

Columbia engineers map energy use in NYC buildings

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(PhysOrg.com) -- Cities across the globe are trying to develop plans to cut down their energy consumption and lower their carbon footprint by reducing the associated greenhouse gas emissions. While initial efforts have focused on individual buildings by incorporating more energy efficient lighting, windows, and building systems, deeper reductions will call for changes beyond individual buildings, requiring a rethinking of how future infrastructure and energy policies should evolve.

A new study by Columbia Engineering School will help <u>urban planners</u>, policy makers, and engineers understand the local dynamics of building <u>energy use</u> in <u>New York City</u>—where over two-thirds of the energy consumption is from buildings—and help jumpstart the exchange of ideas.

"The lack of information about building energy use is staggering," said the study's lead author Bianca Howard, a Ph.D. student in mechanical engineering at Columbia Engineering. "We want to start the conversation for the average New Yorker about energy efficiency and conservation by placing their energy consumption in the context of other New Yorkers. Just knowing about your own consumption can change your entire perspective."

The <u>study</u>, which Howard conducted with Mechanical Engineering Professor Vijay Modi, was published in the November 7, 2011, online edition of *Energy and Buildings* and is featured in the February 2012 print edition. The research team included collaborators from Columbia's



School of International and Public Affairs, the Earth Institute at Columbia University, and the Mayor's Office of Long-Term Planning and Sustainability.

"This is a critical issue," said Modi. "While discussions frequently focus on electricity use, homes in New York City, whether a townhouse or a large apartment building, use far more energy in form of heat rather than electricity. Nearly all of this heat is obtained from heating oil or natural gas. In addition, current electricity distribution infrastructure in many urban areas relies on large amounts of electricity brought in from outside the city, making it difficult to support increased future use without requiring significant investment of resources and funds. We are looking at ways we can address both these issues—reducing our heating bills and increasing local electricity generation capacity."

Modi's team performed a statistical analysis to estimate New York Cityspecific building energy use. Their statistical model utilizes zipcodelevel <u>energy consumption</u> data to estimate the average annual energy use for every tax lot—at practically building level—through all five boroughs of the city.

This energy use was further broken down into what the building uses for space heating, space cooling, water heating, and base electric applications such as lighting, and, with this information, the Columbia Engineering team created an <u>interactive web map</u> that shows what type of energy is being used, for which purpose, and in what quantity. "This map will enable NYC building owners to see whether their own building consumes more or less than what an average building with similar function and size would," said Professor Modi. "This is the first time anyone has provided an estimate like this for New York City and the first time anyone has offered information to the public in the form of an interactive map."



The researchers plan to use their understanding of the distribution of energy to estimate where various distributed energy systems, such as photovoltaic, solar thermal, or combined heat and power systems, could have the largest impacts. "What is perhaps the most valuable contribution of this map," Modi said, "is that it enables New York City building owners and energy services providers to explore the possibility of two or more buildings, or an entire block, or even a neighborhood, to share resources and <u>infrastructure</u>, and thus save considerably on both <u>energy</u> and emissions."

"And," Modi added, "Information is the first step toward sustainability."

Provided by Columbia University

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