The COVID-19 pandemic has revealed vulnerabilities in waste management chains, which could hinder disease containment and increase environmental pollution.

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COVID-19's unsustainable waste management

The coronavirus disease 2019 (COVID-19) pandemic has led to an abrupt collapse of waste management chains. Safely managing medical and domestic waste is crucial to successfully containing the disease (*1*). Mismanagement can also lead to increased environmental pollution. All countries facing excess waste should evaluate their management systems to incorporate disaster preparedness and resilience.

Wuhan, the COVID-19 epicenter of China, experienced a massive increase of medical waste from between 40 and 50 tons/day before the outbreak to about 247 tons on 1 March (*2*). Cities such as Manila, Kuala Lumpur, Hanoi, and Bangkok experienced similar increases, producing 154 to 280 tons more medical waste per day than before the pandemic (*3*). Meanwhile, the widespread lockdown has caused a substantial increase in domestic waste in the United Kingdom (*4*). These large amounts of waste require collection and recycling, both of which are compromised as a result of manpower shortages and efforts to enforce infection control measures (*5*, *6*).

Disrupted services have led to waste mismanagement increases of 300% in some rural UK communities (*7*). With fewer options available, traditional waste management practices such as landfills and incineration are replacing more sustainable measures such as recycling, with adverse effects on the environment (*8*). The U.K. Environment Agency further threatens the environment by allowing temporary storage of waste and incineration ash at sites that have not been granted a permit, as is usually required (*9*, *10*).

To address the overflow of medical waste, the United Kingdom and other affected countries should install mobile treatment systems near hospitals and health care centers (*2*). The design and analysis of sustainable waste management chains, including logistics, recycling, and treatment technologies and policies, should be prioritized (*11*). To reduce the socio-economic and environmental impacts of waste management, the whole system must be considered, including waste generation, collection, transport, recycling and treatment, recovered resource use, and disposal of remains. Protecting waste management chains will help achieve sustainable cities and communities as outlined in the UN Sustainable Development Goals (*12*).

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Misguided forest action in EU Biodiversity Strategy

After failing to achieve the 2020 Aichi biodiversity targets, governing bodies are preparing targets for the future. In doing so, they must acknowledge that effective policies address not only the quantity of protected areas but also the quality of protection and the management of the surrounding matrix. The European Union's Biodiversity Strategy for 2030 (*1*), launched in May, is an opportunity to enact successful conservation. The Biodiversity Strategy commits to protecting the European Union's

remaining forests and restoring forest ecosystem resilience. However, the plans for implementing these goals are misguided.

The EU Strategy commits to "strictly protecting…primary and old-growth forests." Known primary forests represent 0.7% of Europe's forest area, of which only 46% are strictly protected (*2*). Strictly protecting the remaining forests is the right strategy, given that forest management seriously threatens remaining primeval and old forests in Europe, including the Białowieża Forest, Carpathian forests, and Scandinavian Mountains Green Belt (*3*, *4*). However, the EU Strategy overlooks the need for spatial coherence. Tiny protected patches of forest will be of little relevance if intensive forestry prevails in the surrounding matrix. An ecosystem-based approach to forest management must complement protection efforts.

The EU Strategy also commits to restoring forest ecosystems but only offers planting more than 3 billion trees as a concrete action. Planting trees in forest habitats may have detrimental effects (*5*, *6*). The EU Strategy doesn't specify what kinds of trees should be planted, a necessary detail given that the forestry sector in most countries increasingly undermines ecosystem functionality by introducing exotic species believed to be better adapted to future climates (*7*).

Instead of planting trees, conservationists should focus on reducing the rate of forest degradation (namely, tree harvesting) and supporting natural renewal processes. The EU Strategy does not consider natural restoration of spontaneously regenerating forests, the surface of which has decreased 7% worldwide over the past 30 years (*8*). Simply allowing the forests to naturally regrow often results in more trees at much lower costs than planting (*6*). The EU Strategy should advocate a hands-off strategy for safeguarding ecosystemic responses to degradation and environmental change. Policies should support the natural recruitment and selection for trees with greater resistance to insect attacks or extreme events (*9*) and biomass-rich forests with closed canopies (*10*), and they should prevent road construction through valuable forest patches (*11*). Actions aimed at promoting the adaptation of forests to global change and increasing their resilience should be based on all available ecological science and require a more complex view than a simplistic planting strategy. The EU Forest Strategy planned for 2021 should focus on developing a holistic approach with a clearly defined timetable of actions.

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Afforestation falls short as a biodiversity strategy

The recent EU Biodiversity Strategy for 2030 (*1*) recognizes the importance of biodiversity for increasing our resilience to natural disasters and pandemics and, thus, for human well-being. Although it proposes ambitious measures such as reversing pollinator decline and controlling invasive species, it also introduces the ill-advised idea of planting 3 billion trees.

Massive tree plantation programs (*2*, *3*) have been strongly criticized by the scientific community for their negative ecological and economic impacts and their limited role in climate change and CO_2 mitigation (*4*–*8*). The specific number of trees proposed in the EU Strategy suggests a lack of a serious, science-based ecological assessment of actual restoration needs. Meeting such a target could threaten biodiverse treeless ecosystems (*4*, *6*, *7*, *9*) and would waste an opportunity to implement ecologically sound management practices to restore fully functionally integrated mosaics of natural, seminatural, and sustainable agricultural ecosystems.

Massive tree planting could also substantially change the fire regime, especially given the increasing frequency of heat waves and droughts in an area with high population density (*10*). The probability of large intense fires that threaten biodiversity and human assets is largely influenced by the type, amount, and continuity of biomass. Therefore, determining how many trees should be planted is less important than figuring out the most safe and effective conservation strategy.

We need to move toward optimizing our landscapes. A diverse mosaic of nature-based production systems should be interspersed with protected natural areas to maximize biodiversity, resilience, and ecosystem services. Trees are not synonymous with biodiversity. Policy-makers and society need to internalize this message to make proper decisions in the context of environmental and health crises.

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