

**Title:**

**Gray Wave of the Great Transformation:  
A Satellite View of Urbanization, Climate Change, and Food Security.**

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**Abstract:**

Land cover change driven by human activity is profoundly affecting Earth's natural systems with impacts ranging from a loss of biological diversity to changes in regional and global climate. This change has been so pervasive and has progressed so rapidly compared to natural processes that scientists refer to it as "the great transformation". Urbanization or the 'gray wave' of land transformation is being increasingly recognized as an important process affecting environments and bio-geochemical cycles at local, regional, and global scales. A hallmark of our success as a species, large urban conglomerates do in fact alter the land surface so profoundly that both local climate and the basic ecology of the landscape are affected in ways that have consequences to human health and economic wellbeing. Fortunately, we have incredible new tools for planning and developing urban places that are both enjoyable and sustainable. A suite of Earth observing satellites is making it possible to study the interactions between urbanization, biological processes, weather, and climate. Space-based sensors collect data during the daytime and at night measuring surface temperature, vegetation, urban lighting, impervious surface area, aerosols and gases (such as carbon monoxide, ozone, and compounds of nitrogen and sulphur dioxide) inside and outside urban areas. Using these Earth Observatories we are learning how urban heat islands form and how we might ameliorate them, how urbanization can affect rainfall, pollution, and surface water recharge at the local level and even how urbanization might affect climate and food security globally.