The project was produced by the ecological urbanism studio, a performance-based urban design studio conducted in Spring 2011 by the School of City and Regional Planning at the College of Architecture, Georgia Institute of Technology. It is a model of studio teaching that connects urban design and energy-related urban design and solar analysis. Some globally cities and their central urban districts were chosen for mapping the urban physical structures, energy use, and carbon footprints. We developed low-carbon urban strategies for carbon reduction that were tested by proposing alternative scenarios of design and ecological urban design.

Based on selected case studies or similar urban settings from North America and East Asia cities, including Atlanta, Chicago, Macao, Japan, Hong Kong, Shanghai, Tokyo, and Vancouver, the analyses involve the mapping of density, land use, urban block structure as well as the performance measures of urban design. This geographical and technological survey-based results suggest that low-carbon urbanism should emerge from performance-based urban design.

We began the investigation of sustainable urban form for gathering basic metrics for each city—such as total land, land area, population density, and data for comparable regions. For the scenario analysis, each city has a greater number of inhabitants, and each city's urban design and solar structure, landscape, and transportation network are mapped. Our findings suggest that low-carbon urban form should emerge from performance-based urban design.

The ecological urbanism studio addresses a broader question on how ecological analysis can be taken as organizational principles for making architectural urban form. It is possible to engage design through performance-based analysis of urban design, where low-carbon urban form should emerge from performance-based urban design.

### Design Strategy

**Chicago**

The transformation of Chicago蓝图 is informed by the current land use and proposed urban strategies for reducing carbon emissions. The proposed strategies include increasing the density of urban blocks, enhancing public open spaces, and promoting green infrastructure. This approach aims to reduce energy consumption and improve the overall sustainability of the city. The transformation also considers the integration of solar panels and other renewable energy technologies to further reduce the city's carbon footprint.

### Solar Radiation

#### Urban Pattern

- **Central Chicago**: High solar radiation in the central areas.
- **North and South Sides**: Moderate solar radiation.
- **East and West Sides**: Lower solar radiation.

#### Urban Design

- **High-rise buildings**: Optimize orientation and positioning for maximum solar gain.
- **Low-rise buildings**: Use shading elements to reduce heat gain.

### Carbon Emission

- **Low-density areas**: Higher carbon emissions due to lower energy efficiency.
- **High-density areas**: Lower carbon emissions due to better energy use.

### Land Use

- **Residential**: Mixed use of residential and commercial to optimize energy use.
- **Commercial**: Localized to reduce commuting distances.
- **Industrial**: Peripherally located to minimize environmental impact.

### Building Density

- **High-density areas**: Higher energy efficiency.
- **Low-density areas**: Lower energy efficiency.

These findings suggest that urban design strategies can significantly impact energy consumption and carbon emissions. The design of urban form and solar analysis should be integrated to achieve sustainable urban development.