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Session: Protecting the planet and building resilience

Pursuing policies, investments and innovation to address disaster risk reduction and protect the planet from degradation

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1. ***Systems transformation***
   What are the fundamental systems transformations needed to halt nature degradation, reverse loss and manage risk, while eradicating poverty, ensuring food security for a growing population, securing livelihoods and promoting resilience?

In the past 50 years, the human population has doubled and in this same time period, we have shifted from predominantly rural to predominantly urban. Despite this concentration of our populations into cities, our activities now impact 75% of the planet's terrestrial land surface (Venter, Sanderson et al. 2016, https://www.nature.com/articles/ncomms12558). Agriculture dominates, with crop and livestock production now covering over one-third of the globe with projections beyond half if current trends continue unabated (Mehrabi, Ellis et al. 2018, https://www.nature.com/articles/s41893-018-0119-8). In light of this, what urban dwellers choose to eat and how their needs are supplied will largely shape food and land-use systems. To ensure that these choices will not further degrade natural systems, deepen poverty, and heighten food insecurity, we must transform our agriculture and food system at all levels and within all sectors to promote healthy diets, substantially reduced food waste, and promote regenerative agricultural practices. This process will also require transformation of our financial systems. Despite the largely decentralized nature of our global economy, a relatively small number of institutions manage the majority of financial resources. The central role of these institutions as financiers provide an opportunity to turn around environmentally destructive practices and drive up sustainability standards across the supply chain.

2. ***Specific actions to drive transformation***
   Please describe 2-3 specific, promising actions at different levels that can drive these systems transformations. These actions could relate for instance to scaling up the use of nature-based solutions, sustainable consumption and production, or other approaches. How have these actions helped (or how *could* they help) break down siloes, support the systemic management of risk, and trigger positive changes in society? How can co-benefits between actions be maximized and the risk in trade-offs stemming from these actions (i.e. negative impacts on other aspects of the 2030 Agenda) managed?

Too often, commercial activities that require large-scale land-use change levy tremendous costs that are not considered in cost:benefit analyses because the costs are not shouldered by those profiting. These negative externalities include disruption of critical ecosystem services that then lead to global challenges such as climate change and pandemics. There are many examples of pathogen spillover related to deforestation for agricultural monocultures including palm oil (Lassa and Nipah viruses), sugar cane (Hanta virus) and soy (Hanta virus). For a future with lower risks of disease spillover, we need to incorporate such negative externalities into the decision-making process.

Establishment of operations for forest-risk commodities like soy and palm oil is capital-intensive, often relying on subsidies, incentives, and substantial financing to achieve solvency. In addition to the negative externality of spillover risk, these industries fail to improve nutrition and result in negative environmental outcomes. Solutions may be found by incorporating sustainability commitments into upfront financing for such activities and reforming risk assessments to incorporate valuation of spillover and loss of forest-associated health co-benefits for forest conversion agricultural proposals.

Individuals in high-income and rapidly developing countries can help to reduce deforestation and associated risks of future spillovers as well as associated losses of ecosystem services by reducing their consumption of animal protein[1] and fried foods[2] to levels recommended by nutritionists, as this would reduce the pressure to convert biodiverse tropical forest systems for agricultural production.

[1]The vast majority of soy production is for animal feed
[2]The primary demand for oil palm is frying oil for China and India

3. ***Means of implementation and the global partnership for development (SDG 17):***
   Achieving the 2030 Agenda relies on a combination of means of implementation to catalyse action and engagement, harness synergies and reduce tradeoffs. Please discuss the means of implementation, including finance, partnerships, and capacity building, needed to make the necessary transformations. How can science, technology and innovation (STI), including social innovation and local and indigenous knowledge, be mobilized to advance these transformations?

4. ***Covid-19 crisis***
   What does the Covid-19 crisis reveal about the human-nature relationship and systemic risk creation? How can nature-based solutions contribute to a post-COVID-19 economic and social recovery that is more sustainable, equitable and resilient? What immediate and medium-term steps are needed to ensure that the post-COVID-19 economic and social recovery is sustainable, equitable and resilient. How can we redirect financial flows and direct recovery efforts to create better outcomes for people, prosperity and planet?

The models used by economists have a central disconcerting similarity to those used by global change biologists: their predictions are initially met very slowly, then suddenly everything happens at once. Emerging disease biologists have warned for over a decade that a global pandemic of a respiratory pathogen was almost inevitable, most likely a coronavirus (Murphy

1994); Covid-19 is now very much upon us. It's unlikely it will be the last global pandemic caused by an emerging pathogen, just as climate change will not be a simple, slow warming of mean temperatures. Both of these existentialist threats to human health and economic welfare are multi-faceted and inherently non-linear (Lloyd-Smith, George et al. 2009, Gortazar, Reperant et al. 2014).

What does Covid-19's emergence tell us about becoming better prepared for climate change and other environmental shocks? Equally significantly, can any of the solutions required to prevent and prepare for future pathogen pandemics help slow rates of climates change and create economic policies that place significantly stronger weight on the valuation of services provided by the environment, while reflecting the dependence of many essential goods and services on climate variability?

Viral spillover is increasing and this trend is most strongly associated with agricultural drivers such as tropical forest conversion to monoculture plantations and industrial livestock production.

Virus richness scales with wild mammal richness and the highest mammalian diversity occurs in tropical forests. Commercial agriculture is expanding rapidly in regions of tropical forests. This process increases the risk of pathogen spillover by 1) increasing the interface between wild mammals and people and 2) promoting novel behaviors by wild mammals often related to seeking out new food sources as their longstanding natural sources disappear or become less dependable (picture wildlife becoming unwelcome guests/ pests in homes and / or crop fields).

In addition to establishment of agricultural monocultures in the tropics, how we source our protein also promotes spillover risks. Pandemic influenza is our greatest concern in this regard. The human influenza virus accumulates mutations through a process known as antigenic drift- these gradual changes are sufficient enough to negate the protective immunity provided by vaccination or previous infection, which is why the vaccine must be reformulated every year to keep up with the evolutionary change of the virus. The influenza virus causing the 1918-19 pandemic was caused by a different process known as antigenic shift. Antigenic shift is human exposure to a novel strain of influenza from animals (typically birds or pigs). This process results in a virus that can be associated with a higher mortality rate and that is so distinct from the seasonal flu that a substantial and timely effort is needed to create a viable vaccine. Four such pandemics have occurred in the past 100 years, and the opportunities for them to emerge are becoming far more common. Here's why- in 1919, the global population was less than two billion. One hundred years later, the world population has quadrupled, while the global demand for swine and poultry has increased at an even greater rate. The density of such animals in industrial operations creates the perfect storm for novel influenza viruses to spillover from birds and pigs to people.

When extractive industries (i.e., logging, oil exploration/extraction, mining, and commercial bushmeat hunting) are implemented in largely uninhabited wilderness areas, they provide another mechanism for human exposure to novel pathogens. The staff of these industries can be infected via vectors (mosquitoes, ticks) or by butchering and eating local wildlife. These same types of zoonotic transmission events have occurred for generations in forest-associated indigenous communities. Whether such transmission can result in establishment of a new pathogen with the capacity to spread from person to person depends on the accumulation of

mutations and subsequent natural selection. Since tropical forest mammals tend to occur at low density, this process tends to be inefficient, and successful spillover is rare. HIV provides an excellent example- people butchered chimpanzees and gorillas for generations – so there were 10's to 100's of thousands of events that led to SIV viruses entering humans. Despite this, we have just a handful of cases where the virus evolved to persist and transmit among humans.

There's been a focus in the media on the role of wet markets in spillover. Whenever you have novel interactions among a diverse range of species in one place — whether that's in a natural environment like a tropical forest or in an artificially created environment like a wet market — you can have spillover events. So yes, closing wet markets would reduce the risk of spillover, but it's important to recognize that it's a secondary risk relative to tropical forest conversion for monoculture plantations and industrial livestock production.

Although we know wild mammals are the primary source of novel viral pathogens, we still lack even presence/absence data regarding zoonotic viruses for almost 90% of wild mammal species. This highlights our desperate need for well-designed empirical studies that integrate animal and human pathogen surveillance complimented by detailed ecological data on natural and anthropogenic systems. Medical and veterinary doctors have important roles to play in this effort, as do social scientists, but ecologists and epidemiologists must be empowered (and funded) to lead such efforts as their detailed understandings of population and community dynamics are central to solving these problems. Unfortunately, there are minimal funding mechanisms currently available for this. This needs to change if we want to improve the data available to inform policy on mitigating future spillover events and associated pandemics.