

# 'Tip of the iceberg': is our destruction of nature responsible for Covid-19?

DESTRUCTION OF HABITAT AND LOSS OF BIODIVERSITY ARE CREATING THE PERFECT CONDITIONS FOR DISEASES LIKE COVID-19 TO EMERGE

*As habitat and biodiversity loss increase globally, the novel coronavirus outbreak may be just the beginning of mass pandemics*



Illicit Endangered Wildlife Trade in Mōng La, Shan, Myanmar Photo courtesy of Dan Bennett from Wikimedia, licensed under CC BY 2.0.



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*March 17, 2020* — Mayibout 2 is not a healthy place. The 150 or so people who live in the village, which sits on the south bank of the Ivindo River, deep in the great Minkebe forest in northern Gabon, are used to occasional bouts of diseases such as malaria, dengue, yellow fever and sleeping sickness. Mostly they shrug them off.

But in January 1996, Ebola, a deadly virus then barely known to humans, unexpectedly [spilled out of the forest](#) in a wave of small epidemics. The disease killed 21 of 37 villagers who were reported to have been infected, including a number who had carried, skinned, chopped or eaten a chimpanzee from the nearby forest.



A dead monkey sold as bushmeat hangs outside a villager's house in north-east Gabon. Photograph: Christine Nesbitt/AP

I traveled to Mayibout 2 in 2004 to investigate why deadly diseases new to humans were emerging from biodiversity “hot spots” like tropical rainforests and bushmeat markets in African and Asian cities.

It took a day by canoe and then many hours down degraded forest logging roads passing Baka villages and a small gold mine to reach the village. There, I found traumatized people still fearful that the deadly virus, [which kills up to 90% of the people it infects](#), would return.

Villagers [told me](#) how children had gone into the forest with dogs that had killed a chimp. They said that everyone who cooked or ate it got a terrible fever within a few hours. Some died immediately, while others were taken down the river to hospital. A few, like Nesto Bematsick, recovered. “We used to love the forest, now we fear it,” he told me. Many of Bematsick’s family members died.

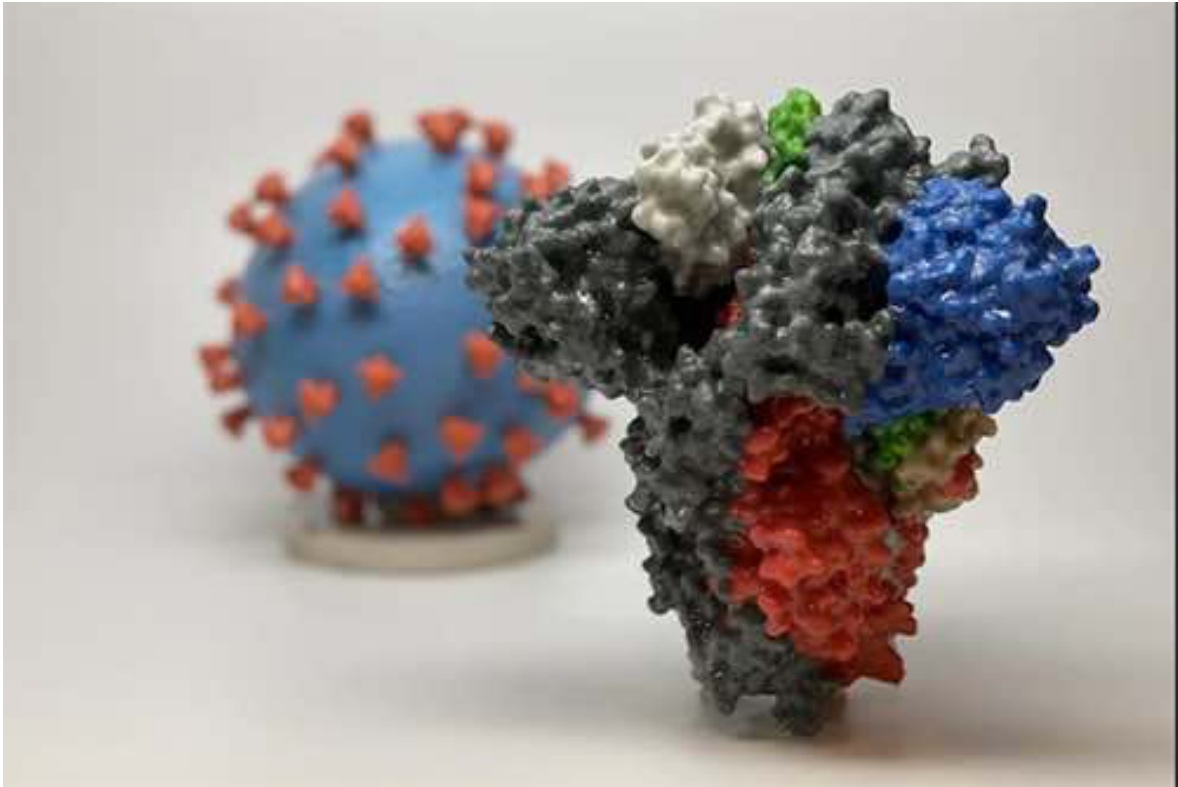
Only a decade or two ago it was widely thought that tropical forests and intact natural environments teeming with exotic

wildlife threatened humans by harboring the viruses and pathogens that lead to new diseases in humans like Ebola, HIV and dengue.



Logging and other habitat disruption creates new opportunities for disease organisms to move from non-human animals to people. Photo courtesy of euflegredd from Flickr licensed under [CC BY-NC-SA 2.0](https://creativecommons.org/licenses/by-nc-sa/2.0/)

But a number of researchers today think that it is actually humanity's destruction of biodiversity that creates the conditions for new viruses and diseases like COVID-19, the viral disease that emerged in China in December 2019, to arise — with profound health and economic impacts in rich and poor countries alike. In fact, a new discipline, planetary health, is emerging that focuses on the increasingly visible connections among the well-being of humans, other living things and entire ecosystems.



A 3D print of a spike protein and a Covid-19 virus particle. On the virus model (behind), the virus surface (blue) is covered with spike proteins (red) that enable the virus to enter and infect human cells. Photograph: National Institutes of Health/AFP via Getty Images

Is it possible, then, that it was human activity, such as road building, mining, hunting and logging, that triggered the Ebola epidemics in Mayibout 2 and elsewhere in the 1990s and that is unleashing new terrors today?

“We invade tropical forests and other wild landscapes, which harbor so many species of animals and plants — and within those creatures, so many unknown viruses,” David Quammen, author of *Spillover: Animal Infections and the Next Pandemic*, [recently wrote](#) in the New York Times. “We cut the trees; we kill the animals or cage them and send them to markets. We disrupt ecosystems, and we shake viruses loose from their natural hosts. When that happens, they need a new host. Often, we are it.”



Bats are trapped in nets to be examined for possible viral load at the Franceville International Centre of Medical Research in Gabon. Photograph: Steeve Jordan/AFP via Getty Images

## Increasing Threat

[Research suggests](#) that outbreaks of animal-borne and other infectious diseases like Ebola, SARS, bird flu and now COVID-19, caused by a novel coronavirus, are on the rise. Pathogens are [crossing from animals to humans](#), and many are now able to spread quickly to new places. The U.S. Centers for Disease Control and Prevention (CDC) estimates that three-quarters of “new or emerging” diseases that infect humans originate in nonhuman animals.

Some, like rabies and plague, crossed from animals centuries ago. Others, like Marburg, which is thought to be transmitted by bats, are still rare. A few, like COVID-19, which emerged last year in Wuhan, China, and MERS, which is linked to camels in the Middle East, are new to humans and spreading globally.

Other diseases [that have crossed into humans](#) include [Lassa](#)

[fever](#), which was first identified in 1969 in Nigeria; Nipah from Malaysia; and SARS from China, which killed more than 700 people and traveled to 30 countries in 2002–03. Some, like Zika and West Nile virus, which emerged in Africa, have mutated and become established on other continents.



The emergence of COVID-19 as a global threat is drawing attention to the important connections between human and ecosystem well-being. Photo courtesy of Chad Davis from Flickr licensed under [CC BY-SA 2.0](#).

Kate Jones, chair of ecology and biodiversity at UCL, calls emerging animal-borne infectious diseases an “increasing and very significant threat to global health, security and economies.”

### **Amplification Effect**

In 2008, Jones and a team of researchers [identified](#) 335 diseases that emerged between 1960 and 2004, at least 60% of which came from non-human animals.

Increasingly, says Jones, these zoonotic diseases are linked to environmental change and human behavior. The disruption of pristine forests driven by logging, mining, [road building](#)

[through remote places](#), rapid urbanization and population growth is bringing people into closer contact with animal species they may never have been near before, she says.

The resulting transmission of disease from wildlife to humans, she says, is now “a hidden cost of human economic development. There are just so many more of us, in every environment. We are going into largely undisturbed places and being exposed more and more. We are creating habitats where viruses are transmitted more easily, and then we are surprised that we have new ones.”

Jones studies how land use change contributes to the risk. “We are researching how species in degraded habitats are likely to carry more viruses which can infect humans,” she says. “Simpler systems get an amplification effect. Destroy landscapes, and the species you are left with are the ones humans get the diseases from.”





UCL biodiversity expert Kate Jones calls the spread of disease from wildlife to humans “a hidden cost of human economic development.” Photo courtesy of Kate Jones

“There are countless pathogens out there continuing to evolve which at some point could pose a threat to humans,” says Eric Fevre, chair of veterinary infectious diseases at the University of Liverpool’s [Institute of Infection and Global Health](#). “The risk [of pathogens jumping from animals to humans] has always been there.”

The difference between now and a few decades ago, Fevre says, is that diseases are likely to spring up in both urban and natural environments. “We have created densely packed populations where alongside us are bats and rodents and birds, pets and other living things. That creates intense interaction and opportunities for things to move from species to species,” he

says.



Disease ecologist Thomas Gillespie with primatologist Jane Goodall. Photograph: Courtesy of Thomas Gillespie

## Tip of the Iceberg

“Pathogens do not respect species boundaries,” says disease ecologist Thomas Gillespie, an associate professor in Emory University’s [Department of Environmental Sciences](#) who studies how shrinking natural habitats and changing behavior add to the risks of diseases spilling over from animals to humans.

“I am not at all surprised about the coronavirus outbreak,” he says. “The majority of pathogens are still to be discovered. We are at the very tip of the iceberg.”

Humans, says Gillespie, are creating the conditions for the spread of diseases by reducing the natural barriers between virus host animals — in which the virus is naturally circulating — and themselves. “We fully expect the arrival of pandemic influenza; we can expect large-scale human mortalities; we can expect other pathogens with other impacts. A disease like Ebola is not easily spread. But something with a mortality rate of Ebola spread by something like measles would be catastrophic,”

Gillespie says.

Wildlife everywhere is being put under more stress, he says. “Major landscape changes are causing animals to lose habitats, which means species become crowded together and also come into greater contact with humans. Species that survive change are now moving and mixing with different animals and with humans.”

Gillespie sees this in the U.S., where suburbs fragmenting forests raise the risk of humans contracting Lyme disease. “Altering the ecosystem affects the complex cycle of the Lyme pathogen. People living close by are more likely to get bitten by a tick carrying Lyme bacteria,” he says.



The disruption of pristine forests driven by logging, mining, road building, rapid urbanisation and population growth is bringing people into closer contact with wildlife, increasing the risk of disease. Photograph: Samir Tounsi/AFP/Getty Images

Yet human health research seldom considers the surrounding natural ecosystems, says Richard Ostfeld, distinguished senior scientist at the Cary Institute of Ecosystem Studies in Millbrook, New York. He and others are developing the emerging discipline of planetary health, which looks at the links

between human and ecosystem health.



Disease ecologist Richard Ostfeld is one of a growing number of researchers looking at the human health impacts of ecosystem changes through a “planetary health” lens. Photo courtesy of Robin Moore © Cary Institute of Ecosystem Studies

“There’s misapprehension among scientists and the public that natural ecosystems are the source of threats to ourselves. It’s a mistake. Nature poses threats, it is true, but it’s human activities that do the real damage. The health risks in a natural environment can be made much worse when we interfere with it,” he says.

Ostfeld points to [rats](#) and [bats](#), which are strongly linked with the direct and indirect spread of zoonotic diseases. “Rodents and some bats thrive when we disrupt natural habitats. They are the most likely to promote transmissions [of pathogens]. The more we disturb the forests and habitats the more danger

we are in,” he says.

Felicia Keesing, professor of biology at Bard College, New York, studies how environmental changes influence the probability that humans will be exposed to infectious diseases. “When we erode biodiversity, we see a proliferation of the species most likely to transmit *new* diseases to us, but there’s also good evidence that those same species are the best hosts for *existing* diseases,” she wrote in an email to Ensia.



Dead pangolins seized by authorities in North Sumatra. Disease ecologists argue that viruses and other pathogens are likely to move from animals to humans in wildlife markets. Photograph: Gatha Ginting/AFP via Getty Images

## **The Market Connection**

Disease ecologists argue that viruses and other pathogens are also likely to move from animals to humans in the many informal markets that have sprung up to provide fresh meat to fast-growing urban populations around the world. Here

animals are slaughtered, cut up and sold on the spot.

The “wet market” (one that sells fresh produce and meat) in Wuhan, thought by the Chinese government to be the starting point of the current COVID-19 pandemic, was known to sell [numerous wild animals](#), including live wolf pups, salamanders, crocodiles, scorpions, rats, squirrels, foxes, civets and turtles.

Equally, urban markets in west and central Africa see monkeys, bats, rats and dozens of species of bird, mammal, insect and rodent slaughtered and sold close to open refuse dumps and with no drainage.

“Wet markets make a perfect storm for cross-species transmission of pathogens,” says Gillespie. “Whenever you have novel interactions with a range of species in one place, whether that is in a natural environment like a forest or a wet market, you can have a spillover event.”



Bushmeat is one channel through which viruses can travel from wild animals to humans. Photo courtesy of Karsing Megu & Victor Meyer-Rochow.

The Wuhan market, along with others that sell live animals, has been shut by the Chinese authorities, and the government in February [outlawed trading and eating wild animals](#) except for fish and seafood. But bans on live animals being sold in urban areas or informal markets are not the answer, say some scientists.

“The wet market in Lagos is notorious. It’s like a nuclear bomb waiting to happen. But it’s not fair to demonize places which do not have fridges. These traditional markets provide much of the food for Africa and Asia,” says Jones.

“These markets are essential sources of food for hundreds of millions of poor people, and getting rid of them is impossible,” says Delia Grace, a senior epidemiologist and veterinarian with the International Livestock Research Institute, which is based in Nairobi, Kenya. She argues that bans force traders underground, where they may pay less attention to hygiene.

Fevre and Cecilia Tacoli, principal researcher in the human settlements research group at the International Institute of Environment and Development (IIED), [argue in a blog post](#) that “rather than pointing the finger at wet markets,” we should look at the burgeoning trade in wild animals.

“[I]t is wild animals rather than farmed animals that are the natural hosts of many viruses,” they write. “Wet markets are considered part of the informal food trade that is often blamed for contributing to spreading disease. But ... evidence shows the link between informal markets and disease [is not always so clear cut](#).”



A bushmeat stall with pangolins, bush rats and tiger cats for sale on the roadside outside Bata in Equatorial Guinea. Photograph: Carl de Souza/AFP/Getty Images

## Changing Behavior

So what, if anything, can we do about all of this?

Jones says that change must come from both rich and poor societies. Demand for wood, minerals and resources from the Global North leads to the degraded landscapes and ecological disruption that drives disease, she says. “We must think about global biosecurity, find the weak points and bolster the provision of health care in developing countries. Otherwise we can expect more of the same,” she says.

“The risks are greater now. They were always present and have been there for generations. It is our interactions with that risk which must be changed,” says Brian Bird, a research virologist at the University of California, Davis School of Veterinary Medicine One Health Institute, where he leads Ebola-related surveillance activities in Sierra Leone and elsewhere.

“We are in an era now of chronic emergency,” Bird says.



“Diseases are more likely to travel further and faster than before, which means we must be faster in our responses. It needs investments, change in human behavior, and it means we must listen to people at community levels.”



A poster in Beijing promoting wildlife as friends instead of food, after a crackdown on wild animal markets following the coronavirus outbreak. Photograph: Andy Wong/AP

Getting the message about pathogens and disease to hunters, loggers, market traders and consumers is key, Bird says. “These spillovers start with one or two people. The solutions start with education and awareness. We must make people aware things are different now. I have learned from working in Sierra Leone with Ebola-affected people that local communities have the hunger and desire to have information,” he says. “They want to know what to do. They want to learn.”

Fevre and Tacoli advocate rethinking urban infrastructure, particularly within low-income and informal settlements. “Short-term efforts are focused on containing the spread of infection,” [they write](#). “The longer term — given that new infectious diseases will likely continue to spread rapidly into and within cities — calls for an overhaul of current approaches

to urban planning and development.”

The bottom line, Bird says, is to be prepared. “We can’t predict where the next pandemic will come from, so we need mitigation plans to take into account the worst possible scenarios,” he says. “The only certain thing is that the next one will certainly come.”