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Corona, Climate Change, and Evolved Human Behavior

Carsten Schradin[1,2,*]

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Most scientists agree that we have to restrict climate change, but there is much frustration that we are failing. The Corona Crisis exemplifies how human behavior is constrained by its evolution, cognition, and resource availability, explaining why we do not act to avoid climate change for the benefit of future generations.

Corona and Climate Change, Two Crises for Humanity

The Corona Crisis [resulting from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)] demonstrates how countries worldwide have been able to implement drastic measures. Scientific modeling indicates that worldwide interventions prevented or delayed the infection of more than half a billion people, saving the lives of millions [1]. Countries differed in how they reacted and how hard they were hit. Considering how humans reacted to Corona might allow us to understand how humans behave in other crises. There is consent among more than 11 000 scientists that climate change poses the most threatening crisis for humanity [2], an opinion shared by the public [3].

Frustration results when expectations are not met. This is unnecessary if the expectations are scientifically unsound. This article does not offer a solution to avoid climate change. It highlights why it is hard for humans to behave for the **benefit of the species** (see Glossary).

Why Do We Fail in Preventing Climate Change?

The First World Climate Conference, held in 1979 in Geneva, highlighted that reducing CO_2 emissions is needed to mitigate climate change. Reducing CO_2 emissions by 45% from 2010 to 2030 would restrict the increase in global temperature to 1.5°C. Instead, CO_2 emissions continue to increase[i]. While publications from scientists spanning multiple disciplines summarize what we should do [2], we do not sufficiently incorporate scientific insight from an evolutionary perspective into why we fail.

While our failure to avoid climate change is frustrating, this behavior can be explained with evolutionary theory (Boxes 1 and 2). Human **adaptive behavior** evolved because it increased Darwinian fitness in the environment of our ancestors, not because it benefitted future generations. Using science to mitigate climate change demands that we consider scientific insight from studies in animal behavior, which is assumed to also apply to human behavior [4].

Cognitive Decisions Are Constrained

The Corona Crisis demonstrated that humans are better at reacting to a crisis than preventing one. Humans regard the costs of preventing a crisis as too high when they do not experience its costs. This has been called the 'prevention paradox' (a form of self-defeating prophecy), where humans question the measures taken to avoid the pandemic because the predicted negative consequences did not occur.

This is due to evolved **cognitive mechanisms** [5]. We acquire past and present information to predict the future. Cognition leads to decisions, that is, we decide to show behaviors that are predicted to increase our current **proximate benefits** [6]. While the

Glossary

Adaptive behavior: behavior that leads to an individual fitness benefit in the present, normally because it led to a fitness benefit in past generations.
Behavior that benefits the species: behavior can be beneficial for the species (for future generations), but, if it is, then it did not evolve because of these consequences. It evolved because it led to individual fitness benefits in previous generations.
Cognitive mechanisms: the neural processing of information from the external environment, which includes decision-making through the acquisition, integration, storage, and retrieval of information.
Proximate benefits: anything that activates the reward system and increases well-being, often causing pleasure in humans. Proximate benefits exist because they induced behavior that increased fitness.
Proximate costs: decrease in well-being and pleasure.
Selfish behavior: behavior that leads to an increase of direct individual fitness, independent of the costs it induces to others.
Tragedy of the commons: situation where individuals overexploit common goods to increase individual fitness. The costs of overexploitation are shared by all community members, while the benefits accrue to the individual.

climate did change during evolutionary history, this change was too slow to directly influence individuals and climate change was not predictable on an individual level.

The dilemma humans face with regards to climate change is that we can scientifically predict the future of the next decades, but our cognitive mechanisms are constrained because they evolved to make behavioral decisions that benefit us now [7]. We make decisions that bring us immediate proximate benefits. The **proximate costs** induced by fearing climate change in the coming decades are lower than the proximate benefits of our current climate-damaging behavior.

During the Corona Crisis, the costs suffered in countries that acted too late or insufficiently helped decision-makers of other countries to justify their prevention actions. It appears that countries with low

Box 1. Constraints: Why Humans Fail to Change their Behavior to Avoid Climate Change

Cognitive decisions are constrained. They are based on information about the past to predict the consequences of actions on our current proximate well-being (Figure I). While we can cognitively predict the future in several decades (acquisition and integration of information), we have not evolved cognitive mechanisms allowing for decisions to avoid a future in several decades at current proximate costs. To trigger cognitive decisions that cause climate neutral behavior, we must emphasize current examples of problems caused by climate change or provide current benefits.

The tragedy of the commons. If a behavior leads to a net fitness benefit for the individual, it will be shown even if it causes a net cost for the community. Overexploitation of common goods, such as the climate, can be adaptive for individuals if it increases their fitness. Political change is needed for the benefit of future generations (Figure I).

Availability of resources. The availability of resources was critical in the efficiency of the Corona Crisis response and it will be critical in the response towards consequences of climate change (Figure I). I recommend making resources available now on a regional, national, and international level to increase resilience to the future crisis.
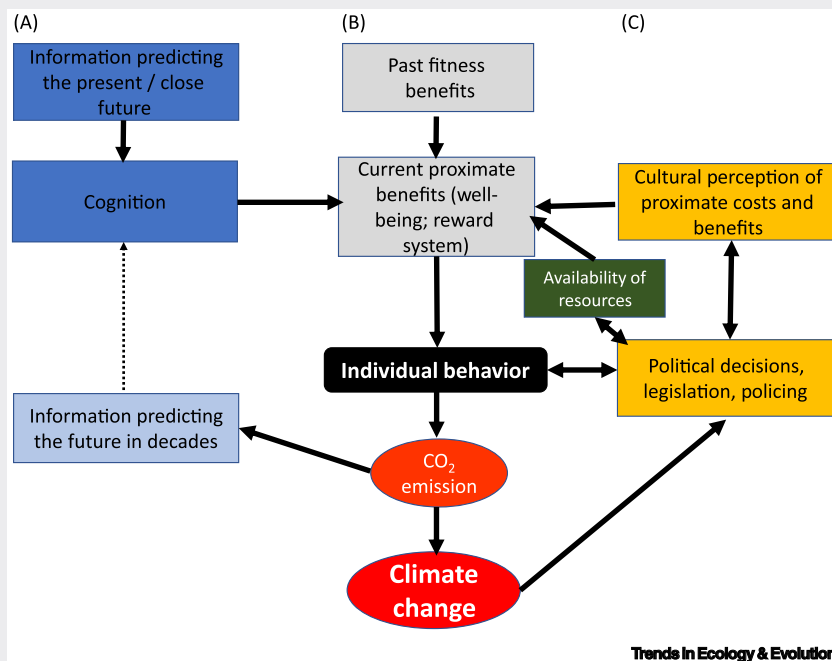

Figure I. A Framework Explaining Constraints of Human Behavior to Reduce CO_2 Emissions.
For a Figure360 author presentation of Figure I, see the figure legend at https://doi.org/10.1016/j.tree.2021.03.010. Black box: individual behavior is what we want to understand to allow us to reduce climate change, which is accelerated by human CO_2 emission (used here as a well-known example, although it is not the only factor leading to climate change). (A): information predicting that the present and close future influence motivation, emotion, and cognition, which influences current decisions. Cognition is itself a proximate mechanism, which functions to increase proximate benefits (reward system) increasing current well-being, which in the past increased fitness of our ancestors (B). Information predicting the distant future in decades can be acquired and integrated cognitively, but has less influence on cognitive decisions about current actions (broken line). (B): past fitness benefits associated with certain behaviors led to the evolution of a physiological reward system that leads to the experience of current proximate benefits (well-being and pleasure) if this behavior is shown. Currently, increased use of resources for a high standard of living increases proximate benefits, causing increased CO_2 emissions, which accelerates climate change. (C): the individual proximate costs and benefits are weighted differently in different cultures. To reduce climate change, political decisions changing individual behavior are needed. Political decisions, legislation, and policing depend not only on the cultural and political system, but also on individual behavior (e.g., through elections). Political decisions influence individual behavior through legislation and policing. Politics influence which resources will be made available to reduce and to adapt to climate change. The availability of resources themselves influences which political actions are possible, and which behavior individuals show.

proximate costs due to Corona Crisis during the first wave were less willing to experience costs of mitigation actions in the second wave, which then caused higher proximate costs. Similarly, the Climate Change Crisis will continue to grow because most humans are not currently experiencing its costs. By emphasizing current examples of proximate costs of climate change (wildfires, droughts, and rising sea levels), humans living in areas not yet affected can learn about the negative consequences, inducing a behavioral change.

The Tragedy of the Commons

Behavior causing overexploitation of common goods has evolved because it increased individual fitness, even though this individual benefit is lower than the communal costs shared by all (so-called 'Tragedy of the Commons') [8]. For humans, this means there is evolved selfish behavior at a cost for the community [7]. The climate is a common good.

During the Corona Crisis, many politicians expected the public to behave in a way that minimized costs for the community. Politicians did not consider that the experienced net costs differed between people, for a variety of reasons (e.g., amount and source of income; risk of severe symptoms after infection), making it cheap for some to follow the recommendations, but expensive for others. Some individuals were cheating to reduce their individual costs. To counter cheating, a common solution was to implement even stricter measures.

A common response to such problems is to complain about the selfish actions of people [9]. However, humans are not 'behaving stupidly', but their behavior fits evolutionary theory. While humans are highly cooperative creatures, our evolved mechanisms of cooperation will not help us to avoid climate change, but might even accelerate it. Cooperation evolved

because it increases resource acquisition that increases individual fitness (Box 2). Increased resource acquisition typically leads to increased consumerism, which is associated with increased CO_2 emissions.

Availability of Critical Resources

During the Corona Crisis, it was the impact on the health system that sent shocking pictures around the globe. Critical to the response was the resource availability of hospitals as well as the capacity of health departments[ii]. Theoretically, identifying and then quarantining only potentially infectious persons would have been sufficient to break infection chains and to stop the pandemic. Instead, entire countries were quarantined, leading to immense economic, health, and social costs.

The availability of resources will be critical in our response towards the consequences of climate change. As an example, I use the predicted increases in heat waves and droughts [10]. In 2015 and 2018, Europe experienced more severe drought years than during the previous 2100 years [11], that affected the agricultural sector [12]. If several drought years will occur in succession in the future, the consequences for food availability in those densely populated

regions could be dramatic [10]. Hence, it is advisable to create resources to cope with droughts now, including a network of regional departments with the necessary human as well as technological resources. Government programs to stabilize and strengthen the economy could invest in companies producing and improving irrigation systems. Rich countries should invest to create affordable resources for all countries [13].

Predicting Our Behavior to Prepare for the Future

We are selfish by evolution. We seek our individual benefits even if it comes at a cost for the community (Box 1). We cooperate to get access to ever more resources, increasing CO_2 emissions (Box 2). We are better at reacting to the consequences of crises than preventing them. Our cognitive mechanisms evolved to make the best short-term, not long-term decisions.

Human behavior is complex, depending on cultural differences, which influence how proximate costs and benefits are perceived. Economists and social anthropologists developing mitigation strategies should take evolved human nature into account. The ecologists and climate

activists who demand the maximal course of action should consider switching to demands that are possible for humans to incorporate. Otherwise, political decision-makers and the public might not act but conclude that the demands of the climate activists are unimplementable.

Global energy expenditure will increase in the future because we will not reduce our travel, consumerism, production of goods, while, globally, billions of people want to raise their standards of living, [13]. To restrict climate change, we have to invest in alternative forms of energy production with lower CO_2 emissions and in technologies that actively remove CO_2 from the atmosphere [13]. For this, we need societies that are willing to invest into these changes, and this needs democratic majorities.

Even when the majority agreed with the Corona restrictions, a significant minority not adhering to them was enough for the pandemic to worsen. Similarly, even when the majority in a country decides that burning of fossil fuels must be reduced, demand for cheap energy might keep CO_2 emissions high. It is important to win majorities voting for changed legislation. Legislation must then be enforced by policing. In the fight against Corona, we waited 9 months for the first vaccine, which might restore our freedom. In the case of climate change, we will have to wait much longer for sufficient alternative energy sources.

I have no doubt that climate change will continue to progress and, thus, we need to build resilient societies. I propose we fight for a reduction in CO_2 emissions while being aware that climate change cannot be stopped. We invested billions to fight Corona. I recommend investing more in technologies that reduce CO_2 and in adaptation to climate change [14]. It will be easier to achieve this if it leads to individual benefits (jobs, achieving and

maintaining a high standard of living) than to aim for stopping climate change via altruistic renunciation.

Declaration of Interests

None declared by author.

Resources

[i]https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions
[ii]https://ourworldindata.org/covid-exemplar-germany

[1]CNRS, UMR7178, 67087 Strasbourg, France
[2]School of Animal, Plant, and Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa

*Correspondence:
carsten.schradin@iphc.cnrs.fr (C. Schradin).

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