**Supplementary Material:**

Feinberg A (2022) Solar Geoengineering Modeling and Applications: Assessing Key Parameters and the Urban Heat Island Influence. Front. Clim. 4:870071. doi: 10.3389/fclim.2022.870071

**Appendix A: Estimating Urban Area Growth from 1950 to 2018**

Estimates of urbanization areas vary partly due to the confusing definition of what is urban. However, two studies that were used in the author’s past work (Feinberg, 2020) will be used. Of interest is the UHI and LCLU area growth from 1950 to 2019. Table A.1 summarizes the results of estimates provided in the author’s prior study and a proposed strategy (Feinberg, 2020).

 **Table A.1** Extrapolated and amplified urbanized coverage estimates

|  |  |  |
| --- | --- | --- |
| **Year** | **% Urban coverage****of the Earth** | **%Urban Coverage****Of the Earth** **Using Liu et al** **Definition** |
| Schneider study [20] |
| 1950 | 0.059\* |  |
| 2019 | 0.188\* |  |
| 2019–1950 | 0.129\* | 0.09 (=.0129x.7) |
| Worst-case GRUMP study [21]  |
| 1950 | 0.316\* |  |
| 2019 | 0.952\* |  |
| 2019–1950 | 0.636\* | 0.191 (=0.3x0.636) |
| Estimated % of UrbanizationIncrease from 1950 to 2019 | **0.28** (=0.09+0.19) |

A Schneider et al. study (2009) on 2000 data estimated that 0.148% of the earth was covered by UHIs and the associated surrounding urban areas. This study was also referenced in an IPCC AR5 report (Satterthwaite et. al., 2014). Using city growth rates, this extrapolates (Feinberg, 2020) to the values shown for 1950, and 2019. Similarly, another study from GRUMP (2005) found global urbanization with a larger value in 2000 of 0.783% that extrapolates to 0.953% (Feinberg, 2020) of the earth’s area in 2019. Using a definition by Liu et al., the GRUMP (2005) area estimate fits the definition of “urban area”, where the Schneider et al. (2009) estimate fits the definition of “built-up area”. The strategy developed in the author’s article (Feinberg, 2020) is to use a weighting of 70% Schneider et al. (2009) and 30% GRUMP (2005) for final comparisons. This yields the estimated percent increase in urbanization extent from 1950 to 2019 value of 0.28% in Table A.1.

**Appendix A: References**

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Schneider A, Friedl M, and Potere D (2009) A new map of global urban extent from MODIS satellite data. Environmental Research Letters, 4, 4, 044003, doi:10.1088/ 1748-9326/4/4/044003