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Commentary

Learning from the COVID-19 Pandemic Crisis to Overcome the Global Environmental Crisis

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Abstract: The COVID-19 crisis and the environmental crisis share a range of similarities. Both crises take place on a global scale and affect all aspects of our lives. However, we humans respond differently to these challenges. Here, we compare and comment on characteristics of the COVID-19 crisis and the environmental crisis, explore how far these two crises are comparable, and what we can learn from actions that have been taken against the COVID-19 crisis. We discuss how human societies are affected by the respective crises, and analyze policy makers' responses and offer pathways to better inform policy. We highlight the role of science, which significantly contributed to decision making throughout the COVID-19 crisis, but seems frequently underrepresented in the environmental crisis. We conclude that there are significant differences between the two crises in terms of perceptibility and thus communicability. While problems and solutions in the COVID-19 crisis are largely linearly correlated, the challenges of the environmental crisis are far more complex and decoupled, and thus appear much more complex and are often only perceived with difficulty by humans. Thus, tackling the environmental crisis is much more challenging than solving the COVID-19 crisis. To overcome the environmental crisis, purely technical approaches for combating symptoms are not sufficient. However, political interests are usually short-term, and do not correspond with the temporal and spatial scales of global change. There is an urgent need to improve institutionalized scientific advisory mechanisms and to empower global policy makers who are independent of local interest groups. Furthermore, we need the sound communication of complex interactions to the general public and the translation of scientific findings into action. One possibility to achieve this is to bring together natural scientists with expertise in biology, climate and geosciences and social scientists, psychologists, and, possibly, artists.

Keywords: pandemics; environmental crisis; linearity; complexity; symptoms; causes; policy; communication; time-scales

1. COVID-19 Pandemic and Environmental Crisis

The COVID-19 pandemic is a global crisis that poses severe challenges to humanity. Although similar far-reaching diseases have occurred throughout history, the speed of its spread was unprecedented due to the interconnected and globalized world [1] (Farzanegan et al. 2021). Within a comparatively short period of time, global travel and contact restrictions, and the obligation to wear FFP2 masks were broadly implemented [2] (Haug et al. 2020). In this situation, scientific research is playing an extraordinary role. Antibody tests were developed at record speed and several vaccines were successfully developed. In parallel, media shared information about the advantages and disadvantages of certain vaccines, different virus variants, and how they work. The public were continuously informed about the dynamics of the crisis and confronted with basic statistics. Mathematical concepts such as exponential growth or R-values have become commonplace among the public, in TV news and press releases [3] (Gozzi et al. 2020). The relevance of international cooperation was also validated, with vaccine availability required for all nations in order to stop the dynamics of a mutating virus across a globalized world [4] (Wouters et al. 2021).

At first glance, the environmental crisis, including climate change and biodiversity loss, constitutes a parallel. Similarities of both crises have been addressed from different viewpoints [5,6] (Vinke et al. 2020; Schmidt 2021). Like the environmental crisis, the pandemic too is a global crisis hitherto unknown to humankind demanding a global solution. However, the time span over which humans induced global change extends much longer than the COVID-19 crisis. While in the case of COVID-19 there were only a few months between the recognition of the dramatic nature of the crisis and political, scientific and social action, in the case of man-made environmental change it took several generations. These different timescales and the degree of perceptibility raise the question of how comparable the two crises are, and what we can learn from the COVID-19 crisis to overcome the environmental crisis. In the following, we discuss both crises with a focus on effects from contrasting timescales, complexity, and perceptibility. Our ultimate goal was to understand whether the proposed similarity of both crises holds up, and if so, how we can adopt potential solutions and possible ways out of the environmental crisis through lessons learned during the COVID-19 crisis.

2. Timescales, Complexity and Perceptibility

The COVID-19 crisis revealed largely linear chains of cause and effect and thus, the perceptibility of this global challenge was relatively simple. In addition to restrictions in public life [7] (Summers-Gabr 2020), vaccinations effectively reduced the mortality rate (e.g., Lopez Bernal et al. 2021 [8]). These immediate and linear effects between measures taken and the spread of the virus were largely successfully communicated to the public. Despite its negative global impact, perceptibility as well as ease of communication with the public are much more difficult in case of the environmental crisis. Instead of linear cause–consequence relationships, the environmental crisis takes place simultaneously on different spatial and temporal scales, and individual processes overlap and interact with antagonistic and synergistic effects. For example, In 1896, Arrhenius had already drawn attention to the direct correlation between the CO_2 content of the atmosphere and the global temperature, and postulated that "temperature in the Arctic regions would rise about 8 to 9 °C, if the carbonic acid increased to 2.5 or 3 times its present value" [9] (Arrhenius 1896). The dramatic implications of this finding for humankind were neither widely considered, nor recognized. In the middle of the last century, confidential reports in the oil industry and international research cooperations showed that the large-scale burning of fossil fuels has a potentially long lasting and irreversible impact on the Earth's climate [10] (Franta 2018). It took a few more decades until the topic arrived in the center of the wider public discourse, and awareness was raised through civil movements such as the recent 'Fridays for Future'. In the meantime, it is widely acknowledged and the environmental crisis is understood not just by the scientific community, but generally as the greatest challenge facing mankind.

The situation is similar to the decline in global biodiversity [11] (Maxwell et al. 2016). This is because the climate crisis as well as the decline in global biodiversity share the same root cause, i.e., the resource intensive lifestyle of humankind [12] (Rinder et al. 2022). These changes have occurred gradually, and over long periods rather than abruptly. With comparatively slow, gradual changes, we humans find it difficult to perceive these changes. This phenomenon, the Shifting Baseline Syndrome [13] (Soga and Gaston 2018), usually completely undercuts the importance of counteracting these changes. Thus, the backing and adequate support to cope with environmental changes is usually insufficient. For many people, global changes do not represent an existential threat. Environmental changes are only perceived as threats when ecosystems are disturbed to such a degree that their ability to function is reduced and their ability to provide services to societies is impacted (loss of clean water, degradation of soils, limited pollination, Oliver et al. 2015 [14]).

Because of the complicated interactions in combination with the different timescales on which individual processes happen, a straightforward linear coupling of cause and consequence are rare in the environmental crisis, and a response chain often appears spatially and temporally decoupled. Such temporal and spatial decoupling poses great challenges for communicating with non-specialists, as they are difficult to perceive. Other feedbacks that increase the complexity are issues such as the CO_2 driven global warming resulting in permafrost thawing, and additional release of greenhouse gasses, which contributes to further heating of the global climate. The positive feedback between the CO_2 driven global warming resulting in permafrost thawing, and thus the additional release of greenhouse gasses, which in turn contributes to further heating of the global climate may act as one example. Such feedbacks increase the complexity of the processes and result in delayed and seemingly decoupled cause and consequence and pose great challenges for communicating with non-specialists.

In order to visualize the complexity of the two crises, we looked at the total number of COVID-19 cases per inhabitant, as well as the GermanWatch Climate Risk Index (Figure 1). For the COVID-19 cases, a straightforward relationship becomes apparent. Generally, countries of the Global North show lower numbers as compared to countries of the Global South. This can be attributed to the accessibility to vaccinations, and the consequent decreased spread of the virus. This shows that technical solutions and the accessibility to them show immediate effects. In contrast, the Climate Risk Index, somewhat unexpectedly, shows no clear difference between the Global South and Global North [15] (Eckstein et al. 2020). The reason for this is that here cause and effect are not linear, and the effects of the climate crisis are multi-dimensional. Consequently, no clear normal or inverse correlation between the two crises can be observed (Figure 1). The climate crisis and its effects are much more complex than the COVID-19 crisis. One expression of this is that the climate crisis acts on multiple timescales, ranging from individual catastrophic events to million-year, geological timescales.

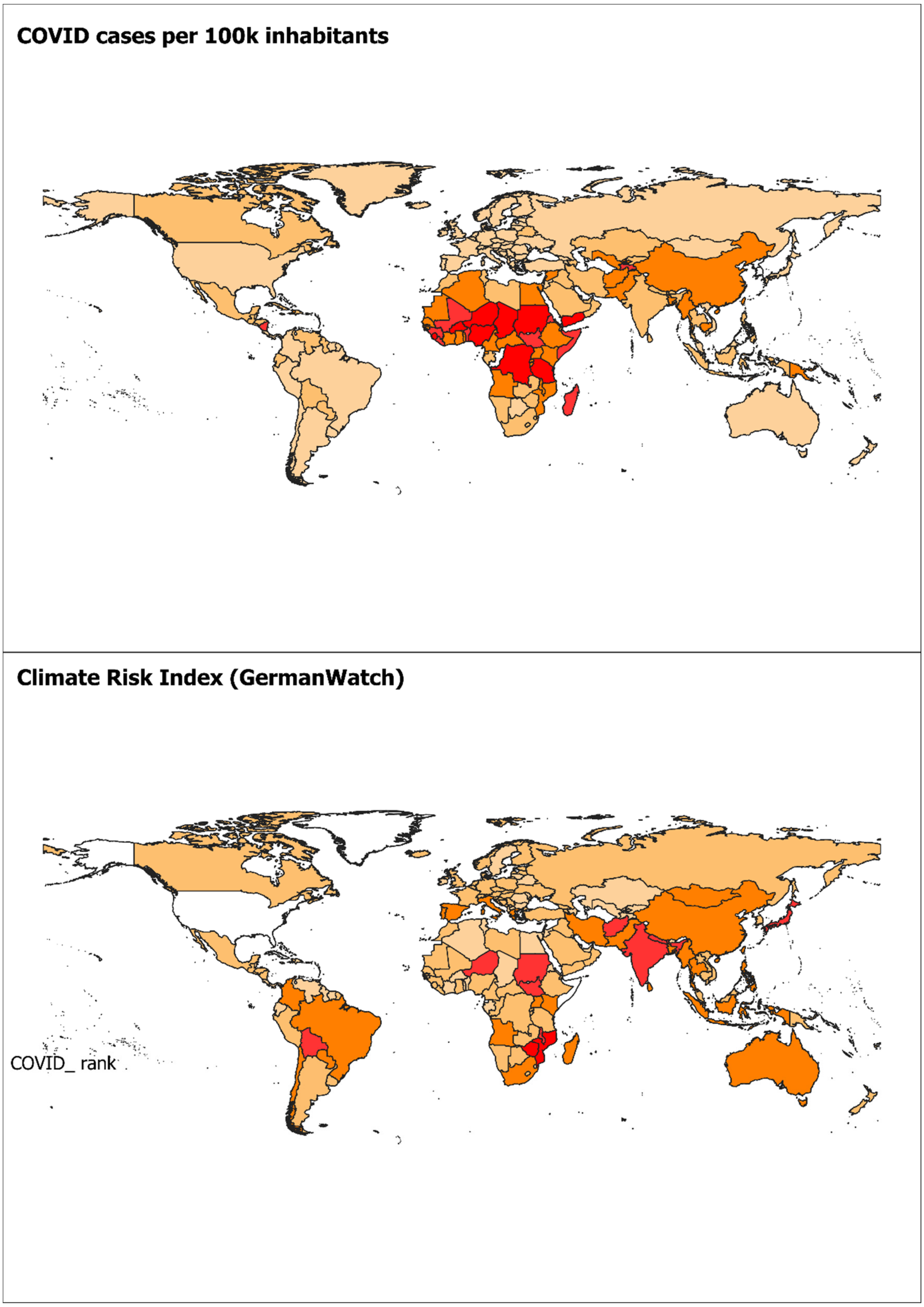

Figure 1. Cumulative total number of COVID-19 cases per 100,000 population (status August 2021) (**upper map**), as well as Climate Risk Index (German Watch) of the year 2021 (**lower map**). Both metrics were ranked, and presented by identical coloring. Where technical solutions have been accessible (Global North), numbers of COVID-19 cases are low. Due to the highly non-linear and multi-dimensional effects of the climate crisis, no correlation between Climate Risk Index and access to technical solutions is observed.

3. Technical Solutions and Lifestyle

During the COVID-19 crisis, technical solutions proved to be extremely successful. Developing vaccines and wearing masks successfully help to combat the pandemic. Hand in hand with that, technical solutions have seen a boost in daily lives, making online meetings as well as knowledge acquisition more common [16] (Xie et al. 2020), promoting new markets such as blockchain technologies [17] (Martinez et al. 2020). In addition to the technical solutions during the COVID 19 crisis, there were also huge changes to everyday life, primarily through the cancellation of public events and travel restrictions. While it is yet unclear where these technical developments will lead, and how they will transform global societies, it is clear that they affected economies, social life and mental health. Furthermore, it could be shown that the environmental effects of such measures are significant (e.g., [18,19] Le Quéré et al. 2020; Nakada and Urban 2020), even though the COVID 19 crisis partly hampered the progression of reaching the international sustainable development goals [20] (Chopra et al. 2022). This demonstrates that technical solutions in combination with a global vision and responsible action of individuals works well for combatting the COVID-19 crises. This raises the question as to whether such an approach would work likewise for the environmental crisis.

Like in the case of the COVID-19 crisis, numerous initiatives were also launched to combat the environmental crisis, which were also largely technical in nature. Examples include filter systems for exhaust gas and wastewater treatment, the fertilization of depleted soils, electric cars, carbon capture and storage techniques, or the switch from fossil energy to renewable energy. To combat climate change more effectively, technical solutions on a global scale have been suggested, such as Solar Radiation Management (to increase Earth' albedo and thus reduce the energy input from the sun, e.g., Vaughan and Lenton 2011 [21]), enhanced weathering (a technique to remove carbon dioxide from the atmosphere by accelerating weathering process, e.g., Rinder and von Hagke 2021 [22]), or the REDD+ initiative of the United Nations (aiming for carbon fixation through reforestation of degraded and non-degraded land, Griscom et al. 2017 [23]). However, as opposed to the COVID-19 crisis, short-lived restrictions can only have a short-term effect on anthropogenic climate change. This is problematic, as the climate crisis acts on multiple timescales. Consequently, to tackle the crisis, measures need to be taken that work on all timescales, including negative emissions and long-term solutions of CO_2 storage. Furthermore, the climate crisis does not follow a linear and direct cause and effect chain. This suggests that to reach the global 1.5 or 2 °C aims, technical solutions do not suffice anymore. Instead, technical solutions combined with sustained changes in lifestyle are essential [12] (Rinder et al., 2022). This poses a severe problem, as it is questionable whether the world population is ready for such profound changes to prevent an even greater environmental crises. In order to achieve this, it is essential that above the individual level, policymakers implement or encourage such actions on a larger scale. This is not yet happening to an adequate level, as we discuss in the following.

4. Scientific Evidence for Global Policies

The COVID-19 crisis highlighted the stark differences in national and regional scientific advice mechanisms, the way in which governments obtain and use scientific information in their policymaking processes. It showcased the benefits of integrating scientific evidence into policymaking and scientific advisory panels are becoming increasingly common in parliaments and town halls across the world. The International Network for Government Science Advice (INGSA) created an extensive overview of the policy interventions (https://www.ingsa.org/covid/policymaking-tracker-comparative/) that were taken by governments across the world in response to the COVID-19 crisis and how these were informed by scientific advice mechanisms. In a preliminary report, INGSA found that new science advisory mechanisms were frequently mobilized at the start of the pandemic rather than existing mechanisms, perhaps indicating that the existing methods of integrating science into the policymaking process were insufficient to deal with a crisis [24,25] (Allen et al. 2020; Gluckman et al. 2021).

Identifying flaws in our scientific advisory mechanisms and creating more efficient systems to integrate evidence into policymaking processes will be key to not only managing immediate crises as they arise but also slower-burning emergencies such as climate change and biodiversity loss. Practitioners working at the interface of science and policy outlined the need for science advisory mechanisms to move away from linear communication. Instead of the linear communication currently being used (e.g., scientists either answering a question posed by a policymaker or providing unsolicited scientific evidence), a two-way continued dialogue between the two sectors should be created to facilitate greater understanding and trust. Effective knowledge brokering also requires a range of stakeholders and could benefit from the involvement of individuals who are able to translate and synthesize scientific information in a way that is both accurate and useful for policymakers [25] (Gluckman et al. 2021).

5. Conclusions

While combating the COVID-19 crisis is relatively straightforward to plan and implement, combating the environmental crisis poses spatial and temporal hurdles. Linking spatial and temporal scales is difficult to communicate to both policymakers and society, as it is hard to conceptualize. Inoculating the population has a positive effect—on the local as well as on the global population, and reopens certain freedoms to the citizen as a reward (travel and the private life sector). In contrast, positive behavior that is conducive to mitigating the environmental crisis is not immediately rewarded in a tangible way. Therefore, the willingness of governments to create policies that protect the environment and of the public to follow these policies is likely to be significantly lower. Additionally, the mechanism that were successful in addressing the pandemic resulted in the relaxation of restrictions, and thus provided immediate reward of appropriate behavior, which is absent in the environmental crisis. Earth's systems tend to respond slowly, and thus there is a significant time lag between human action and environmental response. In addition, political time frames such as election periods and short-term interests through lobbyism do not match the long-lasting modes of the environmental crisis.

In summary, low perceptibility, lack of recognizable local effects, and absence of prompt reward effectively hinder compelling and timely action to solve the environmental crisis, particularly when looking at long-term changes. The crisis is assessed in scientific studies but rarely perceived as threatening individual existence—a fundamental and fatal human fallacy. Science is trapped between knowledge of the length of the time scales of the environmental crisis and pragmatic but short-scale solutions that find acceptance. However, even though we demonstrated that the COVID-19 crisis and the environmental crisis are not fully comparable, we have learned during the COVID-19 crisis that it is appropriate to confront society with scientific evidence and to develop scenarios of the results of political actions (or inactions). This opens the door for future research and actions concerning all aspects of the environmental crisis. We need a much more profound understanding of how the Earth reacts to the ongoing crisis on a global scale. This requires research of paleo-climatic crises we know of in the Earth's history. Similarly, we need to understand how ecosystems as well as human settlements including large cities can cope with the ongoing change on longer time periods better. Eventually, we urgently need to link this natural science basis with research in the humanities. Here, solutions from sociology and psychology are of timely importance, as they can help to communicate the hard scientific facts to the general public and decision makers. We feel it is time now to also confront society with complicated issues such as temporal and spatial decoupling, and non-linear systems, to underline the urgency to fight against the environmental crisis now—not for immediate benefits but for the benefit of future generations.

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