Urban Sustainability Research Activities at a University Level

Luís M. A. Bettencourt

Inaugural Director, Mansueto Institute For Urban Innovation
Dep. Ecology & Evolution, Dep. Sociology, University of Chicago
External Professor Santa Fe Institute
bettencourt@uchicago.edu   @BettencourtLuis
We study the fundamental processes that drive, shape, and sustain cities.

At the Mansueto Institute for Urban Innovation, our researchers come from the social, natural, and computational sciences, along with the humanities. Together, we pursue innovative, interdisciplinary scholarship, develop new educational programs, and provide leadership and evidence to support global, sustainable urban development.
Urban Science: Integrating scales + disciplines

Scale Integration Mechanism

Urban Systems

Individual

Livability
Safety
Schools
Knowledge

Neighborhood

Selection
Segregation
Mixing
Contagion

City

Migration
Trade
Knowledge diffusion

Mechanism

Cognition
Life-course
Human development
Seeds of economic growth

Neighborhood effects
Cumulative (dis)advantage

Scaling and agglomeration
Social + physical networks
Economy, information, land uses

Laws of geography
Gravity law, Zipf’s law
Urban hierarchy

Billions
Millions
Thousands
Shanghai

25 years!
1987

Not Sustainable

2012

Shanghai

25 years!
Media

30 OF THE WORLD’S LARGEST & MOST INFLUENTIAL CITIES HAVE PEAKED GREENHOUSE GAS EMISSIONS.

Austin, Athens, Lisbon, and Venice latest C40 cities that have peaked greenhouse gas emissions in line with science-based targets to limit global temperature rise to 1.5°C.

C40 announces launch of C40 Knowledge Hub, an online platform providing cities with cutting-edge intelligence to drive climate action at greater speed and scale.

**Copenhagen, Denmark (October 8, 2019)** - Austin, Athens, Lisbon, and Venice are the latest major cities to have peaked their greenhouse gas emissions. The world’s leading scientists have calculated that global greenhouse gas emissions must peak by 2020 in order to limit global temperature rise to 1.5°C. New analysis published ahead of the C40 World Mayors Summit confirms that 30 of the world’s largest cities, representing more than 58 million urban citizens, have now reached this crucial milestone.

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Universities’ contributions to advancing urban sustainability research and practice

Research  Demonstration  Education  Partnership
Research
Research

new+ better evidence (data)
mixed methods
multiple scales
theory development

Resolve false dichotomies

environment

prosperity

equity

Global North                    Global South
priorities
Toward cities without slums: Topology and the spatial evolution of neighborhoods

Christa Brelsford¹,²,.*, Taylor Martin³, Joe Hand¹ and Luís M. A. Bettencourt¹,⁴
+ See all authors and affiliations

Heterogeneity and scale of sustainable development in cities

Christa Brelsford, José Lobo, Joe Hand, and Luís M. A. Bettencourt

PNAS August 22, 2017 114 (34) 8963-8968; first published May 1, 2017 https://doi.org/10.1073/pnas.1606033114
Edited by Karen C. Seto, Yale University, New Haven, CT, and accepted by Editorial Board Member B. L. Turner March 21, 2017 (received for review June 24, 2016)

Economic geography and the scaling of urban and regional income in India

Anand Sahasranaman, Luís MA Bettencourt
First Published October 9, 2019 | Research Article https://doi.org/10.1177/2399808319879463

Growth and development in prefecture-level cities in China

Daniel Zünd, Luís M. A. Bettencourt
Published: September 3, 2019 • https://doi.org/10.1371/journal.pone.0221017
Demonstration
Executive Summary

Managing greenhouse gas emissions is the University’s top sustainability priority.

By reducing building energy use, the University manages greenhouse gas emissions and realizes major economic benefits.

See individual area pages for additional details.

**HIGHLIGHTS**
- Recipient of philanthropic support from James and Paula Crown to support the University’s aims to reduce its greenhouse gas emissions.
- Accelerate Performance grant partner (a U.S. Department of Energy funded initiative)
- Two-Star Green Restaurant Association Certification at Arley D. Cathey Dining Commons and Café Logan in 2015
- 2011 Green Star Grand Award from the Professional Grounds Management Society for exceptional grounds maintenance
- Member of the Chicagoland Network for Sustainability in Higher Education (CNSHE) since 2010
- Member of the Ivy Plus Sustainability Consortium since 2009

**AREA 1** CLIMATE CHANGE AND ENERGY

Approximate 1% decrease in greenhouse gas emissions

**AREA 2** HIGH PERFORMANCE BUILDINGS

- 9 LEED certified buildings since 2010
- 200+ building energy efficiency measures since 2009

**AREA 3** MULTI-MODAL TRANSPORTATION

- 39% decrease in greenhouse gas emissions from student commuting
- 15% decrease in greenhouse gas emissions from faculty & staff commuting

**AREA 4** WASTE REDUCTION

More than 40% of UChicago waste was diverted from landfills in 2015.

**AREA 5** FOOD SYSTEMS

- 35% of food served is grown, processed, and purchased within 150 miles.
- 40% of food served is grown, processed, and purchased within 250 miles.

**AREA 6** GREEN SPACE

46% of the University of Chicago campus is green space.

**AREA 7** WATER CONSERVATION

14 centrally controlled smart irrigation systems installed

**AREA 8** ENVIRONMENTALLY PREFERABLE PROCUREMENT

120,000 gallon underground stormwater retention system installed in 2015

**AREA 9** BUILDING AWARENESS AND PARTNERSHIPS

- 100% of the cleaning products used in UChicago dining halls and kitchens are Green Seal certified.
- 80% of the University’s janitorial supplies are green products.

**27,000+ UChicagoans** have a role to play in creating a more sustainable campus.
A central challenge of our time is sustaining the world’s developing population while minimizing damage to the environment. The Campus as a Lab (CaaL) Initiative uses Chicago’s own campus as a test bed for creating innovative solutions and developing skills in analyzing systems of energy and resource flows. CaaL involves education in quantitative environmental analysis, research into practical energy management strategies, and communication that explains our campus and environment. Projects reflect our core values: data-driven and quantitative analysis, implementable solutions, and open-source tools and data.

**What is Campus as a Lab?**

Who: undergraduates, graduate students, faculty, and Facilities staff working in collaboration.

When: ongoing, launched in Spring 2016 and featuring 4 core events in 2016-2017

What: data hackathons on campus energy and resource, demonstration events on waste and energy, and opportunities to be involved in research on campus energy, water, and waste. Focus areas include operation of campus facilities and infrastructure, economics of U Chicago’s energy purchases, building retrofit suggestions, transportation planning, and behavioral incentives.
array of things
Array of Things

Faculty Lead

Charlie Catlett

Senior Computer Scientist, Argonne National Laboratory

Creating Sensor Networks and Software Tools to Promote Health and Well-being in Cities

The Array of Things is a network of interactive, modular sensors that collect real-time data on a city's environment, infrastructure, and activity for research and public use. The initiative enables anyone to access data about climate, air quality, noise, and other factors that affect the livability of our built and natural environments.

over 100 nodes operational in Chicago, plans 500.
What Can be Done with this Data?

Potential applications of data collected by the Array of Things include:

- Sensors monitoring air quality, sound and vibration (to detect heavy vehicle traffic), and temperature can be used to suggest the healthiest and unhealthiest walking times and routes through the city, or to study the relationship between diseases and the urban environment.
- Real-time detection of urban flooding can improve city services and infrastructure to prevent property damage and illness.
- Measurements of micro-climate in different areas of the city, so that residents can get up-to-date, high-resolution "block-by-block" weather and climate information.
- Observe which areas of the city are heavily populated by pedestrians at different times of day to suggest safe and efficient routes for walking late at night or for timing traffic lights during peak traffic hours to improve pedestrian safety and reduce congestion-related pollution.

Array of Things data and technology will also be available for educational purposes, engaging local students and training them on important job skills. Read more about our educational initiatives and curricula.
Array of Things Releases APIs for Chicago Data, Enabling Applications

Array of Things Locations, May 2019

GIS map created by Arpan Laha, Center for Spatial Data Science, University of Chicago.
Education
Over the course of eight weeks, the student teams learned important skills, such as:

1. **Formulating an hypothesis or question to be answered through experimentation.** Although the curriculum revolves around sensors and IoT technologies, these are means rather than ends. To conduct a real scientific project, student teams first conceived of an hypothesis or a question. A good example is the project from Group 403. These students were interested in learning whether there is “a correlation between temperature, humidity, carbon monoxide, hydrogen, and UV levels in a greenhouse. The greenhouse gets the most sunlight out of any room in Lane Tech, so we wondered if there was any correlation with UV from the sun and the various gas levels in the room.”
Environmental Frontiers

Faculty Leads

Liz Moyer and Sabina Shaikh

Professor, Department of Geophysics; and

Senior Lecturer in Environmental Studies and Public Policy Studies

Empowering Students to Create a Scientifically Robust, Sustainable Future

Environmental Frontiers gives UChicago students a scientific and practical understanding of urban sustainable development, starting with projects on campus. Students work under the guidance of faculty to develop research and applied projects that explore and enhance campus sustainability, with an eye toward broader impact into whole urban areas and their neighborhoods.
new, revamped curriculum for 2019/20
A pipeline of Talent for a new Field

- College Major + Undergraduate research + Masters Support + Urban Doctoral Fellows + Postdoc Fellows

Constantly Identifying and Promoting Transformational New Ideas

- working groups + conferences + fellows convenings + visitor series + Initiatives

Leading and Enabling a Network of Scholars at the University and throughout the World

- International Schools + Convening Peer Institutions + Signature Thought-Leadership Events + Global Centers
Partnership

(& Policy + Practice)
save the date
October 23-25, 2019
City of Chicago, IL

Global Symposium on Sustainable Cities and Neighborhoods
FEATURED NEWS

Top Ten Charts of 2019

EPIC faculty research has shed new light on some of the most crucial topics in energy this year. Check out some of their insights in our top charts from the year.

Learn More

MISSION

To confront the global energy challenge by ensuring Energy Markets provide access to reliable, affordable energy needed for growth, while limiting emissions that cause Climate Change and damages to the Environment.
The circular economy could save life on Earth – starting with our cities

Cities are where we square the circle between consumption and sustainability.

Imagine a future where human prosperity does not translate into sacrificing nature.

A world with no wastes, no pollution, where animals and plants on land and in the oceans prosper from the existence of humans as much as we do from the biology and geophysics of the Earth.

08 Mar 2018

Luis Bettencourt
Pritzker Director of Mansueto Institute for Urban Innovation, University of Chicago
World Urban Forum 9 convened earlier this month in Kuala Lumpur, Malaysia, to take the measure of our fast-urbanizing world. Central to all discussions was how to create human sustainable development worldwide through better cities as part of the Sustainable Development Goals (SDGs) and the New Urban Agenda.
Chicago’s Ambitious Transformation is Possible. The SDGs Can Help.

When Mayor Lori Lightfoot delivered her first budget address last month, she spoke of her commitment to equity and prosperity “for every community and every resident.” She emphasized that the “budget is more than just a math problem...It’s a values statement for what we prioritize and the kind of city we want to be.” Areas for investment include health care and well-being, safe streets, housing, education, clean air and clean water, and neighborhood development with the goal of “leaving no one behind.”
TECH TRANSFER FOR THE PUBLIC SECTOR.

We are MetroLab Network, a City + University Collaborative for Civic Innovation.

We drive partnerships between local governments and universities, poised to help the public sector adapt to rapid technology change.

We activate this network of stakeholders through convening, collaboration, and programming.

30+ Cities
30+ Universities
100+ Projects
Universities’ contributions to advancing urban sustainability research and practice

Research    Demonstration    Education    Partnership

critical and unique functions

Learning

Memory

Connective Tissue

Incubation

Support
Questions for Panel I:

- Among your key urban sustainability research activities, what are the most significant outcomes of research in an interdisciplinary context?

- What are characteristics of urban sustainability programs at universities? For example, are these multi-disciplinary, cross-campus initiatives? Do they bring together research and practice? What disciplines are engaged and/or taking the lead?

- What key strategies have been developed for linking research to policy, promoting sustained collaboration, and making impacts on policy decisions?

- What are some of the key strategies that can be effectively implemented across universities? How have these efforts been developed and what makes them succeed?