Actionable Recommendations and Ambitious Directions for Restoring Planetary Health in the COVID-19 Era

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Actionable Recommendations and Ambitious Directions for Restoring Planetary Health in the COVID-19 Era: IGES Position Paper 3.0

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Key Messages

1. COVID-19's wide-ranging social, environmental, and economic impacts has led to calls for policymakers to restore planetary health.
2. The Institute for Global Environmental Strategies' (IGES) COVID-19 position paper 3.0 aims to help policymakers translate support for a healthy planet into actionable recommendations and ambitious policy directions.
3. The paper's recommendations begin with employing a "fire triangle approach" as a basis for strengthening monitoring of wildlife for infectious diseases; regulating bushmeat trade and consumption; and improving hygienic slaughtering practices. They also underline reorienting meat supply chains to small-scale production and promoting sustainable diets.
4. Because SARS-CoV-2 is traceable in wastewater, other recommendations center on using "proactive" wastewater management to complement costly clinical testing for COVID-19 and other viruses. Installing efficient disinfection (e.g., chlorination, UV irradiation) could prevent transmission of water-borne and other diseases.
5. An additional set of recommendations focus on allocating stimulus funds to clean energy while ensuring climate ambitions translate into implementable actions that reduce post-lockdown emission rebounds.
6. Extending energy audits and greening buildings/infrastructure through retrofit programmes that install efficient insulation, heating, ventilation, and rooftop solar systems will strengthen the previous recommendations.
7. Continuing investments in electric transport and mobility infrastructure to drive the renewable energy transition as well as walking and cycling, public transport, and expansion of systems also support the previous recommendations.
8. Fiscal transfers that motivate cities to invest in the above solutions and related industries can enhance climate mitigation and resilience while delivering other co-benefits.
9. Strengthening the integration between policies protecting ecosystems and the climate can support many of these recommendations. Greater cooperation between scientific assessments (IPCC and IPBES) and National Biodiversity Strategy and Action Plans (NBSAP) and Nationally Determined Contributions (NDCs) can foster this integration.
10. Concepts such as the Circulating and Ecological Sphere (CES) can offer a basis for more integrated actions and localisation of resource use patterns, strengthening coherence between ecosystem and climate policies at multiple levels.
11. Ensuring that these recommendations limit inequities requires strengthening debt relief efforts while expanding opportunities for meaningful inclusion of disadvantaged groups in ecosystem and climate policy decisions.

1 Introduction

The novel coronavirus disease (COVID-19) pandemic has caused immense suffering and loss in nearly every corner of the globe. As of July 2021, the world has witnessed over 180 million confirmed COVID-19 cases and over 4 million related deaths (Center for Systems Science and Engineering at Johns Hopkins, 2021). The pandemic's *economic* impacts have also been stark and sobering. Perhaps the most striking of these impacts is a rise in global poverty rates for the first time since 1997 (Kharas & Dooley, 2021). On the other hand, the 2021 rollout of efficacious vaccines for SARS-CoV-2 have offered some countries and communities hope that a sustainable COVID-19 recovery may be on the horizon.

Some unpleasant realities should nevertheless temper this cautiously optimistic outlook. One of the more worrying realities is that the global vaccine rollout has been sharply uneven: as of September 2021, over 80% of the population was at least partially vaccinated in some countries (such as the United Arab Emirates and Portugal), while in other countries (such as Kenya, Nigeria, and Tanzania) less than 4% have had access to a single dose (Our World In Data, 2021).

As the above implies, not only is the world likely to live with COVID-19's wide-ranging impacts, but policymakers need to become more adept at managing these diverse impacts. To some extent, the need to act on a range of COVID-19's consequences has been recognized. As suggested in Figure 1, a defining feature of the pandemic is it has not only affected public health but other dimensions of sustainable development. One of the dimensions with a strong interrelationship with COVID-19 is the environment. In fact, some have argued that a sustainable solution to COVID-19 (as well as future pandemics and the climate crisis) requires restoring planetary health (Brown & Horton, 2020; Waugh, Lam, & Sonne, 2020).

There is nonetheless a risk that calls to restore the health of the planet run into strong opposition. These risks are arguably aggravated by the need to strengthen links between those advocating for planetary health and actionable and ambitious reforms consistent with these claims. A critical question for policymakers navigating the quickly evolving COVID-19 landscape is how to generate support from a broad coalition of stakeholders with interests in these multiple issues for actionable yet ambitious recommendations capable of overcoming possible opposition.

This paper—the third of Institute for Global Environmental Strategies COVID-19 position papers[1]—aims to provide policymakers with recommendations towards achieving these ends. The proposed recommendations intend to limit opposition by capitalizing on relationships

[1] Since the start of the pandemic, the Institute for Global Environmental Strategies (IGES) has published two COVID-19 position papers. The first paper outlines the environmental implications using a short-term, medium-term, and long-term timeframe, while the second paper builds on the first paper with the introduction of the Triple R Framework (response, recovery, and redesign) to help policymakers arrive at decisions addressing near-term but long-term threats to sustainability.

between the environment, health, and other dimensions of sustainable development.

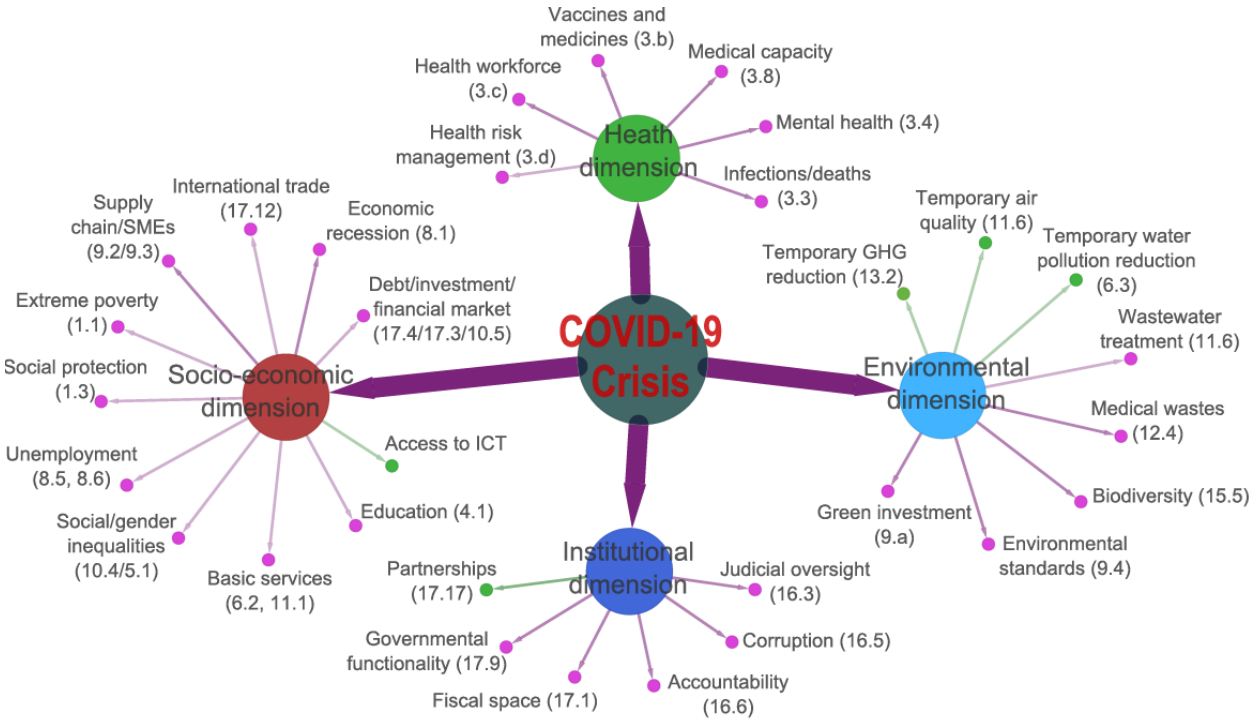

Figure 1. The Multi-Dimensional Impacts of COVID-19 Based on Zhou and Mustafa, 2021

The paper also uses Figure 1 to help organize relevant insights and recommendations with the potential to move past opposition. Figure 1, which draws upon IGES interlinkages tool, offers a color-coded illustration of positive (green) or negative (purple) relationships between the COVID-19 crisis and different Sustainable Development Goal (SDG) indicators (see, for example, Zhou and Mustafa, 2021). Much like the SDGs themselves, it therefore provides a broad overview of COVID's interrelationships with many issues.

As also suggested in Figure 1, after a review of the core concepts of planetary health and One Health, it offers recommendations related to green and blue issues--ecosystems and water systems in section 3. It then offers suggestions in section 4 on how to maintain modest momentum in allocating stimulus funds to interventions to address brown and grey issues--protecting the climate and curbing air pollution. The final section reflects on how to integrate protecting ecosystems and the climate while also ensuring developing countries and disadvantaged stakeholders are not left behind in the process. The paper draws heavily on research and initiatives undertaken at IGES over the past 18 months (with an emphasis on the past eight months).

2. Planetary Health and One Health: Toward Actionable Recommendations and Ambitions Directions

The unprecedented impact of COVID-19 has led many policymakers to reflect on the importance of more coordinated, systemic approaches to managing public health. This reflection has also motivated experts and policymakers to focus attention on the transdisciplinary study of "planetary health." The term planetary health was conceived less than a decade ago to suggest that human health and wellbeing depends on the health of nature, biodiversity and ecosystems; sustaining ecosystems requires recognizing and acting on the interdependencies between natural and socioeconomic systems (Whitmee et al., 2015). High-profile reports such as United Nations Environment Programme's Global Environmental Outlook (GEO) have stressed similar interlinkages in arguing that healthy people require a healthy planet (UN Environment, 2016).

Advocates of planetary health recognise that making these linkages and overcoming opposition from well-placed interests requires support from many stakeholders. They nonetheless differed on which stakeholders were the key to making progress. Some sought to harness emerging voices by calling for "powerful social movement based on collective action at every level of society" (Horton et al., 2014). Others cautioned against forgetting the "recognition, inclusion, coordination, and strengthening of *existing* social movements" (Schuftan, Legge, Sanders, & Nadimpally, 2014). Yet another perspective contended that the world needed a "global treaty" to advance the principles of planetary health (Burkle, 2014). These views differed in which stakeholders would drive their similarly ambitious change they sought to achieve. However, they may have also shared simplistic anthroprocentric beliefs that humans could bring about policy changes capable of transforming the environment (Lerner & Berg, 2017). By stressing that social movements protesting from below or politicians negotiating from above were key to transformation, relevant experts and policymakers with more balanced perspectives on the relationship between human and nature were given insufficient attention in collectively developing more balanced policy changes.

One Health—a similarly motivated holistic approach that predates but informed the concept of planetary health—suggests animal and human health as well as environmental professionals are essential to more balanced policy changes. Much like planetary health, One Health uses an interdisciplinary lens that draws insights from the biological, ecological, climate, and social sciences to identify causes and solutions to interrelated threats across multiple dimensions of health (Lerner & Berg, 2017). Yet, even more than planetary health, it stresses the need to work across three evenly weighted and interlinked policy concerns--human, animal, and environmental health--as a precondition for a healthy planet and people. It further points out the active role of medical and animal health professionals in collaborating with environmental specialists and policymakers to achieve this outcome (Kahn, Kaplan, Monath, Woodall, & Conti, 2014). The key to moving forward is to marry the ambitious aspirations set forth by advocates of planetary health with the need to work across policy domains underpinning the One Health view to arrive at concrete recommendations.

Combining the strengths of planetary health and One Health have gained traction as policymakers have sought to understand drivers of the pandemic in the context of their green recovery efforts. Some of that reflection has centred on broad-based concerns that human encroachment on natural habitats could increase the risk of future pandemics (Kumar et al., 2020) (See Figure 2). Researchers have, for instance, offered ambitious visions of how to limit that encroachment by suggesting a need for governments at different levels "…to respond to emergencies and to the long-term processes that denigrate health and environment…and perhaps international, Marshall-like planning (i.e., a programme to provide economic rescue on a large scale) to reconfigure food production…[and other systems]" (Hinchliffe, Manderson, & Moore, 2021). Others have opted for more narrowly drawn policies and measures that target possible contributors to the pandemic such as wet markets. The next section of the paper highlights some recommendations based on IGES and partner research and initiatives that start narrowly and grow in scope and ambition to restore the health of the planet, creating conditions that enable healthy societies.

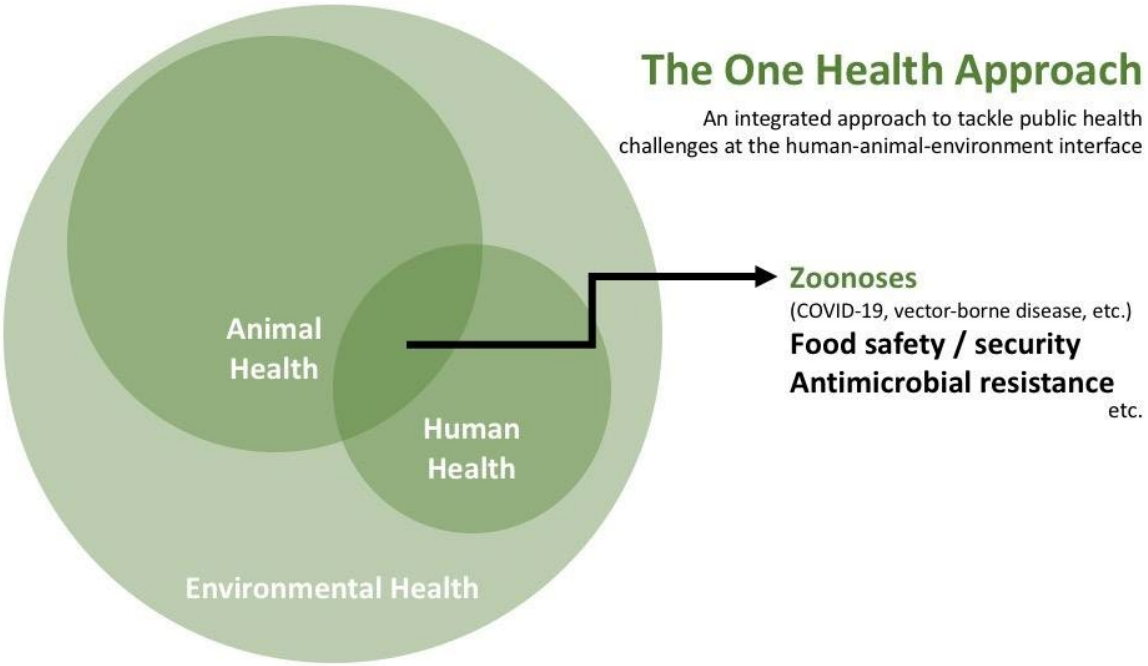

Figure 2: One Health, an integrated approach linking human, animal, and environmental health. Source: authors, based upon Bonilla-Aldana, Dhama, & Rodriguez-Morales, 2020

3. Using Planetary Health and One Health to Manage and Prevent Pandemics

Some of these recommendations centre on taking action on potential risk factors of zoonosis.

While the exact origins of the virus behind COVID-19 (SARS-CoV-2) remain in dispute, many outbreaks in recent years, including SARS, MERS, and H1N1 Influenza, are attributable to zoonotic transmission across species from animals to humans. In COVID-19's case, evidence suggests that SARS-CoV-2 is genetically similar to related coronaviruses identified in certain bat species; thus, this particular case of zoonosis may have originated in bats (Andersen, Rambaut, Lipkin, Holmes, & Garry, 2020; Lu et al., 2020; Maxmen, 2021; Shereen, Khan, Kazmi, Bashir, & Siddique, 2020; Tang et al., 2020; Wu et al., 2020). Using the One Health lens, it is clear that addressing or preventing zoonotic disease risks as well as their impacts involves taking actions to bridge gaps between human, animal, and environmental health.

3.1 Reducing Health Risks Associated with Human-Animal Contact in Wet Markets

At the community level, a critical next step for policymakers is how to manage potential zoonotic risks that could arise at the human-animal interface--for instance, at markets that sell animals (or their meat) that are considered to be "high risk". One of the decision-making frameworks that can help in this regard by addressing the most direct risks is based on the "fire triangle approach." This approach is so-named because, just as addressing the three elements of heat, oxygen, and fuel can prevent fires, targeting bushmeat, wet markets, and disease (three potential sources of zoonosis) may help reduce its risk. Some of the concrete recommendations that come out of using this framework include stronger national and international monitoring of wildlife for infectious diseases and regulating bushmeat trade and consumption. Other similarly well-defined steps include the uptake or more hygienic and careful slaughtering practices, improved caging conditions, increased awareness of possible risks among bushmeat vendors, transporters, and the public as well as proper animal waste and wastewater management.

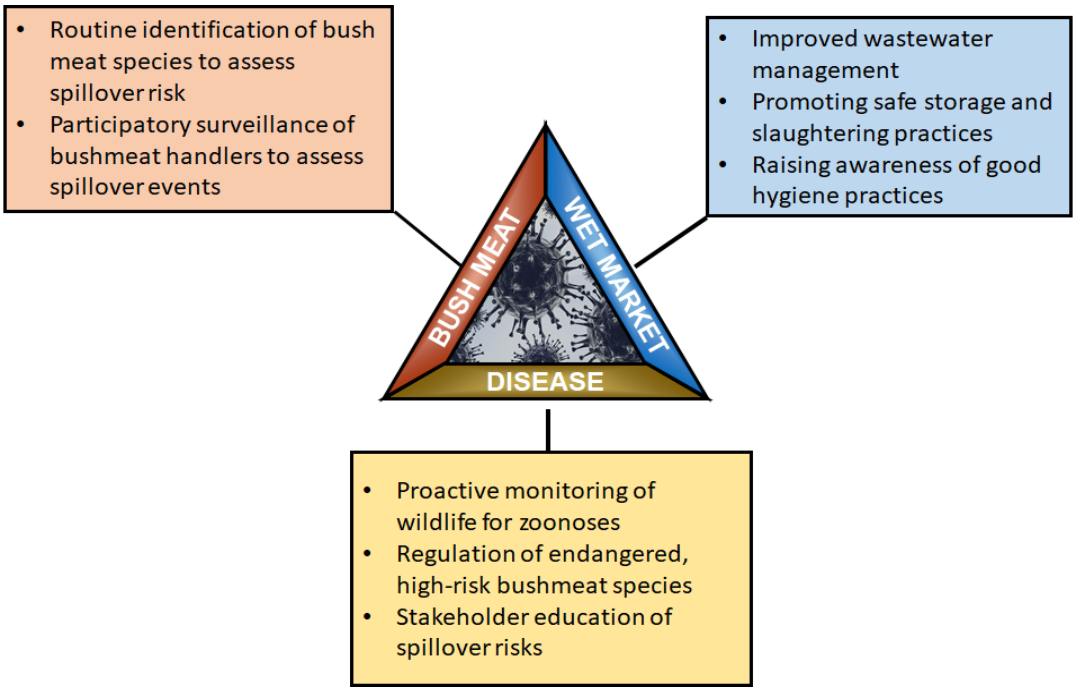

Figure 3: Fire Triangle Approach. Source: Peros, Dasgupta, Kumar, & Johnson, 2021

In addition to taking concrete actions on wet markets, a complementary set of steps with environmental and health benefits is reducing excessive meat production and consumption (especially in high-income populations) (Peros et al., 2021; Petrikova, Cole, & Farlow, 2020; Willett et al., 2019). Arguing that banning wet markets outright may only incentivise unregulated trade of live animals in the black market, Petrikova et al. (2020) highlight the potential of small-scale animal husbandry, which is thought to be less polluting and less resource-intensive than industrial animal rearing along the supply chain. Because of the limits on production, it is also associated with less meat consumption (Petrikova et al., 2020).

Limiting meat production makes sense from the health perspective: many epidemiological studies have linked red meat consumption to health risks such as cardiovascular disease, colorectal cancer, and type II diabetes (Richi et al., 2015), and limiting meat consumption to 35 g per day has been associated with living longer (Willett et al., 2019). At the same time, reducing meat consumption has climate and other environmental benefits because livestock rearing contributes to methane emissions (Petrikova et al., 2020; Willett et al., 2019) and often land clearing and other land-use change. In view of these benefits, restructuring food systems away from industrial animal farming and toward local, small-scale farms, as well as promoting healthier diets with less meat, presents an opportunity to improve human and environmental health.

3.2 Managing Wastewater and Aquatic Ecosystems for a Healthier Environment

Another set of actionable recommendations at the human-environment interface involve wastewater and water management. Evidence suggests that appropriate wastewater management may be key to monitoring and controlling ongoing infections, and potentially mitigating future health risks. SARS-CoV-2 has been found to survive in treated and untreated water (Bao & Canh, 2021; M. Kumar et al., 2021; Panda, B., Chidambaram, S., & Malakar, 2021; Takeda et al., 2020). As illustrated in Figure 4, the coronavirus and its viral RNA may travel through the water and wastewater service sector through multiple channels. While no cases of water-borne transmission of COVID-19 have been documented to date, since 1.8 billion people worldwide use faecal-contaminated water sources for drinking (Bhowmick et al., 2020), safer water management practices are nevertheless vital for improving health and safety of people and the planet.

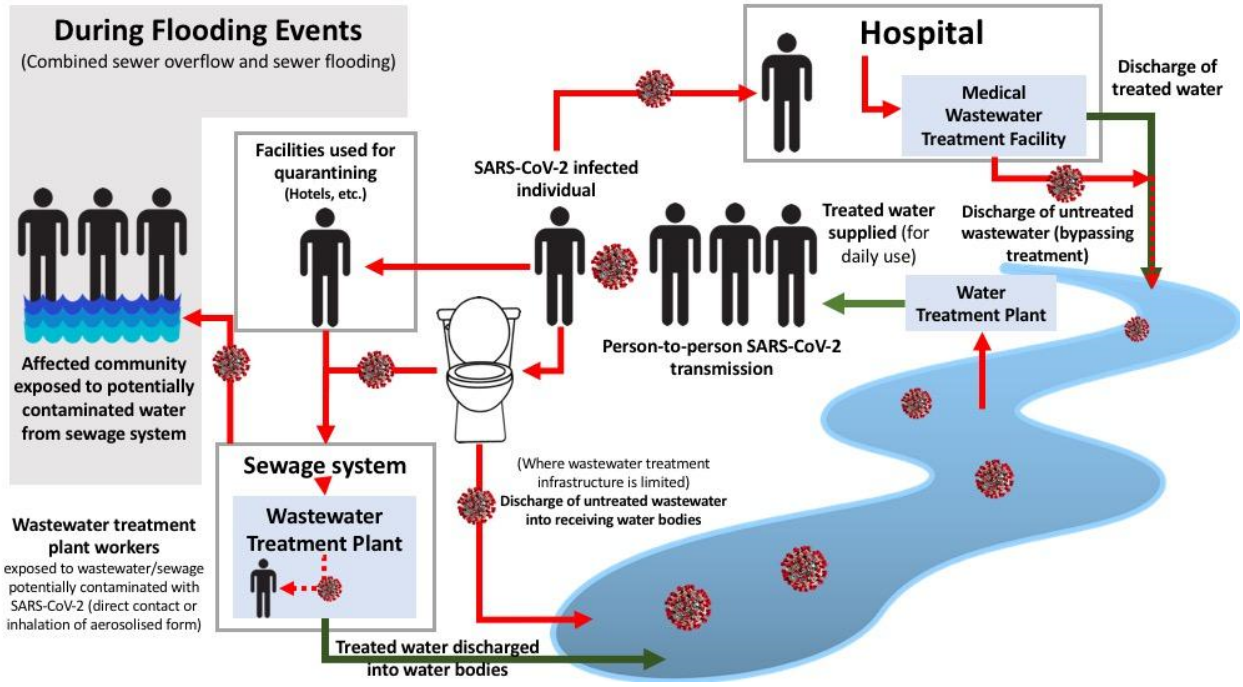

Figure 4: Potential routes of SARS-CoV-2 exposure with respect to the water and wastewater services sector Source: Authors, based on Bao and Canh, 2021

As outlined above, strengthening wastewater management can also help track COVID-19 and potentially other viruses. Experience has shown that the evidence of viable virus and RNA in wastewater can be used to understand the scale of transmission. The best way to access this evidence for not only the current wave of COVID-19 but future viruses is moving from conventional "reactive" to "proactive" wastewater management. Such proactive approaches could include introducing a regular virus surveillance system along the wastewater service chain to assess the occurrence, trends, and hotspots for COVID-19. Some parts of the United States have demonstrated this approach can be successfully employed to complement costly and time-consuming clinical diagnostic testing for COVID-19 (Wu et al., 2021), and a COVID-19 sewage surveillance program is already in operation at the subnational level in Australia (see New South Wales Government, 2021, for example). Again, they may have even more utility to safeguard against future risks.

Another set of similarly motivated interventions that have implications for COVID-19 in addition to human and environmental health involve the operation of wastewater treatment plans. For instance, efforts should be made to enhance safety at treatment, including installing efficient disinfection (e.g., chlorination, UV irradiation, ozonation disinfection) plants that receive domestic wastewater from COVID-19 related facilities. Measures for protecting the health of sanitation workers of water and wastewater treatment facilities and water/wastewater service providers is another important short to medium-term step in this direction. Over the long term, policymakers would be wise to invest in improved sanitation systems and more effective water

quality control measures and introduce improved domestic wastewater treatment facilities with appropriate disinfection systems in vulnerable areas and locations.

Another, albeit slightly different, way that COVID-19 has impacted the health of the planet involves aquatic ecosystems. In this case, lockdown measures and accompanying cessation of socioeconomic activities in some parts of the world have had inadvertent impacts on water quality and productivity (Ramanathan et al., 2021). Studies have shown, for instance, that the temporary halting of economic activity on water quality (river, lagoon) has led to reductions in bacteria and water pollution (*E. coli*, BOD, DO, COD) in some locations (Vidyarthi, Parashar, Ranjan, & Ramanathan, 2021). Similar to discussions of retaining reductions in CO_2 and air pollution featured in the next section, allocating resources to reduce inevitable rebounds in water pollution and retain some improvements in water productivity would help retain these gains. This could also contribute to building resilience to climate change and other planetary and health challenges.

3.3 Policy and Governance Recommendations to Preserve Ecosystems

To some extent, the question of retaining these gains involves how successfully policymakers translate the principles of planetary health and one health into policy and governance reforms that protect ecosystems beyond the sector-specific options in previous subsections. This will be particularly important for preventing future pandemics and limiting the human encroachment on ecosystems that some see as more broadly responsible for COVID-19 and zoonosis. Some of the policies that have the potential to leverage possible synergies between environmental and human health and preserve ecosystems involve promoting improved techniques for valuing nature; employing fiscal and regulatory instruments to raise finance for restoring ecosystems; and using strategic information, risk communication and awareness raising to build public and policymaker support around these reforms (Whitmee et al., 2015; Machalaba et al., 2021).

Other recommendations go beyond simple policies to more expansive governance reforms that influence how policies are formulated and implemented. In this connection, central governments will not only have to increase financial support for ecosystem protection and preservation but should also afford subnational authorities some flexibility in responding to local safety and security challenges arising from COVID-19 and potentially other multi-dimensional threats. Similarly, strengthening stakeholder engagement mechanisms--further discussed in section 3 of this paper—could help building support across the human, animal and environmental health communities. Fitting with the overall argument of the paper, these mechanisms could strengthen alliances across professionals and work concretely on activities with implications that include but go beyond COVID-19 such as the co-design of health screening and assessments (Sudatip et al., 2021).

A related set of governance reforms should centre on mobilising different actors in carrying out the above actions would prove more effective with collaborative, multi-level governance. Effective coordination across levels of decision making will be particularly helpful for ensuring a steady supply of transparent data, especially for the early detection of diseases. Systematising

national and international reporting on transdisciplinary research on issues such as diagnosis, treatment, and disease prevention involving stakeholders in the human, animal, and environmental health could all help to, once again, translate the ambition of planetary health and One Health from abstract concept into a concrete and actionable reality (Charron, 2012).

4. Stabilising the Climate

4.1. Moving from Code Red to a Green Recovery and Redesign

As outlined in the previous section, in addition to relatively focused, actionable interventions, more ambitious reforms targeting the human-animal-environment interface remain critical for addressing immediate and longer-term threats to human and planetary health. Another area where working across multiple policy areas is needed relates to the climate emergency. According to the recent release of the First Working Group Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), this task has become even more urgent: there is no longer time to delay transformative change. The world is facing what has aptly been termed a "code red" (IPCC, 2021).

While COVID-19 lockdowns and the associated halting of economic activity have had modest near-term effects on harmful emissions, well designed pandemic stimulus packages will arguably be the most effective at curbing greenhouse gases and pollutants over a longer time period. As part of the Energy Policy Tracker, IGES has worked with international partners to analyse stimulus packages, focused chiefly on the energy sector, in various G20 countries. Research findings have revealed largely negative, but also some encouraging news for the climate. In terms of the bad news, G20 countries have allocated about US$290 billion to fossil fuels. Further, this funding has largely been "unconditional", meaning that it does not take in account climate or pollution reduction requirements. The good news is that G20 countries have also set aside nearly US$235 billion for clean energy. Moreover, as illustrated in Figure 5, is that the percentage of resources dedicated to clean energy recorded in the Energy Policy Tracker has grown moderately over time to 44% from an initial 37% starting point (though somewhat down from 47% in March 2021). Similar to the conclusions drawn in the previous section, continuing this upward momentum necessitates both ambitious and actionable recommendations that leverage synergies across multiple dimensions of development (IISD et al., 2021).

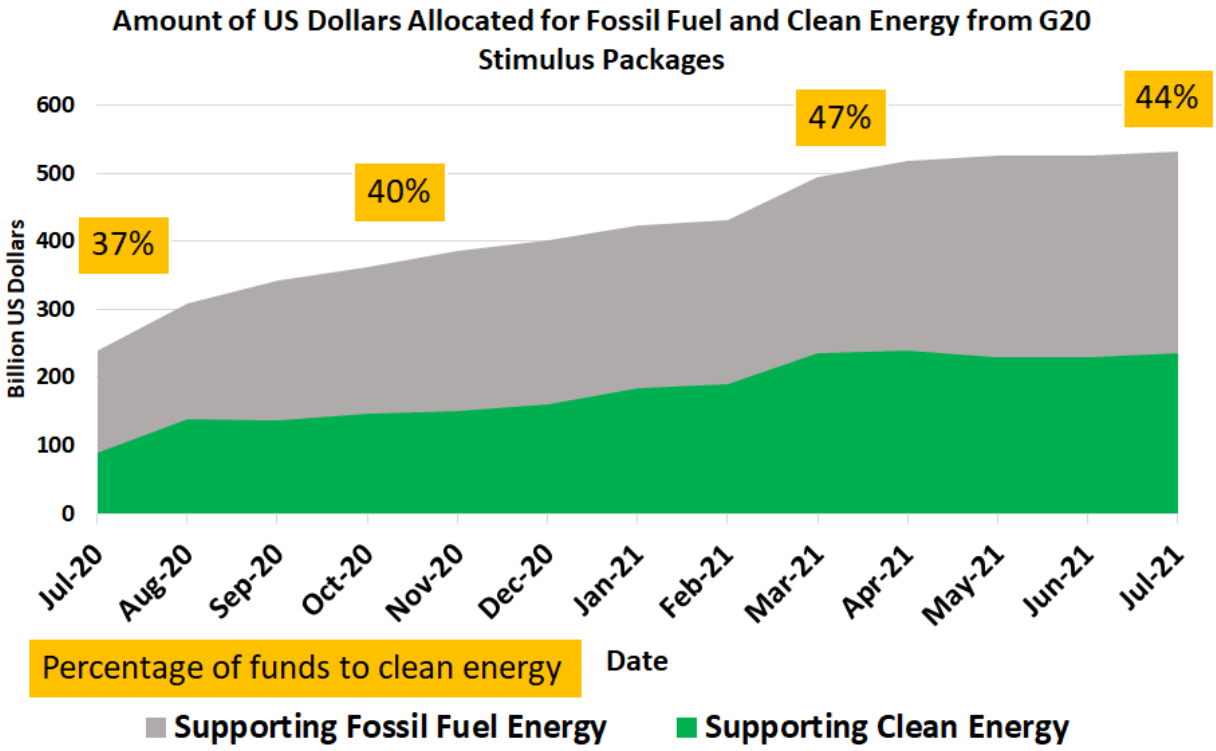

Figure 5: Allocation of G20 Energy-Related Stimulus Funding Over Time. Source: Authors. Data Taken from IISD et al., 2021

4.2 Strengthening Climate and Clean Energy Policies

To some extent, governments that have earmarked funding for clean energy have also made pledges for stronger climate action. For example, at the Leaders' Summit on Climate convened by the United States in the lead up to the 2021 United Nations 26th Conference of the Parties (COP26), an increasing number of countries reaffirmed their commitment to meeting their emissions reduction goals. Further, more stringent reductions targets have been incorporated in Nationally Determined Contributions (NDCs). Countries have an opportunity to further raise the ambition of their NDCs by allocating stimulus funds towards reforms that decarbonise energy systems. There is no shortage of options for doing so: whether updating carbon tax regimes, investing in clean energy infrastructure, or divesting from fossil fuels, governments have multiple instruments at their disposal. Policymakers facing opposition can counter their detractors with examples of the numerous benefits resulting from many of these reforms (discussed in greater detail elsewhere in this section). More decisive action also needs to be encouraged given that there is still a significant gap in reaching the 1.5°C goal set out by the Paris Agreement (IPCC, 2018). A further hurdle is that the CO_2 emissions reductions initially associated with pandemic lockdowns have since rebounded in many countries (see Figure 6).

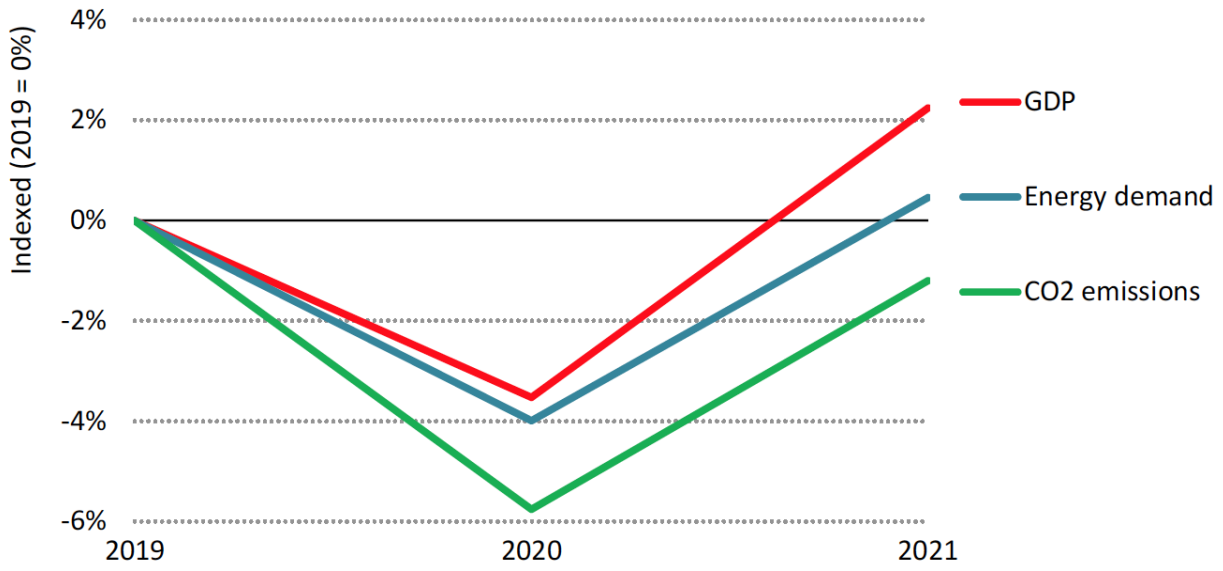

Figure 6: Trends in global GDP, total primary energy demand, and energy-related CO_2 emissions, relative to 2019 Source: IEA, 2021

A possible source of actionable recommendations that could help narrow shortfalls, limit rebounds and sustain the moderate momentum of green spending in the lead up to the COP26 is the Platform for Redesign 2020 (PLATFORM for REDESIGN, 2021). The Platform for Redesign is an online initiative led by the Government of Japan, supported by the UNFCCC, and managed by IGES that invites national governments to share and showcase policies and measures relevant to achieving a sustainable and resilient recovery from COVID-19. Many of the recommendations that follow can be found on the Platform for Redesign.

4.3 Strengthening Building and Infrastructure Policies

Some of the options highlighted in the Platform for Redesign and elsewhere reference increasingly important actions in the green building sector. Greening buildings and infrastructure have numerous benefits for addressing climate change and many other development priorities, thereby contributing to restoring planetary health. Green retrofit programmes, for instance, can help stimulate the domestic economy, generate local jobs and offer long-term multiplier effects for other development concerns. Importantly, stimulus funding could spur momentum for more retrofitting of building stock. To illustrate, countries such as France and the United Kingdom have devoted resources to improving energy efficiency in buildings through green retrofit programmes (US$30.6 billion) that aim to install insulation, heating, ventilation, and rooftop solar systems; energy audit work has also been implemented to great effect (O'Callaghan & Murdock, 2021). Equally important, efforts to leverage the COVID recovery funding towards driving forward these reforms have not been limited strictly to developed countries. Lao PDR has also promoted environmentally friendly and clean/hygienic housing and green spaces as part of its recovery efforts (PLATFORM for REDESIGN, 2021).

4.4 Strengthening Transport Policies

The stimulus can also be used to promote greener, cleaner and healthier transport. Some of the most promising transport investments have been made in electric mobility and supporting infrastructure--with some high-income countries advancing these transport initiatives as part of broader renewable energy transition. Yet, it should be borne in mind this system transition perspective was largely not seen in low- and middle-income counterparts. Another set of actions in many countries is the finance of infrastructure for active mobility and public transport. Countries such as the Philippines have focused on bolstering public transport--an area that may have been hit particularly hard by declining ridership. Another area where programmes such as the NextGenerationEU can help reduce transport emissions is digitalisation--both through the expansion of the information and communication industry (Asakawa & Kuriyama, 2021) as well as other industries.

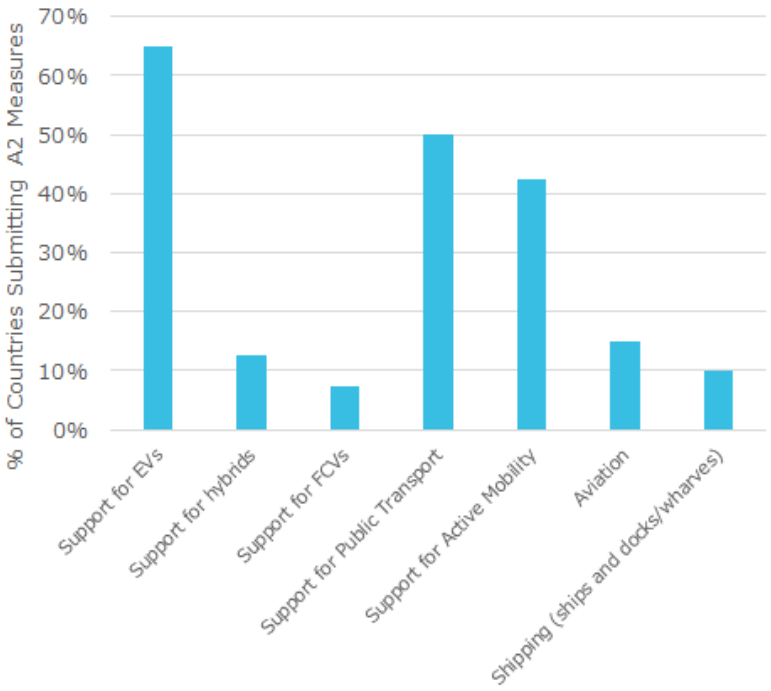

Figure 7: Trends in the Transport Sector. Source: IGES, based on data from the Platform for Redesign 2020 (as of January 2021)

Another key to capturing the full range of benefits includes actionable recommendations for cities. Cities are the forefront of action, well-placed to connect climate and other development goals. In some countries, temporary improvements in air quality resulting from pandemic lockdowns have also led to opportunities for enacting measures that sustain these improvements over time. For instance, Jakarta, Indonesia, a city that routinely suffers from poor air quality, has introduced reforms that aim to reduce congestion and curb demand for personal motorised transport that have gained momentum due to COVID-19. Such policies contributing to long-term improvements in air quality help to demonstrate how planetary health can be translated at the

local level, providing lasting benefits for both the environment and the health of citizens. Unfortunately, similar to CO_2, some rebounds have also been observed with respect to air pollution, particularly levels of nitrogen dioxide (NO_2) (The European Space Agency, 2021). Given that most of the gains in air quality have been due to lockdowns, lasting air quality improvements will require a transition away from fossil fuel-based industrial processes, energy production, and transportation.

5. Integration and Inclusion

As emphasised in the previous sections, the health of the planet – and all those who inhabit it – depend on addressing the climate crisis with a greater aim of boosting the resilience of ecosystems on which all of life is based. Restoring planetary health for a sustainable and healthy future for all requires both sectoral and spatial integration, as well as social inclusion.

5.1 Integration: Bringing Together Ecosystems and Climate

Some actions focus on strengthening policy integration, with a view towards holistically tackling environmental crises inextricably linked to human health. Since 2004 the COP to the CBD has discussed and issued decisions on such linkages, with the Convention producing numerous publications on the topic. These issues have been amplified over many decades by the rhetoric of major conservation NGOs such as IUCN and WWF. Recently the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the IPCC made an important contribution by jointly convening a workshop and producing a report on the topic of biodiversity and climate change; one of the 21 proposed targets of the soon-to-be-adopted post-2020 global biodiversity framework under the CBD is in fact dedicated to maximising these synergies. Likewise, two of the 20 targets of the GBF's predecessor, the Strategic Plan for Biodiversity 2011-2020, also link to climate change. This may be why various countries have incorporated climate change in their national biodiversity strategies and action plans (NBSAPs). It is hoped that the GBF will encourage further coherence, including between NDCs and NBSAPs.

A useful way to promote synergistic actions towards biodiversity and climate change targets could be the creation of self-reliant and decentralised local communities through a concept known as the circulating and ecological sphere (CES). By fostering decentralised communities that conserve energy and resources over the lifecycle of goods and services, CES can help in reducing emissions as well as enriching the natural vitality of landscapes and seascapes. Further, CES and similarly motivated concepts can spread with increased funding and other forms of support from higher-level national policies and international processes. Hence, one of the keys to improved horizontal integration across issues such as ecosystem protection and climate change is greater vertical integration between local, national, and international levels of decision making. This can be achieved, by way of example, through budget tagging of fiscal transfers for multiple SDGs.

5.2 Social Inclusion: Toward a Sustainable Future for All

Sectoral and spatial integration will not be all that is needed. The pandemic further highlighted

the need to focus greater attention on the social dimensions of crises, as exemplified by reports of disadvantaged groups being most at risk of exposure to the virus and/or experiencing more severe health outcomes (see, for example, Raifman & Raifman, 2020). In the environmental policy sphere, long before the COVID-19 crisis, a key concern has been how to address impacts among disadvantaged groups and populations, who are often disproportionately exposed to pollutants. While environmental justice issues, especially at the subnational level, warrant a more detailed discussion that falls beyond the scope of this paper, it is critical to recognise that pre-existing social and economic inequities may be exacerbated by shocks like COVID-19 and responses to such shocks.

In addition to disproportionate impacts on vulnerable populations within countries, some analyses have further suggested that public funds for pandemic recoveries could actually widen socioeconomic gaps across countries. Research on the effects of COVID-19 recovery in Bangladesh and the Republic of Korea has underlined why this might be the case. The study found that Bangladesh concentrated chiefly on its most immediate needs such as supporting the livelihoods of vulnerable people and the operations of small and medium enterprises (SMEs), but did not include potential impacts on sustainability concerns such as rising industrial pollution and ecosystem degradation in its recovery plans. On the other hand, the Republic of Korea leveraged its fiscal capacity to invest in projects and programmes that seek to strengthen social protection, ensure full and productive employment, expand renewable energy, and preserve ecosystems (Zhou & Moinuddin, 2021). This specific example echoes fears that the pandemic gives way to "K-shaped" recoveries where those who benefit the most from government support have the fewest needs, while low-income and marginalised populations get left further behind and have increasingly limited chances at a sustainable (Titimur, 2020).

Similar to enhancing integration between biodiversity and climate change, there is also potential to take steps at the international level that will help to avoid K-shaped recoveries across countries. Such recoveries see high-income countries (and communities) experience significant improvements in development following a crisis and follow a development path tracing the upward sloping part of the K. In contrast, lower-income countries follow the downward sloping part of K and fall further behind. While the full environmental impacts of this polarisation depend on various factors and thus require further research, the stagnation or regression of economies in lower-income countries has potentially detrimental implications for the availability of national financing to address environmental crises and ultimately achieve a sustainable future for all.

The concern of K-shaped recoveries is accentuated by inequities in vaccine access, especially in the face of emerging COVID-19 variants. While immunisation has helped lower the burden of disease, the virus has continued to replicate and mutate among unvaccinated or otherwise susceptible individuals: in the summer of 2021, the Delta variant, which due to relatively greater transmissibility even among the vaccinated (Center for Disease Control, 2021), has quickly spread across the world and possibly led to a decline in vaccine efficacy (World Health Organization, 2021). A related cause for concern is that the emergence of the Delta variant has led some high-income countries to move ahead with administering booster doses (Kar-gupta & Copley, 2021), despite the World Health Organization's (WHO) statement that this "will exacerbate inequities"

(World Health Organization, 2021). Vaccine inequity may further widen the gap between high-income and low-income countries and communities, a situation in which high-income countries enjoy an economic rebound, while low-income (and resource-poor) countries continue to be severely burdened by disease and thereby left behind.

To counter this trend, one familiar set of proposals that have been given renewed attention is forgiving debts that have accumulated in the wake of the pandemic by many developing countries. A related set of options involves using a broader set of sustainability indices to assess the credit worthiness of different countries, thereby encouraging all countries to work with the longer term prospects of planetary health in mind. Many of these options are referenced in the Addis Ababa Action Agenda on Financing for Development, for example.

Similar to the integration of environmental agendas (climate, ecosystems, etc.), some of the most influential reforms take into account the issue of social equity in national and local decisions. This is already happening to an extent with climate change in various countries, such as the United States, which framed its recent climate policies around creating jobs. While much of the analysis looking at the potential for job creation has focused on energy-related employment, considerable scope exists to promote a wider variety of environmentally sustainable jobs that help preserve ecosystems and prevent disasters. Job creation programmes will need to be guided by social dialogue between different stakeholders, and supported by training and job matching programs that facilitate an expanded view of just transition. Such a view helps not simply those working in fossil fuel related industries but other low-wage sectors with limited prospects for upward mobility and sustainable incomes.

Finally, in promoting this more expansive view of a just transition, it s important to recognise the disproportionate impacts that structural changes may have on disadvantaged groups, and the need to ensure relevant decisions are made more socially inclusive. This is happening in countries such as the United Kingdom and France, for example, where efforts have been undertaken to create climate citizenship councils. Researchers can also extend efforts for co-design and co-implementation strategies that aim to protect the climate and preserve natural resources to disadvantaged groups and social segments. Social inclusion can help strengthen sectoral integration.

5.3 Concluding Thoughts

Going forward, it may be prudent to analyse the environmental implications of several potential scenarios outlining the trajectory of the pandemic. Depending on the efficacy of interventions such as global vaccine rollouts, COVID-19 may become manageable to the point where economies and societies more or less return to pre-pandemic conditions within a few years. Alternatively, if interventions cannot respond effectively to the evolving public health situation such as emerging variants of concern, pandemic-era restrictions on certain economic activities may continue during waves of infection, potentially leading to new kinds of economic activities that are in better alignment with the COVID era. Meanwhile, it is also possible that another global public health crisis may emerge concurrently or after the COVID-19 pandemic is over. Future research examining how such scenarios can impact economic and societal structures with

cascading effects on the environment may be instructive in assessing which actions are feasible and/or should be prioritised.

While much remains uncertain about the evolution of this pandemic, it is clear that we are urgently required to introduce and implement measures that reconstruct the economy and society into a decarbonised, disaster-resilient society operating within planetary boundaries and grounded on the principle of planetary health. These measures should contribute to the transition to a decarbonised society and the realisation of the SDGs amidst rapid global changes and uncertain extreme weather conditions.

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