Key considerations for Official Development Assistance (ODA) in reducing the risk of emerging zoonotic diseases from wildlife

Wildlife Conservation Society

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The **Wildlife Conservation Society** (WCS), a global non-profit organization, *saves wildlife and wild places worldwide through science, conservation action, education, and inspiring people to value nature.* Established in 1895, today WCS maintains an on-the-ground presence in ~60 countries in Africa, Asia, the Pacific, and the Americas. In the last 125 years, WCS has helped nations and Indigenous Peoples establish and manage 245 parks and reserves protecting nature and has ongoing partnerships with more than 300 Indigenous Peoples and local communities (IPLCs). WCS is also the world's only global conservation organization with an embedded Wildlife Health Program. With more than 100 years of hands-on veterinary work, disease surveillance and ground-breaking scientific research, WCS has been the pioneer in promoting wildlife health as critical to saving wildlife and wild places. WCS initiated and remains a leader in the One World – One Health™ interdisciplinary approach.

In 2004, with the publication of the Manhattan Principles, WCS launched the modern One Health initiative – calling for recognition of "the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require." This integrated approach, called One Health, has since been adopted by the World Health Organization and others (and sometimes under other names, such as Planetary Health). The Principles, updated in 2019 as the Berlin Principles, discuss global health challenges at the nexus of human, animal, and ecosystem health. By engaging partners across conservation, public health, agriculture, and beyond, WCS provides critical information that influences policy and action.

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INTRODUCTION

Since COVID-19 emerged in Wuhan, China in December 2019, it has infected millions of people across six of the world's seven continents, and caused hundreds of thousands of deaths. The situation is dynamic and these numbers continue to increase. To reduce the spread of COVID-19, more than half of the world's population has been locked down, disrupting the global economy on a massive scale. Although there is substantial uncertainty, the International Monetary Fund predicts global economic losses at $9 trillion for 2020-2021, and a decline in GDP in advanced economies of 6.1%[1]. The cause of this pandemic was the spillover of a virus (SARS-CoV-2) from wildlife to people[2,3], possibly at a wildlife trading market[3,4]. Its global explosion has been enabled by unprecedented levels of human interconnectivity, mobility, and trade[5].

The majority of emerging infectious disease threats are zoonotic (diseases that are transmitted between animals and people). By tracking the origins of 335 emerging infectious diseases between 1940 and 2004, Jones et al. [6] found that 60% that were zoonotic, 72% of which originated in wildlife, including HIV/AIDs, Ebola, Hendra virus, Nipah Virus, Severe Acute Respiratory Syndrome (SARS), while 28% originated in domestic animals. There are an estimated 1.6 million unknown viruses in wildlife, of which roughly 700,000 are thought to have zoonotic potential[7]. COVID-19 and SARS are both linked to bats and to wildlife trade for human consumption[8]. The rapid transmission trajectories of both of these diseases demonstrate that human contact with wildlife (whether direct, i.e., handling or eating, or indirect, e.g., saliva, blood, feces or urine) can lead to potentially devastating consequences when a spillover spreads rapidly because of extraordinarily high levels of human and trade interconnectivity and mobility.

THE DRIVERS OF ZOONOTIC DISEASE RISK

The current pandemic underscores the need to understand the social, economic, and ecological conditions that drive the emergence and spread of zoonotic diseases, with the aim of reducing the likelihood of future zoonotic outbreaks and pandemics. While we recognize the need for preparedness and well-coordinated rapid responses to prevent spread, we focus our recommendations on the areas where we have relevant expertise and insights. There is substantial evidence that the loss and degradation of natural ecosystems and the commercial trade of wild animals for human consumption – especially in urban markets - increase the chance of spillover of zoonotic diseases to humans.

1. **Ecosystem loss and degradation expand the interface between intact ecosystems and human-dominated systems and increase the likelihood of human-wildlife contact:** Zoonotic disease outbreaks and pandemics are facilitated when natural ecosystems - especially tropical forests with their high biodiversity and pool of possible zoonotic diseases - are fragmented or degraded[9-12]. Forest landscapes undergoing rapid land-use change are particularly conducive to such disease

spillovers[13-16]. Without specific policies, incentives, and investments to maintain intact ecosystems, we will not be able to reduce this vulnerability in the future.

Deforestation and ecosystem fragmentation affect ecosystem integrity and spillover risk of zoonotic diseases through multiple pathways. Whenever the structure and composition of ecological communities change, the abundance of particular wildlife species, together with particular pathogens they host, can change, affecting spillover risk in ways that are difficult to predict[17]. Fragmentation and degradation of ecosystems increase the risk of spillover by creating 'edges' that increase the number of human-wildlife encounters within a given area or that enlarge the area over which human-wildlife contacts occur[12,18]. Increased human-wildlife contacts can occur in a multitude of ways[19]. Loss of wildlife habitat can lead to increased contact and spillovers, as wildlife moves out of natural ecosystems and into surrounding agricultural or peri-urban landscapes in search of food [20]. Certain livelihood activities, e.g., foraging for wild foods, hunting wild animals, collecting wood poles or non-timber forest products, that involve people moving into natural ecosystems, provide opportunities for disease transmission from wildlife to people[21-23]. In addition, infrastructure development, such as roads, and resource extraction, such as mining and industrial logging, can increase the risk of spread once a spillover event occurs by increasing human population density and connectivity[24].

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2. **Wildlife trade supply chains for human consumption increase the risk of disease spillover and spread:** Increased contact between people and wildlife along wildlife trade supply chains heightens the risk of disease transmission and spread[25]. Zoonotic disease transmission can occur at any point along the value chain, from hunting in the forest, to the point of consumption. While any single human-wildlife contact has a low risk of disease spillover from wildlife to people,

at each point in the supply chain, multiple direct and indirect contacts increase that risk. Live wildlife trade, large trade volumes, mixing of diverse species and their pathogens, and poor hygiene increase the risk of zoonotic disease infection and spread[23, 25, 26] . Urban markets, where wild species are butchered and meat is sold fresh, create conditions that are particularly conducive to the emergence of viral zoonotic diseases[27,28]. Live wild animals and raw wild meat are often transported long distances to satisfy urban demand, bringing novel pathogens from remote forest areas into the heart of populous cities. The mixing of large numbers of different species in close proximity, with individual animals being highly stressed and hence immune-compromised, and butchering of fresh carcasses in dense urban markets, create a conducive environment for zoonotic disease emergence, transmission and spread.

3. **Climate change increases complexity:** Accelerating climate change interacts in complex, synergistic ways with land use/land cover change, ecological change, emerging zoonotic diseases and social inequities[14,29]. Geographic patterns in climate, changes in climatic variability, and land-cover, affect the density and distribution of wildlife species and their associated disease reservoirs[30]. Extreme climatic events, such as intense rainfall and prolonged droughts, affect the timing and intensity of zoonotic disease outbreaks[30-34] . The combination of deforestation with extreme climate events is especially conducive to disease emergence and spread[35] Further, it has long been recognized that climate change, ecological change, as well as social inequities all interact to influence disease patterns, including those of pandemics[36].

STRATEGIC RECOMMENDATIONS: How ODA can can contribute to reducing the risk of future emerging zoonotic diseases from wildlife

Within a very short period of time, COVID-19 has affected most of humanity. The international community, including governments, intergovernmental organizations, civil society and the private sector - and indeed all of us as individuals - have a shared responsibility to take concrete actions to prevent similar zoonotic outbreaks and pandemic events in the future. Specific responsibilities and actions will vary according to geographic and development context, but a spirit of collective action will require that the ODA community support the efforts of low-income and low capacity countries to take preemptive action to address the conditions that continue to create the opportunity for catastrophic spillover events. While essential, immediate measures to address the current emergency are insufficient, and ODA investments in strategies for long-term change are also critical. Successful intervention to significantly decrease the probability of zoonotic disease spillover to people will require a set of interventions strategically targeted at multiple levels and scales. Below we outline a set of key recommendations and areas for investment:

1. **Support efforts that will decrease and eventually stop the loss and degradation of existing intact ecosystems, and where necessary undertake targeted restoration to significantly lower the probability of zoonotic disease transmission to humans.**

WCS [report](): *Links between ecological integrity, emerging infectious diseases originating from wildlife, and other aspects of human health - an overview of the literature*

Multiple lines of evidence indicate that ecological change and land-use land-cover change drive the emergence and transmission of zoonotic diseases. Maintaining ecosystem integrity by preventing degradation and fragmentation of intact ecosystems – especially tropical forests with their high levels of biodiversity - is one of multiple interventions needed to reduce the risks of future zoonotic spillover and disease outbreaks. A primary ODA intervention is to secure adequate funding for improved management of the existing protected area estate, especially where legal and physical infrastructure are in place to prevent ecosystem loss and degradation, while recognizing and respecting the rights of Indigenous Peoples. In addition, funding should be directed to address the wider landscapes surrounding these protected areas by: a) strategically identifying and effectively protecting additional areas of high ecological integrity or importance for biodiversity, including those that are owned, managed and governed by IPLCs; and b) investing in restoration projects that reduce fragmentation and increase overall ecosystem integrity.

In addition to direct funding for protected areas and surrounding landscapes and seascapes, ODA investments to support biodiversity-related research can increase understanding of biodiversity values and the interacting economic, social and ecological drivers of disease emergence, spread and impacts.

2. **To prevent expansion of the human-wildlife interface, which brings increased risk of disease spillover, agricultural development and infrastructure investments need rigorous measures to minimize the loss, degradation, and fragmentation of intact ecosystems.**

Large-scale investments in agricultural and infrastructure development are central to poverty alleviation and to ensuring food security. However, such projects frequently negatively impact ecosystem integrity. As such, where such developments are politically motivated; driven by unsubstantiated economic aspirations that lack rigorous economic, environmental and social cost-benefit assessments; or do not consider cumulative or cascading impacts among multiple projects[24] ODA investments should be avoided. Policy reforms and standards are needed that require explicit consideration of environmental, social and health consequences of proposed development, including the optimal location of development in relation to intact ecosystems to minimize loss of ecosystem integrity and to reduce human health impacts and ensuring free, prior and informed consent. This does not mean foregoing development. Rather it means developing and adopting a structured assessment framework for explicitly maximizing the economic benefits of development while minimizing environmental, social and human costs, as well as defining thresholds of negative environmental, social and human health damage that are unacceptable[38,39]. Any private capital that is crowded in alongside ODA should be held to the same standards. To reinforce the first line of defense above, there is also a need to increase development assistance that supports policies and practices to promote and appropriately value the ecological integrity of intact forests.

3. **Disrupt the rural-urban supply chain for the sale of wild animal species for human consumption by controlling the commercial trade and closing markets, while simultaneously protecting the nutrition and food security of Indigenous Peoples and rural communities.**

To substantively reduce the probability of new viral zoonotic disease outbreaks and pandemics, ODA investments should support national efforts to control and stop the transportation and commercial sale of wild animal species for human consumption, particularly the sale of live wild animals and fresh meat in commercial urban markets. This will require support of a) coordinated legislation; b) policy reform with associated behavior change and public support campaigns; as well as c) increased and sustained ODA investment in law enforcement and information gathering to provide actionable intelligence to eliminate illegal wildlife trade across subnational, national, regional, and international levels. Support of policy and legal reform must be informed by a transparent and consultative processes to ensure the perspectives of all stakeholders (e.g., actors in the supply chain, virologists, epidemiologists, disease ecologists, public health experts, national governments, law enforcement agencies and conservationists) are equitably considered. Support is also needed for programs that promote alternative economic opportunities for rural actors engaged in wild meat consumption supply chains to diversify income generating activities.

Equally, it is important to recognize that many local communities directly depend on natural resources for their livelihoods. This includes subsistence hunting practices of IPLCs, for whom there are often few or no other sources of protein[40-42]. Here, a focus should be on minimizing and mitigating risk of disease transmission from wildlife to hunters by, e.g., assessing the level of the risk associated with hunting or eating different species and discouraging the hunting and consumption of high-risk species; through participatory processes to build on traditional hunting best practices; as well as through appropriate public health messaging.

4. **Invest in high-impact, community-led health systems, together with outreach, communication and reporting systems in partnership with IPLCs to reduce the risk of wildlife-to-human disease transmission.**

IPLCs who directly depend on hunting and foraging for wild foods and other natural resources are correspondingly vulnerable to emerging zoonotic diseases, especially where the natural ecosystems on which they depend are disrupted and degraded. In traditional public health structures, information flows through a hierarchy of health care providers to local or national authorities, who then communicate to the public through periodic announcements[43]. These systems are not effective for IPLCs in remote areas. Today, more than 1 billion people live their entire lives without seeing a single health care worker. ODA investments should support (a) collaborative design and implementation of community-led health systems that are effective for IPLCs; (b) establishment of communication and reporting mechanisms that are appropriate for IPLCs; and (c) participatory epidemiological systems. Participatory epidemiological systems use mobile technology, surveys or discussion to collect and share information among multiple stakeholders and experts. Collaboratively designed community health systems and participatory epidemiological systems can transform local community members from passive recipients of information or treatment to active members of a collaborative community. Community monitoring can provide detailed data, e.g., reporting of animals found dead in the forest, or monitoring wildlife populations and movements, and function on the frontlines of spillover as part of a public health surveillance and early warning system [44]. This needs to be accompanied by outreach and training on how to minimize the risk of zoonotic disease transmission, e.g., by reducing direct and indirect contact with high-risk species and on proper hygiene when handling live or dead wildlife, including wild meat.

5. **Establish and invest in a multilateral, surveillance, research and early warning initiative for zoonotic diseases.**

The risk of emerging zoonotic diseases from wildlife is greatest in areas of high biodiversity such as tropical forests. These are typically found in tropical, often developing countries. In contrast, most global scientific resources for surveillance and research are targeted to wealthier, developed countries (Europe, North America, Australia and some parts of Asia)[6]. To rectify this bias, we recommend that ODA investments should support the creation of a surveillance and 'early warning' system, which effectively and efficiently targets high risk geographies, particularly in Africa, Latin America and Asia.

To reduce the likelihood of future zoonotic outbreaks and pandemics, such early warning monitoring should follow an integrative, systems approach, that brings together multiple disciplines, e.g., from ecology, epidemiology, public health, geography, climate science and economics, as well as the perspectives of public and private sectors, civil society and Indigenous Peoples and local communities. Initial screening can identify areas of rapid land-use land-cover change, and high population densities in proximity to intact ecosystems, as well as locations of commercial wildlife markets and other risk factors. Within these frontiers of risk, remote monitoring can be augmented with *in situ* monitoring by relevant disciplinary experts and local stakeholders. The system can be part of an overarching, multi-sectoral, multi-country One Health approach that includes additional interventions to secure human, animal and wildlife health in the future.

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