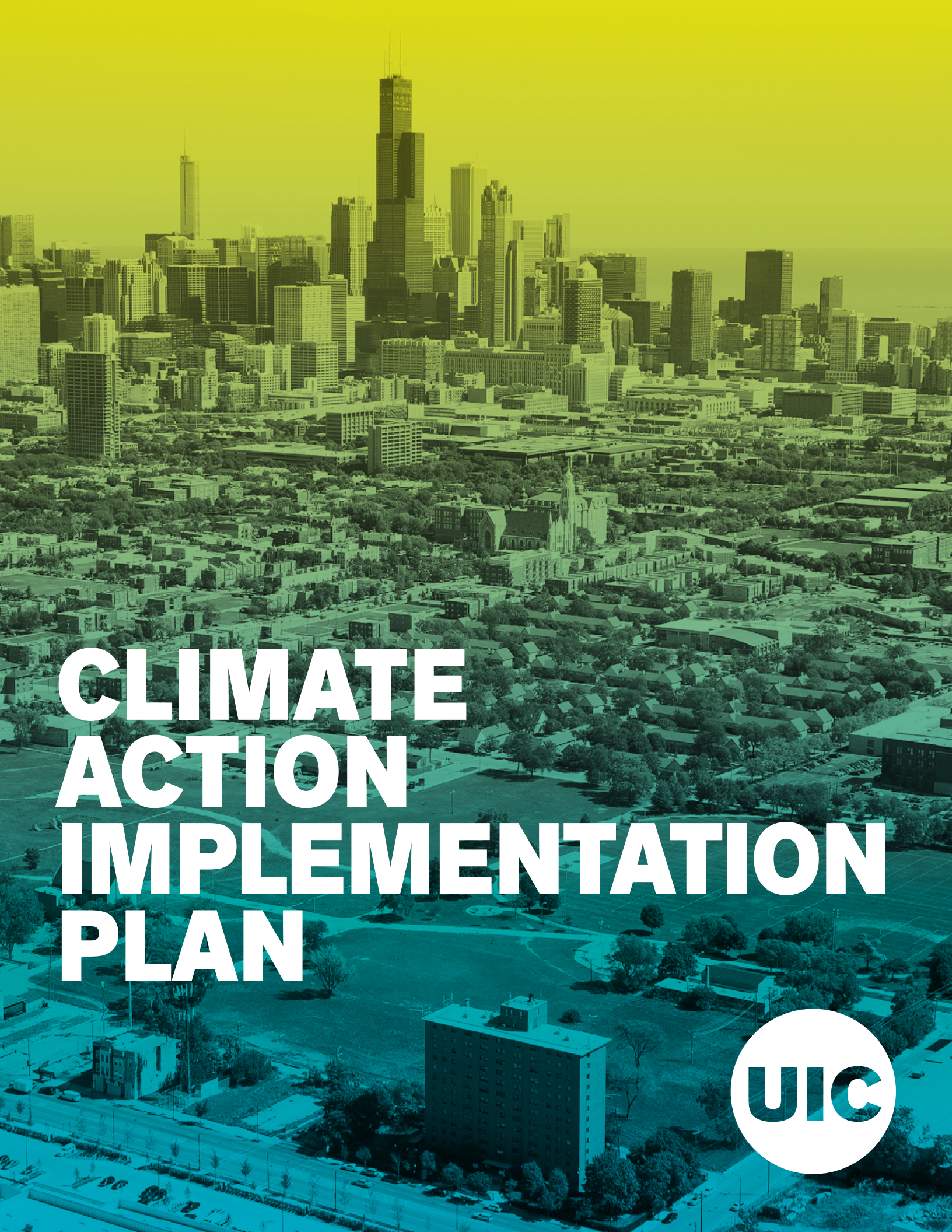

CLIMATE ACTION IMPLEMENTATION PLAN

UIC

Prepared by the UIC Office of Sustainability in conjunction with the Chancellor's Committee on Sustainability and Energy (CCSE)

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Office of the Chancellor

Office of the Vice Chancellor for Administrative Services

JANUARY 2018

UIC was among the first signees of the American College & University Presidents' Climate Commitment in 2007 putting us firmly at the forefront of the movement among the nation's universities to actively reduce our energy footprint.

Taking the lead again, UIC was among the first of a group of universities to sign Second Nature's newly integrated Climate Commitment expanded action plan. This new level of commitment extends beyond our existing efforts to support carbon reduction, including a commitment to take steps toward making the Chicago region more resilient to environmental challenges.

The UIC Climate Action Implementation Plan (CAIP) lays out the next steps for the university to build a stronger sustainable work and living ethic while reducing campus emissions of greenhouse gases. Our goal is to become a Climate Neutral, Zero Waste, Net Zero Water, and Biodiverse university. We are committed to sustainable practices that make our operations more efficient and conserve resources, serving as a model for our students and the community. We have already accomplished several important objectives including the installation of 50 Big Belly solar powered recycling/waste stations, the formation of a Solar Working Group, and the Arthington Mall green infrastructure project currently under design.

Every individual and unit has a role if these goals are to be achieved, through unit operations, research, and teaching. The Office of Sustainability is tasked with providing tools and expertise to help you in these efforts. The Chancellor's Committee on Sustainability and Energy is tasked with tracking our progress.

UIC is committed to a sustainable future, and with everyone's efforts we will continue to lead the way.

Sincerely,

Michael D. Amiridis
Chancellor

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EXECUTIVE SUMMARY

Climate Action Planning and Implementation

The earth's abundant, yet finite, natural resources are supporting a rapidly growing population and increasingly complex society; yet there is an imbalance in the use of these resources that is inequitable within and between nations, and unsustainable for future generations. The University of Illinois at Chicago (UIC) is a unique hybrid of a diverse student body and high level of faculty research and service, in the third largest city in the United States. This makes UIC uniquely positioned to advance sustainability.

UIC has a formal climate action plan with specific greenhouse gas (GHG) emission reduction targets, and provide a variety of mitigation strategies. The key fundamental difference between the 2009 Climate Action Plan (CAP) and this Climate Action Implementation Plan (CAIP) is the transition from broader mitigation strategies to a refined model of Climate and Resource Planning. This results in a concrete set of solutions with specified time frames and delegated responsibilities.

THE SEVEN CAIP STRATEGIES

The UIC Climate Action Implementation Plan (CAIP) integrates the Aspirational Goals and Short-Term Action Items of the UIC Climate Commitments into seven major strategies containing 33 refined, data-driven solutions.

Strategy 1.0 - Energy Efficiency and Conservation, **Strategy 2.0 - Clean and Renewable Resources**, and **Strategy 3.0 - Reduced Transportation-Related Emissions** all derive from the first UIC Climate Commitment—Carbon Neutral Campus. All solutions embedded within these three strategies of the CAIP work to reduce UIC's GHG emissions in moving towards carbon neutrality by 2050.

Strategy 4.0 - Natural Resources and Ecosystem Services combine the third and fourth UIC Climate Commitments—Net-Zero Water Campus and Biodiverse Campus (respectively) to help UIC realize the goal of consuming no more water than what naturally falls on its surfaces, as well as building upon our biodiversity portfolio.

Strategy 5.0 - Sustainable Materials and Reduced Waste Streams provides achievable solutions to the second UIC Climate Commitment—Zero Waste Campus, as a means to help UIC reach it's 90% diversion rate goal of landfill-bound material through recycling and other waste-reducing techniques.

Strategy 6.0 - Teaching and Learning takes the recommendations from the UIC Climate Commitments and "To Green and Beyond: Excellence Through Sustainability at UIC" that will help UIC incorporate sustainability concepts, themes, and foundational knowledge into the academic curriculum. This strategy also outlines solutions to facilitate research that furthers sustainability goals.

Strategy 7.0 - Climate Resiliency, will add actions that help UIC as well as the greater Chicago region to be better prepared for the likely impacts that will be experienced due to climate change. This strategy will outline UIC's ability and capacity to absorb external disturbances, maintain the core mission and the functions of UIC, and recover to previous or improved conditions by preparing, preventing, mitigating, responding and managing these external disturbances. Strategy 7.0 will be provided as an addendum to the CAIP.

THE STRATEGIC SOLUTIONS

The Office of Sustainability modeled greenhouse gas (GHG) emissions projections based on current usage. By obtaining this data, OS is better able to predict where UIC can best spend its time and resources to reducing these emissions. OS, along with a consulting service, Fovea LLC, created many portfolio solutions to reduce GHG emissions. Many of these portfolio solutions also are cost-effective and will save the university money. Additional information, including the historical background, quantifiable solution modules, key model assumptions of the strategic portfolio solutions, and references can be found in the CAIP appendix online at https://sustainability.uic.edu. If all of the portfolio solutions that are outlined in this CAIP are put into action, UIC can achieve carbon neutrality with using only a small percentage of offsets by 2050.

The OS also developed additional strategic solutions to help UIC realize the goals of the UIC Climate Commitments that do not have a direct impact on GHG emissions. These goals cannot be modeled the same way as GHG-reducing solutions, but careful research and case study testimonials have help shape these solutions. Implementing these solutions, along with the portfolio solutions mentioned above, will make UIC a truly sustainable university in which to work, study, and conduct research.

Piloting, modeling, and scaling solutions represent huge research and educational opportunities for our students as they go forward into an increasingly complicated world. The implementation of this plan to advance sustainability efforts should be infused with a level of urgency and sense of commitment that is commensurate with the global threat posed by climate change, resource depletion, and the failure of our educational system to prepare members of our society to comprehend and confront these challenges.

The following is a brief outline of six of the seven major strategies and their respective set of solutions to implement these goals within the next fifteen years. Adaptation of these recommendations will support the campus Strategic Priority of becoming an Entrepreneurial University through innovation, diversified funding, and increased efficiency.

STRATEGY 1.0 ENERGY EFFICIENCY AND CONSERVATION

1.1 Implement Strategic Energy Management (SEM)

1.1.1 SEM: Energy Conservation Measure (ECM) Portfolio—a portfolio solution that will identify and implement quick payback energy savings projects such as steam trap replacements across buildings on the West side, energy retrofits for PHARM (924) and AOB (941), and Energy Performance Contracts (EPCs) for MBRB (919), BRL (932) and COMRB (934).

1.1.2 SEM: Green Revolving Fund—an additional strategic solution that will provide financing to implement energy efficiency measures and other sustainability-related projects which generate financial savings.

1.2 Reduce Energy Demand

1.2.1 Building Standards (2025 IECC)—a portfolio solution that will require UIC to exceed compliance of current building standards to meet the projected 2025 International Energy Conservation Code (IECC) standard for new buildings, which is 50% less energy intense than the 2015 standard.

1.2.2 Energy Conscious Campus—a portfolio solution that will target an annual 1.5% reduction in campus energy consumption by actively training and educating the UIC community to shift habits into a more energy conscious manner.

STRATEGY 2.0 CLEAN AND RENEWABLE ENERGY SOURCES

2.1 Procure Renewable Energy

2.1.1 Indirect (10-year) PPA—a portfolio solution that will procure renewable energy for UIC through an indirect Power Purchase Agreement (PPA)—a financial transaction between the developer (e.g. proprietor of a wind farm) and offtaker (e.g. UIC) with no physical renewable power being delivered.

2.1.2 Onsite (10-year) PPA—Solar PV Rooftop Generation—a portfolio solution that requires the VCAS Solar Working Group to identify appropriate locations for a 1 MW (sized capacity) solar PV rooftop system and validate full-costs associated with deployment.

2.2 Utilize Thermal Alternatives

2.2.1 Onsite Power Plant Electricity Production—a portfolio solution that will utilize on-campus assets to generate electricity in a more economic and carbon-efficient manner.

STRATEGY 3.0 REDUCED TRANSPORTATION-RELATED EMISSIONS

3.1 Reduce Commuting-Related Emissions

3.1.1 Transportation Demand Management (TDM)

3.1.1.1 Transit Incentives for Faculty and Staff—a portfolio solution that will insert policies and practices to reduce use of single-occupancy vehicles for travel to campus by removing barriers to transit incentives.

3.1.1.2 Bicycle Program—another additional strategic solution that will reduce the use of single occupancy vehicles by increasing the quantity of bicycle parking on campus.

3.2 Reduce University Business Travel-Related Emissions

3.2.1 Fleet Efficiency (Fuel Switch)—a portfolio solution that will increase the number of hybrid, electric, and CNG vehicles by 5% in 5 years (2023), 15% in 10 years (2028), and 20% in 15 years (2033).

3.2.2 Air Travel Carbon Offset Program—a portfolio solution that will allow campus units to offset their business and conference travel with programs that aim to mitigate the environmental impact of these transportation-related emissions.

3.2.3 Inter-Campus Travel—an additional strategic solution that will allow ACCC to select and maintain telecommunication systems and OBFS to advocate for Amtrak usage.

STRATEGY 4.0 NATURAL RESOURCES AND ECOSYSTEM SERVICES

4.1 Retain and Reuse Stormwater

4.1.1 Green Stormwater Infrastructure Implementation Plan—an additional strategic solution that will lay out a comprehensive analysis of UIC's current conditions so that stormwater interventions can be properly addressed using techniques like green infrastructure.

4.2 Reduce Water Use

4.2.1 Building-Level Water Metering—an additional strategic solution that will accurately measure UIC's water consumption to reduce water usage by 52% and will save $2.34 million.

4.2.2 Manual and Low-Flow Fixtures—an additional strategic solution that will retrofit regularly used restrooms that are currently equipped with automatic and/or high-flow fixtures to manual and low-flow fixtures.

4.3 Enhance Biodiversity

4.3.1 Campus Habitat Pollinator Plan—an additional strategic solution that will create a set of recommendations and grounds maintenance practices that allow pollinators to thrive at UIC.

4.3.2 Tree Care Plan—an additional strategic solution that will outline tree benefits, both health and environmental, and will require UIC to be responsible for the financial commitment to maintain a tree inventory and the subsequent health recommendations as outlined by professional arborists.

4.3.3 Productive Land Use for Local Food—an additional strategic solution that will build on activities within various units on campus that have successfully utilized their space for productive land use.

STRATEGY 5.0 SUSTAINABLE MATERIALS AND REDUCED WASTE STREAMS

5.1 Implement Unit-Level Waste Reduction

5.1.1 Department and Unit Zero Waste Plan—an additional strategic solution that requires each unit on campus to develop a plan specific to their operations, to optimize reduction of landfill-bound material.

5.2 Optimize University-Level Operations

5.2.1 Operational Waste Collection Efficiency—a portfolio solution that will simplify recycling and improve efficiency for the campus community by transitioning to a single-stream recycling system and by installing outdoor trash and recycling containers equipped with solar-powered compactors.

5.2.2 Construction and Demolition Waste—an additional strategic solution that will require the UIC Building Standards mandate a 90% diversion rate for C&D waste with complete tracking and documentation.

5.3 Reduce Food Waste

5.3.1 Food Scrap Collection—an additional strategic solution that will require Dining Services and other food service vendors to implement programs that utilize compostable materials and expand composting in their operations by 2020.

5.3.2 Food Recovery—an additional strategic solution that will address food insecurity in both the UIC and surrounding community by packaging, holding, and delivering hundreds of pounds of prepared but uneaten food daily.

5.4 Practice Sustainable Procurement

5.4.1 Purchasing Process—an additional strategic solution that will require the Office of Purchasing to utilize a sustainable purchasing checklist, disseminate sustainability-related language into contracts, and implement a communication plan.

5.4.2 Revenue Generating Contracts—an additional strategic solution that will hold responsible units to the current dining service contract and enforce the 20% local food provision, biodegradable service ware, recycling training, elimination of polystyrene plastics, and food scrap collection requirements.

5.4.3 Purchasing Policies

5.4.3.1 Sustainable Paper Policy—an additional strategic solution that will reduce desktop printers, consolidate to multifunctional printers, and print less, while requiring a percentage of recycled content in paper.

5.4.3.2 Bottled Water Policy—an additional strategic solution that will reduce departmental spending on bottled water by forbidding purchases of bottled water by all departments, unless clearly justified.

STRATEGY 6.0 TEACHING AND LEARNING

6.1 Develop Sustainability-Related Curriculum

6.1.1 Sustainability Course Rubric—an additional strategic solution that will develop a sustainability course rubric that will streamline the process for students interested in taking sustainability-focused courses.

6.1.2 Sustainability-Related Courses for General Education Credit—an additional strategic solution that will review the syllabi of General Education courses for opportunities to infuse sustainability into existing courses.

6.1.3 Interdisciplinary Sustainability Majors, Minors, and Certificates—an additional strategic solution that will require the dissemination of financial incentives for the development of interdisciplinary courses, programs, and certificates.

6.1.4 Faculty Expertise—an additional strategic solution that will encourage colleges and departments to recruit faculty in areas where there are gaps in sustainability expertise.

6.2 Enhance Sustainability-Related Co-Curricular Activity

6.2.1 Learning Opportunities—an additional strategic solution that will utilize educational signage around campus to highlight the environmental, social, and health benefits of various VCAS-directed sustainability projects as well as voicing aspirational ideas that evolve through faculty, staff, and student innovation to the Master Plan Working Group.

6.3 Catalyze Sustainability-Related Research

6.3.1 Research Beyond Campus—an additional strategic solution that will provide seed funds for community-based participatory research to advance broader community and off-campus research as well as create a more nimble process to elevate and bring research discoveries to market.

6.3.2 Interdisciplinary Research—an additional strategic solution that will establish administrative pathways for catalyzing interdisciplinary research with tenure, promotion, and recognition of interdisciplinary publications as well as to provide staff support to assist with grant writing and submittals.

6.3.3 Funding Opportunities—an additional strategic solution that will require the Office of the Vice Chancellor for Research (OVCR) to develop a process to track and optimize funding opportunities in sustainability-related research topics including governmental sources but also specific research foundation opportunities.

Climate Action Implementation Plan

CARBON NEUTRAL CAMPUS

- OFFSET AIR TRAVEL EMISSIONS
- TELECONFERENCING TO TRAVEL LESS
- STRATEGIC ENERGY MANAGEMENT
- ONSITE SOLAR GENERATION
- OFFSITE RENEWABLE ELECTRICITY
- SUSTAINABILITY PROGRAMS
- INTERDISCIPLINARY RESEARCH
- ZERO AND LOW-EMISSION COMMUTING
- LOW-ENERGY NEW BUILDINGS

NET ZERO WATER CAMPUS

- POLLINATOR HABITATS
- LED LIGHTING UPGRADES
- EDUCATIONAL SIGNAGE
- CAMPUS-WIDE TREE INVENTORY
- ELECTRIC AND HYBRID CAMPUS FLEET
- WATER EFFICIENCY
- PERMEABLE PARKING LOTS
- STORMWATER CAPTURE FOR IRRIGATION
- BIOSWALES AND NATIVE PLANTS

TEACHING & LEARNING

ZERO WASTE CAMPUS

- OUTDOOR RECYCLING
- 90% CONSTRUCTION & DEMOLITION WASTE RECYCLING
- FOOD WASTE COLLECTION
- FOOD GARDENS

BIODIVERSE CAMPUS

BUSINESS AS USUAL REFERENCE CASE (BAU)

UIC's Carbon Footprint

UIC has tracked and publicly reported its greenhouse gas (GHG) emissions since Fiscal Year (FY) 2004. UIC's GHG emissions are categorized into three major scopes referred to as Scope 1, Scope 2, and Scope 3.

Scope 1—Direct Emissions are physically produced on campus such as on-campus power production, campus vehicle fleets, natural gas used in laboratories. These sources are owned or directly controlled by UIC.

Scope 2—Indirect Emissions are emissions mostly associated with purchased utilities (electricity) required for campus operations. They are indirect emissions resulting from activities that take place within the organizational boundaries of the institution, but occur at sources owned or controlled by another entity.

Scope 3 - Induced Emissions originate from sources that are not owned or controlled by UIC, but are central to campus operations or activities such as non-fleet transportation, faculty/staff/student commuting, air travel paid for by the university, and landfilling waste.

Figure 1 provides a comprehensive display of UIC's GHG emissions profile as well as forecasted emissions, which can be represented through what is referred to as a Business-As-Usual (BAU) Reference Case (developed by Fovea LLC). Given the GHG emission history, current policies, and best available planning information (such as presumed campus growth due to the goals of the UIC Master Plan update; Envisioning Our Future: 2017-2027 Plan), UIC can better predict where BAU policies are taking UIC.

The BAU model assumes most of proposed growth in student population and buildings will take place in the next 10 years (2017-2027) and no growth thereafter. The development of this BAU Reference Case serves as a foundational scenario that helps ground UIC's understanding of the campus's energy future, build dynamic goals, and move towards designing a cost-effective GHG mitigation portfolio.

Forecasted Energy Spending

In accordance with this BAU Reference Case, based on historical average energy prices for Illinois (U.S. Energy Information Administration's (EIA) State Energy Data System (SEDS) and projected price trends for UIC's region (EIA Annual Energy Outlook (AEO) 2014), forecasted energy spending for UIC Utilities as well as fleet fuel is projected to amount to $741 million (NPV; assuming a nominal discount rate of 5%) through 2050, as shown in Figure 2.

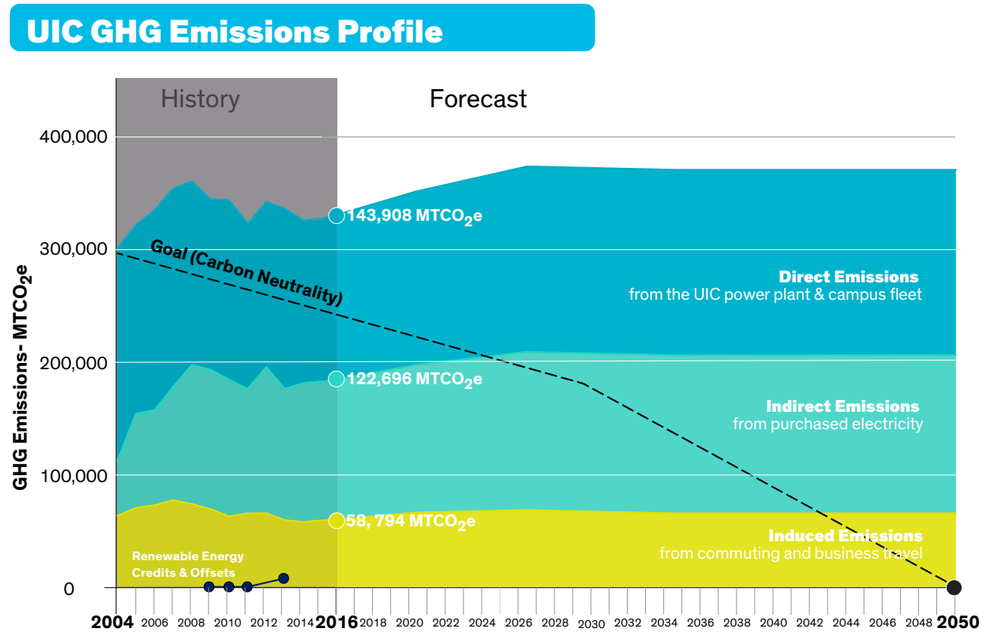


Figure 1 UIC's GHG Emissions Profile; the black (dashed) line represents the emissions reduction goal in comparison to the BAU forecast. The blue area represents Scope 1 (Direct) Emissions. Green represents Scope 2 (Indirect) Emissions. Yellow represents Scope 3 (Induced) Emissions. The highlighted numbers reflect FY 2016 emissions). (Source: Fovea)

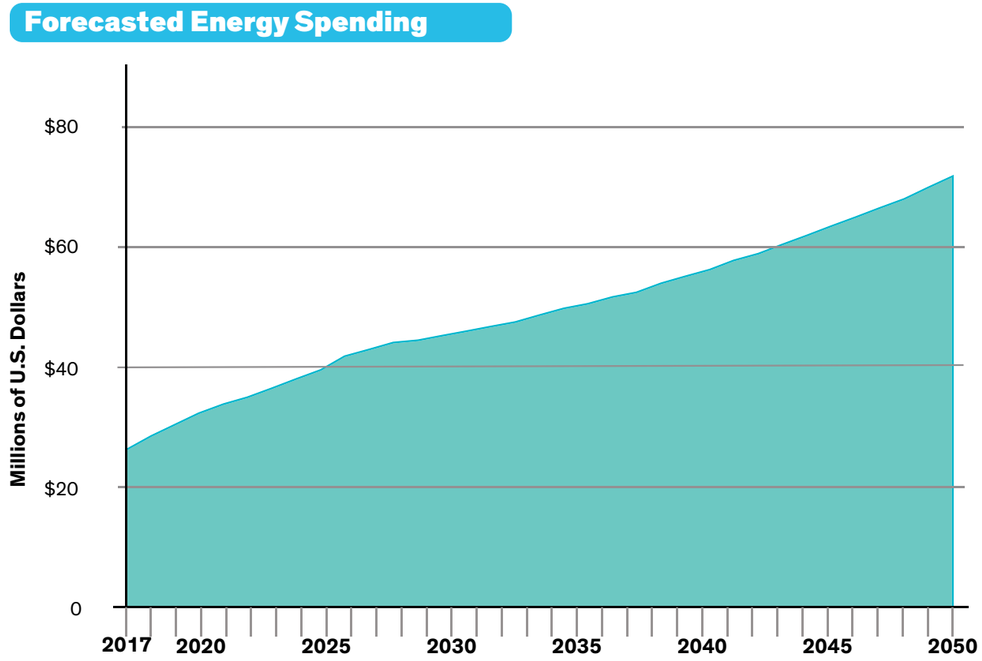


Figure 2 A comprehensive forecast for UIC energy spending. (Source: BAU Reference Case) (Source: Fovea)

WHAT IS THE CAIP?

The main objective of the Climate Action Implementation Plan (CAIP) is to help UIC accelerate through the phases of implementing tangible solutions. The CAIP derives from initial strategies of the 2009 UIC Climate Action Plan (CAP) (Figure 3) as well as the Short-Term Action Items and Aspirational Goals of the 2016 UIC Climate Commitments (Figure 4). Both of the aforementioned ultimately led to the development of a refined cost-effective portfolio of solutions to be implemented in the next 10 years (2018-2028); as well as a variety of additional strategic solutions to be supported, developed, invested in, implemented, or reevaluated on a 5-year incremental basis through 2050.

Due to the dynamic administrative, financial, legislative, and technological landscape it is difficult to provide certainty in the proposed solutions beyond the ten-year framework. Nonetheless, a visionary approach is represented.

METHODOLOGY

The broader field of sustainability is experiencing a paradigm shift from quantifying potential for GHG emissions reduction, to capturing the monetary savings associated with green initiatives. With this in mind, the Office of Sustainability (OS) sought out Fovea LLC for their expertise working with higher education institutions. The OS collaborated with Fovea to provide facilitation, data visualization, and scenario planning for UIC.

In order to understand the financial implications of a potential solution, one should have a granular understanding of the financial aspects that comprise it. The (Fovea) CAP Tool financial model considers impacts on (1) capital expenditures (CAPEX), (2) operational expenditures (OPEX), (3) purchased commodities, and (4) carbon pricing to find solutions that will work in a variety of possible futures. The next step was to model potential solutions for UIC using available data in accordance with assumptions built in the CAP Tool. Figure 5 displays many of the solutions evaluated.

Figure 3. The first five key strategies of the 2009 Climate Action Plan serve as the basis for the seven strategies of the present-day CAIP.

Figure 4 UIC Climate Commitments - CAIP Solutions Roadmap. All solutions originate from one of the 4 UIC Climate Commitments (top) or a Teaching & Learning recommendation. Portfolio Solutions (bottom-left) are solutions which were modeled using the ascribed Fovea CAP Tool model, and as a portfolio of solutions yields favorable cost benefits to University-related expenditures. Additional Strategic Solutions (bottom-right); solutions (or ongoing Plans) which cannot be analyzed through the CAP Tool or are still in varying stages of development, but are still vital investments, in that solutions in the portfolio do not touch on all of the UIC Climate Commitments.

Average Annual GHG Reduction Potential

Figure 5 Savings (or Cost) per metric tons of carbon emissions ($MTCO_2e$) avoided. The green bars represent annual savings per $MTCO_2e$ avoided and the red bars represent the annual cost per $MTCO_2e$ avoided for each portfolio solution. The black bars represent the annual $MTCO_2e$ reduction potential for each portfolio solution (Source: Fovea).

Solutions for UIC were subsequently prioritized based on their impact on

1. Energy Purchases ($),
2. Operating Expenses (OPEX) and Capital Expenditures (CAPEX),
3. Total Cash Flow ($),
4. Average GHG Abatement (MTCO2e per year),
5. Percentage of Average Forecasted Emissions (%), and
6. Levelized Cost of GHG Abatement ($ per MTCO2e).

In addition, factors for consideration included availability of external grants and funding mechanisms, alignment with UIC's Strategic Priorities, and other previously mentioned UIC strategic plans. Each CAIP Portfolio Solution can be attributed to either an Aspirational Goal or Short-Term Action Item from the UIC Climate Commitments.

The Additional Strategic Solutions proposed in this plan cannot be quantified through the Fovea CAP Tool model (given its focused specialization in GHG reduction impacts) or are still in varying stages of development. However, the additional strategic solutions are still vital investments in that the refined portfolio of solutions (to date) excludes other significant areas of planning, such as waste, water, biodiversity, and student success. Utilizing historic and forecasted financial data, along with costs for achieving these goals, solutions can be assessed for reaching all of UIC's Climate Commitments. However, utilizing historic and forecasted financial data along with costs for achieving the goals in these areas, solutions can be assessed for reaching all of UIC's Climate Commitments (namely): Zero Waste Campus, Net Zero Water Campus, and Biodiverse Campus.

POTENTIAL OUTCOMES

FINANCIAL PROJECTIONS

Prioritized Portfolio Solutions are modeled in unison as a refined CAIP Portfolio that can be examined as a whole, in comparison to the BAU Reference Case (see Figure 7). This comparison is critical to better predict implications on incremental cumulative CAPEX, as well as UIC's operating budget (OPEX; including annual changes in purchased fuels, utilities, and other operating and maintenance expenses) (see Figure 6).

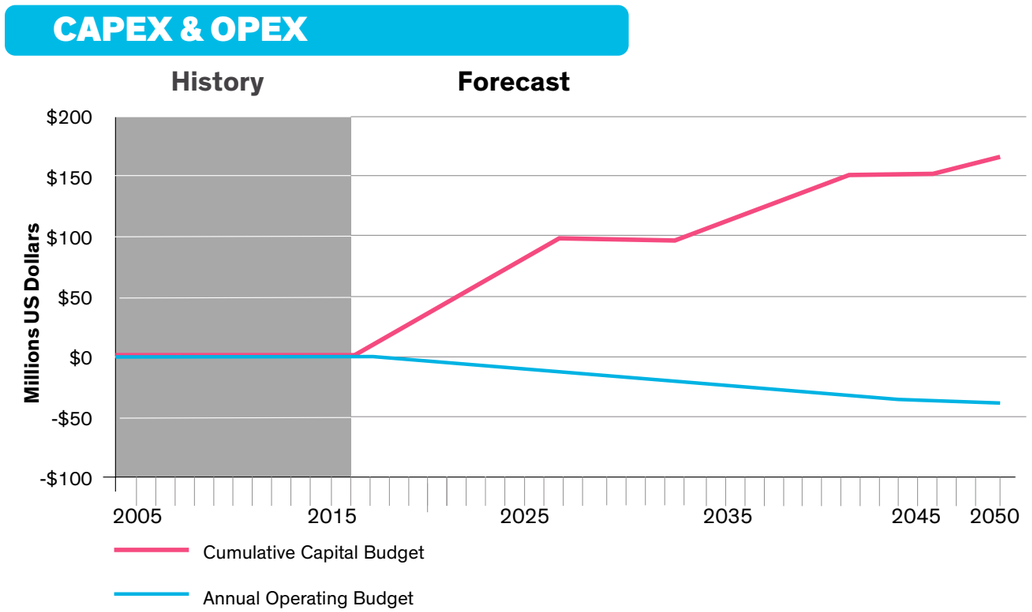


Figure 6 Cumulative CAPEX relative to BAU Reference case. (Source: Fovea)

This comparison estimates that if UIC invests roughly $9.8 million per year (into the CAIP Portfolio) through 2028, Utilities would achieve an approximate $204 million savings in Energy Purchases (purchased energy and fuel) over the 10-year time frame of the CAIP (2018-2028); a Total Cash Flow (savings) of $107 million for UIC by 2028. Furthermore, this investment would reduce UIC GHG emissions by an average of 15,900 MTCO2e per year (a total of 159,000 MTCO2e by 2028).

$741 million
forecasted energy spending through 2050 (BAU)

$234 million
avoided energy spending with the UIC Climate Action Implementation Plan

20% Less
exposure to Price Uncertainty

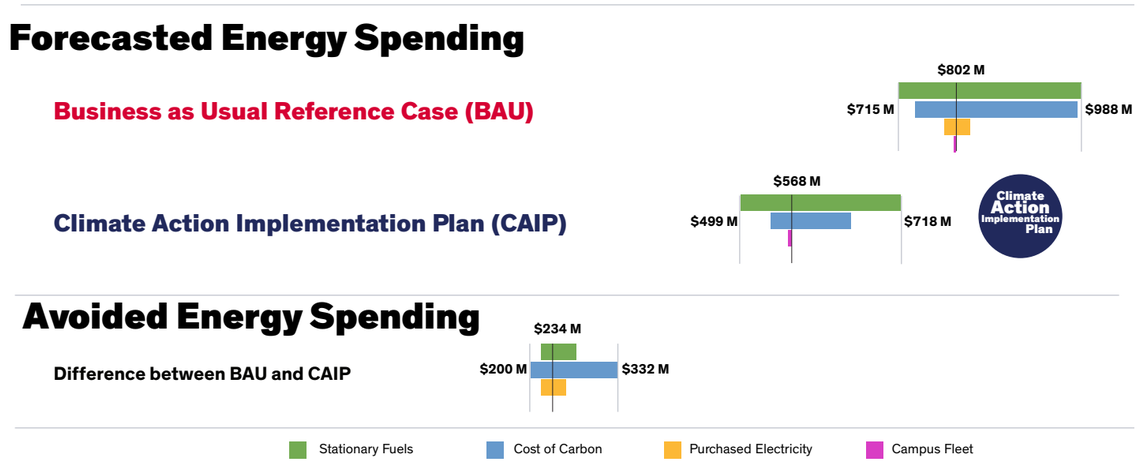


Figure 7 CAIP Portfolio impact through in comparison to BAU Reference Case. (Source: Fovea)

Forecasted Emissions with Portfolio (2028) and Visionary Solutions (2050)

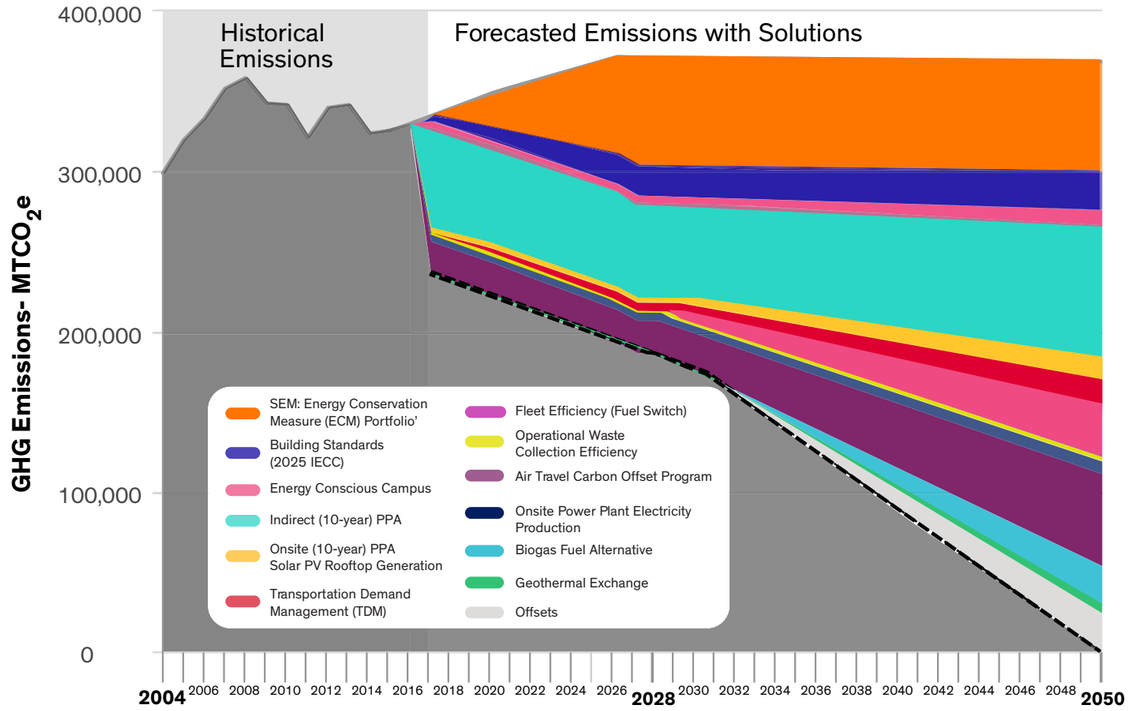


Figure 8 CAIP Portfolio MTCO2e reduction impact. (Source: Fovea)

ENVIRONMENTAL IMPACT

Investment in the CAIP Portfolio will keep UIC on track to meet its GHG emissions reduction goal of 50% by 2028 (Figure 8). Furthering reductions beyond this 10-year time frame will become increasingly complex, and must be met with a robust commitment to achieving the UIC Climate Commitments. The CAIP will serve as the foundation for UIC to become the goal of a Carbon Neutral Campus, Zero Waste Campus, Net Zero Water Campus, and Biodiverse Campus.

The overarching goal of this investment in sustainability at UIC is to advance the frontier of knowledge, attitudes toward and practice of sustainability among all campus members through operations, education, research, and leadership. These activities reflect current best evidence for strategies and innovation to sustain the environment, economic productivity, infrastructure quality, energy accessibility and social systems to enable intergenerational well-being.

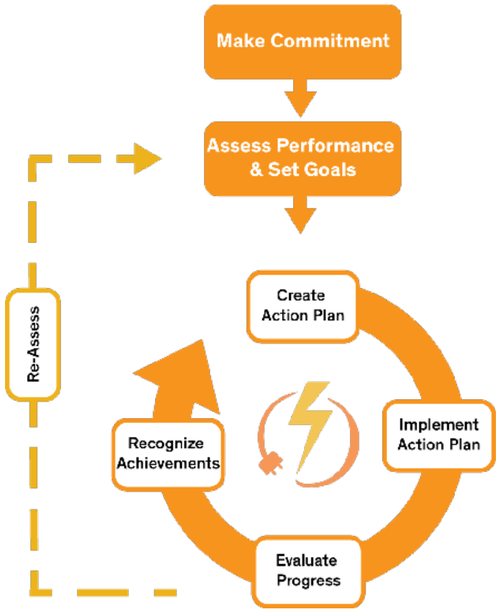
STRATEGY 1.0 ENERGY EFFICIENCY AND CONSERVATION

1.1 IMPLEMENT STRATEGIC ENERGY MANAGEMENT (SEM)

Strategic Energy Management (SEM) allows for continuous energy performance improvements by providing the processes and systems needed to incorporate energy considerations and management into daily operations. SEM is a long-term approach which works to institutionalize best practices, in driving increased and sustained energy savings persistence (US EPA's Energy Star Guidelines for Energy Management).

Core Program Functions of SEM include:

- Coordination and Resources
  (relating to solutions 1.1.1 and 1.1.2)
- Planning and Project Portfolio Management
  (relating to solution 1.1.1)
- Tracking and Reporting Systems
  (relating to solution 1.1.1)
- Communication and Recognition
  (relating to solution 1.2.2)



The Office of Capital Planning and Project Management (CPPM) is developing the Capital Plan, and it is envisioned to include analysis of buildings and projects from a number of perspectives, including energy efficiency. Additionally, a framework to facilitate project and building prioritization has been developed, which involves categorizing projects on a variety of needs like energy conservation. SEM prioritization should be informed and coordinated with the UIC Capital Plan.

There are four major steps to formalize SEM at UIC.

1. Add Energy Efficiency function to the Vice Chancellor of Administrative Services (VCAS) organizational structure.
2. Re-establish functional organization and/or unit priorities within VCAS to enhance energy management and outcomes.
3. Create a dedicated funding mechanism to support program.
4. Coordinate various energy-related functions through a delegated "Energy Management Team", such as the existing CCSE Energy and Utilities subcommittee. Membership will be made up of the following functions:
   - Associate Chancellor for Sustainability
   - Director of Utilities
   - Energy Manager
   - East and West Side Engineers
   - Representative from UI Health
   - Zone Managers (as needed)
   - Representative from the Office of the Vice Chancellor for Student Affairs (VCSA)

1.1.1 SEM: Energy Conservation Measure (ECM) Portfolio

The subsequent development and management of an Energy Conservation Measure (ECM) Portfolio is a central component of SEM. By identifying quick payback energy savings projects, managing funds for energy reduction efforts, ensuring appropriate monitoring and data collection activities, and energy benchmarking in general, a well-developed ECM portfolio can have a massive impact on campus energy use.

Examples of near-term projects that have already been identified include steam trap replacements across buildings on West side, outdoor LED light fixture upgrade projects for East and West side (for West- only Parking Lots and Garages have been modeled), as well as energy retrofit projects for buildings 919 (Molecular Biology Research Building), 924 (College of Pharmacy), 934 (College of Medicine Research Building), and 941 (Administrative Office Building). An Additional funding mechanism is an Energy Performance Contract (EPC) which utilizes and Energy Service Company (ESCO) to audit, implement, measure, verify, and guarantee savings.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$31.86 Million**
Net O&M (NPV)	**$0.67 Million**
Net Fuel Costs (NPV)	**($49.93) Million**
Cash Flows (NPV)	**($17.40) Million**
Avg. GHG Impact	**-37,941 $MTCO_2e$**
% of Avg. Forecasted Emissions	**-10.47 %**
Levelized Cost of GHG Abatement	**($46.22) per $MTCO_2e$**

1.1.2 SEM: Green Revolving Fund

SEM funding mechanisms are predicated on the idea that energy efficiency generates cost savings. A Green Revolving Fund (GRF) would provide financing to implement energy efficiency measures and other sustainability-related projects which will generate financial savings. These savings would then be tracked and used to replenish the fund for the next round of projects identified. Achieved utility savings would be returned to this fund until the initial investment has been recovered. This model encompasses the entire anticipated annual investment of $4.633M for FY 2019 - 2027, to achieve the optimal impact of CAIP solution 1.1.1 (SEM: ECM Portfolio). This concept could be implemented on a smaller scale initially as proof of concept.

This program would be implemented through funding that was received from past and future energy saving activities (i.e. ComEd, Peoples Gas, Advancement, Campus). The VCAS, through the OS, could provide $0.5-2M to perform small building energy retro-commissioning, mechanical system upgrades, and installations that would lower energy costs tied to consumption and capacity, as well as reduce GHG emissions. Moreover, this program would be the first to provide UIC-dedicated energy efficiency funds. The OS will also continue to seek other external grants that are available for innovative energy technologies.

Investment Summary

	Seed Funds	Savings Reinvested
First-Year Investment	$60,000	$0.00
Second-Year Investment	$2,350,000	$0.00
Third-Year Investment	$1,940,000	$410,000
Fourth-Year Investment	$1,470,000	$880,000
Fifth-Year Investment	**$1,000,000**	**$1,350,000**
Sixth-Year Investment	$530,000	$1,820,000
Seventh-Year Investment	$60,000	$2,290,000
Eighth-Year Investment	$0.00	$2,760,000

1.2 REDUCE ENERGY DEMAND

Reducing UIC's energy demand will alleviate an already increased reliance on external electricity purchases. When new buildings are built to replace old ones, or major renovations are undertaken, UIC Building Standards need to ensure that the highest energy efficiency standards are adopted (Solution 1.2.1). In addition, it must be understood that while UIC sets overall goals of lowering water, waste, and energy use, and increasing biodiversity, new buildings have the duty to exceed those goals to offset the environmental impacts of existing inefficient buildings.

Additionally, the occupants of buildings (colleges, departments, units, and individuals) need to be engaged and incentivized to buy efficient equipment and reduce any wasteful energy consuming habits (Solution 1.2.2). In March 2008, UIC participated in a world-wide energy conservation campaign encouraging people to turn off all electronic equipment for one specified hour (Earth Hour), and during that hour UIC consumed 3.7% less electricity compared to the same hour on the previous four Saturdays. Although this campaign saw a relatively small GHG emissions reduction, this indicates that with greater awareness there is potential for reduced energy consumption by modifying behavior.

1.2.1 Building Standards (2025 IECC)

UIC Building Standards require all renovation and construction projects of $5M or higher to achieve a U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating of Silver-level or higher, however this plan raises the bar to gold-level or higher. UIC currently utilizes the LEED checklist as guidance for new construction which requires a simulation module using ANSI/ASHRAE/IESNA Standard 90.1-2010. For new construction. LEED v4 (NC) requires at least a 5% performance improvement over baseline. The 2015 Illinois Energy Conservation Code (IECC) uses the ASHRAE Standard 90.1 (2013), which yields an average reduction in new building energy consumption of 8.5% for source energy and 7.6% when considering site energy. Should UIC meet targets listed in the IECC, UIC Building Standards would already exceed the minimum LEED requirements by about 3.5%.

UIC must follow the 2015 IECC standards, as well as the ASHRAE Standard 90.1 (2013), through design and construction for commercial buildings. This Portfolio Solution requires that UIC go beyond compliance to meet the projected 2025 IECC standard for new buildings, which is roughly 50% less energy intense than the current 2015 standard, as projected by the American Council for an Energy-Efficient Economy (ACEEE).

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$34.57 Million
Net O&M (NPV)	$0.00 Million
Net Fuel Costs (NPV)	($15.79) Million
Cash Flows (NPV)	$18.78 Million
Avg. GHG Impact	-11,273 $MTCO_2e$
% of Avg. Forecasted Emissions	-3.11 %
Levelized Cost of GHG Abatement	$165.07 per $MTCO_2e$

1.2.2 Energy Conscious Campus

Energy conservation is limited by UIC's decentralized organizational structure. To achieve the UIC Climate Commitment to be a Carbon Neutral Campus, a comprehensive, campus-wide energy conservation campaign is necessary that includes a strong and consistent message to the campus community. Capital requirements for this Portfolio Solution are comprised of operational expenditures for a program like staffing, technology, and best practices. This program would target an annual reduction of 1.5% in campus energy consumption by actively training and educating building occupants on how to shift habits into a more energy conscious manner. Under this project, information about all energy-savings related efforts will be communicated to the campus and beyond.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$0.00 Million
Net O&M (NPV)	$3.36 Million
Net Fuel Costs (NPV)	($5.66) Million
Cash Flows (NPV)	($2.30) Million
Avg. GHG Impact	-3,859 $MTCO_2e$
% of Avg. Forecasted Emissions	-1.07 %
Levelized Cost of GHG Abatement	($53.57) per $MTCO_2e$

STRATEGY 2.0 CLEAN AND RENEWABLE ENRGY SOURCES

2.1 PROCURE RENEWABLE ENERGY

Viable options for increasing UIC's reliance on renewable-sourced power include a long-term offsite power purchase agreement (PPA) and a variety of onsite options for integrating solar photovoltaic (PV) generation onto campus building rooftops.

In lieu of purchasing a traditional mix of electricity from the grid, UIC can purchase non-direct renewable power (Solution 2.1.1). Indirect long-term PPA's are a financial transaction between the generating facility and the off-taker; no renewable power is physically delivered. Instead of routing renewable power to the off-taker, the generator sells the power directly to the grid and receives the open market price. Students have expressed their support for this type of procurement.

Onsite renewable energy such as solar PV rooftop generation, is a way to physically source a portion of a facility's energy needs, improve the fuel diversity of the system, and promote energy independence by visibly demonstrating a civic commitment to reduce reliance on fossil fuels (Solution 2.1.2). Additional funding streams for physical deployment and/or procurement include grants and public-private partnerships, of which are currently and will continue to be sought out by the OS and coordinated by the VCAS.

Furthermore, with the update of the Illinois Renewable Energy Portfolio Standards, the options for supporting the development of Illinois-based sources of solar (and other renewable sources of energy) are enhanced, and increasingly competitive, if contracted for over a 15 to 25-year period. However, the University of Illinois typically does not enter into procurement of energy commodities for more than 10 years. It is recommended that options for extending that time line be explored by the VCAS Solar Working Group (see 2.1.2)

2.1.1 Indirect (10-year) PPA

The OS and Utilities are working with Prairieland Energy Inc., to procure an Indirect PPA. Indirect PPA's have financial, environmental, transactional, and marketing benefits, in better managing costs and risks associated with physical deployment.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$0.00 Million**
Net O&M (NPV)	**$0.00 Million**
Net Fuel Costs (NPV)	**($3.62) Million**
Cash Flows (NPV)	**($3.62) Million**
Avg. GHG Impact	**-53,589 $MTCO_2e$**
% of Avg. Forecasted Emissions	**-14.79 %**
Levelized Cost of GHG Abatement	**($6.00) per $MTCO_2e$**

2.1.2 Onsite (10-year) PPA Solar PV Rooftop Generation

An initial techno-economic assessment for onsite solar PV feasibility was conducted for four rooftop locations on campus that were deemed structurally appropriate; 607-608 (Science & Engineering Laboratory Complex), 605 (Student Center East), 934 (College of Medicine Research Building), and the soon to be constructed Engineering Innovation Building (Envisioning Our Future: 2017-2027 Implementation Plan).

After determining recommended system sizes, estimated capital cost to implement the technology, and estimated life-cycle cost savings, the assessment evaluated projects through two different financing scenarios: direct (ownership), and indirect (through an onsite PPA). This analysis provided the cost effectiveness for proposed systems in net present value (NPV), which included the present value of all costs and incentives applicable through each financing option. The onsite PPA yielded the more economically favorable scenario.

The likelihood of being able to physically deploy 2.3 MW of installed capacity (total for 4 buildings assessed) outright, given today's market trends and structural uncertainties of existing rooftops, is not feasible. However, by downsizing results derived from the techno-economic assessment described above, we can generate results for an onsite PPA of 1 MW installed capacity to be formalized by FY 2019. It should be noted that given the current solar PV market, now is the time to invest, as incentives will begin to incrementally decrease in the coming years. At the end of the 10-year contract agreement UIC would proceed to buy-out the system and shift to direct ownership. Implementation of this system would satisfy approximately 66% of the adjusted 2028 onsite goal of 1.5 MW installed capacity.

The VCAS Solar Working Group is tasked with developing a Pro Forma to validate full-costs associated, and refine the list of buildings with appropriate roof conditions for a 1 MW system. Subsequently major action items include issuing a Request for Information (RFI) from prospective developers (preferably in the Chicagoland region), followed by a formal Request for Proposal (RFP), bids will be reviewed from prospective developers, ultimately selecting a developer for implementation. Lastly, Real Estate Services will need to review and approve the rooftop lease. Additional responsible parties for implementation phases include Campus Auxiliary Services (CAS), and Prairieland Energy Inc. Physical deployment of refined, leased systems should be formalized as soon as major phases are complete.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$2.74 Million
Net O&M (NPV)	$0.00 Million
Net Fuel Costs (NPV)	($0.62) Million
Cash Flows (NPV)	$2.12 Million
Avg. GHG Impact	-686 $MTCO_2e$
% of Avg. Forecasted Emissions	-0.19 %
Levelized Cost of GHG Abatement	$283.12 per $MTCO_2e$

2.2 UTILIZE THERMAL ALTERNATIVES

UIC primarily purchases natural gas and electricity through mechanisms such as reverse auctions to reduce reliance on spot markets which decreases budgetary uncertainty. When calculating emissions from purchased electricity, UIC uses the U.S. Environmental Protection Agency's (US EPA) regional Emissions & Generation Resource Integrated Database (eGRID) subregion RFCW data which is comprised of 60% coal, 25.7% nuclear, 3.6% renewable, and 9.3% natural gas. In spite of the recent efficiencies achieved, there was an overall increase in CO2 emissions per kWh of electricity utilized by UIC. This negates much of the emission reductions that should have been realized through progress, but is explained by UIC's onsite use of cogeneration, or combined heat and power (CHP).

Power plants at UIC use an engine or turbine to generate electricity and utilize the excess heat generated from equipment for heating buildings. This can be up to twice as efficient in its energy use as a typical coal or gas-fired powered electricity plant. These plants produce electricity, steam, and high temperature hot water for heating, cooling, and electric loads. While the plants primarily run on natural gas, they also use diesel oil to start up engines or to operate in emergencies. The increase in UIC's GHG emissions between 2004 and 2009 can be attributed to the economically-driven shift towards purchasing significantly more electricity from the grid, rather than generating on site (see Figure 9).

Onsite Power Plant Production vs. Purchased Electricity

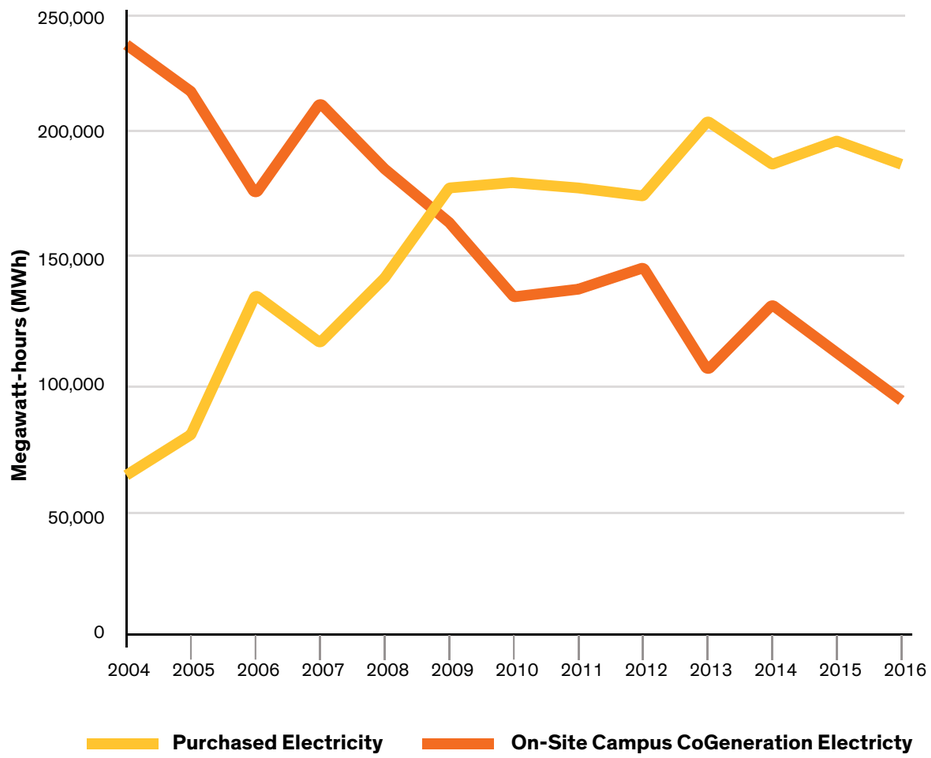


Figure 9 Historical overview for onsite power plant electricity production (MWh) compared to total electricity purchased (MWh).

2.2.1 Onsite Power Plant Electricity Production

Historically, UIC's cogeneration plants have generated electricity when it is cost-effective to do so; which is heavily driven by the cost of natural gas used in the production of electricity. The emissions attributed to on-site generation are significantly lower than those from purchased electricity. A relatively low price for grid-purchased electricity compared to the production costs of onsite UIC-generated electricity—including elevated delivered natural gas cost, deferred maintenance challenges of installed generation equipment, system reliability concerns, and economically-driven decision processes—has resulted in Utilities purchasing more electricity than it produces in its two power plants (Figure 9).

Utilities has become more strategic in predicting when it is cost beneficial to deploy its assets, to generate power at a lower cost when real-time market prices are inflated. Utilities has improved the material condition of generation assets, resolved system reliability issues, and instituted new fuel delivery processes to reduce the cost of delivered natural gas. In coordination with external consultants, Utilities is conducting a heat rate analysis that will allow them to better deploy assets to generate electricity in a more economic manner. A preliminary simplified Portfolio Solution was modeled to assess the GHG emissions reduction impact of increased production.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$0.00 Million**
Net O&M (NPV)	**$0.00 Million**
Net Fuel Costs (NPV)	**($2.11) Million**
Avg. GHG Impact	**-17,820 $MTCO_2e$**
% of Avg. Forecasted Emissions	**-4.92 %**
Levelized Cost of GHG Abatement	**($118.13) per $MTCO_2e$**

STRATEGY 3.0 REDUCED TRANSPORTATION-RELATED EMISSIONS

3.1 REDUCE COMMUTING-RELATED EMISSIONS

The 2015 Multimodal Plan prepared by the Chicago Metropolitan Agency for Planning (CMAP) found that UIC's commuter mode split is lower for single-occupant driving (40%) compared to Chicago (51%) and the broader region (70%) [2]. A recent survey shows that while UIC students prefer walking and taking the bus, UIC faculty and staff drive a single-occupancy vehicle as their preferred method of commuting to UIC (Figure 10). Faculty, staff, and students commuting by private vehicles constitutes the largest share of UIC's transportation-related emissions (Figure 11).

Additionally, current data collection methods do not account for the variance in emissions by distance; thus, travel data must be improved to include greater detail on origin and destination. Full-time students are most likely to commute via public transit as more than 35% live within five miles of campus. Although nearly 40% of faculty and staff live in areas with good/excellent transit accessibility, these subgroups are the most likely to drive alone and least likely to use transit. Understanding the characteristics and habits of subgroups in our campus supports more informed planning.

Although implementation of alternative transit improvements like the Chicago Transit Authority (CTA) bus routes and bike lanes lies with municipal agencies, UIC maintains relationships with these agencies with support from the Office of Public and Government Affairs. UIC Human Resources (UIC HR) and Office of the Vice Chancellor for Student Affairs (VCSA) can support alternative transportation education of new faculty, staff, and students respectively via trainings and orientations.

UIC can support all recommendations set forth by CMAP's 2015 Multimodal Plan including prioritizing pedestrians; supporting a connected network of safe and efficient bicycle-friendly routes and constructing secure facilities to encourage bicycle commuting; and increasing transit ridership by making transit an efficient and cost-effective option for all campus users.

UIC Commuting Mode Split

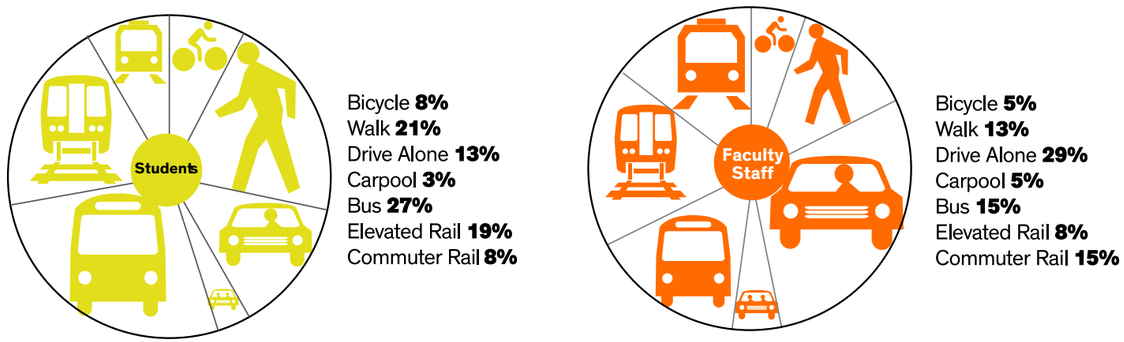


Figure 10 FY 2016 UIC faculty, staff, and student mode trip distribution (%).

3.1.1 Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the application of strategies and policies to reduce travel demand of single-occupancy vehicles which are the largest source of UIC's Scope 3 GHG emissions (Figure 11). Best practices include pricing parking to encourage shifting modes away from single occupancy vehicles like improved walking, biking, and transit conditions.

Sources of Travel-Related (Scope 3) Emissions

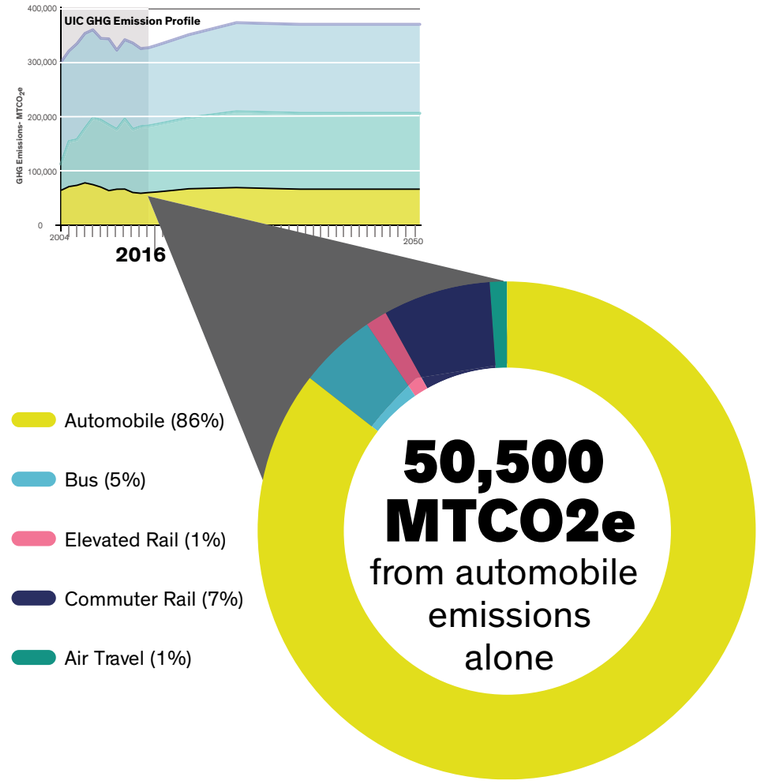


Figure 11. Automobile emissions represent over 85% of UIC's FY 2016 transportation-related emissions. This can primarily be attributed to a commuting campus culture.

3.1.1.1 Transit Incentives for Faculty and Staff

Currently UIC parking costs are below market value and create an incentive for faculty, staff, and students to drive. For example, an annual parking pass costs $75.50 per month, less than the monthly $100.00 transit pass offered by the Chicago Transit Authority (CTA). While campus stakeholders have a range of perspectives on appropriate parking supply and pricing, and existing institutional and contractual barriers remain for pricing changes, current parking policies do not support UIC's Climate Commitment to be a Carbon Neutral Campus.

It is recommended that parking spaces are not added nor replaced at UIC, and that demand is instead managed through pricing. It is recommended that pricing policies are adopted to align parking policy and the aforementioned Commitment. Parking pricing can be designed to manage demand and be sensitive to different pay scales, such as health and insurance costs.

The implementation of the U-PASS resulted in a significant decrease in students driving to campus. Similarly, reducing the cost of a transit pass to faculty and staff could result in an increase in transit use, and employee satisfaction.

3.1.1.2 Bicycle Program

The 2015 Multimodal Plan found that current supply of 800 bicycle parking spaces throughout the UIC campus is well below the industry standard of 1 space for every 10 campus users. To meet this standard, UIC must increase bike rack capacity by 20% in 3 years, and 50% in 7 years. Long-term strategic planning by the Campus Master Plan Committee has the capacity to give direction to consultants working on large campus improvements. Additionally, UIC is a Bike Friendly University and in order to keep (or improve from) silver-level status, UIC should invest in secured, indoor bicycle parking accompanied with appropriate amenities.

Facilities Management will be responsible for purchasing and installation of bicycle racks and related infrastructure improvements around state-operated buildings; OS will be responsible for research, planning, developing standards as well as status reporting. The Campus Architect and Campus Master Planning Committee will be responsible for institutionalizing funding, planning and placement of bicycle racks and rooms. Individual departments and units will be responsible for allocating space, as well as getting requisite (e.g. Dean or Vice-Chancellor) approvals and funding for indoor bicycle parking.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$0.00 Million
Net O&M (NPV)	$0.34 Million
Net Fuel Costs (NPV)	$0.00 Million
Cash Flows (NPV)	$0.34 Million
Avg. GHG Impact	-3,246 $MTCO_2e$
% of Avg. Forecasted Emissions	-0.90 %
Levelized Cost of GHG Abatement	$10.06 per $MTCO_2e$

3.2 REDUCE UNIVERSITY BUSINESS TRAVEL-RELATED EMISSIONS

Transportation Services and Grounds (Facilities Management) is responsible for campus fleet, which consists of approximately 250 vehicles including cars, buses, and trucks. GHG emissions in this category are associated with traveling from one part of campus to another in a university vehicle like the campus shuttle, departmental, trades, and grounds vehicles. This category also includes travel from one University to another, such as trips from Chicago to Urbana-Champaign or Springfield, as well as faculty and staff air travel.

Expanding use of the campus shuttle to travel between East and West side for business would reduce emissions from departmental vehicles. Fundamental barriers to campus shuttle use includes lack of knowledge of the resources available, unreliability compared to other modes of transportation, and the need to improve the information technology associated with this service. Key action items include purchasing alternative fuel vehicles (Solution 3.2.1), increasing use of telecommunications/video conferencing (Solution 3.2.3), and the development of an opt-in carbon offset purchase program, which works in conjunction with existing travel reimbursement mechanisms (Solution 3.2.2).

3.2.1 Fleet Efficiency (Fuel Switch)

Since 1990, campus fleet has shifted to include more E85 (flex-fuel), hybrid, and CNG powered vehicles. UIC is in compliance with the Chicago Illinois Clean Diesel Grant Program and has obtained assistance from the Chicago Area Green Fleet Grant Program, administered by the Illinois Environmental Protection Agency (IEPA).

The goal for this Portfolio Solution is to increase the number of hybrid, electric, and CNG vehicles by 5% in 5 years (2023), 15% in 10 years (2028), and 20% in 15 years (2033).
The timeline for implementation (of vehicle-type switching) is affected by the mileage, age of car, type of vehicle, departmental preferences, federal and state policy, and budgeting.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$0.00 Million
Net O&M (NPV)	$0.00 Million
Net Fuel Costs (NPV)	($0.32) Million
Cash Flows (NPV)	($0.32) Million
Avg. GHG Impact	-68 $MTCO_2e$
% of Avg. Forecasted Emissions	-0.02 %
Levelized Cost of GHG Abatement	($475.26) per $MTCO_2e$

3.2.2 Air Travel Carbon Offset Program

A carbon offset program is necessary to reduce emissions attributed to UIC faculty and staff air travel. It is unreasonable to expect that faculty and staff can forgo all conferences and presentations to professional groups, which may require air travel. It is important to thoroughly understand carbon offset programs prior to implementing a program. Once an offset program is established for air travel, the program can be expanded to include other modes of travel.

The Office of Business and Financial Services (OBFS) has worked with UIC's sister campus in Champaign-Urbana (UIUC) to develop an administrative mechanism that would allow units to "buy into" periodic campus-wide purchases of verified offsets. The OS and OBFS are responsible for administering this program.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$0.00 Million**
Net O&M (NPV)	**$0.30 Million**
Net Fuel Costs (NPV)	**$0.00 Million**
Cash Flows (NPV)	**$0.30 Million**
Avg. GHG Impact	**-5,316 $MTCO_2e$**
% of Avg. Forecasted Emissions	**-1.47 %**
Levelized Cost of GHG Abatement	**$5.00 per $MTCO_2e$**

3.2.3 Inter-Campus Travel

For meetings that do not require face-to-face interactions, the use of telecommunications and video conferencing can be expanded. Additional use of railroad travel service like Amtrak may also be advocated, which has a lower GHG emissions profile compared to automobiles. Implementation of this goal requires promotion of existing technology, and improved data collection and reporting. Improving data collection will allow for monitoring of technology. Expanding use of telecommunication and video conferencing will require standardization of equipment, as well as the process for requesting equipment.

The UIC Academic Computing and Communications Center (ACCC) is charged with selecting and maintaining telecommunications systems. OBFS is responsible for advocating Amtrak usage and running reports through the Travel and Expense Management (TEM) system. A Transportation Demand Manager would request those reports annually and communicate with departments that have high individual vehicle use for travel.

STRATEGY 4.0 NATURAL RESOURCES AND ECOSYSTEM SERVICES

4.1 RETAIN AND REDUCE STORMWATER

UIC lies within the southern Great Lakes basin which is currently labeled as a “high” water risk area by the World Resources Institute. The Chicagoland region is putting the fresh water source, Lake Michigan and the Great Lakes, at risk due to nonpoint source pollution such as stormwater runoff into the lakes, rivers, and streams. The Chicagoland region is under “extremely high” stress level for flooding which can cause millions of dollars of damage to property and presents a significant liability issue.

Chicago’s current method of managing stormwater is not sustainable. The City of Chicago (the City) operates a combined sewer system; both stormwater and sewage drain into a single sewer for treatment and subsequently is discharged back into the Chicago River. The problem arises when heavy rains overflow the system, forcing the city to open the overflow points along the river, and in extreme cases, opening the locks and releasing the stormwater that is mixed with sewage back into Lake Michigan - close to where UIC obtains its drinking water.

Sustainable stormwater management is aimed at retaining water on site for use, evaporation or percolation, and separation from wastewater. Sustainable water management entails using less water and thus reducing water waste into the sewer system. Before UIC implements green infrastructure on campus, there is a need to make sure that the strategies have been piloted and proven to work. Ultimately, the goal is to measure and then reduce runoff to the City’s Combined Sewer Overflow (CSO) system from surfaces owned by UIC. This can be achieved through best practices in green infrastructure techniques such as bioswales, green roofs, greenways, native landscaping with soil amendments, rain gardens, rainwater capture, and/or the removal of paving and structures.

4.1.1 Green Stormwater Infrastructure Implementation Plan

There are significant operational costs allocated to clearing pedestrian pathways after a large storm. Costs are not only incurred by Grounds (Facilities Management), but also any department that manages its own grounds, including Parking Services, Campus Auxiliary Services, and UI Health. Managing stormwater on-site will better equip UIC to more efficiently spend its operations budget. Furthermore, it will make UIC a better steward of its natural resources. There is general acceptance of the efficacy of green infrastructure measures, but a general lack of integration into institutional processes.

Urban Transformations 2.0: A Green Storm Water Infrastructure Implementation Plan for the University of Illinois at Chicago (UT 2.0) develops and demonstrates an incremental, scalable, and adaptive approach to implementing green infrastructure in a highly urbanized context. Transforming UIC’s campus with green infrastructure will help mitigate flooding and will model how cities can manage water in a more sustainable way. The project team, representing Civil and Materials Engineering, Urban Planning and Policy and the English departments, coupled modeling outputs from a stormwater calculator with green infrastructure techniques, stakeholder interviews, expert advice, and a collaborative planning process to craft a plan that balances effectiveness with feasibility. The resulting plan provides direction and guidance on potential reduction, most efficacious measures, estimated costs, implementation phasing, and the benefits, not just to the environment, but to UIC students and to UIC as an institution.

Through an agreement with the Metropolitan Water Reclamation District of Chicago (MWRD) and the City, UIC could leverage its intellectual and financial capital to plan, design, implement, and monitor the plan. It is important to note that green infrastructure projects that reduce stormwater on campus will also aide with biodiversity issues outlined in section 4.3.

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	$9.00 Million
Net O&M (NPV)	$0.00 Million
Net Water and Sewer Services Costs (NPV)	($5.70) Million
Cash Flows (NPV)	$3.30 Million
Water Retained On Site	187.5 Million Gallons
% of Water Use Reduction	-7.0 %

4.2 REDUCE WATER USE

UIC receives 37.83 inches of rainfall per year on its 244-acre campus, an equivalent of 251 million gallons of stormwater falling on a mix of landscaping, roofs, sidewalks, parking lots, and streets. UIC consumed on average 660,000,000 gallons of water annually between FY 2012 and FY 2016 (Figure 12).

Past studies show that the power plants use the majority of water on campus (Figure 14). High-temperature hot water and steam are used for heating while chilled water is used for cooling. Anytime there is a major leak or break in these closed-looped systems it creates a spike in water usage for that year, which is disproportionate to the average use (Figure 13). A significant component of water use efficiency is prevention and management of piping for central heating and cooling systems. Key strategies to reduce water use include building-level water metering (Solution 4.2.1), and retrofitting restroom fixtures—particularly automatic flushers and/or toilet basins with manual low-flow fixtures (Solution 4.2.2).

Operational Water Consumption

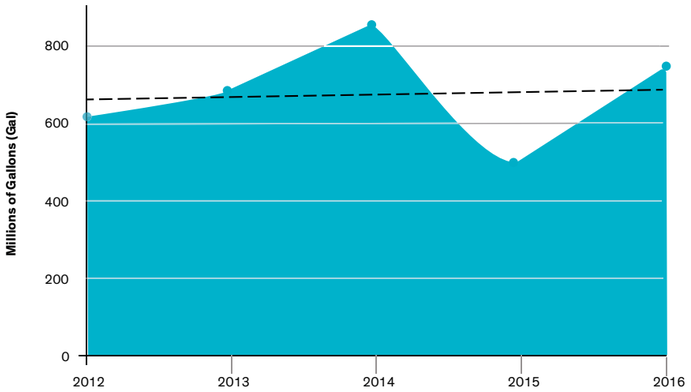


Figure 12 Historical Total Campus Water Use for last 5 fiscal years. The dashed black line represents the campus' average consumption level.

Water Consumption of Top Water Users on Campus

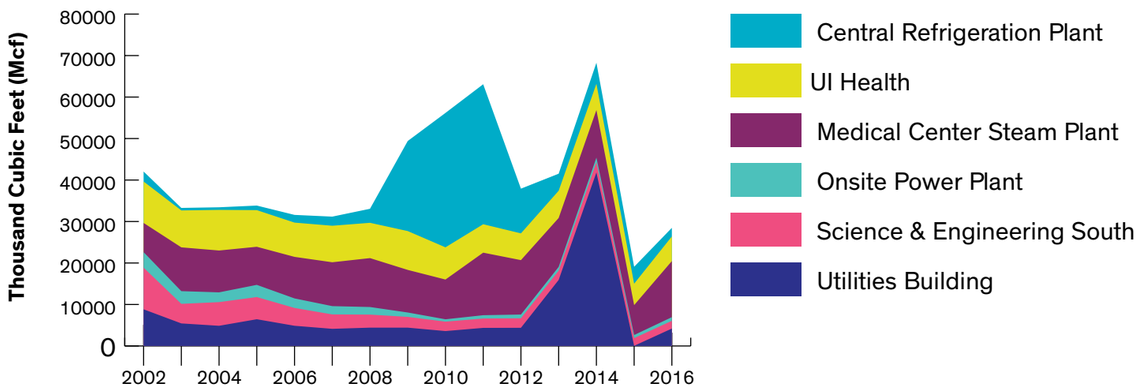


Figure 13 Historical overview for Top Water Users at UIC. The two spikes in campus water use that occurred between FY 2008-2011 and FY 2014 can be attributed to breaks in the closed-loop systems that provide cooling and heating to buildings. (Source: Utilities)

4.2.1 Building-Level Water Metering

Similar to energy, UIC cannot monitor our water usage if is not accurately measured. UIC tracks water use based on the City's water bills. Meter readings are conducted every two months, and often times are simple estimates. However, trends can be identified when the campus averages water use over the past several years.

The price of water and sewer service has tripled since 2008, to $3.88 per 1000 gallons and $29.04 per 1000 cubic feet - respectively. However, it should be noted that Utilities does receive an evaporation credit for the cooling towers in the power plants. UIC pays approximately $4.50 million for water and sewer charges annually.

If UIC were to reduce water use by 52%, there would be an approximate annual savings of $2.34 million (NPV). In addition, the City has imposed a sewer and water tax at $0.59 per 1000 gallons, with plans for the rate to increase to $2.51 per 1000 gallons in FY 2020 or FY 2021.

Understanding water use at UIC requires good metering at the building level, and by use (such as for irrigation). Compared to energy metering efforts, water metering at UIC is considered at least 10 years out-of-date. Utilities currently deploys engineers to read the meters on a monthly basis, however, the information extracted from specific-use metering remains limited.

In order to monitor savings from water efficiency retrofits, remote building-level-read metering needs to be updated and used in the buildings with the greatest water consumption. Using data from FY 2016, a model to estimate usage calculated UIC's current water share distribution (Figure 14). However, in this model it is likely that research and clinical use are underestimated since some usage is unaccounted.

Estimated Water Share Distribution

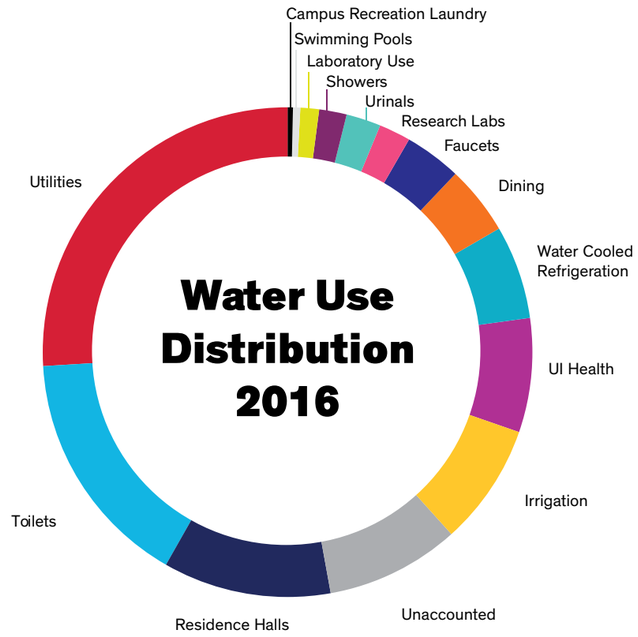


Figure 14 FY 2016 estimated water share distribution for UIC; using Water Management Inc. model. (Source: UIC Utilities)

4.2.2 Manual and Low-Flow Fixtures

Utilizing the Water Management Inc. model that generated water share distribution (Figure 14) retrofitting urinals and toilets to meet today's water efficiency standards would save an excess of $600,000 per year in water expenses. Based on the Taft Hall case study, it is expected to have a financial payback in less than one year.

OS's Sustainability Internship Program (SIP) and an Industrial Engineering Design Team researched restroom water usage at UIC. The results of these studies suggest a quick payback—less than 1 year—for retrofitting regularly used restrooms currently equipped with automatic and/or high-flow flushers (to manual and low-flow fixtures).

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$0.61 Million**
Net Water Savings (NPV)	**($9.17) Million**
Cash Flows (NPV)	**($8.56) Million**
Water Use Avoided	**-1.18 Million Gallons**
% of Water Reduction	**-7.0 %**

CASE STUDY
MANUAL AND LOW-FLOW FIXTURES IN TAFT HALL

OS's Sustainability Internship Program (SIP) and an Industrial Engineering Design Team researched restroom water use at UIC. The results of this study suggest a quick payback for regularly used restrooms that are equipped with automatic flushers.

The steps the Team took to arrive at a final recommendation included: audit of women's and men's bathrooms in one building, distribution of campus-wide survey, calculation of a cost analysis, and the use of the Analytical Hierarchy Process to select amongst alternatives. Toilets inside Taft Hall bathrooms have automatic flushers and the models used are five years old or older. Each time an occupant opens the door, uses the toilet, and closes the door, an automatic flush occurs. This totals to an average of three flushes per occupant. If each toilet were to be flushed once per user, 562,272 gallons of water consumption could be avoided but could go as high as 843,408 gallons at 3 flushes per occupant. Upgrading Taft Hall toilets to the recommended model would cost between $2,000.00-2,800.00 dependent on whether bowls need to be replaced as well. Estimated cost savings are represented in Figure 15.

After a systematic analysis of alternatives based on weighted preferences for dollars saved, water consumed, required maintenance, and environmental impact, the Team concluded that installation of the Sloan ROYAL 111 manual flushers would be the best choice. Even under the worst case scenario, it was predicted water usage by the toilets would be reduced 72% from this implementation, with a payback shorter than a year, and greatly reduce maintenance costs.

Cost of Water for 4 Academic Years

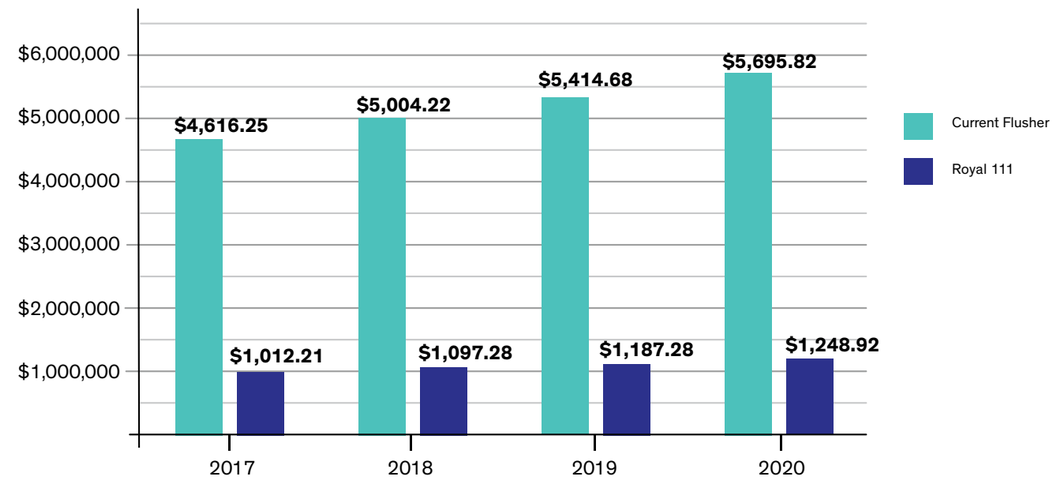


Figure 15 Cost Comparison for Taft Hall restroom toilet fixtures; current automatic flusher and proposed Royal 111 manual flusher. Accounting for sewer and water tax, as well as proposed price increases. (Source: Industrial Engineering Design Team)

4.3 ENHANCE BIODIVERSITY

UIC covers over 240 acres and some of the largest green spaces in proximity to the Chicago Loop (after the Chicago Park District's Millennium Park and Grant Park). Preserving this open space for aesthetics and student activities can be accomplished while providing ecosystem services such as landscapes that enhance pollination and are critical to maintaining an active food supply. Integrating biodiversity into campus operations will also aide in stormwater reduction (section 4.1.1) through native plantings.

UIC has set institutional goals beneficial to pollinators such as increasing native prairie, and woodland plants (Solution 4.3.1) and has goals that recognize the environmental, economic, and human health and well-being benefits of trees (Solution 4.3.2). UIC can also enhance the soil through biodiversity improvements since the right soil plays an important role in stormwater reduction and carbon sequestration. Facilities Management is engaged in partnerships to implement an integrated pest management plan and to diversify plants in support of pollinators; and therefore will be a key partner in providing an enhanced habitat for pollinators.

4.3.1 Campus Habitat Pollinator Plan

Pollinator populations have been on the decline throughout the United States. There is no single cause for this, yet significant drivers include disease, agricultural practices, pesticides, and urbanization. The OS takes pride in the fact that Bee City USA granted UIC Bee Campus USA status; the first university in Illinois to gain this recognition.

The decline of pollinators affects not only natural ecosystems in place but also the production of crops and other plants that can remove air pollutants. The purpose of the Campus Habitat Pollinator Plan is to create a set of recommendations and practices that allow pollinators to thrive at UIC through planting recommendations, maintenance policies and educational tools.

4.3.2 Tree Care Plan

The Tree Care Plan encourages a greater diversity and care within UIC's tree inventory. UIC is among a few universities that participate in the Tree Campus USA program. This program promotes effective tree management, campus community involvement, and nature connectivity among faculty, staff, and students through forestry efforts. UIC is proud to help the City live up to the motto, "urbs in horto", city in a garden. Let's be proud that UIC is a university in a city in a garden, "universitas in urbs in horto".

In 2015, UIC partnered with Bartlett Tree Experts to build and maintain an inventory of trees on campus. The management information provided by the inventory will provide UIC with specific, long-term solutions for tree care. A full inventory is essential in effectively allocating the Tree Care Plan expenditures, as it allows UIC to prioritize and strategize what is best for the campus. An up-to-date inventory presents a complete idea of what each tree requires to remain healthy and how to prepare efficiently for potential losses. Each unit at UIC that is responsible for maintaining their grounds must also be responsible for the financial commitment to maintain their tree inventory and the subsequent health recommendations.

Every tree at UIC is valuable in that green spaces and trees are a good predictor of surrounding human health. Trees offer a wide range of environmental, health, and economic benefits at the individual, community, and social level. These benefits include improved air quality, increased mental and physical activity, and a fostered sense of community through social connections.

Fiscal Requirements Summary

	Year 1	Ongoing	Commitment in Place
Parking	$50,000	$50,000	Yes
Facilities Management (Grounds)	$35,000	$35,000	Yes
Office of the Vice Chancellor for Health Affairs (each responsible unit)	$25,000	$10,000	No
Office of the Vice Chancellor for Student Affairs (each responsible unit)	$25,000	$10,000	No
Athletics	$25,000	$10,000	No

CASE STUDY
PRODUCTIVE LAND USE FOR LOCAL FOOD

A different type of landscape is sprouting up at UIC, which provides productive land use opportunity for locally grown food. There are already several gardens that produce food, each one serving a different purpose:

The Plant Research Laboratory at the UIC Greenhouse originated in conjunction with the Jane Addams Hull-House Museum and is maintained by the Department of Biological Sciences. Today a small amount of produce is grown for distribution to faculty, staff, and students within their department.

The Heritage Garden is a hands-on learning internship program. Students work with faculty, staff, and community members to connect horticulture with environmental sustainability, cultural diversity, and social justice. There are currently eight satellite gardens on the East side of campus growing plants such as sunflowers, corn, basil, epazote, chamomile, kale, and much more.

The College of Applied Health Sciences Nutrition Garden is an extensive site that is managed by a trained chef and experienced gardener. Growing food responsibly is taught to the students of two undergraduate foods and nutrition courses. Students assist with planting and harvesting, washing produce, and preparing it as meals. This College's vision to use UIC to model different types of urban gardening will be echoed through all types of gardening on campus.

The College of Education Garden was developed by undergraduate students in Human Development and Learning. This garden aims to address issues of sustainability and food security in low-income Chicago communities. According to one of the student leaders, the goal is "to make a campus-wide local food movement," and to bring together all gardening projects on campus.

These spaces represent the applied teaching and learning opportunities that gardens provide whether related to cultural connections, nutrition, self-care, or community education. Inside and outside the classroom, these living laboratories provide opportunities that UIC will explore and support.

Strawberries, kale, and other edible food grows at the College of Applied Health Sciences Nutrition Garden.

STRATEGY 5.0 SUSTAINABLE MATERIALS AND REDUCED WASTE STREAMS

5.1 IMPLEMENT UNIT-LEVEL WASTE REDUCTION

UIC's current recycling rate is around 45%. The goal of the UIC Recycling Program is to minimize waste through landfill reduction and encouraging the conservation of resources. There are two basic methods of recycling on campus: individual recycling (the efforts of individuals), and organizational recycling (the efforts of UIC and specialized staff), in which systems established divert waste into recycling and compost. In the coming decade, the goal is to increase the recycling or diversion rate to 50%, and to become a Zero Waste Campus by diverting 90% of landfill-bound material by 2050.

5.1.1 Department and Unit Zero Waste Plan

Achieving UIC's Climate Commitment to be a Zero Waste Campus will require planning and implementation by each department and unit at UIC. There are unique waste diversion opportunities and areas for improvement for each unit on campus. Departments need to provide input and develop a plan within their units to contribute to UIC's zero waste efforts.

The OS will look to units for guidance in setting a timeline for development and implementation; including plans for engagement, surveys, and strategies for improvement in collection operations, recycling performance, and cost efficiency. The OS will in turn guide the units with building-level data, such as waste audits and weekly recycling weights.

UI Health and the College of Dentistry (COD) each sought the help of the OS to determine how to reduce waste. The UI Health waste audit showed that non-biohazardous healthcare plastics comprise 20% of the trash. The audit also found that by capturing the "back of the house" food waste alone would push the Hospital's recycling rate from the current 29% to over 35%; and increase the total campus recycling rate by 1.5%. In addition, capturing all the cardboard, paper, and bottles and cans in the building's waste streams would result in a savings (in hauling costs and fees) of over $8,000.00 a year for UI Health.

The College of Dentistry's waste audit discovered that plastic film and food scraps constitute over 11% of the waste stream, and programs already exist at UIC for these materials. The COD is working in conjunction with the OS to develop a program to collect specific recyclable materials that are generated through the dental clinic, such as dental chair sleeves and wrap used in sterilizing instruments. With an optimized program including updated recycling infrastructure and education in the COD, capturing recyclable materials from the building's waste stream (cardboard, paper, bottles and cans) would result in significant savings of $1,200 annually by removing 24 tons of recycling from the waste stream.

Figure 16 Material breakdown (% by volume) found in COD waste audit.

5.2 OPTIMIZE UNIVERSITY-LEVEL OPERATIONS

The OS is responsible for setting recycling standards, providing guidance for equipment, training of Building Service Workers (BSWs), and coordinating with transportation for delivery of equipment and pick-ups of recycling. Furthermore, the OS tracks recycling rates, promotes UIC's Recycling Program (e.g. Great Stuff Exchange for office supplies, and LabShare - for lab supplies), and educates individuals on best waste reduction practices. Facilities Management is responsible for collecting the materials. As such, these departments and units provide university-level services. Below are some of the strategies that the OS is currently coordinating at the university-level to improve operations, reduce costs, and increase diversion rates.

5.2.1 Operational Waste Collection Efficiency

There are two major operational efficiency initiatives around waste and recycling collection that are being implemented in phases that will result in increased operational efficiency and reduced fleet GHG emissions. They will also simplify recycling for the campus community. The first is to transition to a single-stream recycling system (from multi-stream; to consolidate currently separated recycled materials of paper, cardboard, and bottles/cans). The second component is installation of Big Belly Solar Compactors (outdoor trash and recycling containers).

15-Year Fiscal Impact Summary

Net CAPEX (NPV)	**$0.00 Million**
Net O&M (NPV)	**($3.40) Million**
Net Fuel Costs (NPV)	**($0.19) Million**
Cash Flows (NPV)	**($3.59) Million**
Avg. GHG Impact	**-186 $MTCO_2e$**

5.2.2 Construction and Demolition Waste

Waste from construction and demolition (C&D) of building projects is another category of non-hazardous MSW that UIC generates. This data is tracked separately from solid waste. UIC has a policy in place to reduce reliance on landfilling of C&D waste, which includes the aim to recycle and/or salvage at least 75% of non-hazardous C&D debris by weight; at a minimum, 50% must be recycled or salvaged. The requirements for reaching the 90% waste diversion goal should be built into the UIC Building Standards in FY 2018. Data for 18 projects reported (for the period of November 2014 to June 2017) to the OS to date shows an average of 90% diversion. Complete tracking and documenting for C&D waste will be achieved by requiring Small Project Management (Facilities Management) to provide records of waste and recycling hauled off-site.

5.3 Reduce Food Waste

In the hierarchy of food waste reduction, food recovery is a preferred approach since it conserves all the resources that went into growing, processing, transporting, preparing, and cooking food, as well as the need to handle the waste. The first objective is recovering (non-contaminated) prepared food for donation, which also helps address the problem of food insecurity in neighboring communities as well as amongst UIC students (Solution 5.3.2). The second objective is to divert the food scraps from landfill into a composting program to preserve the nutrients and recycle the material back into usable products like fertilizer (Solution 5.3.1)

5.3.1 Food Scrap Collection

The OS has coordinated a food scrap collection program in Dining Services kitchens at Student Center East (SCE) for the past five years, and Student Center West (SCW) from January 2013 through December 2015. UIC currently collects approximately 50 tons of food scraps annually, which represents 1% of campus MSW.

Recent waste audits (2016-2017) found 1,400 pounds of food scraps in a single day at UI Health's kitchen, or about 0.4 pounds of scraps for each meal served to patients, visitors and staff. This would result in 234 tons of food scraps annually from UI Health's kitchen alone. Another 150 tons of food waste could be recovered from non-surgical areas at UI Health, largely from staff break rooms. Also, an estimated 400 and 600 pounds of kitchen food waste was prepared food that had not been served, which could easily be collected for a food recovery program to address the problem of food insecurity among students and the community around the university.

The OS identified an opportunity to coordinate hauling with the food scrap collection program at SCE to secure the level of service that the campus requires. A new bid for food scrap collection should be issued and awarded by Student Centers leadership in FY 2018, which can be utilized by UI Health.

Student Centers' leadership should continue to work with Dining Services and food service vendors to implement programs that utilize compostable (or recyclable) materials, and expand composting to more locations by FY 2020. Future food service contracts (FY 2023) should require "front of the house" and "back of the house" composting by all vendors.

5.3.2 Food Recovery

The Food Recovery Network is a student-led group which has been operating a small program at SCE for the past two years. With the additional help of SIP Students, the students found UI Health kitchen staff are willing to package leftover food, and kitchen management has offered to provide disposable aluminum trays as well as space in kitchen refrigerators for overnight storage. The launch of a food recovery program in Hospital Food and Dietary Services is imminent. The OS assessed opportunities for food waste reduction in UI Health, through (no-cost) technical assistance provided through a grant from the Illinois Food Scrap Coalition and Seven Generations Ahead. This program could divert 400 to 500 pounds daily to meet food insecurity needs in the area, and perhaps even amongst our own student population. Implementation should commence in FY 2018.

5.4 PRACTICE SUSTAINABLE PROCUREMENT

UIC's Climate Commitment to be a Zero Waste Campus can be assisted through good supply chain management. Integrating environmentally and financially viable practices throughout the supply chain - from design, material selection, manufacturing, packaging, transportation, consumption, to disposal - can lower the environmental footprint of a purchased material or product. While incorporating best practices, optimizing operations can also achieve greater cost savings at a relatively low effort.

5.4.1 Purchasing Process

Purchases are currently made in a variety of ways - with P-Cards, iBuy, RFPs, existing contracts through various purchasing consortiums, etc. - which provides complex oversight and control. A checklist for purchasing that describes the "why" and "how" of sustainable purchasing, and identifies product certifications as well as existing industry standards has been developed, but not yet disseminated. Other actions to be taken by the Office of Purchasing include adding language to the vendor entry document (Vendor Information Form) related to sustainability, adding sustainability language to templates for contracts, and developing a communication plan.

5.4.2 Revenue Generating Contracts

Revenue generating contracts are agreements under which UIC receives compensation or revenue-sharing from a vendor who provides services to the campus community while operating on university property. A key UIC revenue generating contract is for Dining Services. UIC's current contract is in place through FY 2023. It is incumbent upon those responsible for the contract to enforce those requirements. These include procurement of 20% of produce from growers or processors within 250 miles of campus, annual accounting and reporting of procurement, use of recyclable (pre-consumer) materials, staff training for recycling, elimination of Polystyrene plastics (#6 PS), use of plant-based or biodegradable serviceware, particularly where composting is provided, and requirements for food scrap collection. The Office of Vice Chancellor for Student Affairs (OVCSA) is responsible in enforcing this contract.

5.4.3 Purchasing Policies

It is recommended that two purchasing policies be formalized:

5.4.3.1 Sustainable Paper Policy

This policy would reduce desktop printers, consolidate to multifunctional printers, and print less, while requiring a percentage of recycled content in paper; a pilot study is currently underway. Printing less would not only reduce the costs associated with printing, but also collection costs of paper (which is our costliest recycled material at $550.00 per ton).

5.4.3.2 Bottled Water Policy

This policy would forbid purchases of bottled water by all departments, unless justified due to lack of access to safe water. An increasing number of filtered water bottle filling stations are installed on campus, allowing such a policy to reduce wasteful spending, waste created from plastic bottles, and emissions from transporting the bottled water from the producer.

These policies are either cost neutral or cost beneficial. Implementing sustainability requirements into purchasing policies may initially raise costs, however, since UIC has large purchasing power often times these costs can be negotiated down. The Office of Purchasing and the CCSE Sustainable Materials subcommittee will take lead in developing and implementing these policies; which should be formalized in FY 2018 or FY 2019 at the latest. All departments and units will be responsible for the implementation of this solution.

STRATEGY 6.0 TEACHING AND LEARNING

UIC's Climate Commitments—which mainly address campus operations—must extend to our core mission in education and research, UIC's strategic priorities of student experience and success, and Chicago and community engagement by infusing sustainability content into curricular and co-curricular programs. A successful outcome requires the engagement of UIC's academic community in creating meaningful learning and research opportunities in sustainability for faculty, staff, and students, as well as the broader community.

"We can be confident—we are teaching the leaders of tomorrow."
Provost Susan Poser, UIC Leadership Retreat, August 2017

6.1 DEVELOP SUSTAINABILITY-RELATED CURRICULUM

A survey conducted in FY 2017, found a strong interest by respondents to teach a sustainability-related course in their discipline if provided instructional support. Currently, sustainability is integrated into UIC curriculum offerings through faculty-initiated course development. Coordinated and formal approaches - to date - for developing curricular content and guiding sequences of courses geared toward delivering the philosophy, knowledge, skills, and tools that prepare students for sustainability-focused careers - have been very limited and tend to remain within disciplinary boundaries.

The College of Urban Planning and Public Affairs (CUPPA) offers an undergraduate minor in Sustainable Cities. This minor offers two introductory courses related to sustainability: US 130 "Principles of Urban Sustainability" and US 230 "Practices for Sustainable Cities". Additionally, the Graduate College has provided support for developing an interdisciplinary graduate certificate in Sustainable Systems. The most recent course inclusion in relation to the certificate was GC 550 "Principles of Sustainability" in Spring 2017. The certificate is projected to be launched by Spring 2018, and could potentially include a web-based option to attain as well.

Furthermore, there are ongoing discussions regarding interdisciplinary master's degree programs. The College of Liberal Arts and Sciences (LAS) is working towards a 4+1 professional master's degree in sustainability for majors in Biological Science, Earth and Environmental Science, Physics, Chemistry, Urban Studies, Anthropology, and Civil Engineering. Earth and Environmental Sciences and Business Administration have also proposed a combined undergraduate degree in Environmental Management.

6.1.1 Sustainability Course Rubric

The previously noted survey (FY 2017) also found that there are about 70 courses that could be defined as sustainability-related or focused. In order to assist students in identifying sustainability-related courses more readily, the CCSE Teaching & Learning (T&L) Subcommittee is tasked with developing a sustainability course rubric, facilitated by the assistance of a 0.50 FTE Graduate Assistant. This rubric would centralize and better advertise offerings and - imminently - degrees. It would be required that departments utilize the rubric, and subsequently, existing courses would be cross-listed. The Graduate Assistant is necessary since the CCSE does not have a budget for support staff. This position would report to the OS or the Institute for Environmental Science and Policy (IESP).

6.1.2 Sustainability-Related Courses for General Education Credit

Specific courses that are already under consideration, or could qualify for General Education Credit (that are currently offered at UIC) include HON 134 “Sustainability and Policy” and US 230 “Practices for Sustainable Cities”.

The syllabi of existing General Education courses should be reviewed for further opportunities to infuse sustainability into existing courses, with an initial focus on courses that meet the General Education requirements of Analyzing the Natural World and U.S. and Society; which are more likely to have courses that fit this unique opportunity. The CCSE T&L Subcommittee is tasked to communicate with faculty that pertain to discuss opportunities to add-in a sustainability component.

LEARNING OBJECTIVES AND OUTCOMES FOR SUSTAINABILITY

Response Objectives

System dynamics Human systems and natural systems are linked. Changes in any part of a system have multiple consequences that reach far beyond change.

Tradeoffs Solving almost all problems related to sustainability involves tradeoffs. There are rarely perfect solutions with no costs, and there are often winners and losers.

Cascading effects and unintended consequences There are positive and negative, intended and unintended cascading effects of human policies, decisions and actions, all of which have implications for sustainability.

Complex systemic problems More often than not problems in sustainability are classifies as “wicked”, as opposed to “tame”. Tame problems lend themselves to “elegant” solutions (e.g. acid rain), but solutions to wicked problems are “clumsy”, requiring frequent revisiting and revision (e.g. climate change).

Interdisciplinary There is no single disciplinary perspective for addressing sustainability. It is a truly interdisciplinary field of study.

Outcomes

Upon completion of the program or course students should have

An understanding in critical knowledge along with approaches and tools at the interface of sustainability and leadership.

Proficiency in applying solution-based knowledge along with tools for institutional development and change for sustainability.

The ability to participate in institutional change and development toward sustainability.

Proficiency in building and communicating cases for sustainability including opportunities and challenges.

An understanding of the emerging global sustainability context and proficiency in life-long learning in this rapidly evolving arena.

The CCSE T&L Subcommittee developed a set of learning objectives and outcomes. This should be presented to the Committee of Associate and Assistant Deans, Education Policy Committees in the Colleges, Gen Ed Council, and targeted departments (e.g. Anthropology, Public Health, Sociology, Engineering) along with the reasons why faculty might want to integrate sustainability into their courses.

Programs and courses created by faculty are generally developed within departments or colleges. Utilizing the aforementioned rubric as a framework for defining sustainability-related courses, the OS and the CCSE T&L Subcommittee will draft a presentation for each faculty member on the subcommittee to present within their own department, other departments, and to any college or campus committee on which they serve.

Additionally, the UIC Center for the Advancement of Teaching-Learning Communities (TLC) has posted workshops related to integrating sustainability across curriculum. Including faculty who teach sustainability-focused courses as Master Teaching Scholar in the TLC program, could subsequently provide guidance to other faculties interested in integrating sustainability across their curriculum. TLC is tasked with developing a best practices toolkit for adding sustainability material to courses.

6.1.3 Interdisciplinary Sustainability Majors, Minors, and Certificates

Program development is driven by tuition distribution and the desire to develop programs to increase enrollments. Tuition generally goes to the college from which the course originated and the college may reallocate funds to departments based on internal formulas. Incentives for development of interdisciplinary courses, programs, and certificates should be established through the Associate Chancellor for Budget and Resource Planning and the Office of the Provost.

The UIC Extended Campus offers a platform for the development of revenue generating programs, whether standard in-person classroom, online, or blended formats. Opportunities to offer sustainability-focused courses, certificates, and other educational program are currently being explored. The Graduate College has provided support for developing the interdisciplinary graduate certificate in Sustainable Systems.

6.1.4 Faculty Expertise

An approach to recruiting faculty in areas where there are gaps in expertise—that results in missed opportunities to engage in sustainability research and respond to national and regional priorities—should be developed by the Colleges and Departments with the support of the Office of the Provost.

The academic areas of Energy and Sustainability, Environmental Economics, Environmental Sociology, Environmental Justice, Corporate Social Responsibility, and Urban Infrastructure Sustainability, should be targeted for the next cluster of faculty hiring. The Office of the Chancellor and the Office of the Provost are delegated in providing funds for to incentivize cluster hires.

6.2 ENHANCE SUSTAINABILITY-RELATED COCURRICULAR ACTIVITY

There are several notable, ongoing successes of sustainability-related co-curricular programs at UIC, including:

UIC Impact (cocurricular transcript) Environmental Awareness and Sustainability one of the 6 areas of concentration, students participate in sustainability-related research and internships that offer hands-on learning experiences that advance the overall mission of greater social, economic, and environmental sustainability in the campus community. The OVCSA is delegated in promoting UIC Impact.

Sustainability Internship Program (SIP) An applied learning seminar along with student internship placements, instituted by the OS.

UIC Heritage Garden Internship A hands-on learning project with an internship program that connects horticulture with environmental sustainability, cultural diversity, and social justice.

LCC Environmental and Climate Justice Dialogue Initiative UIC classes help students explore links between environmental and climate justice, cultural heritage, and pressing community concerns. In Academic Year 2016/2017 over 1,300 students (including UIC classes) participated.

UIC Sustainable Mobility Lecture Series Utilized through UIC Extended Campus, engages the broader community (non-UIC audience and participants). UIC Extended Campus also hosted the Air Water Earth Summer Camp 2017.

Political Ecology as Practice: A Regional Approach to the Anthropocene Hosted by The Institute for Humanities, engages faculty, staff, and graduate students from the humanities and social sciences.

Cultivating Wellbeing: The Social and Ecological Effects of Urban Gardening in Chicago A collaborative project between The Department of Anthropology, Department of Biological Sciences, Department of Medicine, and the Field Museum.

Industrial Ecology The Institute of Environmental Science and Policy supports a faculty cluster in Industrial Ecology, with hires in the College of Engineering Civil and Materials Engineering and Urban Planning. Industrial Ecology has been described as the science of sustainable development.

The Freshwater Lab Supported through the Institute of Humanities, is an initiative to communicate Great Lakes water issues to the general public, create tools to visualize the current state and future scenarios of water sources, engage unaffiliated groups in water planning, and train a new generation of Great Lakes leaders.

Behavior Economics Energy Sustainability and Technology (BEEST) Made possible through the Energy Initiative, provides an interdisciplinary place for undergraduate and graduate students to explore specific topics - such as energy efficiency, water resources, resilient communities, innovative technologies, and techno-behavioral influences—within this research area.

A selection of sustainability-oriented co-curricular programs, informal educational opportunities, and tangential activities have grown in presence over the last decade at UIC, clearly indicating a market shift for our faculty, staff, and student body. The SIP and the Heritage Garden Internship should receive steady institutional funding for Program Coordinators and to support each respective program. Total estimated costs for both programs is $165,000.00 per year. Potential sources include an increased Sustainability Fee, OVCSA, or the Office of Advancement. The Centers for Cultural Understanding and Social Change, the Rafael Cintrón Ortiz Latino Cultural Center (LCC), and Office of Sustainability are responsible for running these programs.

The LCC dialogues are also part of the Hispanic-Serving Institutions Science, Technology, Engineering and Mathematic (HSI/STEM) grant curriculum. This initiative should receive institutional support in the form of a 0.5 FTE Graduate Assistance to help coordinate and co-facilitate the dialogues. The LCC is responsible for running this program.

6.2.1 Learning Opportunities

Every green infrastructure project is an opportunity to utilize the campus as a learning laboratory. Therefore, education signage should be included for every capital project, which the VCAS is responsible for. Aspirational ideas that evolve through faculty, staff, and student innovation to broaden this concept should be integrated into the campus vision as described in the Master Plan. This would further integrate campus infrastructure as a learning and research tool. The OS will be responsible for bringing these ideas to the Master Plan Working Group.

6.3 CATALYZE SUSTAINABILITY-RELATED RESEARCH

Many faculty are engaged in sustainability-related research through various academic and research programs. Research that furthers specific sustainability goals - including disciplinary, interdisciplinary, collaborative, and translational projects, as well as community-based participatory research - must be facilitated and supported across campus.

6.3.1 Research Beyond Campus

In order to advance (broader) community and off-campus research, relevant colleges as well as OVCR should provide seed funds for community-based participatory research to help neighboring communities address issues of sustainability.

Off-campus research partnerships must be facilitated, with industry and foundations, to develop innovative projects designed to improve efficiencies in energy and resource usage consistent with sustainability goals. The campus needs a more nimble process to elevate and bring research discoveries to market. Those responsible include UIC Advancement, Office of Technology Management, UIC Innovation Center, and the Center for Clinical and Translational Science.

6.3.2 Interdisciplinary Research

The OVCR and Office of the Provost are tasked with establishing administrative pathways for catalyzing interdisciplinary research. This may involve tenure and promotion and recognition of interdisciplinary publications.

The OVCR has been convening researchers around the topic of water as well as urban sustainability. However, in order to create a cohesive vision and a stronger collaboration among individual researchers, staff support is needed to stay on task and assist with grant writing and submittals. Staffing may be done by an advanced graduate student, post-doc or staff with strong grant writing and management background. Research Development Services in the OVCR should provide this support. In addition, seed funds should be provided through the OVCR to facilitate collaborative partnerships across disciplines to secure extramural funds for large complex projects.

6.3.3 Funding Opportunities

The OVCR is tasked with developing a process to track and optimize funding opportunities in sustainability-related research topics including governmental sources but also specific research foundation opportunities.

Chancellor's Committee on Sustainability and Energy

Office of Sustainability

THE UNIVERSITY OF ILLINOIS AT CHICAGO

CHANCELLOR AND VICE CHANCELLOR FOR ADMINISTRATIVE SERVICES

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