# Dynamics of zoonotic spillover
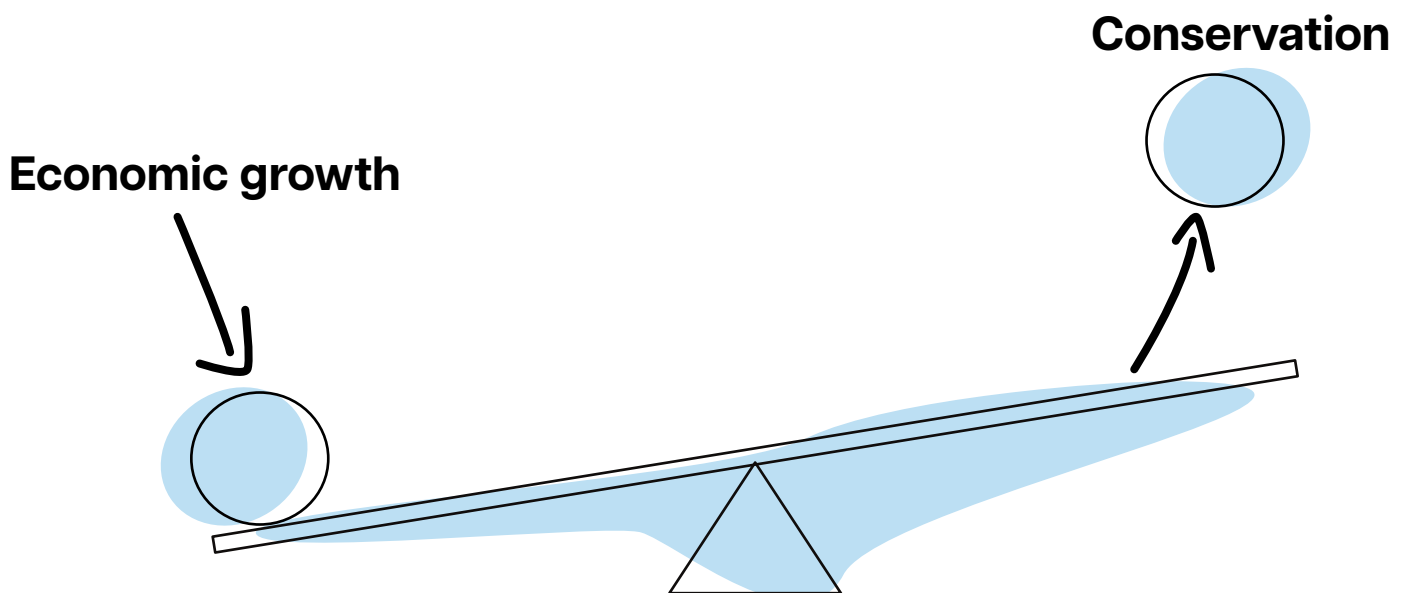
What is zoonotic spillover?

◆ Many of our recent epidemics and pandemics have involved diseases that come from wildlife, such as Ebola, SARS, and COVID-19.

◆ These outbreaks are the result of what is called a **zoonotic spillover event**: the transmission of a pathogen from wildlife and livestock to people. Zoonotic spillover events are becoming increasingly frequent, with devastating impacts on global health.

◆ There are **several ways that people interact with wildlife** which drives zoonotic spillover events:

1. Human-wildlife encounters as human activities and populations expand into wildlife habitat; and

2. Hunting, trade and consumption of wildlife, which is further amplified due to commercialization.

**Livestock**
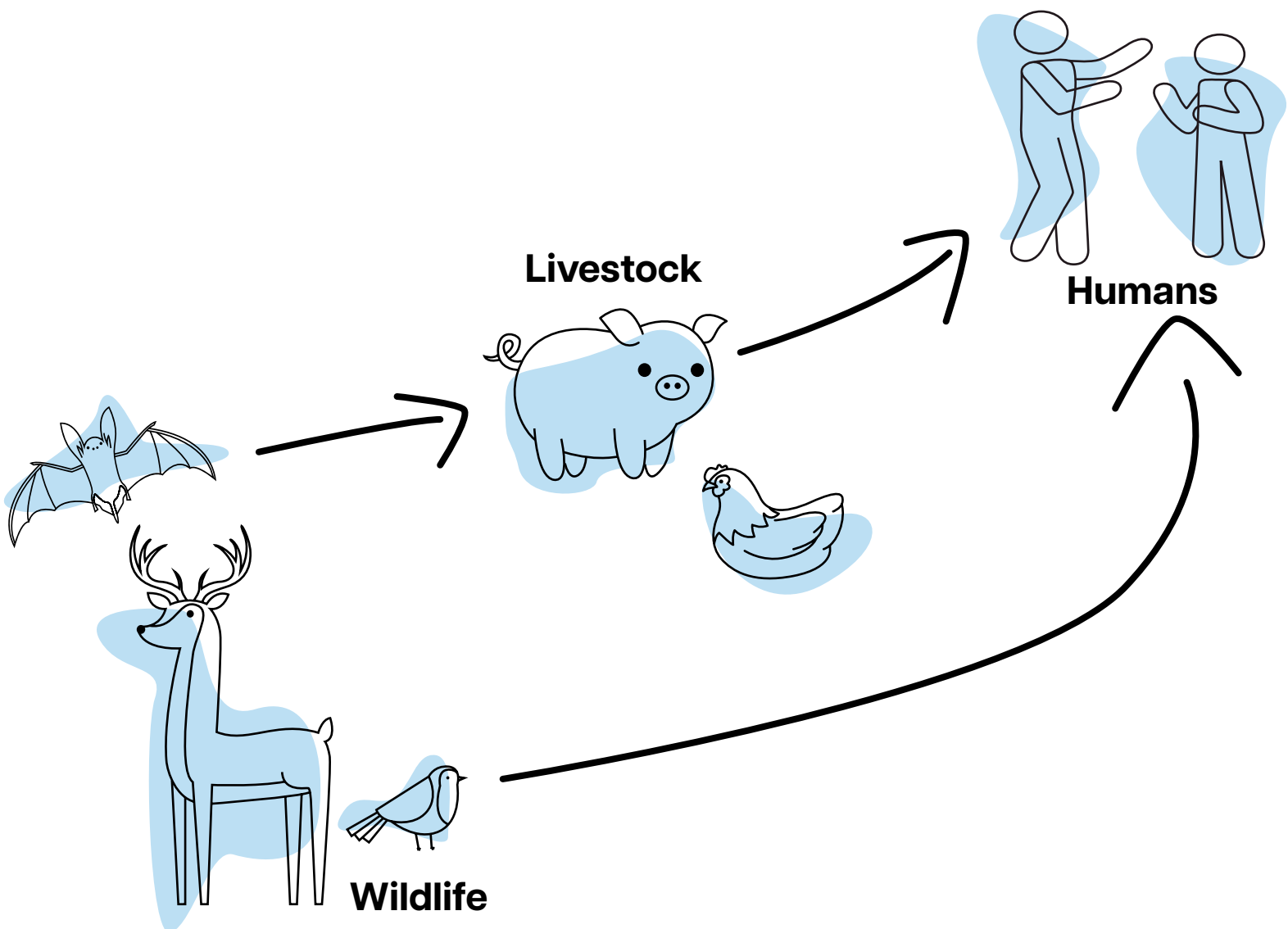
Humans

Wildlife

How does the tension between economic growth and conservation shape human-wildlife interactions?

- The opportunities for **human-wildlife encounters** increase as human activities and populations expand into wildlife habitats.

- For example, **urbanization and agricultural expansion** are the result of economic growth, but have led to environmental impacts such as deforestation.

- The tension between economic growth and conservation has long been recognized, but our findings suggest this has an **impact on zoonotic spillover events due to increased contact** between humans and livestock with wildlife.

Conservation

Economic growth

What are unintended consequences of policies to prevent hunting, trade, and consumption of wildlife?

- **Hunting, trade and consumption of wildlife** is one of the causes of zoonotic spillover events. While wildlife hunting has been a traditional practice in many cultures for generations, **expanding global demand and marketisation is increasing the volume of wildlife hunting and trade**.

- Policies to govern wildlife populations and their habitats typically aren't evaluated for their impacts on zoonotic disease risk. In the complex ecosystems that wildlife inhabit, intervening can be very tricky, and the unintended consequences for human health can be severe.

- These interventions sometimes become '**fixes that fail**': interventions that address a problem symptom without tackling the deeper structure that is driving the symptom. While the interventions may initially seem to 'fix' the problem, **over time the unintended consequences of the intervention undermine progress**, making the problem as bad as it was before - if not worse.
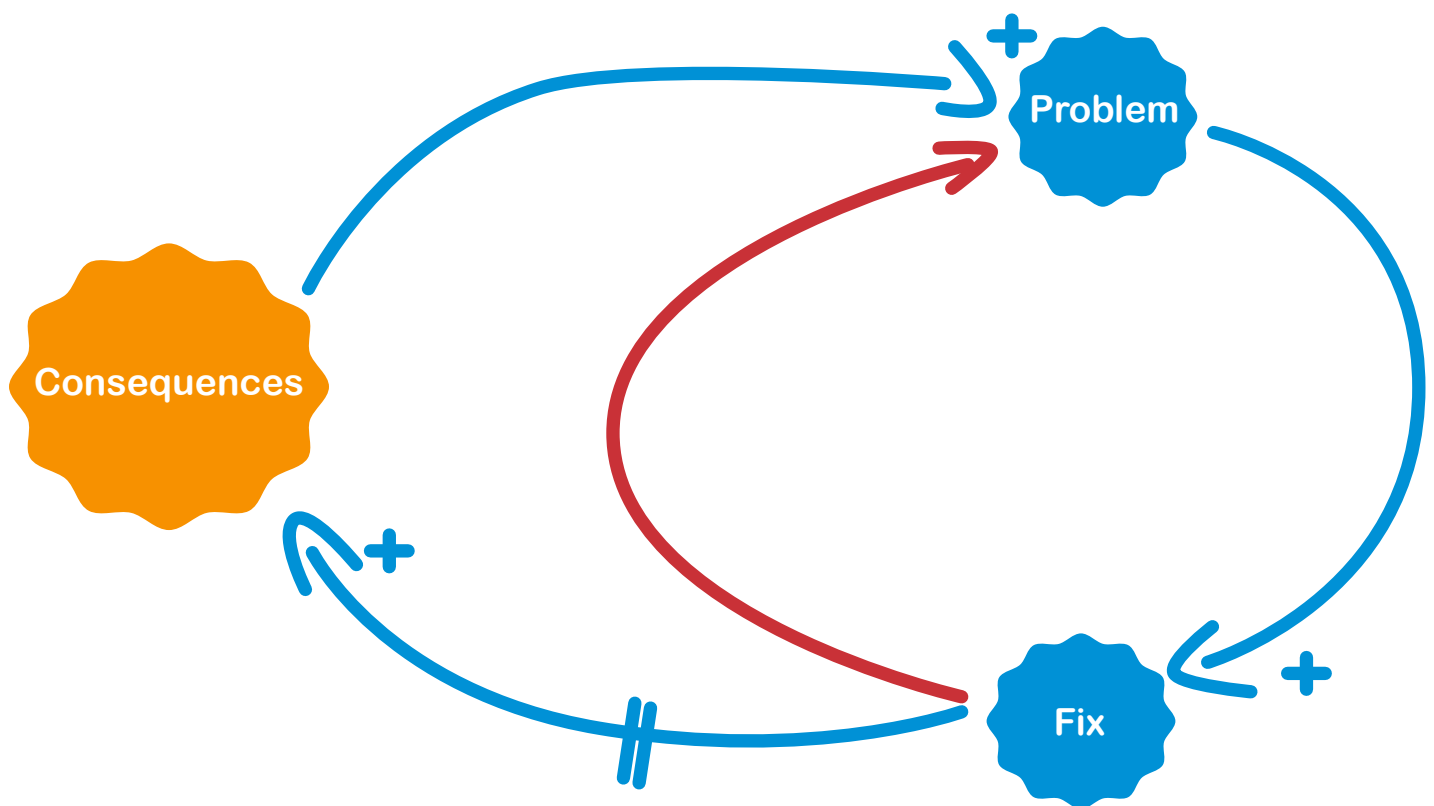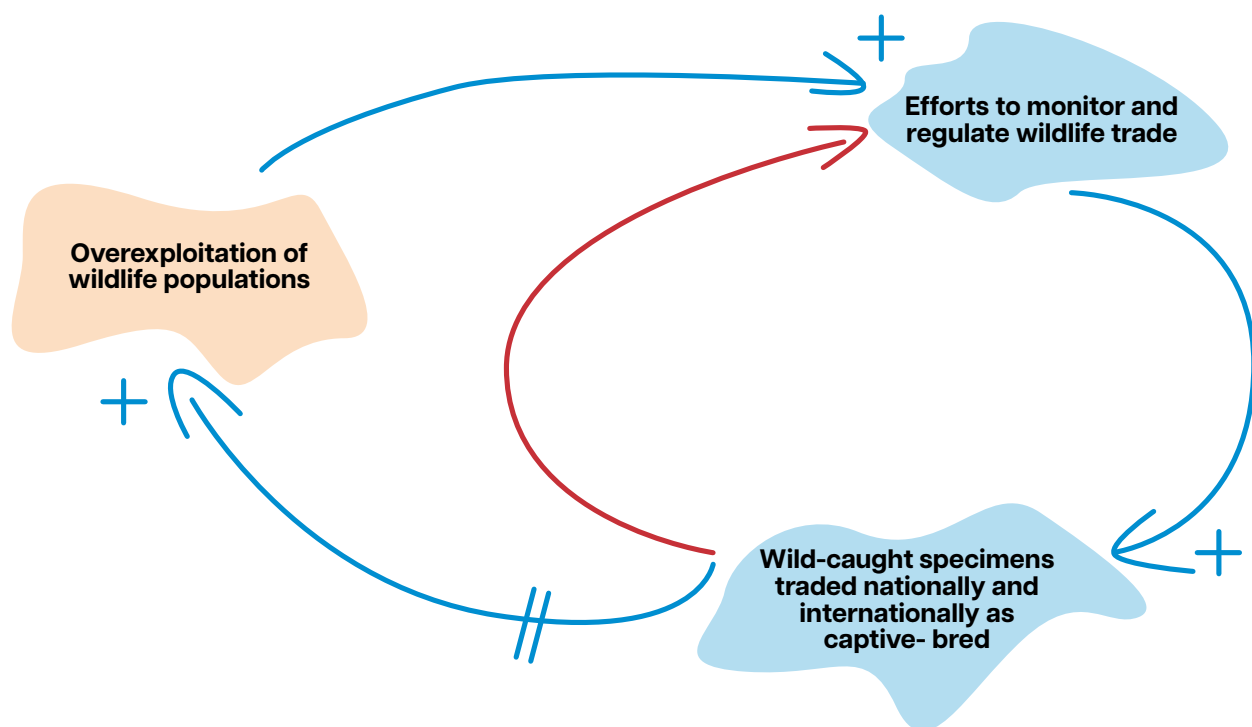
Example of 'fixes that fail': Wildlife farming in China

- In China, the overexploitation of wildlife populations is of substantial concern to the government.

- One of the policy responses has been to provide support for wildlife farming. This is seen as an alternative source of income for communities and individuals who have previously relied on hunting.

- By supporting wildlife farming, the government hoped to deter these actors from exploiting wild populations. However, capturing wildlife remains cheaper and easier than raising them domestically.

- As a result, wildlife farms are being used to 'launder' wild-caught specimens, and sell them on as captive-bred, which are legal to sell and purchase.

- This presents a lot of risk for zoonotic diseases since wildlife farms involve dense populations of wild species in frequent contact with humans. Wild-caught specimens are brought to farms, and wildlife hunting continues.

- Conscientious of the harms of wildlife farming, the Chinese government has now banned the practice.
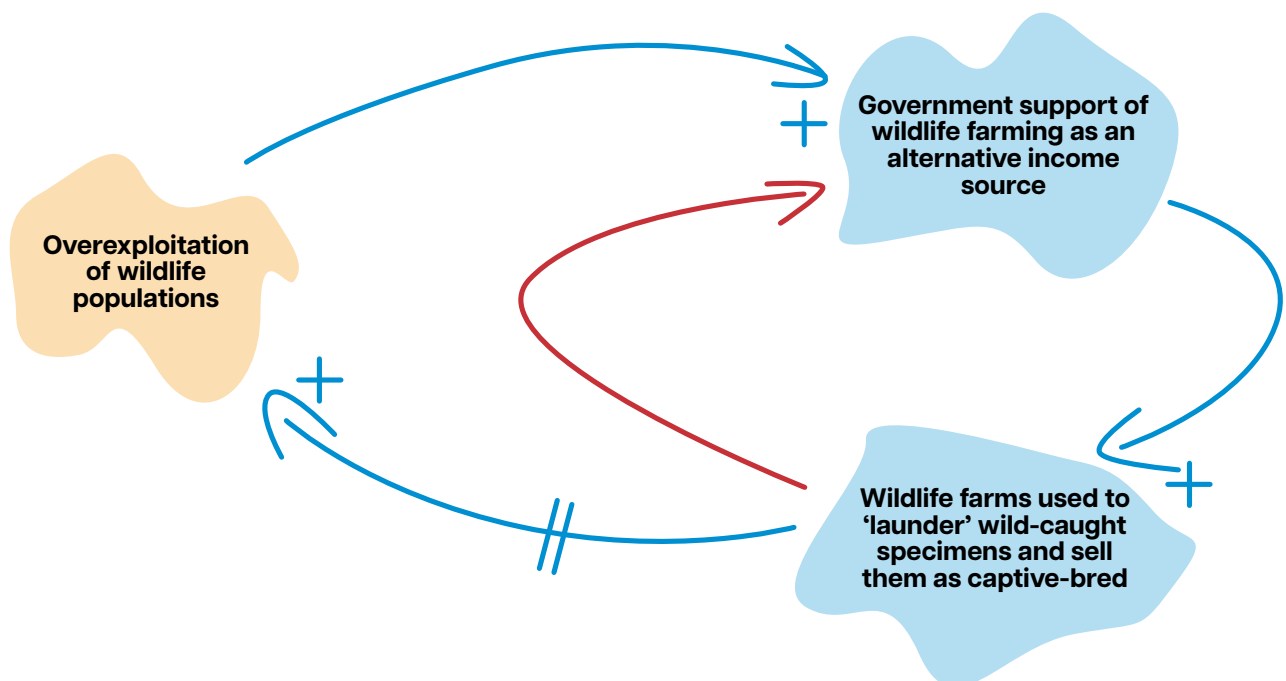
Example of 'fixes that fail': Wildlife trade regulation in the Philippines

- In the Philippines, the overexploitation of wildlife populations drove increased efforts to monitor and regulate wildlife trade across the country's national borders.

- These efforts to monitor and regulate wildlife trade resulted in false declarations at the border of wild-caught specimens as captive-bred. Illegal trading activity bypassed efforts to regulate wildlife trade, and also went unmonitored due to traders not disclosing the true origins of their animal specimens.

- Continued hunting and trading despite these regulations have meant that the risk of spillover has been sustained, while the wildlife trade has become even more difficult to monitor.

Example of 'fixes that fail': Establishment of a new national park in the Democratic Republic of Congo

- In the Democratic Republic of the Congo, overexploitation of wildlife populations has driven the establishment of new national parks.

- However, these parks are often not resourced to adequately protect the spaces included in them, nor are they always developed with buy-in from local communities.

- As a result, the implementation of national park status causes concern around land tenure and livelihood security in surrounding communities, which can reduce pro-wildlife attitudes and increases wildlife casualties and hunting.

- From the perspective of zoonotic spillover risk, illegal hunting and trading continue, and can even augment due to anti-wildlife sentiments. This causes continued and sometimes increased risk through contact during hunting and consumption.
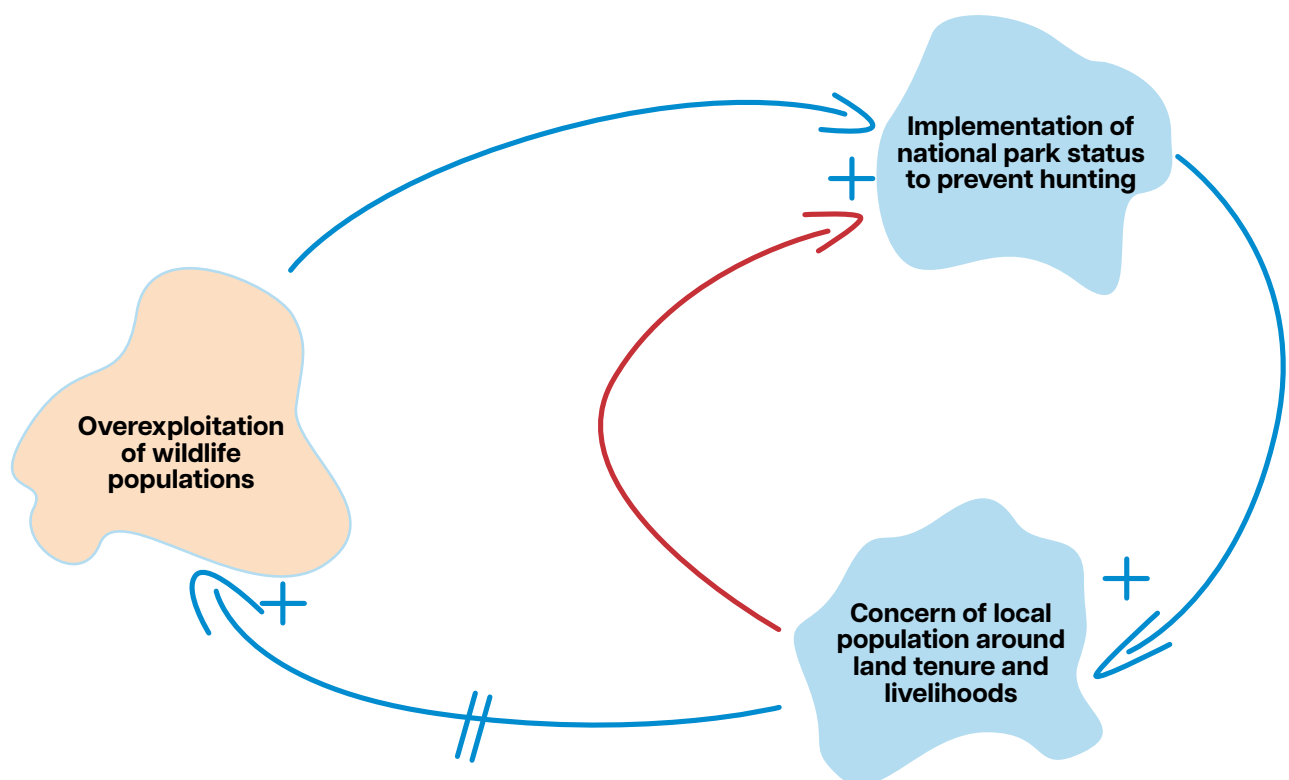
What can policy makers and global organizations do zoonotic spillover?

Intervening to reduce the risk of zoonotic spillover is challenging, involving a complex array of social, ecological, economic and political factors that can mean policies don't always work the way they are intended.

What's more, **governments have to weigh up the trade-offs** between the economic advantages of developing natural spaces, and the harms that may come to humans, animals, and the environment.

We recommend some key actions and orientations to help us prevent the next pandemic:

1 **Better collaboration and coordination across sectors.**
Wildlife intersects with the aims and agendas of many sectors of government. We need coordinated action across sectors to ensure that wildlife-related policies work effectively and avoid unintended consequences.

2 **Global solidarity to support countries making decisions around how to manage their wildlife populations.**
Conservation is an important part of preventing zoonotic spillover, but it comes at an economic cost. As a global community, we need to recognise the threat that these outbreaks represent, and invest in supporting countries to prevent them.

Relevant papers

Clifford Astbury C, Lee KM, McLeod R, Demeshko A, Aguiar R, Atique A, et al. Policies to prevent the spillover of zoonotic disease: a systematic scoping review of evaluative evidence. Globalization and Health 2023; 19: 82.

Clifford Astbury C, Demeshko A, McLeod R, Gallo-Cajiao E, Wiktorowicz M, Aenishaenslin C, et al. Governance of the wildlife trade and prevention of emerging zoonoses: a mixed methods network analysis of transnational organisations, silos, and power dynamics. Globalization and Health. [Submitted]

Clifford Astbury C, Demeshko A, Aguilar R, Mapatano MA, Li A, Togño KC, et al. Tensions between agricultural development and conservation and the impact on emerging zoonoses of wildlife origin: a complex systems analysis in China, the Philippines and the Democratic Republic of Congo. [In preparation]

Clifford Astbury C, Demeshko A, Aguilar R, Mapatano MA, Li A, Togño KC, et al. Wildlife policy, the food system and One Health: a complex systems analysis of unintended consequences for emerging zoonoses in China, the Philippines and the Democratic Republic of Congo. [In preparation]

Partners

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For more information, visit us at www.pandemicprevention.dighr.org