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Perspectives on One Health and the environment at SLU – a conceptually based overview and strategies for the future

Patrik Beard

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SLU Future One Health – a strategic initiative for tomorrow's complex challenges

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**Perspectives on One Health and the environment at SLU
– a conceptually based overview and strategies for the future**

Author: Patrik Baard, Swedish university of agricultural sciences (SLU)

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Background

This report* was initiated and funded through a call launched in 2024 by SLU Future One Health for researchers to write reports on One Health and the environment. As the environmental aspect of One Health is more recent, and less specified, than human/animal health, there was a need to concretise SLU's focus and work within this field. Two reports (**) were written on previous and current SLU research in environmental issues linked to One Health, and future perspectives of this research (both within SLU and on a global scale). The aim of the reports are to identify gaps, challenges, and opportunities for enhancing SLU's contribution to the environmental parts of One Health.

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** SLU Future One Health reports, report number 4

Perspectives on One Health and the environment at SLU¹

A conceptually based overview and strategies for the future

ABSTRACT: This report focuses on how the environmental dimension is incorporated in One Health (OH) with a specific focus on SLU researchers. The material largely confirms the assumption that the environmental dimension is modestly included but also highlight that there are challenges to incorporating it. A conceptual analysis supplemented by empirical material provides the foundation for recommendations to solidify the inclusion of the environmental dimension of OH at SLU. Recommendations are provided throughout the report. Starting with noting a core ambiguity in the OH concept allowing both a wide and a narrow interpretation, four conditions of the definition are identified: *The Unification condition*, *the Aim condition*, *the Sustainability condition*, and *the Health condition*. The conditions are used analytically to scrutinize how they can be balanced, before proceeding with a discussion on how the environmental dimension can be assessed and included. Before summarizing the report, contrasts between the findings at SLU and existing research on how the OH concept has been implemented at Swedish governmental agencies will be discussed with a specific focus on the environmental dimension.

¹ This report has been written by Patrik Baard, researcher in applied ethics at SLU. He wishes to extend an acknowledgment to several of the library staff, who have provided valuable help regarding databases, the library's work related to OH, and bibliometric data. He also wishes to thank Helena Röcklinsberg.

Executive summary

This report corroborates the assumption that the environmental dimension of One Health receives modest inclusion in the OH umbrella relative other dimensions. Based on empirical material and conceptual analyses, the following recommendations are stipulated intended for the SLU Future One Health Platform, and SLU in general, but could also benefit researchers and research groups already working, or are planning to work, on

OH-related topics:

Recommendation 1: If you are a researcher at SLU working on something that could be related to OH, please take a look at the website for OH publications and help SLU Library refine the search! Is your research included? Should it be included? How can it be included?

Recommendation 2: Advice researchers at SLU to recognize how their research can be relevant to OH.

Recommendation 3: Stipulate a workable and conceptually consistent definition and specification of the conditions of OH with the intended purpose of usage by SLU researchers, possibly in dialogue with such researchers across faculties

Recommendation 4: Explicate and recognize the normative assumptions regarding the ecological dimension. How is it weighed against the other dimensions, how is it conceptualized relative the other dimensions of OH? How should it be weighed; can it be weighed differently?

Recommendation 5: Recognize the relevance of available expertise when establishing metrics of ecosystem health, but also the role of normative and social goals when doing so

Recommendation 6: Establish a forum that stimulates trans-disciplinary dialogue on the environmental dimension of health. Be clear on in what context ecosystem health is conceptualized and the aspirations inherent in that context. How is ecosystem health related to the other forms of health?

Recommendation 7: Invite, encourage, and recognize the great resources in fields such as ecology and environmental science at SLU in the work on OH

Recommendation 8: Establish a forum for strengthening existing ties between researchers and invite new ones for collaboration with OH as a guiding topic

SLU stands in a unique position to both strengthen its own research on the environmental dimension of One Health, but also contribute to developing the One Health concept as such.

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1. Introduction

Winter 2023–2024 the SLU Future One Health Platform issued a call requesting an overview of how research at SLU includes the environmental dimension of One Health (hereafter OH), with the ambition to identify gaps where there are room for future improvement.² This report contributes to achieving this aim by combining several approaches, ranging from bibliometric overview, talks with researchers, and conceptual analyses.

The One Health High Level Expert Panel (OHHLEP) provides a definition of OH, which is the working definition for this study:

Definition: One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

Though other definitions exist (see Gibbs 2014 and Kahn et al 2012 for discussions), the OHHLEP definition will guide this report.³ The definition lends itself to both very wide and very narrow interpretations, which will be discussed at length below. The possibility for differing interpretations is not unique for OH, as it shares this characteristic with an influential concept such as ‘sustainable development’. Consequently, it need not necessarily be a challenge for its usage and relevance. Yet, the ambiguity of the concept,

² While some speak of the health of humans, animals, and ecosystems as three *pillars* of OH (WWF 2024), here the concept *dimension* will be preferred. The concept of dimension gestures toward how there can be different dimensions of the same entity. A concept such as pillars, in contrast, expresses a separation, though it can also be interpreted that the pillars support a specific thing.

³ The definition is also guiding for the SLU Future OH Platform. <https://www.slu.se/centrumbildningar-och-projekt/slu-future-one-health/oh-definition/> (Accessed: November 19, 2024)

and challenges in interpretation, seems to lead to a mismatch between the ambitions of the concept and its practical implementation, especially regarding the environmental dimension.

The report is structured as follows. After this introduction there will be a brief overview of the methods used. After that, bibliometric data and results from talks with SLU researchers will be provided. This will be followed by a conceptual discussion. Before ending with a summary, the work on the environment in OH at SLU will be compared with other parts of Sweden. Throughout, there will be a focus on the environmental dimension of OH.

2. Methods

Descriptive bibliometrics will be used to provide an overview of OH at SLU.⁴ This data outlines publication volumes that includes authors or co-authors from SLU. One shortcoming of bibliometrics is that it is based on published output.⁵ Such output may occur at the end of, or even after, a research project. Despite such shortcomings, and despite the purely descriptive use of bibliometrics, it provides enough material to get the analysis off the ground. The bibliometrics will be supplemented with material from talks with SLU researchers.

An additional shortcoming of bibliometrics is that it is dependent on the queries that are put in databases for retrieving results. This provides a specific problem in the current

⁴ Great assistance has been provided from several of the excellent resources at the university library at SLU.

⁵ The report is limited to the Web of Science Core Collection, meaning that output such as SLU reports or other forms of communications, such as policy briefs, are not included. Given the policy-relevance and practical ambitions of OH, this may be an unfortunate shortcoming.

case, as the environmental dimension of OH is a dimension of OH that is difficult to capture conceptually. For this reason, the bibliometrics will be supplemented with a conceptual unpacking and analysis of how the environmental dimension has been implemented in other contexts, such as conceptually by discussing ecosystem health, and in the OH context in Swedish governmental agencies.

In line with the call this report is forward-looking. Drawing on the discussion, recommendations in which SLU has unique opportunities for moving ahead to include the environmental dimension of OH will be stipulated.

3. One Health at SLU: Bibliometric overview of OH at SLU

In this section there will be an overview of the research conducted at SLU relating to OH and the environment. The material reveals the general tendencies of OH research at SLU. It will primarily be based on bibliometrics that will be supplemented by talks with OH researchers. There are different ways of making bibliometric analyses. For example, Lerner and Berg point towards the shortcomings of a “straightforward key-word-based bibliometric exercise” (2017: 2) to demarcate OH. In contrast, they choose a selective approach focusing instead on texts deemed rich in theoretical substance or that have been proved to be influential (Lerner and Berg 2017: 2). Other ways of surveying bibliometric material are possible (see Appendix I provided from the excellent bibliometric services of the SLU library).

A bibliometric challenge specific for the topic of this report is that OH relevant research is not always labelled as OH. This challenge especially concerns the environmental

dimension of OH. That is, research can be relevant for the environmental dimension of OH, without the researchers having explicated OH.⁶

The following should be understood as primarily providing an outline, where a distinction between “not self-characterized” and “self-characterized” OH research output highlights contrasts. Put briefly, the first category consists of research output that is interpreted as belonging to OH regardless of whether the output contains “One Health” in any form, whereas the latter category contains research output that is explicitly related to OH. Both have their shortcomings but are here used to provide sharp contrasts between a wide and a narrow conception of OH, generating different results.

3.1 Not self-characterized OH research at SLU

What is here labelled ‘not self-characterized’ OH research at SLU is research output where OH *per se* is not necessarily included in the title, abstract, keywords, or general topic of an article. Research output included in this category has been *interpreted* as belonging to OH, or search terms have been used that are taken to reliably capture the intended target area – in this case the environmental dimension of OH. Motivating the start with not self-characterized OH research at SLU is to allow for casting a wide initial net that can then be balanced with self-characterized OH research at SLU.

In this context it is noteworthy and commendable that SLU library has a website that compiles scientific publications from SLU on OH. These are divided into the categories ‘antimicrobial resistance’, ‘human-animal interactions’, and ‘nature experiences and

⁶ The reverse could also hold. That is, that something is labelled as OH when it is not. In this report there is no such analysis.

health'.⁷ The results reveal a substantial number of publications in the different categories:

Table 1. Publication categories in OH at SLU, provided by the SLU library's bibliometric service

Category	Number of publications⁸
Antimicrobial resistance	473
- <i>Bacteria</i>	251
- <i>Parasites</i>	98
- <i>Fungi</i>	96
- <i>Viruses</i>	28
Human-animal interactions	51
Nature experiences and health	155
	679

This appears to be a quite substantial number, though it ought to be compared to the total number of research outputs from SLU between 2011–2023.

A timeline of the different categories reveals the following:

⁷<https://www.slu.se/en/Collaborative-Centres-and-Projects/slu-future-one-health/publications/scientific-slu-publications/> (Accessed September 24, 2024)

⁸ Retrieved November 2024. Please note that these numbers, provided by the library's bibliometric service, are slightly different than the one's provided at the SLU Future One Health Platform website. However, they show the same general tendencies. Appendix I utilizes fractioned categories from WoS.

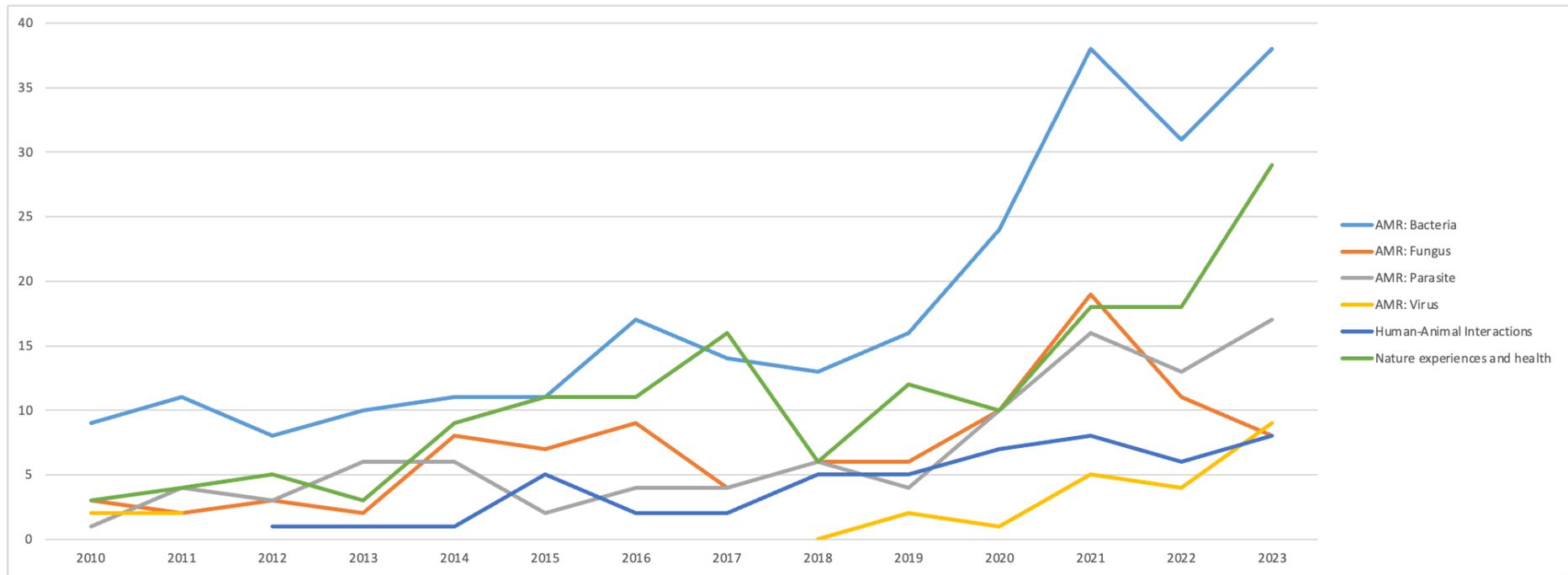


Figure 1. Timeline of the different categories of publications in OH by SLU researchers

It is noteworthy that the category “Nature experiences and health”, though increasing over recent years, has fluctuated since 2011. Yet, the numbers are somewhat low, making it difficult to attribute such fluctuations to anything else than chance. The timeline provides few surprises, as it shows that research within antimicrobial resistance is solidly the most prevalent category. This is consistent with expectations due to how OH is often conceptualized, which will be discussed below.

Zooming in on the environmental dimension, it is limited to the category “Nature experiences and health”. This is somewhat surprising, as the environmental dimension is a possibly very wide dimension. Moreover, the categorization primarily seems to concern the environmental impact on *human health*, rather than environmental health per se. This means that it is defined derivatively (Baard 2022), as it concerns the health impacts of the environment on something else. It is, however, an understandable restriction, given the width and ambiguity of the dimension. Yet, the category stands apart from the other two, with a sharp contrast to the more specific “Antimicrobial resistance”. In Section 4, there will be an in-depth discussion of how the environmental dimension can be conceptually unpacked, and how health is conceptualized depend on which beings that are analytically emphasized.

The library is aware of the limitations of the search string being simultaneously too narrow and too wide, and welcome comments and contributions.⁹ This motivates the first recommendation:

⁹ <https://www.slu.se/en/Collaborative-Centres-and-Projects/slu-future-one-health/publications/scientific-slu-publications/methods-and-search-criteria/>

Recommendation 1: If you are a researcher at SLU working on something that could be related to OH, please take a look at the website for OH publications¹⁰, and help SLU Library refine the search! Is your research included? Should it be included? How can it be included?

This section has primarily solidified what was already assumed – namely that the environmental dimension receives a more modest attention. What has been provided is a more complete picture of how the environmental dimension ranks relative the other dimensions. This picture will become even more clearer in subsequent sections. The next section will look more closely to research output and researchers that explicitly engage with OH research.

3.2 Self-characterized OH research at SLU

This section is limited to “self-characterized OH research”. This refers to research output where at least one co-author’s affiliation is SLU, and where the research output contains OH in some explicit form. This means that the researchers themselves have categorized their work as clearly belonging to the OH domain. In contrast to the data in Appendix I, the data provided here is from quite straightforward search queries in Web of Science core collection on OH – the very approach that Lerner and Berg (2017: 2) warns about. Shortcomings of such an approach should be borne in mind, such as it not capturing all OH relevant research output. Nevertheless, it provides a sharp contrast to the preceding section.

¹⁰ <https://www.slu.se/centrumbildningar-och-projekt/slu-future-one-health/publikationer/slu-publikationer-inom-oh/>

To get a grip of self-characterized OH researchers at SLU, data was retrieved from the Web of Science Core Collection using a rather open and straightforward search query, where at least one author had a SLU affiliation, regardless of author position. Using a simple search string – "One Health" (All fields) AND "Swedish University of Agricultural Sciences" (Affiliation) – retrieved the following results, divided by publication type:

Table 2. Categories of types of publications SLU researchers and OH

Type of publication	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Article	1	1		2	2	4	6	1	3	10	13	12	7	62
Article; Book Chapter			1											1
Article; Early Access												1	1	2
Article; Proceedings Paper		1							1					2
Editorial Material					1						1	1	2	5
Letter												1		1
Proceedings Paper								1						1
Review							1	1	1	3	4	4	4	18
Total	1	2	1	2	3	4	7	3	5	13	18	19	14	92

Unsurprisingly, the two most common categories are articles and reviews, the latter increasing from 2018 and onwards. Interestingly, the frequency of articles seems to fluctuate, apparent in the asymmetry between 2018–2019, and 2022–2023. Both these show a decreasing number of articles being published self-characterized as OH, though it is difficult to draw conclusions from this.

In general, combining all publication types retrieves the following timeline (up to September 2024). This at the very least show a rapid increase in self-characterized OH at SLU since 2019.¹¹

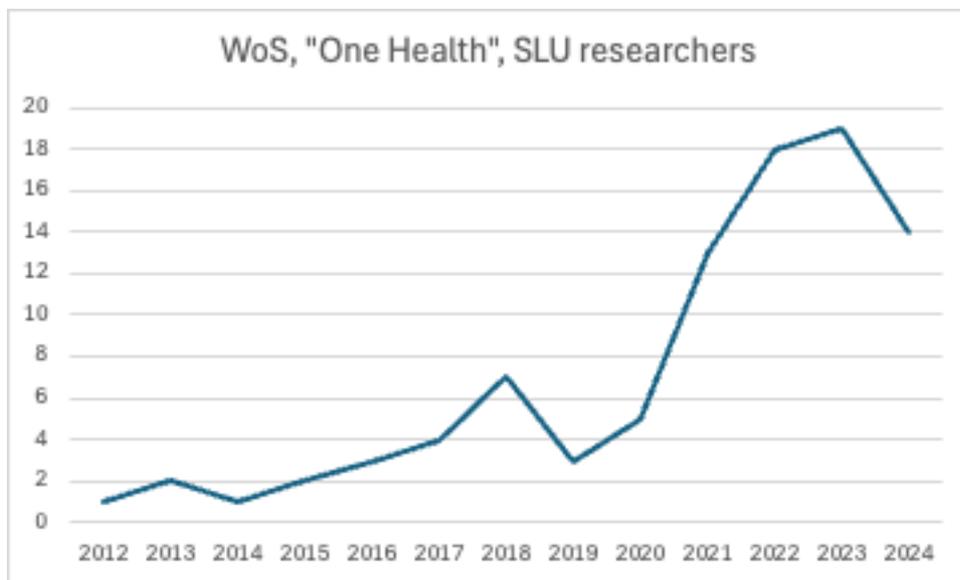


Figure 2. Number of publications per year, SLU researchers in OH

One could entertain different hypotheses for why there is a sharp increase starting around 2019, such as a potential increasing interest in OH during the Covid-19 pandemic. Here, the data is however not correlated with such phenomena.

¹¹ Despite being based on different data, there are similar trends in Figure 1 and Figure 2. Especially regarding a relatively drastic increase during 2018 and onwards.

In addition to including all publication types, the above also cover all topics, for which there is little use in the focus on the environmental dimension. Web of Science Core Collection enables categorization of published research. Those categories generate the following for “One Health” AND “Swedish University of Agricultural Sciences”¹²:

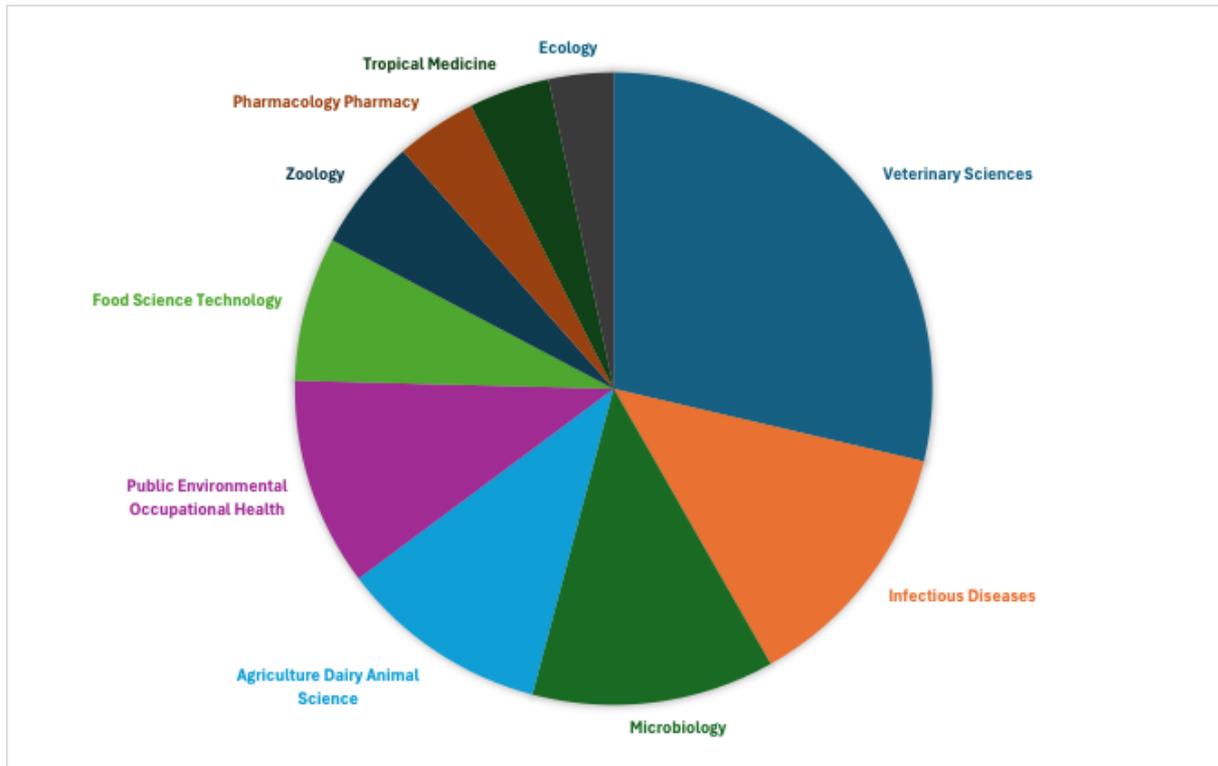


Figure 3. Shares of 10 most common WoS categories, SLU researchers.

The dominance of publications in veterinary sciences and infectious diseases is, again, unsurprising and the finding is consistent with the problem formulation that this report intends to approach.¹³

By way of explanation for this dominance and relating to the previous discussion on not self-characterized OH research, this result may be interpreted as researchers in veterinary sciences more readily identifying their research as belonging to OH and to

¹² Limited to the 10 most common categories. Also note that a single article can be categorized in several categories.

¹³ This dominance is also corroborated in the bibliometric data of Appendix I, despite using a different set of data.

health specifically, whereas this self-characterization as working within the OH umbrella is not as evident in other fields. But is the focus on veterinary medicine a more general challenge for OH, or is it specific to SLU? The concept of OH has been criticized for having “largely remained within the discipline of veterinary medicine and animal health” (Gibbs 2014: 90), despite its inclusive efforts.¹⁴

Interesting contrasts are revealed when the categories of SLU publications in Web of Science with Sweden, and the World, are compared. Again, using the Web of Science labels, this generates the following result, limited to and organized by the 10 most common global categories.¹⁵

¹⁴ According to Gibbs, there are even greater risks with the OH concept, as “there are those in the field of human medicine who see One Health as a field being championed primarily by veterinarians and are suspicious about the motives” (2014: 90, Gibbs is here quoting Atlas 2012: 12). They note that in the field of human medicine, there has been a failure to consider the concept, which stands in contrast to the interest that the OH concept receives amongst professionals in animal and environmental health (Gibbs 2014: 90). Yet, if the first statement holds true, it is not only a failure to consider OH, but also an active resistance against considering it. These claims are difficult to assess in this report. Though Gibbs quote this statement from Atlas (2012: 12), Atlas does not provide material to support the statement.

¹⁵ It should be noted that ‘Sweden’ includes all Swedish higher education institutions, also SLU.

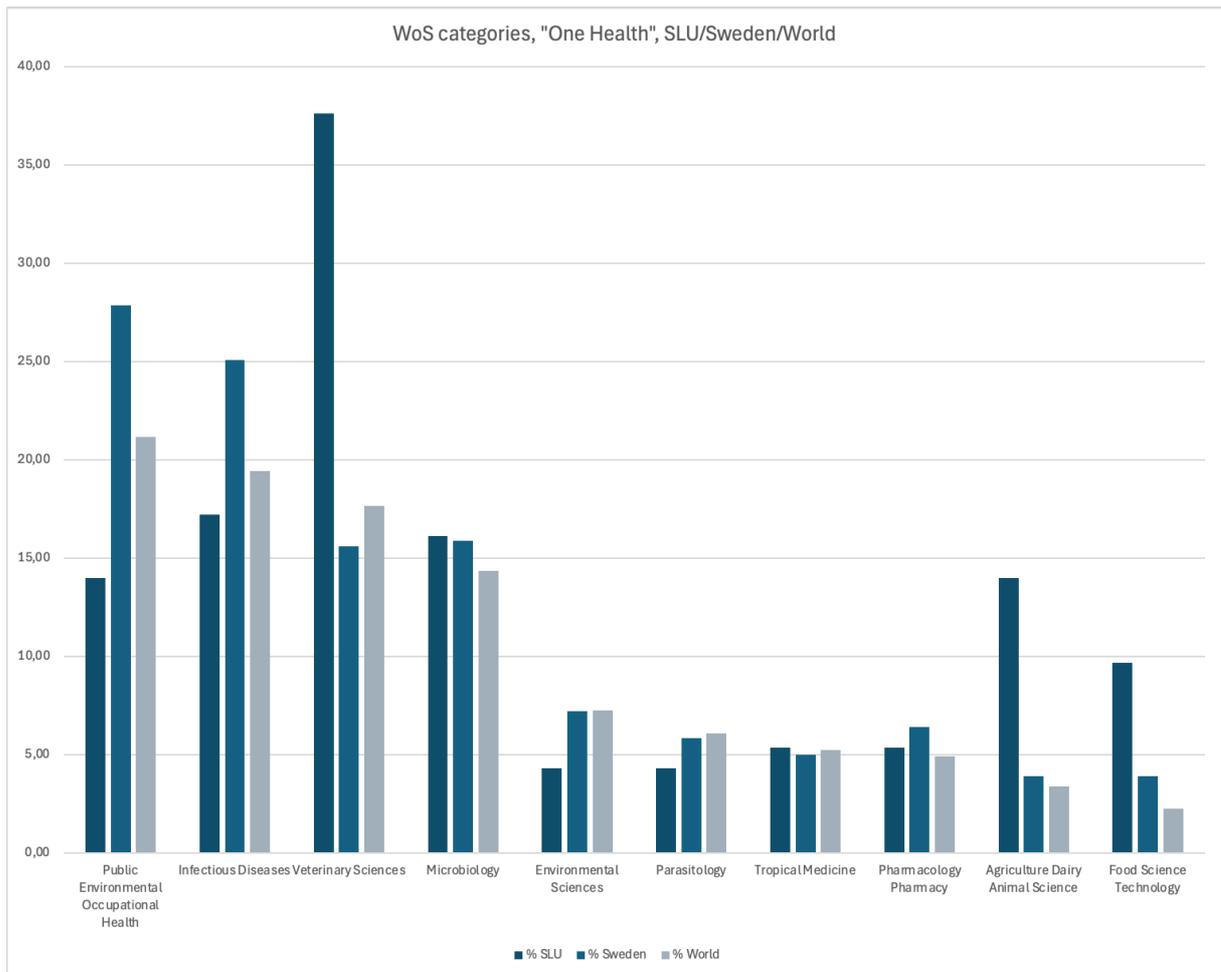


Figure 4. Comparison between SLU researchers, Swedish researchers, and all publications in OH, shares of WoS categories.

This reveals a rather narrow focus of SLU researchers regarding OH when compared to Sweden and World. For instance, while both Sweden and World have the highest share of publications in “Public Environmental Occupational Health” and “Infectious Diseases”, SLU publications are, by far, mostly in the category of “Veterinary Sciences”, and there is an asymmetry in proportions regarding “Agriculture Dairy Animal Science” and “Food Science Technology” when SLU is compared to World and Sweden.

But the focus is not unique to SLU. OH in general emphasize issues such as antimicrobial resistance which has been dubbed “quintessential One Health issue” by one of the most well-cited papers (Robinson et al 2016). If that holds, it is understandable that such topics are assumedly applied to the cases of veterinary sciences.

It is nevertheless noteworthy how small the share of ‘Environmental Sciences’ is when compared to World and Sweden given the wide variety of competencies and skilled researchers at SLU.¹⁶ Specifically, it is noteworthy how ‘Ecology’ is not in the top 10 biggest shares in neither SLU, Sweden, nor World.¹⁷ A possible explanation points towards the more general challenge of including ecology in OH, despite the definition of the approach. This assumption will be investigated by relying on existing research in Section 5. However, given that OH puts a large emphasis on trans-disciplinarity, it is noteworthy that “Multidisciplinary Sciences” only serves a very modest share at both SLU, Sweden, and World.

The above discussion gives rise to the second recommendation:

Recommendation 2: Advice researchers at SLU to recognize how their research can be relevant to OH.

The discussion on not self-characterized OH research revealed a risk of casting the net too wide, whereas self-characterized OH research casts it too narrowly. Ideally, researchers themselves see the relevance of their research output to the environmental dimension of OH.

¹⁶ “Environmental Sciences” at SLU generates the same modest share as “Ecology” above, as did “Multidisciplinary Sciences”. See however the data retrieved in Appendix I. Yet, despite “environmental sciences” having a greater share there, it is still modest compared to categories explicitly or assumedly belonging to veterinary medicine.

¹⁷ In World, self-characterized OH publications categorized in ‘Ecology’ amounts to 2,2 per cent of publications (n=295). This can be compared to the data in Appendix I, where ‘Ecology’ has an even smaller share. Yet, ‘Plant sciences’, which is not evidently in Table X, gets a greater share in Appendix I than ‘Ecology’.

There is a large variety of research at SLU and should all be included under the heading of OH, the concept runs the risk of becoming too wide. Yet, one could expect more research output relevant to the environmental dimension of OH than the self-characterized research findings above. That expectation is justified by the other report in this call, which lists a significant number of projects at SLU relevant for the environmental dimension of OH. This expectation is not fulfilled in the data, as shown above on self-characterized OH research in the environmental field. However, the above results ought to be interpreted with caution. For instance, a focus on veterinary medicine does not necessarily exclude environmental aspects. This was shown in talks with OH researchers, being the topic of the next section.

3.3 Talks with OH researchers

As a part of this study, there were talks with researchers who have been active under the OH umbrella. The purpose was to broaden and inform this study regarding specific challenges and opportunities to include the environmental dimension in OH experience from the viewpoint of active researchers. The talks followed a similar structure (see Appendix II for questionnaire). Since the talks were only used to inform the study, they were neither recorded nor transcribed, though notes were taken during the talks.

Here, some themes that emerged from the talks will be highlighted. The researchers were found by *inter alia* the bibliometric study. The number of talks were a handful of people from different disciplines, and while the material does not strive for completeness, it provided the report with enough different perspectives to enrich the analysis with perspectives that would otherwise have risked going unnoticed.

Some researchers suggested that it was difficult to include the environmental dimension due to vagueness both regarding what an ecosystem is, as well as what *health* means in relation to an ecosystem. One researcher for instance discussed how we are all a part of ecosystems, and that ecosystems does not necessitate being “outdoors”. Even defining what an ecosystem is will depend substantially on what perspective an it is defined from.

Some also highlighted the vastness of the concept of “environment”, and that it runs a conceptual and analytical risk of everything becoming OH research, unless the concept is further specified. Yet, that both human and animal health, and ecosystem health, are tightly connected, is a core idea of the OH approach. For this reason, in some talks it was highlighted that it was problematic to separate the dimension from the others. It was stressed that OH needs to be understood in a unified manner, as an approach that researchers strive to contribute to. Picking it apart may thus be problematic and work at cross-purposes with the ambition of OH.

When talking about the conditions of the concept of OH – which will be further analyzed below – some researchers suggested that the condition of OH integrating different perspectives was necessary and should be interpreted as a methodological concept to increase trans-disciplinarity. In several talks it was raised that it would be a good service for research funders to encourage greater trans-disciplinarity. Time and budget constraints were labelled by many as challenging constraints for increasing the focus on OH and fulfill the conditions of integration and unification of different disciplines.

Some also suggested that pushes for OH need to come also from institutional perspectives. To include for instance ecologists to a greater extent was deemed

substantial, both to discuss OH but also to increase familiarity with available data to facilitate collaboration and integration. Such inclusion becomes both a matter of realizing the “unified and integrated approach” that is an ambition of OH and part of the OHHLEP definition, and which was often interpreted as pointing towards trans-disciplinarity. More concretely, there is a need to both highlight how researchers from other disciplines, such as for instance ecology, are doing research that is relevant to OH, even if they do not themselves characterize it as such. Several talks stressed the importance of learning from each other, while also highlighting that this requires establishing forums where researchers from many different disciplines are invited to enhance mutual co-learning. Yet, an emerging theme was that such trans-disciplinary research takes time which, again, prompted discussions on funding incentives to promote trans-disciplinarity.

In some talks it was highlighted how the concept of “unified” ran the risk of neglecting potential goal conflicts between the different aspects included in OH, such as between human and animal health. Despite this, if there are goal conflicts, it will usually be human interests that prevails, and several mentioned that the concept is often at risk of being interpreted as anthropocentric and focusing primarily or solely on how animals and ecosystems impact on human health, rather than the other way around.

Even if there is a need to stress whose interests and from what perspectives health is discussed, something to be further considered below, some also noted a need for being more “hands-on” and offering greater instruction on how the different dimensions are to be understood relative each other. The focus of OH should by definition not be restricted to human health, but also include health in a wider sense, which may require both highlighting and balancing different interests. But how should that be done in practice? Some also stressed the need for OH approaches to involve not only researchers, but

practitioners and policy-makers. Yet, several of the talks also stressed that not everything is OH, emphasizing the need to draw some form of boundary.

Section 3 has surveyed different material to assess whether the environmental dimension is included in OH research by SLU researchers. The result largely corroborated the assumption that the dimension gets modest attention compared to human and animal health. Moreover, if one assumes that there is a substantial number of research at SLU that implicitly or explicitly concerns the environmental dimension of OH, then one could expect more research output. The research output is also surprising given the categorization of global publications.

Drawing on the bibliometric outlines and talks with SLU researchers, several challenges to inclusion of the environmental dimension have been identified. With this information at hand, a firmer picture of the environmental dimension in OH by SLU researchers has been provided. This sets the foundation for, but also motivates, conceptual analyses of OH.

4. Conceptual analysis: Specifying the conditions of OH

The preceding section point toward the challenges of surveying OH research at SLU based on bibliometric analyses. It revealed that publications going beyond antimicrobial resistance and veterinary medicine were a minority. A closer look at those that were categorized in Web of Science categories going beyond animal health, such as ‘ecology’, or ‘multidisciplinary sciences’, retrieved very few results.

Bibliometric analyses are naturally backward-looking as they are based on existing published research. As every researcher knows, this often happens with some delay

relative the research project that research output is a part of.¹⁸ Even if the recommendations suggested above aim to give a better future coverage, they nevertheless share the backward-looking character of bibliometric analyses. Here and onwards, a foundation that is intended to be more explicitly forward-looking will be outlined, to see how the environmental dimension could more explicitly become a research concern of OH research at SLU.

4.1 The OHHLEP definition and the ambivalent character of OH

There are many differing definitions of OH, and Atlas suggests that “while a uniform definition may not be essential, it would serve as a focal point for defining constituencies and boundaries of relevant activities” (2012: 12). Lerner et al point out the need for conceptual clarity in interdisciplinary projects (2024: 3). How the concept is defined will matter for what activities to include under the OH umbrella.

A balance between clarity and openness is recognized by OHHLEP. Noting the plurality of different definitions of OH prompted “an immediate priority for OHHLEP [...] to develop consensus around a working definition as a solid basis to support a common understanding among the panel members and the partner organizations” (OHHLEP et al 2022: 2). But, as noted, how something is defined matters for what phenomena that are targeted by the concept. Consequently, the conceptual discussion of this section serves to explicate and clarify how the OH concept can be operationalized. How can and should the ecological and environmental dimension be included in OH? Responding to this

¹⁸ This is partly dependent on the time required for producing research results, which can differ depending on type of project and discipline. One important factor is however also the time required for peer review, which differ between disciplines (Björk and Solomon 2013).

question requires engaging in conceptual analysis to establish the set of research that OH is intended to reasonably include.

Reiterating the definition of OH provided by OHHLEP, OH is¹⁹:

Definition: [...] an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

The definition has an addendum, being more of a description of the foundation of OH:

[OH] recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.²⁰

The OHHLEP definition raises several concerns. It runs the risk of being vague, as it stipulates a set where it is not clear what elements that are to be included in the set. If the vagueness is too great, it risks entailing that the judgment of what research to include as OH becomes rather arbitrary.

¹⁹ The definition is said to provide the foundation for a “quadripartite collaboration”, between the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organization for Animal Health (WOAH) <https://www.who.int/teams/one-health-initiative/quadripartite-secretariat-for-one-health>. This would give rise to the following areas being covered: Agriculture, Environment, (Human) Health, and Animal Health.

²⁰ The description of OH continues: “The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.” This coheres with a very wide definition of OH, that is not solely restricted to research.

Yet, there are possibilities of systematizing the definition and its conditions that retains a balance between a narrow and clear definition, and a wide and inclusive one. Vagueness *per se* need not be problematic, and OH could substantially benefit from a wide definition (Lerner and Berg 2015). Stipulating a too specific definition of OH may result in the concept only being relevant on very few occasions and robbing researchers and practitioners of possibilities to define research topics and policies that they deem to be relevant to health and the interaction between humans, animals, and the environment. In other words, a too rigid concept risks stifling researchers' creativity and seeing how their own research is relevant to OH.

A concept should only be as specific as it needs to be to further its usage while retaining relevance and being meaningful. While a very specific concept is often highly regarded in scientific contexts as it makes it transparent and clear what the research is about, a too specific definition may be a problem if a concept is for instance to be used in a policy-setting, where a broader concept can be preferable.²¹

Can OH be expected to be a very specific concept, or should it be allowed to be a wide definition (Lerner and Berg 2015)? What would justify expectations of the OH concept? One aspect of the challenge of understanding OH, is that it is both a policy concept, and a scientific concept. But even in the latter category, OH is used both as a “narrow approach combining public health and veterinary medicine” and as “a wide approach [...] including both scientific fields, core concepts, and interdisciplinary research areas”

²¹ For example, the World Health Organization defined “sustainable development” as “a broad term to describe policies, projects and investments that provide benefits today without sacrificing environmental, social and personal health in the future” (https://www.who.int/health-topics/sustainable-development#tab=tab_1). As evident from numerous policies, treaties, and research, sustainable development is a workable term, despite its width. Yet, such a definition allows quite substantial exploitation as long as the overall stock of capital is not affected.

(Lerner and Berg 2017), and beyond (see footnote 20). This is the ambivalence of the OH concept. The “self-characterized OH” research discussed above at SLU seem primarily to align to this narrow definition.

But it is not given that OH should be more specific than the currently available definitions. Rather, there are potential scientific benefits of a wide OH concept (Lerner and Berg 2015) as it will then be more inclusive. Yet, if OH is *too* broad, it runs the risk of including too much and, at worst, becoming a concept that includes all forms of research that, in whatever vague way, encompass or has the potential to encompass either of the different conditions that the concept includes, which will be discussed in the next section.

Moreover, the OHHLEP definition is explicitly to be understood as balancing between wideness and narrowness, as “the definition should be considered as an overarching set of guiding principles that can be further tailored to specific stakeholders” (OHHLEP et al 2022: 3). The key underlying principles are (OHHLEP et al 2022: 3):

- equity between sectors and disciplines
- parity and inclusion
- equilibrium seeking a harmonious balance
- stewardship and human responsibility
- transdisciplinarity and multisectoral collaboration

These are the principles underlying the OHHLEP definition, that are to be tailored to stakeholders.

Moreover, OH is an *approach*. Exactly how to understand that it is an approach, especially in contrast to other potential conceptual candidates such as principle, theme, or method, is not easy as ‘approach’ is not necessarily a very well-defined term. While OH

has been defined using other concepts, such as “collaborative effort”, “mechanism”, “unification of the medical and veterinary professions with the establishment of collaborative ventures in clinical care” etc, and “strategy” (Gibbs 2014: 87), the idea of approach is an integral part of many definitions, including the OHHLEP definition. The listed alternatives all function in different contexts. That something is a “collaborative effort” signals a methodological issue, whereas “strategy” has fewer such connotations.

Parallels can be drawn to what is commonly called “the capability approach” in political philosophy. While details are not required here, the capability approach is neither a theory nor set of principles. Rather, it has been described as “open ended” and “underspecified” (Robeyns 2017). As suggested by Ingrid Robeyns:

“It is open-ended because the general capability approach can be developed in a range of different directions, with different purposes, and it is underspecified because additional specifications are needed before the capability approach can become effective for a particular purpose”
(Robeyns 2017: 29)

Conceptually, this motivates the assumption that OH can also be considered open-ended and underspecified, similar to the capability approach. They are starting points of a discussion, not concluding remarks. Though they differ substantially, both OH and the capability approach concern well-being, and intends to have practical implications with theoretically justified foundations. Both are just specific enough to be theoretically credible but require further specifications to be practically viable and scientifically credible.

The following will provide a closer scrutiny of the definition of OH, to enable an explication and unpacking of the environmental dimension.

4.2 The conditions underlying OH

Many of the difficulties of including the environmental dimension potentially lay in the ambiguous role of OH, but also in its conceptual vagueness. To abate these difficulties, a conceptual analysis will here be provided. Such a conceptual analysis will have practical implications, in the sense of both clarifying what is meant with OH, but also of identifying gaps and stipulating recommendations.

Commonly, a definition consists of two parts. A concept to be defined (*definiendum*), and a *definiens* (Hansson 2006). Usually, the *definiens* stipulates a set of conditions for determining what the *definiendum* refers to. For analytical purposes the OHHLEP definition can be divided into the following conditions in its *definiens*²²:

One Health is an:

1. Integrated and unifying approach (**Unification condition**)
2. Aiming to (**Aim condition**)
3. Sustainably balance and optimize (**Sustainability condition**)
4. The health of people, animals, and ecosystems (**Health condition**)

²² Exactly how to distinguish the different conditions of OH can be discussed. Just by way of example, the Sustainability condition may be more aptly entitled “balance and optimizing” condition or be further distinguished into a “balance” and a “optimizing” condition. The choice of these categories has been deliberate and partly pragmatic, in order to have a manageable number of conditions, that are reasonable, and which can be further discussed.

Based on this, one could state that research is to be included in the OH set if and only if it fulfills all four conditions, and that it is not OH research if it fails to fulfill all four of them. That is, if research fulfills for example the Unification condition and the Health condition, but fail to fulfill the aim and Sustainability condition, it fails to be regarded as OH. Similarly, if research succeeds to live up to the aim, sustainability, and Health condition, but fail to live up to the Unification condition, it is not fully OH.

Though the identification of the conditions provides a first step to mitigating vagueness, it also leaves much to be desired. Not all the conditions may be necessary or clear enough to motivate such a strict division. Consequently, the status and conceptualization of all four conditions will be further scrutinized.

4.2.1 The Unification condition

OH is ‘integrated’ and ‘unifying’. What should be integrated and unified are most understood as being disciplines or areas. Underlying these notions is, according to some, a more holistic approach to the health of humans, animals, and the environment, as being interrelated and interdependent (Sironi, Inglese and Lavazza 2023). A core value of OH is the emphasis on “multidisciplinarity in research and advisory projects” (Lerner and Berg 2017: 2). The necessity of conceptual clarity in interdisciplinary work has also been noted (Lerner et al 2024: 3). During the talks with researchers, this condition was most often interpreted as referring to the need for enhancing trans-disciplinarity, and for considering health in a unified or holistic manner, pointing towards the Health condition.

The Unification condition seems to be a necessary condition. If there is no integration and unification between different perspectives, one is approaching intra-disciplinary

research. This is of course all well, but it does not qualify research for being included in the OH umbrella. The addendum to the definition also stresses the Unification condition.

The implementation of OH has been criticized for being at odds with the intentions of the approach. Thus, for instance, it has been suggested that “the wildlife component and numerous ecological issues [...] are still neglected, as are certain environmental science components” (Destoumieux-Garzon et al 2018: 9). Moreover, the Unification condition potentially casts a very wide net, as “social, legal, and economic sciences are similarly marginalized” (Destoumieux-Garzon et al 2018: 9). Yet, this points towards the necessity of the Unification condition. Without fulfilling this condition, research cannot be considered OH. That two of the key underlying principles of the OHHLEP refers to multidisciplinary – that is, both equity between sectors and disciplines, and transdisciplinarity and multisectoral collaboration (OHHLEP et al 2022) – further emphasizes the necessity of this condition.

4.2.2 The Aim condition

The Aim condition is somewhat elusive, but a reason for highlighting it is the practical ambition of OH. As stated in the description of the OHHLEP definition, OH “mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems”. Consequently, OH should not be restricted to the domains of research. This could possibly have methodological impacts also on data focusing too narrowly on research projects and research output. After all, one could imagine researchers working within the domains of their discipline, but also connecting with local populations to implement and use that research practically. While the latter may qualify the research for OH, the research,

conducted within the domains of the researchers discipline, may not. This is a potential shortcoming but abating that shortcoming would require a different report than this one.

At face value, the Aim condition points towards the intention or motivation of researchers. If this interpretation holds, then the assessment of whether a research output is to be regarded as OH must consider the motives of the researchers. But motivation need not be related to success, in the sense that one succeeds in fulfilling the sustainability and Health conditions in unified ways.

A different interpretation of the Aim condition would state that the research, if fulfilling the other three conditions, has practical relevance of some sort. While the Aim condition is important to highlight the practical relevance of OH, it seems nevertheless to be a weak, condition. Yet, it is necessary in the sense that research can fulfill the other three conditions but have little ambition of practical relevance. However, the relation between research and practical implementation is complex. Research intended for practical implementation may fail and have modest practical guidance, and basic research that is done without any direct ambition to be practically implementable, can have great practical implications.²³

Yet, it should be noted that OH has a very broad ambition, evident in the description of the OHHLEP definition, which states that OH should include a wide variety of sectors, and not be confined solely to research.

4.2.3 The Sustainability condition

²³ See for instance Vetenskapsrådet (2016; 2023).

The definition seems to invite vagueness. Two such vague aspects will be highlighted being of special interest to the environmental dimension.

First there is the notion of sustainability. While the original definition of sustainable development as formulated in the so-called “Brundtland commission” (WCED 1987) is “development that meets the needs of the present future without compromising the ability of future generations to meet their own needs.” Most readers of this report are likely aware of and familiar with the challenges facing operationalization of the concept of sustainability. Suffice here to say that the concept has since long evoked controversies on how it is to be conceptualized and implemented (see for instance Ayres et al 2001; Beckerman 1994). The definition includes the somewhat elusive notion of “needs” and, while it refers to something persisting over a long time period, it remains silent upon issues such as the possible substitutability of human and natural capital (Ayres et al 2001). Yet, despite arguably being under-specified and open-ended, the concept of sustainable development persists and is evidently used on many levels of both policy and research.

The Sustainability condition could be re-interpreted to rather be more about balance and optimization. These are concepts that would need to be further specified and aligned. One could for instance imagine something being optimized from a specific perspective, but without it necessarily leading to an overall balance. Yet, depending on how strictly the Sustainability condition is regarded, if current optimization occurs at the expense of disrupting long-term balance, then it could not be labelled as both encompassing balance and optimization from long-term perspectives. At a more permissible understanding, which was also raised during the talks, optimization could relate to efficiency in policy measures, which would be very relevant to OH in the sense of research

or interventions aiming to cover several aspects of health. However, it seems as if this is a condition that greatly needs to be unpacked and specified before one can assess its status.

4.2.4 The Health condition

What OH should integrate and unify are found in the conjunction that the definition ends with, that is condition 4, ‘the health of people, animals and ecosystems’, whose health ought to be sustainably balanced and optimized according to the Sustainability condition.

One can understand the conjunction of condition 4 in a strict or colloquial sense. If the latter, then it is at least two of the three components that ought to be included – to include the health of only one would be intra-disciplinary research, defeating the Unification condition. If the stricter understanding is applied, then the conditions of OH are only fulfilled when all three of them are integrated and unified. To be clear, by strong conjunction is meant that all three need to be considered, that is: “the health of people *and* the health of animals *and* the health of ecosystems”.²⁴ The definition gives us few instructions on how to understand this conjunction.

Vagueness can also be found in the Health condition as the very notion of ‘health’ is not necessarily as well-defined as imagined. Classically, it refers either to absence of disease, or to a state of well-being. Here, there is no need to dwell on how human or animal health is defined – being a discussion in the philosophy of medicine that has been conducted for a very long time (Lerner and Berg 2015) – but it is noteworthy that it

²⁴ That is, in the strict sense refers to a logical conjunction. Such a conjunction is only true if all its conditions are true, if that is not the case, the conjunction is false.

becomes increasingly vague as one moves from sentient beings such as humans and animals, to ecosystems. A conceptual discussion can help shed light on several factors regarding environmental health. This is the topic of the next section.

Before proceeding to the next section, the following recommendation is provided, based on the above:

Recommendation 3: Stipulate a workable and conceptually consistent definition and specification of the conditions of OH with the intended purpose of usage by SLU researchers, possibly in dialogue with such researchers across faculties

This is in line with the necessary conceptual clarity that provides a foundation for interdisciplinary work (Lerner et al 2024). For instance, Lerner et al stress how “true interdisciplinarity requires conscious efforts from all parties involved to avoid misunderstanding and to reach beyond simply piecing together information from several fields” (2024: 2).

Such a “local” definition of OH ought to balance the width and narrowness discussed above, responding to the issue of OH being a too underspecified and open-ended approach, while still being an inclusive concept that researchers can further define and specify. It could help SLU avoid OH research being interpreted solely in the narrow sense. Such a definition that is more specific than the more general OH definition that is readily available, can be tailored to SLU’s competencies, but also to the ambitions of SLU of for instance including and highlighting the environmental dimension. Yet, the definition must

not stifle researcher's creativity, but rather enable them to assess how their research fits into the OH umbrella and how the environmental dimension is relevant.

Moreover, such a definition should still meet central conditions and be recognizable as OH. Otherwise, there is a risk of "Humpty dumpty" definitions, entailing that an agent is fully at liberty to define a concept as he or she sees fit, disconnecting the use of that concept with a common or shared understanding of it. This risk has also been pointed out in the literature on OH, where it has been recognized that "definitions of OH tend to reflect the mission of the respective organizations" (Gibbs 2014: 86). Avoiding such a risk requires the stipulation of a common and shared concept that recognizably relates to the conditions of OH. Retaining a flexible concept with a shared common core is a possible key strategy to avoid both the challenges of a too narrow and too wide definition, striving towards one that is tailored to the competencies of SLU researchers, while still being recognizably OH.

5. The elusive ecological dimension

The three components of the conjunction in the Health condition are human, animal, and environmental health. Moreover, according to the Unification condition, these are to be analyzed in a unified and integrated way, in accordance with the Aim and Sustainability conditions. This section contains a closer scrutiny of the environmental dimension, which is unpacked to meet the objective of this report. As discussions on topics such as environmental or ecosystem health are vast, the discussion below does not strive for completeness, but merely outlined to provide recommendations for SLU.

5.1 Clarifying the status of the environmental dimension in OH

Highlighting the ecological dimension does not only play a central role in the Health condition, but also in the Unification and Sustainability conditions. The environmental pillar is deemed as being “perhaps the least well understood and prioritized in One Health strategies” (WWF 2024: 6). Yet, some argue that it is the “incorporation of the ecosystem health, including that of wild fauna” (Destoumieux-Garzon et al 2018) that distinguishes OH from its various predecessors. The role of the environmental dimension goes to the core of how OH is conceptualized. While some suggest that antimicrobial resistance is the quintessential OH issue (Robinson et al 2016), others suggest that “at its heart OH promotes health through interdisciplinary study and action, across all species” (Gibbs 2014: 86). Though this latter definition does not exclude antimicrobial resistance, it puts an emphasis on the Unification and Health conditions and points towards accentuating the former. Despite the novelty of including the environmental dimension, Destoumieux-Garzon et al, in an overview of existing research, conclude that “the environment and its biotic and abiotic components” are at most mentioned “as the scene of transmission, often reduced to global planetary changes or the Anthropocene” (2018: 3). This points towards the need of fulfilling the Unification condition and to resist discounting environmental health in the Health condition.

Still others argue that OH, by emphasizing the Unification condition, requires something more drastic. Without neglecting the importance of issues such as antimicrobial resistance, such arguments state that there is a need for OH to be *non-anthropocentric*.²⁵ Thus, for instance, Sironi, Inglese and Lavazza state that “health can

²⁵ A theory is anthropocentric if it is human-centered. In environmental ethics the issue of anthropocentrism and its limits have been widely discussed: “Many traditional western ethical perspectives, however, are *anthropocentric* or human-centered in that either they assign intrinsic value to

no longer be conceived only in relation to human beings (anthropocentric view, human health)” (2022: 2), and that such an anthropocentric view ought to be renounced to make OH possible.

Yet, they concede that even an anthropocentric basis of OH, which focuses on “prevention and treatment in a broad perspective but is [...] centered on the human being” (Sironi, Inglese, and Lavazza 2022: 2), has the potential to “greatly enhance the protection of our health and simultaneously improve the state of the planet”. However, they conclude that only a non-anthropocentric OH approach “will lead to the protection of the living ecosystems on an equal and not just anthropocentric level” (Sironi, Inglese, and Lavazza 2022: 9). They also call for a productive relationship between health ethics and environmental ethics (Sironi, Inglese and Lavazza 2022: 2), the latter being the discipline most concerned about non-anthropocentric views from both ethical and epistemological perspectives.

An editorial in *The Lancet* expresses similar concerns regarding OH, stating that “modern attitudes to human health take a purely anthropocentric view”, whereas OH “places us in an interconnected and interdependent relationship with non-human animals and the environment” (The Lancet 2023: 169). The editorial ends with the claim that “in its truest sense, One Health is a call for ecological, not merely health, equity” (The Lancet 2023: 169).

human beings alone (i.e., what might be called anthropocentric in a *strong* sense) or they assign a significantly greater amount of intrinsic value to human beings than to any non-human things such that the protection or promotion of human interests or well-being at the expense of non-human things turns out to be nearly always justified (i.e., what might be called anthropocentric in a *weak* sense)” (Brennan and Norva 2024).

In environmental ethics, such equality as described above goes under the heading of “biospherical egalitarianism” (Taylor 2011; Næss 1974), and is largely regarded as having untenable, or at the very least highly impracticable, implications depending on how that equality is interpreted (Baard 2015). In general, there has been disputes between animal and environmental ethics on how to understand the moral standing of individual organisms, such as animals, and more holistic entities such as species or ecosystems (Regan 2004; Callicott 1980). Should, for instance, the health of an individual sentient organism be subjected under the health of an ecosystem? That is, if species of sentient animals risk having negative impacts on an ecosystem, should those species then be forcefully removed or abolished from the ecosystem? To settle which one is the more justified requires explicating the underlying ethical values (see Lerner and Berg 2017: 5ff for a discussion; see also Lerner et al 2024).

The risk for conflicts between for instance animal and environmental ethics are well-known issues that has been discussed for several decades and which could inform discussions on OH, especially if it is required that the perspectives be reconciled to fulfill OH (Lerner et al 2024: 5). In the context of OH, however, the potential points of conflicts need to be unpacked, and may affect for instance the Unification condition. This provides an opportunity that can benefit both OH and environmental ethics alike, but more research is required to synthesize the fields to achieve reconciliation (Lerner et al 2024) between ethical fields that risk giving rise to conflicting ethical recommendations.

An additional example is provided by Lysaght et al who suggest that “OH calls for an ethical framework that fully appreciates the moral value of biodiversity and environmental health beyond their mere instrumental value to human health” (2017: 2). They argue that the “anthropocentric approach may be at least partly due to a limited scope for ethical

deliberations” (Lysaght et al 2017). Thus, in line with the above, Lysaght et al argue for inclusion of non-human animals and environmental health as a matter of justice (2017: 8), and a productive relation with environmental ethics.

Yet another example is Gruetzmacher et al (2021). When formulating ten principles for OH, which they dub the Berlin principles²⁶, they stress the ethical foundation of OH. They suggest that the ten principles are based on a broad ethical framework, that are key to develop OH. At its core lay, they suggest, solidarity and environmental justice (Gruetzmacher et al 2021: 3). They state that “the joined-up ethics of OH provides an opportunity to promote justice and solidarity where humans, other animals, and the environment meet” (Gruetzmacher et al 2021: 3; see also Lerner et al 2024).

To Destoumieux-Garzon et al (2018) ethics should be integrated into the OH concept, especially environmental and biodiversity ethics (Baard 2022), but also legal concepts, “such as human rights, the rights of indigenous people, environmental justice, and animal rights” (Destoumieux-Garzon et al 2018: 10). Such inclusion seems to have a conceptual function, as the neglect of including *inter alia* the ecological and wildlife issues reduces OH to be about bioethics and the ethics of animal health.

To cast a wider conceptual ethical net means assessing more aspects, which has a greater chance of fulfilling the conditions identified above. Yet, reasons must be provided why such aspects ought to be considered. Such reasons can be both epistemological,

²⁶ Which they take to follow the 12 Manhattan Principles formulated in 2004 at a symposium organized by the Wildlife Conservation Society for “establishing a more holistic approach to preventing epidemic/epizootic disease and for maintaining ecosystem integrity for the benefit of humans, their domesticated animals, and the foundational biodiversity that supports us all” (<https://oneworldonehealth.wcs.org/About-Us/Mission/The-Manhattan-Principles.aspx> Accessed 28 November 2024). Like other OH initiatives, the principles are not restricted to the research domain, instead referring to leaders, civil society, the global health community *and* institutions of science.

having to do with knowledge, and normative, having to do with values. Even if a more explicit inclusion of ethical foundations would highlight the normative aspects of OH, as gestured towards above, different ethical frameworks could also serve to explicate potential conflicts between different ethical theories (Baard 2022; see also Lerner et al 2024 for a discussion on ethics in OH for a call for reconciliation of different ethical perspectives within OH). Moreover, from epistemological perspectives, fulfilling the Unification condition can have the potential of offering broader knowledge. Theoretically, fulfilling that condition can also affect traditional quality criteria in science, such as increasing validity and reliability, as well as facilitate the fulfilment of the Aim and Sustainability conditions.

While much can be – and has been – said about the above, they express something that can be formulated as a recommendation, in the following way:

Recommendation 4: Explicate and recognize the normative assumptions regarding the ecological dimension. How is it weighed against the other dimensions, how is it conceptualized relative the other dimensions of OH? How should it be weighed; can it be weighed differently; why?

One does not have to suggest that OH ought necessarily be conceptualized in the ways portrayed above to capture the environmental dimension. Rather, it seems that the conceptualizations rely on very strict readings of the Health and the Unification conditions. That is, that the components of the Health conditions are to be understood as a strong conjunction where all three dimensions must be considered equally. Not only are the three components from the Health condition included, but they are also strongly

unified and equal in status. Due to the potential ethical problems such positions can result in – well-known in the field of applied ethics – there are also reasons to be cautious. A too strict reading also has potential epistemological impacts, as it runs the risk of excluding a lot of relevant OH research. A weaker reading of the conjunction, such as the anthropocentric OH conceptualization, could still have a strong role to play in fulfilling the Aim and Sustainability conditions, as its critics concede (Sironi, Inglese, and Lavazza 2022: 2). Yet, close to hand to such a view is a conceptualization of nature as primarily providing ecosystem services to sentient beings, which again runs the risk of the environmental dimension being under-appreciated and its status reduced.

5.2 Health: Conceptual contrasts

The Health condition includes the health of ecosystems which, according to the Unification condition, is to be understood in an integrated and unified manner. OH is not alone in this insistence, as ecosystem health is included in other documents that shares the ambiguous role of OH, such as Principle 7 of the Rio Declaration on Environment and Development.²⁷

Ecosystem health, in contrast to animal and human health, has been suggested to primarily be used in a metaphorical manner (Rapport 1989; 1995). For instance, the IPBES defines “ecosystem health” in the following way:

²⁷ Principle 7 reads: “States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem” (https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf) (Accessed October 28, 2024)

“Ecosystem health is a metaphor used to describe the condition of an ecosystem, by analogy with human health. Note that there is no universally accepted benchmark for a healthy ecosystem. Rather, the apparent health status of an ecosystem can vary, depending upon which metrics are employed in judging it, and which societal aspirations are driving the assessment”²⁸

The IPBES definition points towards several issues that are of relevance for the Health and Unification conditions. First, it is established that health is a metaphor. While critics may use this to downplay the role of a concept such as ecosystem health and pointing towards loose foundations, the use of metaphors have a scientific role. That scientific role of metaphors “lies in pointing to phenomena in apparently different spheres that bear some structural identity” (Rapport 1989: 120). Yet, and second, such a metaphor is only as strong as the analogy between the target systems that it refers to which, in this case, are analogies between human and ecosystem health. This runs the risk of weakening the metaphor. As suggested by Rapport, health is usually the state of an organism (1995: 293; see also Lerner and Berg 2015). But when the target system is an ecosystem, that analogy risks failing if the differences between an organism and an ecosystem are too vast.

Without taking a stand on which conceptualization that is correct, ecosystems have been conceptualized in different ways since the early days of ecology. The difference between conceptualizations of ecosystems used by researchers Fredric Clements and Henry A. Gleason are often used to highlight the contrasts (Odenbaugh 2007). Clements

²⁸ <https://www.ipbes.net/glossary/ecosystem-health> (Accessed October 28, 2024)

believed that plant communities, in response to disturbances, “follow a very specific sequence of stages [...] and that there is a single self-perpetuating and tightly integrated climax community” (Odenbaugh 2007: 629), and that biotic communities are “superorganisms”. Should this hold, the health analogy is strong as it makes it possible to draw analogies between the self-maintenance of individual organisms and ecosystems. But in contrast to Clements’ view, Gleason suggested that “there is no system, but only individual species reacting to disturbances relatively independently of the others” (Odenbaugh 2007: 629). If that holds the metaphor becomes weaker as, again, health is commonly the state of an individual. Current conservation biologist Kurt Jax for instance describes how the very delimitation of an ecosystem is observer-dependent (2010: 83), consistent with Gleason’s view.

Jax (2010) also argues that the same goes for establishing ecosystem functioning, leading to a third point. IPBES highlights how the “health status of an ecosystem can vary, depending upon which metrics are employed in judging it, and which societal aspirations are driving the assessment”. Related to this is that “there is no universally accepted benchmark for a healthy ecosystem”. This points towards a substantial difference between human and ecosystem health which affects the metaphor. If there is no objective way of measuring ecosystem health, any such measure runs the risk of being deemed observer-dependent. That is, two observers can disagree on the health of an ecosystem, without either of them being wrong. Their conclusions merely rest on different premises, and in the absence of a jointly accepted agent-independent benchmark or metric, it becomes impossible to determine whether either one, or both, are wrong. This seems to provide a sharp contrast to the case of human health and points towards the reliability of assessing ecosystem health.

Yet, the difference between ecosystem health and other forms of health should not be exaggerated for this reason, as there can be differing judgments in both human and veterinarian medicine. The mere possibility for disagreement does not merit concluding that no truth can be found. Rapport emphasizes these aspects when suggesting that “social values play a prominent role in *all* health assessments”, and objectivity or agent-independence in human and veterinary areas “reflect general agreement on the values that govern these types of assessment” (Rapport 1995: 298). This also means that two different medical doctors or veterinarians can make different judgments regarding the same organisms, without that discrediting neither veterinarian nor human medicine. Assumedly, there is a greater risk for such differing judgments in the ecosystem cases, and more challenges to determine the criteria by which such disagreements ought to be settled. Rapport stresses how value judgments go into defining “health”, both in the case of human medicine and ecosystem health. This could be interpreted as introducing a non-scientific aspect, similar to the “societal aspirations” that the IPBES definition refers to.

While a lot of making the Health condition intelligible seems to be about how ecosystem health is conceptualized, there are also issues pertaining to how it should be measured. If there are, as IPBES states, literally *no* universally accepted benchmark, then it becomes highly vague and ambiguous. Taken at face value, *any* criteria or metric could be used to measure ecosystem health, and there is no manner in which to determine the validity of different criteria. But if this is what IPBES intends to say, it risks selling ecological knowledge short. The choice of metric would, at worst, be arbitrary. Nevertheless, it may be *difficult* to establish such criteria and reach consensus on their scientific validity and reliability. Illustrating this difficulty, the “shifting baseline syndrome” (Soga and Gaston 2018) is well-known, describing “a gradual change in the accepted

norms for the condition of the natural environment”, leading to “an increased tolerance for progressive environmental degradation, changes in people’s expectations as to what is a desirable state of the natural environment [...] and the establishment and use of inappropriate baselines for nature conservation, restoration, and management” (Soga and Gaston 2018). But to reiterate, the presence of such no doubt pressing challenges, does not merit concluding that the choice of baseline is fully arbitrary.

In the case of OH, McIntyre et al (2018) recognize the importance of including the ecological dimension due to environmental risk factors being a major determinant of health. They suggest that “when measuring the ecological dimension of One Health, account needs to be taken of the fitness and sustainability (including integrity) of the ecosystem and environment”, and continue that “this is not easy to quantify, as it results in the creation of indexes of heterogeneous variable, which do not provide an easily interpretable output of resilience” (McIntyre et al 2018: 128). Like Rapport, they also note that “when quantifying the health of anything, be it an organism or an ecosystem, the variables measured are all context-dependent”, but they also emphasize that this is especially the case for ecosystem health (McIntyre et al 2018: 129). Among the factors that influence the choice of metrics to quantify health and being likely to impact policy decisions, they identify the following biases relevant for unpacking the ecological dimension of OH (McIntyre et al 2018: 152–153):

- Contextual circumstances
- Temporal and spatial issues, including both sharing and collecting information
- Biases in capturing information

- Consideration on how to measure information, such as the need to standardization, randomization and replication of data-points to create robust research outcomes

McIntyre et al also note that there are various indices that have been developed to quantify environmental health, such as (2018: 130):

- The long-term sustainability of different ecosystems
- The state of the world's biological diversity
- Describing the status of ecosystem services

In a recent report WWF (2024) use several conditions to estimate landscape health relevant to OH. For instance, an 'unhealthy'²⁹ landscape is one where “wildlife populations are stressed by land-use-driven factors (loss or fragmentation of habitat, inability to access food or water resources or move to meet needs) decline in overall health”, and where “highly modified and disturbed land areas can provide the ideal habitat for pathogen hosts” (WWF 2024: 13). In contrast, a 'healthy' landscape is one where “pathogen populations are kept in balance by sufficient numbers of predators and competitors, reducing infection”, and where “healthy wildlife, with lower stress levels, *shed* fewer pathogens” (WWF 2024: 13). The WWF also note that activities such as land-use change can cause ecosystem fragmentation, which increases “the length of the human-wildlife interface or 'edge' between human-dominated areas and natural

²⁹ The apostrophes are used in the WWF report, for both 'unhealthy' and 'healthy' landscapes (WWF 2024: 13), thus distinguishing its use from other contexts.

habitats” which, in turn, means that “the longer the edge, the higher the likelihood of interactions between wildlife and people and/or wildlife and livestock, which could lead to *spillover* of infectious diseases” (WWF 2024: 13).³⁰ Yet, it should be explicated that these conceptualizations primarily concern how landscape ‘health’ increase the risk of pathogens infecting or spillover to animals or humans. This highlights the impacts that conservation measures – or lack thereof – has on health of animals and humans and establishes metrics to assess that impact.

Differences between the McIntyre et al and WWF in establishing of ecosystem health and landscape health can be noted. Where the first-mentioned try to establish the health of the ecosystems directly, the WWF instead point toward how interventions in landscapes have impact on the spread and spillover of pathogens between animals and humans. The motivation for Recommendation 4 is strengthened by these differing conceptualizations of how the environmental dimension “fit” with the other of the Health and Unification conditions.

Despite the availability of such metrics, it seems like there is remaining uncertainty regarding *how* to measure ecosystem health. The choice of such metrics is likely not fully arbitrary, even if uncertainty remains regarding factors such as reliability or validity, and there is a lack of consensus on such issues. Such uncertainty gives rise to the risk that any choice of metrics of whether an ecosystem is healthy will partly be context-dependent, in ways that human and animal health are not to the same degree. This leads to the fifth recommendation:

³⁰ While this is often interpreted as the health of wildlife affecting the health of humans, there are also examples of the spread of pathogens from humans to wildlife. Again, how the interaction is conceptualized makes analytical and normative differences, as the spread of pathogens from wildlife to humans being an overarching concern could be considered highly anthropocentric.

Recommendation 5: Recognize the relevance of available expertise when establishing metrics of ecosystem health, but also the role of normative and social goals when doing so

While the recommendation gestures towards the intra-disciplinary expertise in fields such as ecology or conservation biology relating to the Health condition, more is required to fulfill the conditions of the OH definition. To fulfill the Unification condition, an additional recommendation is motivated:

Recommendation 6: Establish a forum that stimulates trans-disciplinary dialogue on the environmental dimension of health. Be clear on in what context ecosystem health is conceptualized and the aspirations inherent in that context. How is ecosystem health related to the other forms of health?

That forum could very well benefit from including researchers from a wide variety of faculties.

What is formally at stake here is a form of “social learning”, common in adaptive ecosystem management (Norton 2005). Clarity regarding the context in which ecosystem health is measured, the objectives it aims towards, and inclusion of multiple perspectives has the potential of providing more robust hypotheses regarding the state of ecosystems (Norton 2005: 384). This also makes the social aspirations that influence the choice of metrics transparent, and up for discussion. Ecosystem health will for instance likely be determined differently in a context where ecosystems primarily are understood as

providing ecosystem services, in contrast to one that has other normative foundations, again referring to the status of the environmental dimension. Nevertheless, there may be common understandings of unhealthy or degraded ecosystems that could be unpacked through Recommendation 6.

The long discussion in this section has suggested that part of the difficulty of capturing the environmental dimension in OH could be a symptom of a more general challenge of stipulating clear, accessible, and agent-independent ways of measuring health and impacts. To clearly involve ecologists in discussions of health – which SLU likely has a unique position to do in ways that fulfill also the Aim and Sustainability conditions due to the applied character of research at SLU – gives rise to the following recommendation:

Recommendation 7: Invite, encourage, and recognize the great resources in fields such as ecology and environmental science at SLU in the work on OH

This recommendation, and SLU's unique potential, is solidified when comparing the contrasts and similarities between SLU and Swedish agencies working on OH. This is the topic of the next section.

6. Contrasts between SLU and Swedish governmental agencies

Here comparisons will be made between the results above, and discussions on OH on national levels. Given the space and ambition of this report, the focus will be on the Swedish case, drawing from experiences from existing studies.

Through an interview study with analysts from the Public Health Agency, the National Food Agency, the National Veterinary Agency, and the Swedish Environmental Protection

Agency, Humboldt-Dachroeden (2023) overviews OH practices in Swedish governmental agencies. By doing so she identifies both barriers and opportunities to integrating the OH approach within and across agencies. An initial difference between Humboldt-Dachroeden's approach and the topic of this study is that the latter focus on research, while the former focus on agencies. Agencies have clearly stipulated tasks and areas of responsibility, often with an immediately applied focus, defined in steering documents. Yet, differences should not be exaggerated. Agencies also conduct research, often in the form of studies and reports, and SLU research often has a highly applied focus. While more differences and similarities can be observed between governmental agencies and HEIs, Humboldt-Dachroeden's overview is relevant to the case at hand.

Humboldt-Dachroeden begins with observing three challenges derived from their interview study:

1. Ambiguity of what OH entails in practice
2. Lack of engagement of the environment sector
3. Legislative differences

Points (1) and (2) are recognized from the above discussion, but it is interesting to note that regarding (1) there is an emphasis on the impacts of the unclarity and ambiguity of OH in practice. That is, it is not clear what OH *per se* entails in practice, which is the primary focus for governmental agencies. Above, it was suggested that being open-ended and underspecified – parts of being an 'approach' – provided a possible strength of the OH concept if it is recognized that it must be practically operationalized to suit specific purposes. One could expect that this would motivate resources for conceptual

discussion, which does not seem to have been the case given the complaint. Also (2) is familiar from above. Examples of what governmental agencies had done in these areas were limited and case specific. Generally, Humboldt-Dachroeden (2023: 537) notes that the respondents expressed uncertainty regarding the environmental dimension.

It should be noted that Humboldt-Dachroeden conducted interviews with experts from the Swedish Veterinary Agency, Food Agency, Public Health Agency, and the Swedish Environmental Protection Agency. Of these, it is primarily the latter that has the environment as an explicit part of their mission and objectives. This makes it understandable why there are challenges of including the environmental dimensions. Yet, it is also highlighted how for instance the Swedish Environmental Protection Agency does not include OH as a specific topic. SLU has a unique potential to highlight the environmental dimension but may face similar challenges.

Of interest is that Humboldt-Dachroeden (2021: 538ff) identifies opportunities derived from the interviews with analysts in Swedish governmental agencies. She lists four:

1. Well-established collaboration
2. Potential for different terminologies and methods
3. Opportunity from disease outbreaks
4. Disseminating experiences and knowledge

Humboldt-Dachroeden also stresses that successful collaboration stems from regular exchange, collaborating on reports, and through initiatives like One Health Sweden, established routines and cross-disciplinary meetings (2023: 539). Respondents also noted that in order 'to engage the environment sector' it is pivotal with invitations of

researchers having that focus to forums where OH is discussed (Humboldt-Dachroeden 2023: 538). Despite such opportunities and support from analysts for the OH approach notwithstanding, none of the governmental agencies had strategies for implementing OH.

Drawing on the work above provides an additional recommendation:

Recommendation 8: Establish a forum for strengthening existing ties between researchers and invite new ones for collaboration with OH as a guiding topic

Recommendation 8 is consistent with the prior recommendations, highlighting the need for human resources to both help define, and see where and how the environmental dimension ought to be included in OH.

Setting OH in the context of pandemic prevention, Pöllönen et al (2023) conduct a study of steering documents. They suggest that OH has been implemented in Swedish work against antimicrobial resistance, and that it has been practically implemented in cases surrounding zoonoses. Pöllönen et al conclude that they do not see “any clear indications that decision-makers and governmental agencies in Sweden include OH or actively acknowledge the strong connections between health in human-animal-environment in pandemic prevention” (2023: 528).

They point towards conceptual and practical limitations of OH. For instance, they suggest that even if Sweden has integrated OH in work on antimicrobial resistance, animal and environmental health has only been included as components of risk reduction concerning zoonotic diseases, but otherwise rarely considered at all (Pöllönen et al 2023: 528). This motivates a discussion where they criticize the anthropocentric focus of OH.

They state that OH “lacks a clear ethical framework and transparency in how different interests, stakeholders, and relations affects its power dynamics and thus its normative role” (Pöllönen et al 2023: 528). This is in line with the above discussion on explicating and clarifying the status and role of the environmental dimension, and notions such as ecosystem health.

An expanded and non-anthropocentric perspective would emphasize primary prevention, by for instance acknowledging underlying causes to zoonoses. These include habitat loss and destruction of forests, high intakes of animal proteins, and illegal trading of wild animals (Pöllönen et al 2023: 529). Thus, by incorporating non-anthropocentric perspectives, the scope of “health” is enlarged in ways that are beneficial to all three dimensions of OH. At the very least, this requires a conceptual and participatory discussion consistent with the recommendations above.

In this section several commonalities between the results on SLU researchers and governmental agencies has been highlighted. It largely corroborates that it is difficult to include the environmental dimension, and the human-oriented focus of OH, but also the need for establishing forums and platforms to encourage collaboration. In line with the above, such measures are required to fulfill the necessary Unification condition.

7. Summary

The discussion in this report on how the environmental dimension of OH has been covered by SLU researcher has largely confirmed the assumptions that the environmental dimension generally lacks coverage. The view that the environmental dimension is often left out of OH research was corroborated by both bibliometric overviews of both self-characterized OH research, and partly by non self-characterized OH research. That the

dimension is challenging to include was confirmed both by talks with SLU researchers, and by looking at existing research.

The lack of coverage and challenges motivated the recommendations that relate to inclusive conceptual clarification. Another issue that motivates a conceptual and inclusive discussion on the environmental dimension of OH is the ambivalent character of OH. Namely, how it operates on different levels and in different contexts. It is both a concept that is operationalized in research, as well as a policy relevant concept that has a more general guidance.

The recommendations provided in this report can function to highlight the unique competencies available at SLU and provide the foundation for a way forward both for SLU, and OH research in general. As suggested above, there is the risk that a reason for the difficulty of including the environmental dimension lay in how that very dimension is difficult to conceptualize and differ too much to human and animal health. Clarity regarding both by what metrics such health is assessed, and how it relates to the other two dimensions, are key. This also includes clarifying the status of the environmental dimension and notions such as ecosystem health relative the two other dimensions, and what role it plays in the Health condition.

The aim of this report has been constructive. Though conceptual issues of OH have been emphasized, conceptual clarification can only get work on OH so far. What is also needed is practice and institutional initiatives. At a research institution, much practice comes from the researchers themselves, and it is usually good advice to not stifle creativity and curiosity-driven science. Indeed, in that regard, OH understood as an inclusive and wide concept has significant potential. Yet, there also needs to be institutional frameworks, incentives, and agendas. By enabling forums for a creative and

lively discussion on OH, SLU has a strong potential for strengthening the concept and its research in this area.

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Appendix I Subject fields for WoS publications

The following data was provided from the excellent bibliometric service at the SLU library. It should be noted that the number of publications retrieved exceeds that which is analyzed in Section 3.2, which uses results retrieved by a different query to WoS Core collection. Thus, the data in Figure 5 belongs to the category of “not self-characterized OH research”. Yet, despite using a different approach, the data below largely confirms the overall picture of this report, namely that the environmental dimension receives a modest share of explicit OH research output from SLU researchers and instead shows a predominance of veterinary disciplines.

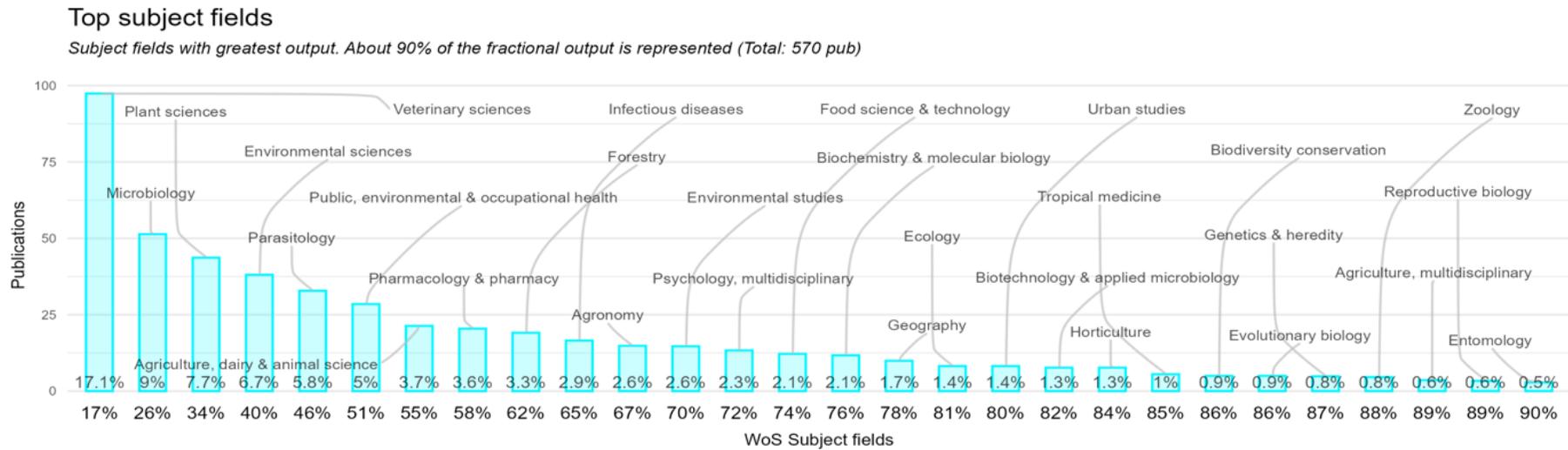


Figure 5. Bibliometric data retrieved from library. WoS categories for all publications interpreted to be in OH, SLU researchers, fractioned categories.

Appendix II Questionnaire

Introduction

This talk is a part of a study done at the initiative of SLU Future One Health Platform. A specific focus is on the environmental dimension of OH, and recommendations for the future.

The study will result in a report. Your contribution is valuable to provide us with an insight in different aspects of OH, from the perspective of researchers.

You will be anonymized in the report, and no quotes will be used. An emphasis in the report will lay on bibliometric and conceptual analysis.

The material from this and other talks will provide us with a more complete picture of different aspects of working within the OH in practice.

Questions

1. Describe what you have done within OH.
2. What focuses have you had?
3. Are there any focuses you wish you could have had?
 - a. If yes, why was it not possible?
4. How should one, according to you, interpret the following components of OH?
 - a. “integrated and unified approach”
 - b. “sustainably balance and optimize”
 - c. “health of people, animals, and ecosystems”
5. Do you think that there are challenges to include the environmental dimension of OH?
 - a. If yes, what challenges?
 - b. Specific challenges for SLU?
6. Do you think that there are opportunities for including the environmental dimension of OH?
 - a. If yes, what opportunities?
 - b. Specific opportunities for SLU?
7. Do you have any recommendations to get a greater focus on the environmental dimension of OH?



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