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POLICY PERSPECTIVE

Healthy planet healthy people

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Abstract

One Health is a cross-sectoral and transdisciplinary approach that emphasizes the fundamental ways in which the health of humans, domestic and wild animals, fungi, plants, microbes, and natural and built ecosystems are interdependent. One Health approaches recognize the links between human health and

a range of environmental concerns including biodiversity, climate, freshwater, food, harmful chemicals, and healthy oceans. Yet the conservation community and its broad interest in biodiversity and the natural world has been notably lacking in discussions about One Health. Partly as a result, both policy and practice have been narrowly focused on one or a few links between human and other healths, such as the human and wildlife health nexus. We provide a set of principles and components that will balance existing discussions by including the natural world and biodiversity and provide a framework for more active involvement by the conservation community. Incorporating these principles and components will enable One Health practice to guide inclusive, multidisciplinary, and cross-sectoral efforts that consider the shared costs and benefits of human, animal, plant, and ecosystem health and help readjust humanity's pursuit of a green, just, and equitable sustainability pathway.

KEYWORDS
domestic animal health, human health, One Health, wildlife health

The COVID-19 pandemic, in addition to human deaths and suffering, has created tremendous social and economic hardship. Governments of the 50 countries with the largest economies have now pledged over $14 trillion in recovery funds (O'Callaghan & Murdock, 2021). The recovery plans implicitly assume that healthier outcomes will result if all natural, social, and economic factors are properly addressed. Building back better or greener (https://www.oecd.org/coronavirus/policy-responses/building-back-better-a-sustainable-resilient-recovery-after-covid-19-52b869f5/), nature-based solutions (https://www.naturebasedsolutionsinitiative.org/what-are-nature-based-solutions/), and other similar efforts seek to correct the relationship between humans and nature. They also embody what the Dasgupta Review calls the simple truth that economies are embedded within nature and not external to it (Dasgupta, 2021).

What is at stake is not just human health but the health of all dimensions of the natural world. The Convention on Biological Diversity (CBD) emphasizes that biodiversity underpins nature's contributions to people and provides ecosystem goods and services that are essential to human health and well-being. Biodiversity is also integral to key development sectors—for example, agriculture, fishing, and forestry—that modulate health outcomes directly or indirectly (Convention on Biological Diversity, 2021b).

Based on this understanding of the relationship between biodiversity and human heath, the Convention on Biological Diversity has explicitly endorsed the broader concept of One Health (Convention on Biological Diversity, 2018), which spans the disciplinary, institutional, and governmental silos that separate human health, domestic animal health, wild animal health, ecosystem and planetary health, and even the health of the microbial world. One Health thereby seeks to strengthen the prevention of factors endangering health by enhancing social and ecological resilience, yielding benefits to humans, domestic animals, and biodiversity more generally.

Many other institutions, including the World Health Organization (WHO), the Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), the International Union for Conservation of Nature (IUCN), and the Global Environment Facility (GEF) likewise recognize that we cannot either recover from the current crisis or prevent future crises unless we restore the health of the environment which will require partnerships between disparate fields. We must recognize that human health is inseparable from the health of biodiversity and the natural systems upon which we depend.

This paper outlines principles that must underpin all One Health approaches as well as six components that are essential to the implementation of those approaches. Implementation of One Health approaches currently under consideration include the One Health High-Level Expert Panel (OHHLEP), called for by WHO, FAO, UNEP, and OIE; (FAO et al., n.d.); the European One Health Surveillance Codex, (Filter et al., 2021); strengthened international cooperation for pandemic preparedness and response through an emerging international pandemic treaty, endorsed by WHO and over 25 countries (WHO, 2021) as well as g the Kunming Declaration released

during the recent COP15 (Convention on Biological Diversity, 2021a).

These efforts show that from its origins some two decades ago, but with roots much deeper in history, One Health is rising on the agendas of national and international organizations. The broad support for the approach is evidenced by the establishment of several national agencies, networks, and consortia, as well as designated degree and training programs (Kelly et al., 2020).

Most promisingly, organizations are reaching out to incorporate a broader range of partners. This includes OIE, which from a focus on domestic animals is calling for greater attention to wild species (OIE, 2021). The WHO, IUCN, and Friends of Ecosystem-based Adaptation are establishing an expert working group that includes attention to One Health (WHO & IUCN, 2021), and the Intergovernmental Platform on Biodiversity and Ecosystem Services is calling for national institutionalization of One Health Programs and the creation of a monitoring framework (IPBES, 2020).

While these are important steps, One Health approaches have not yet gained full traction among policy makers and are rarely considered by the disciples and practices that address the natural world. This applies in particular to the conservation community, which has remained largely on the sidelines; a bibliometric study of One Health publications (Humboldt-Dachroeden et al., 2020) found that no reported conservation or ecology journals had published on this topic. A review of 100 One Health networks revealed that one third did not include the environment within their considerations (Khan et al., 2018).

There were early calls to include specific biodiversity concerns such as in the 2004 Manhattan Principles (https://oneworldonehealth.wcs.org/About-Us/Mission/The-Manhattan-Principles.aspx). But despite these efforts, as well as the adoption of biodiversity-inclusive One Health guidance at the 14th Conference of the Parties of CBD (Convention on Biological Diversity, 2018), it has been only with the COVID-19 pandemic that the conservation community has given One Health wider consideration. Conservationists must engage in order to formalize the important but often neglected, role of nature, biodiversity, and environmental contributions to a fully integrated One Health program.

We, a group of environmental practitioners, development practitioners, conservation biologists, ecologists, and experts in social science, agricultural sciences, health sciences, and global health policy, propose a set of principles and components to underpin and incorporate in One Health approaches. These principles and components, if addressed, could elevate One Health to the same level of policy focus as climate change, biodiversity loss, food safety, and public health. This can be achieved by promoting the strategic integration of One Health approaches into global conventions, regional agreements, and national programs, and the development of complementary tools and policies to decrease the risk of disease spillover and strengthen prevention, in addition to preparedness and response to outbreaks.

In this paper, we complement our experiences with recently published literature that reports experiences with One Health program design and implementation (e.g., Chiesa et al., 2021; Kelly et al., 2020; Khan et al., 2018; Otu et al., 2021; Ribeiro et al., 2019). We do not present a single set of action steps that need to be taken, as no such list could encompass all the circumstances in which a One Health approach is both relevant and potentially powerful. Rather, we highlight the necessity of including all the different components of One Health and building the capacity to look at these as an integrated whole and offer examples of on-the-ground efforts and emphasize the need to build coalitions and a shared vision of One Health that will enable development of the necessary action steps.

1 | DEFINING ONE HEALTH

One Health is a cross-sectoral and transdisciplinary approach that emphasizes the fundamental ways in which the health of humans, domestic and wild animals, fungi, plants, microbes, and natural and built ecosystems are interdependent. But the full range of these connections is poorly understood. As a result, both policy and practice have been narrowly focused on one or a few links between human and other healths. COVID-19, for example, has led to a notable emphasis on the human health-wildlife disease nexus.

One Health originated in practices among wildlife health professionals but has since been adopted across a broad range of sectors. The term has been defined in overlapping ways with different emphases and is one of a family of approaches that includes the concept of Planetary Boundaries (Steffen et al., 2015). The One Health definition we provide is based on previous definitions (c.f. Gruetzmacher et al., 2020) and reflects the broad range of stakeholders as well as emerging information in areas like the microbiome and viral ecology.

2 | PRINCIPLES

1. One Health operates across scales: Individual, community, national, regional, and global, and from genes to species to ecosystems; as well as from local communities to cities to nation states. Responses and partnerships must span all appropriate scales.

2. One Health operates across sectors, disciplines, and practices including, but not limited to: human medicine, epidemiology, veterinary medicine, disease ecology, ecology, ecosystem restoration, nature-based solutions, climate change, globalization, agriculture, food-safety, forestry, public health, biosafety, anthropology, social sciences, and economics.
3. One Health covers both communicable (e.g., influenza) and noncommunicable diseases (e.g., diseases from persistent organic pollutants). Current discussions on One Health tend to focus on the ongoing pandemic and consequently on zoonotic-origin pathogens, but it is vital not to efface the applicability of One Health to other diseases affecting many tens of million humans every year, including vector-borne diseases such as malaria, waterborne diseases such as diarrheal diseases, antimicrobial resistance, and noncommunicable diseases such as chronic respiratory diseases, and malnutrition.
4. One Health is relevant to both natural as well as altered ecosystems and both urbanized and rural areas. For good reason there is considerable interest in disease risk associated with habitat conversion in relatively intact ecosystems, but One Health approaches must also be applied in agricultural, peri-urban, and urban settings. It is also an important practice for counter-urbanizing settings, depopulation of rural areas as well as postdisaster settings struck by wildfires, tsunamis, and postconflict areas.
5. One Health requires an inclusive and diverse participation across genders and age groups by all major stakeholders: public and private sectors, traditional knowledge holders, and scientists.

3 | IMPLEMENTING ONE HEALTH

Implementing One Health approaches requires inclusive multidisciplinary and cross-sectoral efforts that make explicit the links between human health and a range of environmental concerns: biodiversity and ecosystem services; abundant and clean freshwater; access to safe and nutritious foods, the maintenance of a stable and livable climate; resilience to climate change and disasters, an environment free of harmful chemicals; and healthy oceans. One Health is a critical tool to develop and implement upstream policies, programs, and projects that consider the shared costs and benefits of human, animal, plant, and ecosystem health and help readjust humanity's pursuit of a green, just, and equitable sustainability pathway.

One Health should serve primarily as an integrative lens for focusing and, when necessary, broadening, existing efforts nationally, regionally and globally. One Health could become a global model for addressing planetary issues grounded in science and addressing people's rights to health and a healthy environment.

Global support and national adoption of One Health approaches will require incorporation of the following six components. These components build on the Biodiversity-Inclusive One Health guidance adopted at the 14th Conference of the Parties of CBD (Convention on Biological Diversity, 2018), the deliberations included in the IPBES report on Biodiversity and Pandemics (Daszak et al., 2020), and in the published literature referenced herein.

1. Targets: Develop science-based targets, such as those of The Global Commons Alliance (https://globalcommonsalliance.org/alliance-projects/science-based-targets-network/) through an inclusive, intergovernmental process jointly led by stakeholders. The targets should include data management, accessibility, interoperability and sharing protocols using experience from efforts such as the Coalition for Epidemic Preparedness Innovations, USAID's Emerging Pandemic Threats Program, and OIE's worldwide monitoring system for diseases in wild animals (WAHIS-WILD). Such protocols would be enhanced by allowing development of open access data (e.g., ProMED—https://promedmail.org/about-promed/) and adherence to the Findability, Accessibility, Interoperability, and Reuse Principles of digital assets (https://www.go-fair.org/fair-principles/). The targets should also include community, national, and global monitoring, as well as comprehensive, seamless, surveillance networks and reporting frameworks that might incorporate, among others, artificial intelligence, remotely deployed assessment technology, citizen science, and indigenous monitoring. Development of the One Health equivalent of the metric "global burden of disease" for animals (Rushton et al., 2021) is a vital step toward such reporting. A common vocabulary is available to help in cross-sectoral collaboration (Buschardt et al., 2021) and the cross-program applicability that would allow for greater communication between protocols, tools and routines would be an essential contribution. Developing such targets would require intersectoral coordination structures and a whole-of-government approach.
2. Integration. Work with existing relevant organizations—including donors, multilateral fora and treaties, and national regulations to integrate activities relevant to One Health in extant entities. Experience at the national levels has shown that collaboration between stakeholders is the most common challenge to operationalizing One Health approaches (Ribeiro et al., 2019). Joint problem formulation, participatory public processes, and endorsement of

global frameworks such as the Global Health Security Agenda (https://ghsagenda.org/about-the-ghsa/) have all helped overcome such barriers (e.g., Sommanustweechai et al., 2016). Conduct a comprehensive scan of existing treaties and platforms, such as the Sustainable Development Goals, and how they fit together to deliver the integrated suite of One Health targets. For example, work with the CBD, Post-2020 Global Biodiversity Framework, and the UNFCC Conference of the Parties, as well as global initiatives as the Bonn Challenge and the UN Decade for restoration to consider incorporating One Health approaches as part of their recommendations, especially related to nature conservation. These conventions and initiatives already have ambitious targets on forest conservation and ecosystem restoration and could contribute to decreasing the risk of new pathogen spillovers by overlaying the information hotspots of emerging zoonotic diseases. The so-called Chemical Conventions, for example, Stockholm, Minamata and others, should also be brought into the engagement space.

3. Private Sector. Work with the private sector, particularly in agriculture, extractive industries, consumer food and beverages, livestock, pharmaceuticals, shipping, insurance, and re-insurance sectors, to incorporate One Health into existing or emerging practices. Private sector involvement, though critical, has been elusive: only 23 of 100 documented One Health networks involve private for-profit organizations (Khan et al., 2018). In globalized production and trade systems, basic products and raw materials are sourced from various parts of the world, often contributing to ecosystem loss or degradation and significantly increasing the local risk of pathogen spillover from animals to humans. Certification and tracking systems of supply chains should be mainstreamed and include One Heath parameters in their standards and procedures. Included within such approaches need to be considerations of environmental externalities related to One Health such as the impact of deforestation and wildlife trade, role of extensive commercial production of livestock and the well-established potential cost-savings in controlling their role in zoonotic disease spread (e.g., Dobson et al., 2020). Any such collaboration must include appropriate boundaries and safeguards to avoid conflicts of interest and address power imbalances.
4. Building capacity. Strengthen key areas and institutions such as those dealing with human health, domestic animal health, wild animal health, ecosystem and planetary health, and mainstream One Health into their work. This includes enhancing existing animal health frameworks, such as incorporating detection of novel pathogens into the OIE framework (OIE, 2021), as well as building capacity where it is severely limited, as in the field of wild animal health at the interface with humans, and developing inclusive One Health curricula and enhancing learning opportunities (e.g., Afrohun, 2021; Vicente et al., 2021).
5. Integrating science into policy. Build on existing efforts (e.g., Thailand [Sommanustweechai et al., 2016], PREDICT [Kelly et al., 2020], African efforts [Otu et al., 2021], European efforts [Chiesa et al., 2021]), and launch new efforts at national, regional, and global levels to implement One Health, broadening the set of disciplines involved, building capacity for research at the animal–human–environment interface, and engaging with policymakers at the parliamentary level, who can drive national laws and policy. Countries are already adopting One Health strategies and platforms but need to expand them and incorporate integrative standards to implement a whole of government response. The UN Biodiversity Lab (https://unbiodiversitylab.org), a consortium of UN organizations, the CBD, and GEF, with its mission to provide spatial data to decision makers, and Our World in Data (https://ourworldindata.org) are examples of platforms that could promote and house One Health data. Many organizations lack the expertise and funding to collect and share One Health data and particular attention is needed to analyze and incorporate heretofore neglected biodiversity and environmental components into One Health work (c.f. Gruetzmacher et al., 2020; Humboldt-Cachroeden et al., 2020). Building skills to work across disciplines and translate the core science of One Health into usable information for policy makers and the public will also be key, as will effective program monitoring.
6. Equity. Implement One Health programs emphasizing the need for equity to reflect the disproportionate health risks and disease burdens borne by vulnerable, underserved, and marginalized populations such as women, Indigenous Peoples, refugees, and local communities (c.f. Berrian et al., 2018; Garnier et al., 2020; Hillier et al., 2021). A review of 100 One Health networks showed that community groups were involved in only 10 of them (Khan et al., 2018). As with many of the other dimensions of One Health practice, equitable implementation will be highly specific to the social context within which the work is being done.

4 | CONCLUSION

Humans have sought to understand the world around us by dividing it into categories: wild versus domestic, the built environment versus the natural one, the health of human beings versus the health of all other living things.

We then built institutions to deal separately with those categories, and are now reaping the consequences of these divisions.

One of the consequences of these divisions has been to complicate any approach to ensuring health for all—all humans as well as all aspects of biodiversity and the natural world. Incorporating the One Health principles and components laid out in this paper and tailoring them on a case specific basis may be a solution to that problem. Overcoming such deeply entrenched ways of thinking and acting will require a mission with the focus, investment, and ambition of a moonshot to build a trans-sectoral approach to a connected, integrated vision of health. Support for such a mission is emerging. The Leaders' Pledge for Nature (https://www.leaderspledgefornature.org), endorsed by close to 90 countries, for example, called the world to:

> *"…re-double our efforts to end traditional silo thinking and to address the interrelated and interdependent challenges of biodiversity loss, land, freshwater and ocean degradation, deforestation, desertification, pollution and climate change in an integrated and coherent way, ensuring accountability and robust and effective review mechanisms, and lead by example through actions in our own countries."*

Marking its 75th anniversary, the United Nations is looking into advancing the One Health approach as a global governance model anchored in science and human rights. The Convention on Biological Diversity is also emphasizing that the underlying causes of pandemics are the same global environmental changes that drive biodiversity loss and climate change (Convention on Biological Diversity, 2020).

The COVID-19 pandemic has reinforced the understanding that all economic and social development depends on a healthy environment, which in turn depends on biological diversity. There can be no human health or equitable social progress without One Health. Human health cannot be meaningfully separated from other types of health, and a practice of One Health will help address pressing environmental challenges while also setting us on a path to green, equitable, and inclusive development.

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AUTHOR CONTRIBUTIONS

KHR, GdF, CG, and JA conceived of the paper and wrote initial and revised drafts. CMR, SA, DB, GB, RB, PD, CD, JG, KK, AL, BL, TL, DM, CR, MP, NS, CW, CW, KW, and CZ-T contributed to the revising of drafts.

DATA ACCESSIBILITY STATEMENT

There are no supporting data as no datasets were generated or analyzed during the preparation of the paper.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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