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Research Plan 2019

Urban Expansion and Carbon Emissions

A. RATIONALE

By 2050, about 68% of the global population is expected to live in urban areas, compared to 55% in 2018. This amounts to the urban population growth of approximately 2.5 billion people, 90% of which is expected to take place in Asia and Africa (UN 2018). Within such cities, greenhouse gas emissions are widely considered to be contributing to global warming, or at the very least, are clearly correlated to increased temperatures (Oreskes, 2004). It has been found that cities are responsible for over 70% of CO_2 emissions, and generally, contain populations most vulnerable to the effects of climate change (UN-Habitat Climate Change). Additionally, increases in population correspond with increases in CO_2 emissions (Graves, 2016). Such metrics create a clear need to establish a relationship between city growth and CO_2 emissions and to analyze other variables that could prove relevant to this primary relationship.

B. OBJECTIVES

The objective of this study is to establish the carbon emissions per capita in a sample of global cities over time and establish relationships between such emissions and urban extent. It is predicted that cities with larger extents will have lower emissions per capita.

C. RESEARCH METHODS

Procedures: Data will be collected from existing sources. Carbon emissions per capita data will be used from "Our World in Data". This site collected data regarding carbon emissions and population from the Carbon Dioxide Information Analysis Centre, Global Carbon Project, Gapminder & UN Population estimates, and the HYDE database to determine carbon emissions per capita by country. Data regarding city metrics, such as population and urban extent, will be collected from the atlas of urban expansion.

Four cities per region will be chosen for the sample; regions will be selected according to those indicated in the atlas of urban expansion. Two cities per region will have the top populations within the region, and from different countries. The other two cities from each region will have growth rates closest to the median, one higher and one lower, also from different countries. In a scenario where a city is selected as a large city, it will not be used as a growing city, even if it meets such criteria.. This process will continue in each region until cities are selected.

For each city chosen, the stated metrics will be collected. To determine the carbon emission of a city, the carbon emission per capita of the country will be multiplied by the population of the city for 1990, 2000, and 2015.

Risk and Safety: This project involves little to no risk as it is all computational.

Data analysis: Collected data will be graphed; each metric against the city's carbon emissions. The correlation will be tested based upon the significance of the correlation coefficient of the line of best fit, and additional relationships considered.

1. **HUMAN PARTICIPANTS RESEARCH: NA**
2. **VERTEBRATE ANIMAL RESEARCH: NA**
3. **POTENTIALLY HAZARDOUS BIOLOGICAL AGENTS RESEARCH: NA**
4. **HAZARDOUS CHEMICALS, ACTIVITIES & DEVICES: NA**

D. BIBLIOGRAPHY

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THERE ARE NO ADDENDUMS TO THIS RESEARCH PLAN