation for Economic Cooperation and Development |
| OHHLEP | One Health High-Level Expert Panel |
| OHN | One Health Network |
| OHSES | One Health in Socio-Ecological Systems |
| OIE | Office International des Epizooties |
| PEP | post-exposure prophylaxis |
| PVS | performance of veterinary services |
| REACT-EU | Recovery Assistance for Cohesion and the Territories of Europe |
| SAM | Scientific Advice Mechanism |
| SAPEA | Science Advice for Policy by European Academies |
| SDG | Sustainable Development Goal |
| SES | social-ecological systems |
| SPAR | States Parties Self-Assessment Annual Reporting |
| SSI | Statens Serum Institute |
| Swiss TPH | Swiss Tropical and Public Health Institute |
| SWOT | strengths, weaknesses, opportunities and threats |
| UCPH | University of Copenhagen |
| UN | United Nations |
| UN DESA | United Nations Department of Economic and Social Affairs |
| UNEP | United Nations Environment Programme |
| UNITAR | United Nations Institute for Training and Research |
| WHO | World Health Organization |
| WNV | West Nile Virus |
| WOAH | World Organisation for Animal Health |

Annex 3: Responsibilities and working structure within the Scientific Advice Mechanism

The Group of Chief Scientific Advisors is responsible for developing the Scientific Opinion, which contains evidence-based policy recommendations. Three members of the Group were involved with the project: Nicole Grobert (lead for the topic), Naomi Ellemers, Eva Zažímalová

The Science Policy, Advice and Ethics Unit at DG RTD ("SAM secretariat") assists the GCSA in the development of the Scientific Opinion. Fergal Donnelly, Leonard Engels and Nikolaos Stilianakis coordinated the project.

SAPEA is responsible for independently producing the evidence review report that informs the Scientific Opinion. Within SAPEA, FEAM served as lead academy network for the topic. Rúben Castro and Hannah Macdonald, FEAM Scientific Policy Officers, coordinated the report's development, with the support of the SAPEA team of scientific policy officers: Louise Edwards (Academia Europaea), Marie Franquin (Euro-CASE), Stephany Mazon (YASAS), Céline Tschirhart (ALLEA).

To jointly coordinate the project between the three parts of the SAM, regular coordination meetings took place in different configurations. From SAPEA, the co-chairs of the SAPEA working group, the president of the network leading on the topic, and members of staff supporting the project participated.

Annex 4: Selection of experts

Following SAPEA's quality assurance guidelines, we set up an interdisciplinary working group with 19 members from 15 European countries.

The co-chairs of the working group were proposed by the lead academy network, FEAM, and approved by the SAPEA board after their Declaration of Interests forms were assessed.

We issued a call for nominations describing the scope, timeline and expertise required. The areas of expertise were previously discussed with the working group co-chairs, in coordination with the Advisors and the SAM secretariat. The call for nominations was sent via the academy networks to their member academies, who were invited to nominate experts. Experts were also identified through desk research by the academy networks.

The selection committee for the working group met on 25 January 2024. Following our quality assurance guidelines, the selection committee comprised:

- the working group co-chairs
- the president of the lead academy network, FEAM, Stefan Constantinescu
- the president of another academy network, Academia Europaea, Marja Makarow

An additional subject expert is usually invited to be part of the selection committee. In this case, with the presence of 2 co-chairs with different background and expertise, no additional expert was invited.

We received a total of 113 nominations for the working group. The experts were selected on the basis of scientific excellence and disciplinary requirements as a priority, taking into account commitment and time availability, the criteria set out in our strategy of diversity and inclusiveness, and other requirements communicated to the committee in advance:

- inter- and multidisciplinary
- involvement in the wider scientific community, i.e. not only fellows or members of academies
- inclusion of early- and mid-career researchers
- gender balance
- wide geographical coverage, including from Widening countries

In the final working group, 53% of selected experts were female and 47% were early- or mid-career researchers (including one early-career researcher). 15 European countries are represented in the group, with 7 members from Widening countries.

Annex 4: Selection of experts

The composition of the working group was approved by the SAPEA board. All working group members were required to fill out the Standard Declaration of Interests Form of the European Commission, in accordance with SAPEA's quality guidelines. In the assessment, no conflicts of interests were detected.

Following feedback at the expert workshop (see Annex 3), the working group co-chairs decided to include an additional case study to provide an example of non-communicable disease in the One Health context. An additional expert was invited as contributor to the evidence review report, and was also required to fill out the Standard Declaration of Interests Form of the European Commission.

Annex 5: Evidence review process

Scoping phase

In April 2023, the Science Policy, Advice and Ethics Unit at DG-RTD asked the SAPEA literature review team (see Requested literature reviews) to undertake preliminary literature searches in four areas:

- governance approaches to One Health in Europe
- governance approaches to One Health internationally
- integration of under-represented areas (particularly environment, climate change) into One Health initiatives
- operationalisation of One Health, such as successes, failures, use of key performance indicators

In addition, a scoping workshop was held in May 2023 to clarify concepts, address crucial aspects to be tackled, and delimit the scope of the scientific advice that can be provided to policymakers. A report from this workshop is available [on the SAM website](#).

Evidence review process

We compiled this evidence review report based on input from the experts and their in-depth knowledge of the field, together with literature reviews conducted systematically on specific topics for chapter writing teams (see Annex 5). A mapping of the EU policy landscape was also carried out to inform the work (see Annex 4). In data management, we commit to Open Science and FAIR principles.

The evidence necessary to respond to the question in the Scoping Paper was discussed, debated and assessed by the working group members in their meetings, and was written up in iterative drafts of the report. Chapter contributors also reviewed the relevant literature.

The first consolidated draft was reviewed by external experts during an expert workshop, and the final draft underwent a double-blind peer review.

Annex 5: Evidence review process

Timeline

| Month | Process |
|---------------------------|------------------------------------------------------------------------------------------------------|
| January and February 2024 | Final formation of working group |
| February 2024 | Working group meeting |
| March 2024 | Working group meeting |
| April 2024 | Working group meeting |
| May 2024 | Production of first draft; Expert workshop |
| July 2024 | Working group addresses peer reviewers' comments; production of final draft; SAPEA board endorsement |
| November 2024 | Publication of evidence review report and scientific opinion |

Requested literature reviews

A literature review team was formed, comprising information specialists and methodologists at Cardiff University, and SAPEA staff.

To complement their knowledge, the working group made individual requests for literature searches on:

- tools to monitor progress or implementation of One Health initiatives
- cost-benefit of One Health initiatives

The search strategies can be found in Annex 5.

To identify the relevant academic literature, the Web of Science and Ovid MEDLINE databases were searched. In addition, the Overton database was searched for relevant grey literature. The search strategies are presented below.

Through the Science Policy, Advice and Ethics Unit at DG-RTD, the Group of Chief Scientific Advisors asked the Literature Review Team to undertake two preliminary literature searches on:

- mental health and One Health
- key performance indicators in One Health

Expert workshop

In line with our quality assurance guidelines, we organised an expert workshop on 30 May 2024, online, to discuss and review the evidence, especially:

- to provide critique by the wider expert community of the draft evidence review report
- to perform a critical appraisal of the scientific evidence in the report
- to identify any possible gaps, biases or 'blind spots' in the report.

This workshop took place before the peer review process.

In order to select experts to participate, SAPEA Scientific Policy Officers compiled a list of experts that was based on previous academy and network nominations; on new suggestions by the Group of Chief Scientific Advisors, the SAM Secretariat, and the working group; and further desk research. Experts were prioritised based on the selection criteria below and with the help of the working group chairs. The list of potential experts was approved by the SAPEA board.

The criteria for the selection of experts for the expert workshop were:

- scientific background with applied or policy context knowledge in the field of One Health
- complementarity of backgrounds, expertise and interests to cover topics covered in the ERR
- inclusion of early- and mid-career experts
- gender balance
- wide geographical coverage, including from Widening countries
- commitment and availability

In the final selection, 13 scientists or experts with applied knowledge in the field were invited to comment on the draft report, and 12 could join on the day of the workshop. Of the 12, 23% of selected experts were female, and 38% were early- or mid-career researchers. 11 European countries were represented in the group, with 2 experts from Widening countries, and one African country was represented.

Other participants included members of the working group, as well as a group of observers composed of SAPEA representatives, members of the Group of Chief Scientific Advisors, and staff of the European Commission.

The expert workshop followed an established format with the Chatham House rule applied to the entire workshop. Participants had received a draft confidential copy of the report in advance of the workshop. After a general introduction to the report, a keynote speaker presented an overall assessment of the report, with initial observations on strengths, possible limitations and gaps. Each of

Annex 5: Evidence review process

the main chapters was then introduced, followed by feedback from an invited discussant and then an opportunity for open discussion.

After the workshop, members of the working group considered the feedback and agreed on the actions that should be taken to address it. The draft evidence review report was then revised prior to undergoing formal peer review.

The expert workshop report is published separately, as a companion document to this report, [on the SAM website](#).

Peer review

In line with our quality assurance guidelines, we followed a double-blind peer review process. FEAM, the lead Academy Network for this report, established the areas of expertise needed for peer reviewers based on the key areas described in the scoping paper and the areas covered in the report.

The partner network YASAS compiled a list of experts based on academy and network nominations and further desk research. YASAS suggested a list of experts to the SAPEA board based on the areas of expertise defined by FEAM, complementarity of expertise, expertise that included a broad overview of the field rather than in-depth knowledge in a narrow field, taking into account gender and geographical balance, and inclusion of early and mid-career experts. The SAPEA board, excluding FEAM, gave the final approval for the list of peer reviewers to be invited.

Following this process, four reviewers were invited and accepted to act as peer reviewers. Peer reviewers were asked to declare any conflict of interests and any interest that might be perceived by SAPEA as giving rise to a conflict of interests in relation to this scientific topic, using a form which was assessed by Euro-CASE (lead in quality assurance) and YASAS. No conflict of interest was detected for any of the four peer reviewers. Of the reviewers, there was 1 woman, 3 men, and all career stages were included, with 1 senior career researcher, 1 mid-career researcher (MCRs) and 2 early-career researchers (ECRs). One reviewer resides in a Widening country, one from southern Europe, and two from western Europe.

Of the four reviewers, three responses were received in July 2024. The fourth reviewer did not submit their review comments within the given deadline. The comments received from three reviewers were anonymised by YASAS and then shared with FEAM and the working group. Members of the working group reviewed the responses during a joint meeting and agreed on the actions to address the comments. The evidence review report was then revised.

Annex 5: Evidence review process

Questions for peer reviewers

Peer reviewers receive a checklist with the following questions to guide the peer review. In addition to responding with 'yes'/'no'/'partially', reviewers are requested to provide arguments in support of their comments.

- Does the report address satisfactorily the questions posed in the scoping paper?
- Does the report cite and rely on up-to-date literature? Are the bibliography and any appendices relevant, given the purpose of the report?
- Does the executive summary concisely and accurately describe the key findings and conclusions? Is it consistent with the rest of the report? Is it sufficiently effective as a standalone summation of the report?
- Do the arguments advanced in the report show the requisite degree of analytical rigour? Does the report deal competently with data (as applicable) and analyses?
- Are the conclusions and policy options well-supported by the scientific evidence?
- Are the relevant uncertainties or gaps in the scientific evidence base acknowledged and addressed explicitly in the report?
- Overall, has SAPEA produced an objective report? Are there signs of biases or undue influence from individuals or interest groups?
- If you believe the report can be improved significantly, what improvements do you suggest?

Revisions following peer review

Peer review comments were mostly positive. The three peer reviewers found that the report satisfactorily addressed the questions posed in the scoping paper, that the literature cited was comprehensive (additional literature sources suggested by the peer reviewers were incorporated into the text by the working group). The arguments developed in this report mostly showed the requisite degree of analytical rigour, and reviewers offered suggestions on how to strengthen these arguments, which were subsequently addressed by the working group. The reviewers agreed the conclusions and policy options were well supported by the scientific evidence. Two reviewers indicated there were no signs of biases from individuals or interest groups; one reviewer indicated that Chapter 3 contained several citations from a single author and suggested to include additional references.

In response to comments from the peer reviewers, the working group provided additional clarifications by:

- further emphasising the environment dimension is in some cases lacking from practical implementations of One Health, and call to include the environment component more prominently moving forward

Annex 5: Evidence review process

- clarifying some Case Studies do not include the triple human/animal/environment component in equal proportion, and highlight this consideration for the practical implementation of One Health moving forward
- further discussing the One Health implementation trade-offs and synergies to determine policy priorities, with examples on governance roadmaps

expanding on the policy recommendations to include:

- strengthening the interoperability of institutions and programmes
- focusing research on One Health effectiveness and operationalisation
- One Health capacity building

The peer reviews, the response from the working group and their corresponding amendments were sent to the SAPEA board, which approved the outcome of the peer review process.

Plagiarism check

In accordance with the SAPEA quality guidelines, a plagiarism check on the final version of the report was run by Cardiff University using Turnitin software. The results were checked by the Science Policy Officers of FEAM and Academia Europaea.

Publication

This evidence review report was handed over to the Group of Chief Scientific Advisors on 15 November 2024. The main report will be accompanied by an expert workshop report. All documents can be accessed [on the SAM website](#).

Annex 6: Literature search strategies

Tools to monitor progress or implementation of One Health initiatives

To identify the relevant academic literature, the Web of Science and Ovid MEDLINE databases were searched. The search strategies are shared below.

Web of Science

```
1: TS=("one health" NEAR/0 (approach OR initiative OR program* OR framework OR surveillance))
2: AK=("one health") OR KP=("one health")
3: #1 OR #2
4: TS=(monitor* OR metric* OR indicator* OR tool* OR index OR evaluat* OR assess* OR surveillance OR performance OR governance)
5: TS=(OH-index OR OH-ratio OR OH-ness OR OHGI OR OH-EpiCap OR OHMT OR OHEJP)
6: #4 OR #5
7: #3 AND #6
```

3045 results.

MEDLINE via Ovid

```
1 ("one health" adj (approach or initiative or program* or framework or surveillance)).tw.
2 One Health/
3 1 or 2
4 (monitor* or metric* or indicator* or tool* or index or evaluat* or assess* or surveillance or performance or governance).tw.
5 (OH-index or OH-ratio or OH-ness or OHGI or OH-EpiCap or OHMT or OHEJP).tw.
6 4 or 5
7 3 and 6
```

1639 results.

After deduplication, 3306 articles were screened for relevance using the online AI screening tool Rayyan. A total of 113 articles were included, grouped into two categories: 49 articles on tools to evaluate One Health initiatives and 64 articles on tools to support the implementation of One Health initiatives.

Cost-benefit of One Health initiatives

To identify the relevant academic literature, the Web of Science and Ovid MEDLINE databases were searched. After deduplication, 298 articles were screened for relevance, of which 33 were included. The Overton database was searched for relevant grey literature and 1 relevant report is included.

Web of Science

```
1: TS=("one health")
2: TS=(cost NEAR/2 analys?s)
3: TS=("cost consequence" OR "cost effectiveness" OR "cost utility" OR "business case" OR "cost-related outcome*")
4: TS=(cost* NEAR/1 benefit*)
5: TS=(economic NEAR/0 (evaluation* OR valuation*))
6: TS=("health economic*")
7: #2 OR #3 OR #4 OR #5 OR #6
8: #1 AND #7
```

172 results.

MEDLINE via Ovid

```
1 One Health/
2 one health.tw.
3 1 or 2
4 exp "Costs and Cost Analysis"/
5 (cost adj3 analys#s).tw.
6 (cost consequence or cost effectiveness or cost utility or business case or cost-related outcome*).tw.
7(cost* adj2 benefit*).tw.
8 (economic adj1 (evaluation* or valuation*)).tw.
9 health economic*.tw.
10 4 or 5 or 6 or 7 or 8 or 9
11 3 and 10
```

Annex 6: Literature search strategies

248 results.

Annex 7: Summary of an EU policy narrative on One Health

The EU policy landscape provides an overview of legal acts and preparatory documents relevant to understanding the inclusion of One Health across different policy areas at an EU level. Particular focus was provided to documents stemming from the European Commission, as the sole institution with powers of legislative initiative.

The narrative focuses on the One Health approach, but also on the three main cohorts within it – Human Health, Animal Health and the Environment. The first section highlights the first documents focusing on One Health and shows how antimicrobial resistance worked as a gateway for inclusion of the approach in EU policy. The second section focuses on the legal framework around animal health, ever since the Commission adopted a new strategy in 2007 whereby it acknowledges that “prevention is better than cure”. It includes legislative initiatives on veterinary medicinal products, medicated feed, crisis management, food safety and animal welfare. The third section summarises relevant policies relating to human health from the perspective of One Health. It touches upon health emergencies, zoonotic diseases, medicinal products, emerging health threats, and the development of EU surveillance structures. The final sections cover policy areas such as the environment, industrial policy, biodiversity and agriculture.

The narrative has been produced by Frederico Rocha, European Information Librarian at Cardiff University, on behalf of SAPEA’s literature review team. The full policy landscape is available as a separate document, published [on the SAM website](#).

Annex 8: Acknowledgements

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Working group members

The names of the working group members who wrote this report are listed at the start of the report.

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