Geophysical Research Abstracts
Vol. 14, EGU2012-13153-1, 2012
EGU General Assembly 2012

Food security, growth and spatial organization of urban areas: a global perspective

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Urban areas are increasingly admonished to play a prominent role in achieving sustainability at global scale. They host more than 50% of the population worldwide and emit approx. 70% of all greenhouse gases worldwide. Land use and climate change are only two of the prominent processes forced by urbanization. In particular in the light of climate change and rapid urbanization cities require to increase their food security while reducing CO_2 emissions related to food supply, such as due to transportation. Using high resolution data of land-use, agricultural yield and population data, we provide an estimate of the current human carrying capacity of peri-urban areas worldwide, for urban areas with more than 500,000 inhabitants. We discuss the application of a novel algorithm to delineate city boundaries in terms of population and built-up area, which allows to characterize urban growth and its impacts on the peri-urban human carrying capacity in further detail. In addition, this algorithm is used to characterize the spatial organization of urban zones at regional scale. Our results show scale-free pattern, e.g. clusters of urban spots, which may distinguish cities in developed and developing countries. Using this benchmarking helps to measure the degree of sustainability of a city.