SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

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Response to Zeng et al. “Environmental destruction not avoided with the Sustainable Development Goals”

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Abstract

Zeng et al. [1] seek to "evaluate the ability of the SDGs to reflect actual progress towards biodiversity conservation". To this end the authors assess the correlation of countries' performance on environmental metrics among the official global SDG Indicators with performance on eleven "independent and well-established measures of environmental protection". In this Working Paper we describe the major issues related to the framing, method, and proposed policy implications of this work. We emphasize that the SDGs provide the right vision for addressing the challenges of our times, including the climate and biodiversity crises. Yet, the official list of SDG indicators developed by the Inter-Agency and Expert Group on SDG Indicators and validated by the United Nations Statistical Commission does have significant limitations. It should be complemented by non-official data and further efforts to strengthen statistical capacities to provide an accurate assessment of countries' performance on the SDGs, especially the climate and biodiversity goals.

About the SDSN

The UN Sustainable Development Solutions Network (SDSN) mobilizes scientific and technical expertise from academia, civil society, and the private sector to support practical problem solving for sustainable development at local, national, and global scales. The SDSN has been operating since 2012 under the auspices of the UN Secretary-General. The SDSN is building national and regional networks of knowledge institutions, solution-focused thematic networks, and the SDG Academy, an online university for sustainable development.

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1. Introduction

Zeng et al.[1] seek to "evaluate the ability of the SDGs to reflect actual progress towards biodiversity conservation". To this end the authors assess the correlation of countries' performance on environmental metrics among the official global SDG Indicators with performance on eleven "independent and well-established measures of environmental protection". We see major issues related to the framing, method, and proposed policy implications of this work.

We emphasize in this Working Paper that the SDGs provide the right vision for addressing the challenges of our times, including the climate and biodiversity crises. Yet, the official list of SDG indicators developed by the Inter-Agency and Expert Group on SDG Indicators and validated by the United Nations Statistical Commission does have significant limitations. It should be complemented by non-official data and further efforts to strengthen statistical capacities globally to provide an accurate assessment of countries' performance on the SDGs, especially the climate and biodiversity goals.

2. Four major issues related to the framing, method, and proposed policy implications of the findings included in Zeng et al.

First the paper's title and abstract are misleading. They assert that the SDGs do not avoid environmental destruction and "will likely serve as a smokescreen for further environment destruction", but these claims are not borne out by the paper. Zeng et al. test correlations between the global SDG indicators and environmental state variables selected by the authors. The observed lack of correlation between environmental SDG indicators and the "measures of environmental protection" might suggest weaknesses in the former, but not necessarily the goals themselves.

The distinction between the SDGs, their targets, and indicators is important because they are each binding to a different degree. The goals and targets were adopted by all UN member states as part of the 2030 Agenda. While the goals are binding on all countries, targets are "aspirational and global, with each government setting its own national targets guided by the global level of ambition"[2]. Meanwhile, the indicators were proposed later by the Inter-Agency Experts Group on SDG Indicators (IAEG-SDGs) and adopted by the General Assembly in July 2017, emphasizing that they were "an initial set of indicators to be refined annually."[3]

It would be a mistake to conclude from possible weaknesses in the indicators that the goals themselves are consistent with environmental destruction. Yet, the poor framing of the paper has led many to draw this conclusion (e.g. Refs[4–7]).

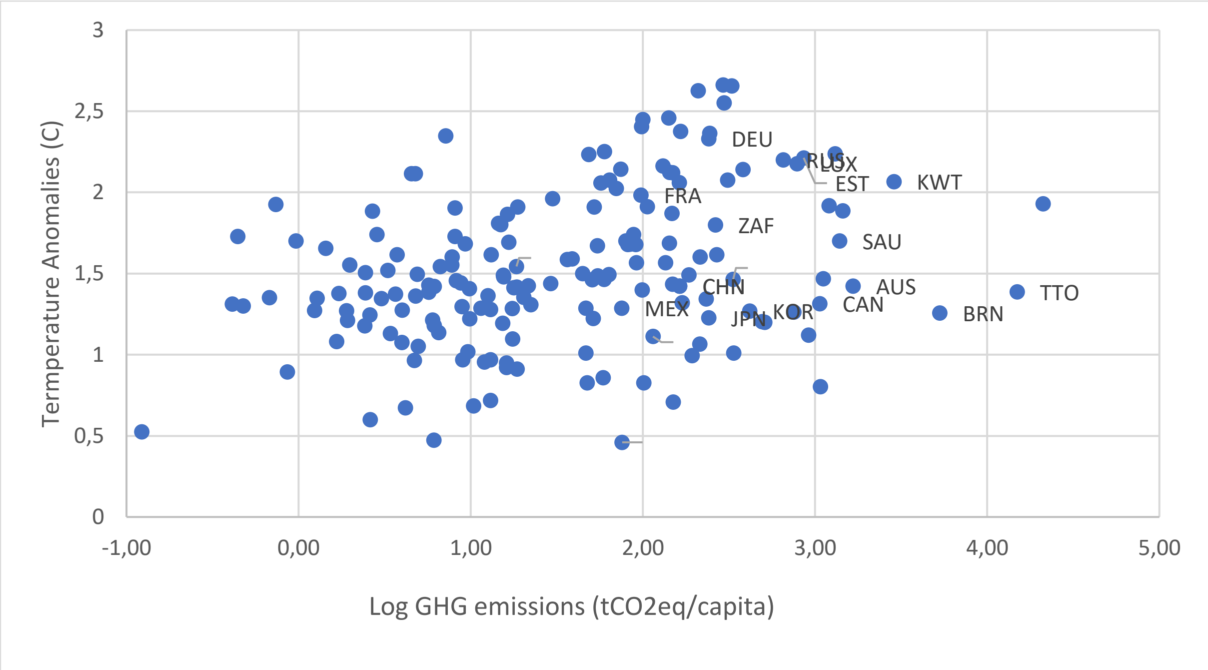
Second and closely related, the UN General Assembly resolution states the official global SDG indicators "will be complemented by indicators at the regional and national levels."[3] We concur with criticisms[8] cited by the Zeng et al. that the global SDG indicators have many gaps and deficiencies, and some of us have made similar points[9,10]. As one glaring example, the official indicators did not include measures of greenhouse gas emissions until 2020[11] even though SDG 13 calls on countries to combat climate change. Moreover, many official indicators for environmental SDGs 12-15 focus on policy means, such as the existence of strategies or ratification of conventions, whereas direct measures of environmental impact and policy outcomes might be useful to track progress towards the SDGs. Official indicators also do not measure international spillovers.

Because of these widely recognized weaknesses global SDG indicators need to be complemented with additional metrics, particularly for the environment, as is commonly done by national [10,12] and cross-country assessments[10]. We believe it was a mistake that the authors do not acknowledge this critical point and therefore limit themselves to too restrictive a set of national SDG indicators.

Third, the methodology leads to spurious and misleading correlations for many environmental SDG indicators. As an accountability framework and management tool for implementing the SDGs, annual SDG indicators should cover metrics that countries can affect year-on-year, such as greenhouse gas emissions, depletion of fisheries under their control, air and water pollution, or protected areas. Yet, the control variables used by the Zeng et al. describe cumulative human impacts. The resulting correlations therefore suffer from stock-flow problems. Others control variables are driven by regional or global environmental changes, so their correlation with national indicators leads to attribution errors.

To illustrate the stock-flow problem, temperature and precipitation anomalies reflect cumulative disturbances to the climate systems and are not affected by greenhouse gas emissions during a given year. Consequently, neither variable is correlated with annual greenhouse gas emissions (Figure 1, SI). And if all countries achieved the Paris Agreement goal of net negative emissions, then these correlations would become negative. All variables used by Zeng et al. – with the exception of Terrestrial Wilderness Change – track cumulative human impacts. They would therefore not necessarily correlate with annual policy or flow variables used to track year-on-year progress to the SDGs.

Figure 1 | Annual GHG emissions from all sources except LULUCF per capita against temperature anomalies at the country-level (r = 0.27). *GHG emission data from ref[13] and temperature anomalies from ref[14].*



Instead of using the underlying data for temperature anomalies in Zeng et al., we extracted data from the FAO and sourced from NASA[14], as we were unable to re-extract, replicate or verify the data on temperature anomalies in Zeng et al.

To illustrate the attribution error, Zeng et al. use country-level temperature and precipitation anomalies as a test for environmental SDG indicators, but the former are driven by global greenhouse gas concentrations, which may not correlate with national greenhouse gas emissions. In some cases, one might even expect a negative correlation, because some developing countries with low per capita emissions experience some of the highest precipitation and temperature anomalies[15]. Another possible reason for spurious correlations with temperature and precipitation anomalies is that Earth system dynamics lead to higher temperature anomalies at higher latitudes and elevation, and precipitation anomalies are also unevenly distributed[16]. The data does indeed suggest no clear correlation (Figure 1). Similarly, precipitation anomalies show no correlation with greenhouse gas emissions (SI). Yet, all scientific assessments concur that for the 2030 timeframe considered by the SDGs, national greenhouse gas emissions are a critical indicator for progress towards the climate goals[16], and the Paris Agreement aims for net-zero emissions[17]. Other control variables used by Zeng et al., such as Marine Wilderness and Marine Threats, would also give rise to attribution errors in the correlations with SDG variables.

A final, more minor methodological concern stems from the indicator normalization method. Zeng et al. normalize each indicator on a scale of 0 to 100. The numerical bounds are defined by the lowest and highest performance, respectively, for the indicator in question. This method makes the normalized indicator values highly sensitive to extremes in the distribution, which is why such extremes are usually truncated or censored[18]. Moreover, this normalization assumes that the performance of the highest-performing countries is synonymous with "goal achievement". While this is a reasonable assumption for many socioeconomic indicators, such as life expectancy, literacy rates, or Gini coefficients, it is not a good assumption for environmental indicators because many key objectives have not been achieved by a single country. For example, no country has met the objectives of the Paris Agreement, and rates of biodiversity loss are high everywhere[19], so normalizing by "best performance" will lead to erroneously positive scores for all countries. A better approach is to normalize indicators in relation to science-based targets and objectives of the major conventions[12]. On balance, the normalization method used in Ref[1] generates inconsistent normalizations across SDG indicators, which further weaken the correlation analysis performed by the authors.

3. Conclusion

These methodological shortcomings combine to generate spurious correlations for the control variables used by Zeng et al. and as illustrated in Figures 1 and 2. In some cases even the direction of the correlation is spurious. The method is unsuitable for determining the usefulness of annual environmental SDG indicators.

To be clear, we agree that countries should track the state of their environment, including in areas that are driven by regional or global dynamics, such as temperature anomalies. The purpose of the SDGs and major environmental conventions must be to ensure that these state variables stay or return to levels that are consistent with environmental sustainability and planetary safety.

A better approach to determining whether SDG achievement, as measured by national SDG indicators, will avoid environmental destruction, is to compare national SDG indicators against benchmarks that must be met in the future in order to achieve long-term environmental goals, such as carbon neutrality by mid-century. Such approaches are widely practiced for the climate goal, particularly in relation to energy decarbonization[20]. They are more difficult to apply to biodiversity conservation owing to the large number of drivers acting on biodiversity loss and widespread data gaps[21], but efforts are underway to define mid-century targets and to prepare long-term pathways towards achieving them against which the performance of annual SDG indicators can then be assessed[22].

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Supplementary Information

Figure 2 | Annual greenhouse gas emissions from all sources except LULUCF per capita against precipitation anomalies at the country-level (r = 0.16). *For presentation purposes, only countries with precipitation anomalies of 100 and above were retained. GHG emission data from ref[13] and temperature anomalies from ref [1].*