

Earth Syst. Dynam. Discuss., community comment CC3
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Reply on RC2

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Community comment on "ESD Ideas: Planetary Antifragility: A new dimension in the definition of the Safe Operating Space for Humanity" by Oliver López-Corona et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-26-CC3>, 2021

I agree that by measuring the albedo of the earth one can get a measure of how what you call entropy "production" (what I would call "negative entropy production") is evolving on the earth, in particular plant life. But the albedo also provides information about any part of the earth's surface which reflects sunlight such as the growth of cities, the shrinkage of ice fields, the growth of deserts, subtle changes in the surface of the oceans, etc. So, for example, one could argue that the expansion of cities might be an indicator of bigger governments that might help mitigate climate change and help communities become more resilient to it. Furthermore, climate change itself changes the albedo of the earth in complex ways in addition to the incremental ways that humanity is changing the albedo, such as by building cities. Some areas of the globe become more desert-like as the earth warms, and some areas of vegetation and other light absorbing ecosystems might expand. Since this article seems to be attempting to provide a fairly aggregate measure of changes in albedo (let's assume they succeed at that), then the results of the article seem to say little about the changing ability of civilization as a whole to response to or be resilient with respect to climate change. Thus I am not challenging the research relied on by the authors regarding a thermodynamic "theory" of the evolution of the biosphere. But since the changes observed in the albedo of the earth due to climate change cause many more kinds of changes than just changes in the biosphere, measuring changes in the albedo does not seem to me to be a good indicator at all of the general ability of humanity to respond to climate change, or, therefore, to measure where the world stands with respect to the complex set of indicators cited in the planetary boundaries literature.

Another example: to mitigate climate change the world needs to cover a significant but small area of the earth's surface with solar farms. While they absorb solar radiation to make electricity, they also might reflect more sunlight than the plant matter might have previously existed in the areas the solar farms were built upon. Thus, while the albedo of those land areas might increase, the ability of humanity to keep within the planetary boundaries might also increase. The authors methodology would claim that this result would be a decrease in resilience because the albedo increased. So a proper analysis of even just the single planetary boundary dealing with climate change, not to speak of the other planetary boundaries, would require a much more disaggregated analysis of how the

albedo of the earth's surface is changing, and what this implies for resilience.