



TOWARDS POST-2020 EXPERTISE ON #28

EMERGING INFECTIOUS DISEASES - BIODIVERSITY AS A SOLUTION TO A HEALTHY PLANET FOR HEALTHY PEOPLE



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Epidemics and emergence of infectious diseases are symptoms of dysfunctional relationships between humans, livestock and biodiversity. As we face decades of growing global epidemics and emerging diseases, and despite much scientific evidence, little has been done to reduce their global and local roots or to implement solutions based on healthy ecosystems.

A growing number of countries face more and more epidemics of zoonotic and vector-borne diseases, some of them originating from wildlife. Epidemics are increasingly becoming pandemics as globalization and international trade favour the global spread of infectious diseases.

In the meantime, countries are less and less resilient to health crises. The causes of the increasing number of zoonotic epidemics and emerging infectious diseases are associated with the biodiversity crisis, the ongoing deforestation, and the loss of habitats traditionally managed for the benefit of commercial plantations. The biodiversity crisis is a major modification of the interspecific interactions essential for the proper functioning of ecosystems and the quality of ecosystem services, in particular when it comes to the essential task of regulating the transmission of diseases.

“HUMAN ACTIVITY HAS ALTERED VIRTUALLY EVERY CORNER OF OUR PLANET, FROM LAND TO OCEAN. AND AS WE CONTINUE TO RELENTLESSLY ENCROACH ON NATURE AND DEGRADE ECOSYSTEMS, WE ENDANGER HUMAN HEALTH. IT IS PRECISELY BECAUSE OF THE INTERCONNECTED NATURE OF ALL LIFE ON THIS PLANET, THAT AN AMBITIOUS POST-2020 BIODIVERSITY FRAMEWORK MATTERS GREATLY, AND WE REMAIN COMMITTED TO EFFORTS TO MAKE THIS HAPPEN.”

Inger Andersen, Executive Director,
United Nations Environment
Program



Field work team investigating rodent-borne diseases in Cambodia. © Serge Morand

1. ARE PANDEMICS RELATED TO BIODIVERSITY LOSS?

A GREAT ACCELERATION OF EPIDEMICS LINKED TO LIVESTOCK EXPANSION

The increasing number of zoonotic epidemics recorded in recent decades is correlated with the biodiversity crisis worldwide. The temporal analysis of global data shows that the increase in livestock is a major cause of both the decline in biodiversity and the increase in epidemics¹. From 1960 to 2016, the number of cattle heads increased by 60% to reach 1.6 billion. At the same time, the number of pigs increased by 200% to 1.5 billion, and the number of chickens by 320% to 22 billion. The biomass of livestock today is greater than that of all humans, and there is more poultry than all wild birds combined.

The growing importance of livestock on the planet is threatening biodiversity². The livestock expansion in places rich in biodiversity creates new interfaces and proximities with wildlife favouring spillover of potential pathogens hosted in wildlife reservoirs. In combination with habitat degradation, the expansion of livestock expansion is increasingly endangering human and animal health.

A GREAT ACCELERATION OF EPIDEMICS LINKED TO DEFORESTATION AND EXPANSION OF COMMERCIAL PLANTATIONS

Along with the conversion of traditionally managed habitats into commercial plantations through unsustainable reforestation, deforestation is a major cause of biodiversity loss and has major consequences on human health³. The global increase in outbreaks of zoonotic and vector-borne diseases from 1990 to 2016 appears to be linked with deforestation, mostly in tropical countries, and with afforestation and tree plantations, mostly in temperate countries. Outbreaks of vector-borne diseases are likely associated with the expansion of palm oil plantations.

The degradation and simplification of habitats through intensive agriculture and animal husbandry have major consequences on ecosystem functions and ecological regulations. Defaunation associated with habitat degradation is characterized by the loss of predators and competitors of reservoir animals and vectors. Relaxing ecological regulations of reservoirs and vectors ultimately favours the spillover of potential pathogens circulating in reservoirs to domestic animals and humans.

The ecosystem service regulating disease transmission is neutralized. The loss of biodiversity in degraded and simplified habitats decreases their ecological resilience as well as their resilience to epidemics.

A GLOBAL EXPANSION OF EPIDEMICS LINKED TO THE GLOBALIZATION OF TRAVELS AND GOODS

More epidemics of zoonotic and vector-borne diseases are occurring. Some of them originate from wildlife, and they affect a growing number of countries. Epidemics are increasingly becoming pandemics. Globalization and international trade favour the global spread of infectious diseases, making countries less and less resilient to health crises.

The great acceleration of epidemics is a consequence of the great acceleration of trade and travels. Since the year 1960, the number of air transport passengers has increased by 1,300%, from 500 million passengers transported in 1960 to more than 4 billion passengers in 2019 (before its dramatic collapse in 2020). Similar dramatic increases are noted for air freight or shipping containers. However, disease emergence takes place in an ecological, social, and economic context, which requires a thorough understanding of the local conditions involved in its interspecific transmission.

In the case of Covid-19, it was probably a spillover of a bat coronavirus to a potential intermediate host, followed by an expanding human-to-human transmission. In other words, it requires understanding how a virus that circulated quietly in bat populations somewhere in Asia could end up spreading a few months later to all human populations.

“HUMAN ACTIVITIES SUCH AS INTENSIVE DEFORESTATION OR WILDLIFE TRADE HAVE AN IMPACT ON THE HEALTH AND BALANCE OF ECOSYSTEMS. CONSIDERING THAT COVID-19 HAS POSSIBLY ORIGINATED FROM WILDLIFE, IT IS CRUCIAL TO ADDRESS THE RISK OF SPILLOVER EVENTS AT THE HUMAN-LIVESTOCK-ECOSYSTEMS INTERFACE, WHILST PRESERVING WELFARE AND BIODIVERSITY.”

Monique Eloit, Director General, World Organisation for Animal Health (OIE)

CLIMATE CHANGE AND EXTREME EVENTS EXACERBATE RISKS OF ZOOLOGICAL DISEASES

A growing body of scientific evidence suggests that climate change is already driving some diseases to higher latitudes and/or higher altitudes. Such effects will likely accelerate in the near future as global warming continues, as recently summarized by the 2020 report of The Lancet Countdown on health and climate change⁴. The burden of climate change is expected to contribute to 37% of the total number of human years lost



Deforestation Mondolkiri Cambodia. © Serge Morand

⁵ McIntyre K.M. et al. Systematic assessment of the climate sensitivity of important human and domestic animals pathogens in Europe. *Scientific Reports* 7: 7134 (2017).

⁶ Alliance for Tropical Forests Conservation. <https://cutt.ly/gn3RYZD>

(expressed by the disability-adjusted-life-years or DALY) arising from human infectious diseases. Most infectious diseases are climate-sensitive with rainfall and temperature as primary drivers⁵. Importantly, zoonotic diseases are more climate sensitive than human- or animal-only infectious diseases, suggesting that climate change will exacerbate risks of zoonotic and vector-borne diseases.

THE LESSONS OF COVID-19 AND THE FAILURE OF PREDICTION AND PREPAREDNESS

A major pandemic was foreseeable. The World Health Organization (WHO) called it “disease X” and has listed several potential infectious agents such as influenza viruses and coronaviruses. Important programs, with considerable resources, have been put in place to forecast, prevent, and prepare. However, the current pandemic cruelly highlights the failure of preparedness strategies and forecasts for the current epidemic.

A similar failure has already been noted with the Ebola outbreak in West Africa and even for the swine flu (H1N1) that emerged from a mega pig farm in North America. Preparedness through bio-surveillance and biosecurity measures or by cataloguing all the viruses of wild animals, while important, are clearly not enough to prevent the emergence of zoonoses or to reduce the conditions favourable to pandemics. We need to better identify the socio-ecological conditions that favour the local emergence of infectious disease and that enhance their global transmission. Importantly, we need to act by preventing habitat destruction, intensive farming practices, forest conservation and reducing wildlife trade.

2. DOES INTERNATIONAL OR NATIONAL GOVERNANCE MATTER?

NEGATIVELY?

Improved policy instruments are needed to halt biodiversity loss, including better preservation of native forests and better management of afforestation through ecological principles to increase their contribution not only to biodiversity or carbon sequestration but to local livelihoods and health. Improving the management of preserved areas in order to avoid their fragmentation, through the construction of roads or mining projects should reduce contact between wildlife, livestock and humans and spillover of pathogens. International governance of forests and their contributions to the health of the planet and populations should be implemented⁶.

Wildlife trade should be prohibited when it endangers species or when wildlife impoverishment affects local livelihoods. In addition, there is no international organization specifically responsible for wildlife health that can monitor the emergence of wildlife diseases, but that could help implement sanitary measures in wet markets, wildlife farms and transnational customs controls.

Globalization and integration into the WTO's open market for agriculture have major consequences for forests, traditionally managed agricultural lands, commercial plantations, but also the expansion of livestock. Solutions to avoid global risks to the environment and health depend on several country-specific factors, namely the growth of human pressures on habitats, unsustainable food production, and changes in eating habits.

POSITIVELY

Since 2008, the “One Health” approach supported by the tripartite agreement WHO - OIE (World Organisation for Animal Health) - FAO (Food and Agriculture Organisation of the United Nations) has attempted to address threats related to zoonotic diseases. Yet, an essential pillar supporting the environmental dimension, such as biodiversity, which contributes to health, is missing.

“JANUARY'S ONE PLANET SUMMIT SAW WORLD LEADERS HIGHLIGHT THE DESTRUCTION OF NATURE AS INCREASING THE RISK OF FUTURE PANDEMICS, AND THE LAUNCH OF THE PREZODE INITIATIVE, THE FIRST GLOBAL INITIATIVE TO HELP PREVENT THE NEXT PANDEMIC THROUGH COLLABORATIVE RESEARCH AND REDUCING PRESSURES ON BIODIVERSITY ... LET US SET IN MOTION THE POLITICAL MOMENTUM NEEDED TO DEVELOP A ROBUST AND AMBITIOUS POST-2020 GLOBAL BIODIVERSITY FRAMEWORK.”

Elizabeth Maruma Mrema, Executive Secretary, Convention on Biological Diversity

The United Nations Environment Program (UNEP), the world's leading authority on the environment, has joined three international organizations to improve the One Health approach. UNEP hosts many multilateral environmental agreements (MEAs), such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity (CBD), the Convention on Migratory Species and the United Nations Convention to Combat Desertification (UNCCD). Through its mandate of international environmental governance, UNEP appears to be able to anchor a new approach to the challenges of a healthy planet for all. SMART measures and actions can be implemented in a transformative way under the One Health umbrella.



Civet raised as a pet in North-eastern Thailand. © Serge Morand

The tripartite partnership WHO - OIE - FAO plus UNEP has launched a One Health High Level Expert Panel (OHHLEP) that will provide analyses on the scientific evidence on the interlinkages between human, animal, and ecosystem health. Specifically, the OHHLEP will assess the impacts of food systems (livestock farming, wildlife hunting and trade, aquaculture, animal products processing) and the ecological and environmental factors that may be contributing to zoonotic diseases and spillover events.

A new international initiative for Preventing Zoonotic Disease Emergence (PREZODE) has been launched at the One Planet Summit for Biodiversity organized on 11 January 2021. The PREZODE program aims at bringing together international research teams to prevent the risk of the emergence of zoonoses at the interface between wildlife and livestock.

3. WHICH SOLUTIONS?

A new approach to health and the environment - One Health or Planetary Health - requires to clearly identify disciplinary and sectoral boundaries to develop collaborative and jointly constructed health and environmental policies involving communities of citizens, scientists, public health, and other administrative bodies as part of a new social-ecological health governance.

Our ability to avoid future health and social crises linked to zoonoses will depend on our capacities to implement a new health and environmental approach, which requires a better integration of scientific knowledge into decision-making.

As a result, protected areas should play an important role with a better spatial planning ⁷, both in size and location, with increasing connectivity but reducing the human, livestock, wildlife interfaces, which ultimately will mitigate spillover events while contributing to biodiversity conservation.

The traditional vision of citizens, education, communities, practitioners, decision-makers must be overcome to move towards a shared understanding of knowledge, representations and values carried by the various stakeholders.

By bringing all sectors into the discussion such as socio-economic development, food security, livelihoods of IPLCs, national and international trade of animals (both livestock and wildlife) we will be able to develop a new governance for biodiversity and health with the inclusion of all stakeholders, all sectors of government, the private sector, and the civil society.

4. WHICH IMPLEMENTATION?

New global initiatives give the opportunity to consider the socio-ecosystems and the interactions between the sociocultural practices and a shared health (animals, humans, ecosystems). The dialogue between science and policy makers is crucial in transforming political commitment into concrete involvement. Moving from strategy to strategy is no longer an option. "We should step back, change the rules and start to act simultaneously, internationally and locally in a genuine way" ⁸.

Scientists, public health practitioners, local communities, stakeholders and policymakers can reconcile the need to preserve biodiversity while taking into account the disease health risks. The development of collaborative research between scientists and local communities will assess the disease regulating service provided by forests and other ecosystems. Such collaborations will help implementing a better governance of forests and their contributions to a healthy planet and people together."

We need a positive vision of a shared health for humans, animals, and ecosystems. Novel research approaches should be implemented promoting nature-based and ecosystem-based solutions ⁹ to improve social-ecological resilience together with resilience to epidemics.

A research program could be implemented with the help of international organisations such as UNEP, IUCN, UNESCO (with its mandates in education and science, carrying the Man and the Biosphere program based on the ecosystem approach used in biosphere reserves), national and international programs, local and international NGOs, initiative from private sectors, and local communities.

⁷ Gaugitsch Helmut, Heissenberger Andreas, Expertise on Landscape Approach (#13): <https://cutt.ly/qn3Rx4k>

⁸ Morand S. Lajaunie C. Biodiversity and Covid-19: a report and a long road ahead to avoid a next pandemic. One Earth, in press, (2021)

⁹ Bulkeley Harriet, McKenna Davis, Expertise on Nature-Based Solutions (#7): <https://cutt.ly/rn3Rv9p>

Cover photo
Roof rat (*Rattus tanezum*) reservoirs of several zoonotic diseases including new emerging diseases.
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