

Report for the EGU sphere manuscript titled: **‘The effect of anthropogenic heat emissions on global warming.’**

The paper attempts to calculate the climate impact of energy consumption and subsequent thermal pollution in the form of sensible heat released into the atmosphere. The topic is relevant as it pertains to the role of direct heat emissions on global warming. However, the present study simply makes empirical estimates without presenting principles and fundamentals of atmospheric heat transfer. Accurate estimation of global temperatures with inclusion of heat emissions in the climate models is increasingly becoming relevant with CO₂ emissions rapidly increasing. However, the paper has the scope to provide convincing scientific arguments to support the results which is missing from the manuscript in the current format.

Following the points that require further explanation:

- The methodology followed for calculating sensible heat released and subsequent temperature changes is based on data from global energy statistics using a simple three-dimensional model. A rigorous statistical analysis accounting for the radiative properties of the atmosphere should have been used as is detailed in previous studies. The three-dimensional heat distribution model used in the model rejects scientific findings of anthropogenic atmospheric heat flux based on very weak assumptions (Line 50 onwards).
- It has been established that the local heat emissions and the subsequent urban heat island effect contributes significantly to the sensible heat flux of the global atmosphere (Yang et al., 2017), while the paper claims otherwise. A proper citation of the previous and important studies that present similar global heat emission estimates is also missing in the paper (Line 85 onwards).
- The science explained is ambiguous. While the author has tried to answer public questions related to heat dynamics in the atmosphere, the scientific understanding of the process is not clearly presented. The fact that the heat released into the atmosphere is affected majorly by the atmospheric and oceanic circulation affecting its

distribution is nowhere mentioned or addressed in the paper. Block et al., 2004 reported that anthropogenic heat in regional climate models resulted in significant rise in land temperature (again contrary to what is reported in the paper). The paper also misses the latent heat released and the indirect heat emissions due to global warming.

- A proper citation of the previous and important studies (Zhang et al., 2013) that present similar global heat emission estimates is also not presented. Citations are not linked to relevant sources of information. For example, in line 43 a reference is made to the latest IPCC report but a 2013 paper is cited.
- Finally, the language used in the manuscript is not scientific with contradictory and incorrect statements provided throughout the text. Statements like, “Therefore, there is still no direct proof that carbon dioxide emissions cause global warming.”, should not have been used without substantial scientific proof and reasoning as they tend to undermine global scientific effort that has established the role of CO₂ in global warming as a fact. The language of the text requires to present facts more clearly and with proper citations. Also, existing knowledge on the subject presented in previous studies along with the existing gaps needs to be provided.

The paper tries to address the contribution of anthropogenic thermal emissions as a result of growing energy consumption on global rise in temperature. The quantification of anthropogenic heat released into the atmosphere is important to make more precise global climate predictions. However, the present study needs a more rigorous scientific analysis with precise presentation of the arguments. It is not recommended for publication in the present format.

References:

Block, A., Keuler, K., & Schaller, E. (2004). Impacts of anthropogenic heat on regional climate patterns. *Geophysical Research Letters*, 31(12).

Yang, W., Luan, Y., Liu, X., Yu, X., Miao, L., & Cui, X. (2017). A new global anthropogenic heat estimation based on high-resolution nighttime light data. *Scientific data*, 4(1), 1-11.

Zhang, G. J., Cai, M., & Hu, A. (2013). Energy consumption and the unexplained winter warming over northern Asia and North America. *Nature Climate Change*, 3(5), 466-470.