

## **Enabling Energy Efficiency in Rental Properties**

**Dow Fellows Distinguished Award Proposal, September 2013**

*Cassarah Brown, Alicia Chin, Amy Eischen, Efrie Friedlander, and Emily Taylor*

The Home Energy Affordability Loan (HEAL), a project of the Clinton Foundation, is designed to improve corporate and homeowner quality of life by reducing GHG emissions through improved energy performance in commercial buildings and residences. The Clinton Foundation, through HEAL, helps companies retrofit their commercial buildings to increase energy efficiency and devote a portion of these energy savings to an employee loan fund.

In partnership with DTE, the Clean Energy Coalition (CEC), and the Clinton Foundation, Zingerman's, a local Ann Arbor business, is serving as a pilot for the HEAL initiative. Our team of current Dow Fellows has been working with Zingerman's for several months to assist in the employee engagement portion of the HEAL initiative. Since only the minority of Zingerman's employees that own their properties will be eligible for the home improvement loan through HEAL, we have been particularly focused on how to engage employees who rent in order to make this program relevant for all employees when it is introduced company-wide in August 2013.

While engaging in this work, our team has solicited input from local authorities and management companies to address the issue of split incentives, which often discourage landlords from investing in energy efficiency improvements for rental properties. Progress in this work has made it apparent that the HEAL model could have larger applications beyond companies and the Zingerman's project. It is for the purposes of this expansion that we are applying for the Dow Distinguished Award. The award will support the funding of energy efficiency initiatives in rental properties through a city-wide revolving loan fund and aid the empowerment of renters to engage their landlords on this important issue.

### **I. Motivation**

Members of the rental market are at a particular disadvantage when looking to finance energy efficiency projects. The commercial banking sector, with some of the largest amounts of capital to expend for project financing, often denies loans to multi-tenanted properties, as these projects lack loan security (Freehling, 2011). Furthermore, large financial institutions are generally disinterested in the small scale of energy efficiency upgrades possible in multi-tenant homes or buildings. This disinterest stems partly from a limited income potential for financial institutions with high capital, as the typical cost for a single improvement project will be less than \$10,000.

Multi-tenant home and building owners, however, have much to gain from finding ways to finance energy efficient retrofits of buildings. Retrofitted buildings are generally appraised at values three to eight percent higher than their conventional counterparts, enabling property owners to benefit from increased property values in addition to being able to charge higher rents while paying lower energy costs (Freehling, 2011).

The lack of engagement from the commercial banking sector in energy efficiency financing, particularly for multi-tenant and non-owner-occupied households, has spurred both federal and state action to help incentivize energy efficiency upgrades. However, many of these initiatives fail to include inhabitants of rental properties. For example, the Federal Residential Energy Efficiency Tax Credit provides a credit up to \$500 per residence for improvements to the building envelope of existing homes and for the purchase of high-efficiency heating, cooling, and water-heating equipment. However, this tax credit, subject to renewal in December 2013, is only applicable to dwellings owned and used by the taxpayer as a primary residence. As a result, renters and many landlords are ineligible for the tax credit (DSIRE, 2013).

Inaccessibility of governmental and private incentives to the rental market is also a problem on the state level. In Michigan, the Michigan Saves Home Energy Loan Program provides an unsecured loan of up to \$20,000 for owner-occupied homes and may not be used for rental units (Michigan Saves). The BetterBuildings for Michigan Program supports rebates through local utility companies to provide up to \$5,000 in incentives (BetterBuildings). Rebate programs like this, however, are often limited in scope and require increased risk on the part of the property owner, who must make changes and retroactively apply for rebates. As a result, these programs often target property owners already more likely to make energy efficiency improvements rather than incentivizing those who would not otherwise do so.

## **II. The Case for Ann Arbor**

The Ann Arbor rental market is unique for several reasons. First, it has a high turnover rate with the student population which creates about 7,000 new renters each year, many whom are signing a lease for the first time (Green Rental). Second, demand often exceeds supply, which creates little incentive for landlords to make property improvements. Third, it is difficult for the City to raise funds for energy efficiency improvements with taxes on utilities, since utilities are privately-owned. Fourth, the rental market consists of many small management companies that own less than 10 rental properties, many of which are former single-family homes that have been converted to multi-unit dwellings.

According to a community-wide greenhouse gas inventory completed as part of the City's Climate Action Plan, the residential sector of Ann Arbor accounts for approximately 22% of the City's greenhouse gas emissions (Climate Action). The City of Ann Arbor will be the next

participant, after Zingerman's, in the HEAL program, which will provide low-interest loans for energy efficiency improvements to homeowners. The City, however, faces the same dilemma as Zingerman's regarding the engagement of renters and the improvement of energy efficiency in rental properties, as over half — 55.2 percent — of the 40,000 residential units in Ann Arbor are rented according to a 2010 Census (please refer to Attachment A, map entitled, "Percent Rental Housing Units by Census Tract, Washtenaw County, 2010"). Based on data from the City Assessor and from the City's Rental Housing Inspection program, the City has an estimated 26,953,427 square feet of rental property. Using the EIA Midwest annual estimate of \$1.10 per square foot of utility spending, over \$29 million per year is spent on utility costs within the city. Over \$11 million of these expenditures likely occurs in residential rental properties of 3 units or less. Based on data from the City of Ann Arbor Rental Inspection Permits and Assessor's Office, the average rental building was built in 1930 and contains approximately 3.6 units. (please refer to Attachment B, map entitled, "Rental Housing Inspection Permits by Permit Subtype, City of Ann Arbor, 2013"). This implies that most rental construction is not built to current energy standards and that the properties tend to be too small to qualify for many existing energy efficiency incentives.

Many larger rental complexes have incentive to make energy efficiency improvements because of the efficiencies of scale, which grant them greater access to capital including grants and loans. For example, Property Assessed Clean Energy (PACE) assessments in Ann Arbor are not available for residential properties with fewer than 4 units, and PACE provides funds starting at \$10,000 (PACE Now). Based on data from the City of Ann Arbor Rental Inspection Permits and Assessor's Office, nearly 90% of Ann Arbor's rental properties have 3 units or less (Attachment B) and the projects will generally cost less than the lower bound of the PACE loans —the CEC estimates that major energy efficiency renovations cost up to \$8,000 to \$10,000. Smaller property owners, however, tend to lack the liquid capital for these smaller efficiency improvements.

Sustainability goals concerning energy efficiency are included in the City's master plan (Sustainability Framework) and the City has HUD Sustainable Communities Challenge grant funding through 2015 dedicated to improving energy efficiency. However, they need to solve the challenge of addressing the rental market if they are to improve overall energy efficiency in the residential sector. While the City is making the shift toward energy efficiency, it is primarily grant funded. There is a need to implement systems to promote energy efficiency in the long-term for the rental market.

### **III. Project scope**

According to the City of Ann Arbor and CEC staff, Ann Arbor is poised and ready to launch a pilot project to address energy efficiency in the rental market. The City is currently in a moment of transition with potential to access matching funds, dedicated staff, and significant economic

development needs in the area. A push provided by initial funding is needed, however, to prioritize and initialize the launch of such a program. To address the barriers to investments in rental unit energy efficiency upgrades, we will mimic the relevant components of the Ann Arbor HEAL program by creating a financial incentive for rental property owners (one to ten units) to invest in their properties.

The project will focus on providing a dual-sided approach to remove the barrier to energy efficiency investments and an engagement strategy for both property owners and renters. The bulk of the pilot administration will focus on engaging with landlords through the provision of access to a financial incentive to make the necessary investments in energy efficiency upgrades, while a parallel effort will educate renters about the benefits they receive when the landlords invest in energy efficiency.

The *A2Energy Rental Fund* can be structured in several ways. For example, preliminary conversations with City of Ann Arbor partners suggest a successful strategy would include a combination of grant funding covering up to 10% of investment costs and low-interest loans, covering up to 90% of investment costs. This fund structure ensures sustainability by requiring property owners to become stakeholders while creating an incentive and removing barriers to rental unit investments.

In conjunction with this fund, a part of the renter education effort will include communicating the importance of engaging in energy smart behaviors as an easy way to decrease utility bills. As a further measure to facilitate the mutual interests of landlords and renters, we will help foster the adoption of green leases. A *green lease* is a customizable agreement signed by both parties. The property owner commits to managing the unit in a sustainable way, and the renter pledges to reduce energy consumption and engage in more environmentally-conscious behaviors.

This multi-prong effort increases the potential impact and success of the project tremendously. In addition to access to potential matching grant funding, the project is strengthened through guaranteed in-kind funding, as well as staff administrative time and pre-established relationships with area-expert partners. Although the ultimate structure of the *A2Energy Rental Fund* will be determined through continued iterative discussions with City officials, experts, and rental property owner focus groups, much of the foundational research and stakeholder buy-in has already been completed. Furthermore, lessons from this pilot have the potential to be shared with a robust network of similar cities across the state and country through organizations like Michigan Green Communities and the Green Rental Housing Network.

#### **IV. Vision of success**

This two-sided approach will create solutions to address an overlooked market, as currently no opportunities to increase energy efficiency in rental properties exist. According to Jamie

Kidwell, a City of Ann Arbor Sustainability Associate, (Interview with Jamie Kidwell, September 6, 2013), there is a clear need for our revolving loan fund in Ann Arbor and the grant from Dow is critical for fund initialization. Many landlords already have an interest in energy efficiency and others could be motivated through financial support and awareness of positive externalities associated with energy efficiency (e.g., property comfort, better tenant retention, better property maintenance).

Support for the successful implementation of the fund is assured, as the City has already stated its interest and City departments with experience in revolving fund administration have pledged guidance. The *A2Energy Rental Fund*, in particular, is supported by the Ann Arbor government because it helps the City achieve its strategic goals to lower greenhouse gas emissions. Additionally, Ann Arbor residents will be equally in favor of the project, as \$50 million is annually spent on utilities in Ann Arbor and Ypsilanti. Thus, reducing these residential energy costs may serve to catalyze economic development.

Our vision of success is supporting the growth and development of Ann Arbor by increasing energy efficiency activity in the rental residential sector. We hope that the revolving loan fund will serve as a model for other cities experiencing similar problems with rental property energy efficiency retrofits financing. The City of Ann Arbor already has an established network to collaborate on sustainability with twelve cities that face similar challenges— none of which have devised a solution to the rental problem.

We will measure short-term success based on how well the fund is able to gain traction prior to implementation. Metrics will include attendance at information sessions and the number of initial loan applications. Non-quantitative measures will include how satisfied the City of Ann Arbor is with our strategic plan for the Fund and qualitative feedback from program participants. Once the fund is implemented, continuous measures of success will include the number of loans administered, resulting energy savings, and the amount of money put back into the fund. We hope, as a long-term goal, that Ann Arbor will serve as a model for implementing revolving energy efficiency loan funds for rental properties in other cities.

## **V. Target deliverables**

The primary objective of our project is to establish a revolving loan fund for energy efficiency projects in Ann Arbor rental properties. We will give funding preference to “single unit rentals,” or entire homes that are rented. Over the next six months, working closely with the City of Ann Arbor, we will develop the exact structure of the fund and process for issuing energy efficiency loans. Based on focus group results with landlords, we will identify the most viable financial structure for the fund. Responsibilities for who will administer and manage the funds, eligibility criteria (e.g., define products and activities that qualify for support), and the application, fund distribution, and verification processes will all be clearly defined. By April 2014, the operation

of the fund and the project will be handed over to the City of Ann Arbor, and established as a permanent policy.

To empower renters to engage with their landlords regarding energy efficiency retrofits, we have created educational and resource tools. As part of our engagement with Zingerman's, we have created an energy efficiency workbook, detailing tips for how renters can implement energy efficiency best practices. We also developed an interactive course for Zingerman's employees to learn how to identify energy efficiency opportunities and implement the actions detailed in the workbook. Renters will be able to fill out a checklist of energy efficiency actions completed to demonstrate to their landlords how they have improved the rental property and begin the conversation on greater energy efficiency upgrades. We will also provide a green lease template to help instigate a tenant-landlord communication about more substantial efficiency improvements. We plan to make a version of the energy efficiency workbook and resources available to all residents of Ann Arbor in order to further educate and empower renters.

### ***Green Leases***

Based on information provided by the City of Ann Arbor, split incentives and access to low-interest capital are two primary obstacles preventing landlords in Ann Arbor from investing in energy efficiency upgrades (Interview with Jamie Kidwell, June 21, 2013). Increasing in popularity, green leases are one strategy that facilitates mutual understanding between landlord and tenant, aligning financial and energy incentives for both parties to work together to save money, conserve resources, and ensure environmental-conscious operation of the rental unit. Green leases can take many forms and are highly customizable given the unique needs and circumstances of the parties. Beyond energy savings as an incentive, there is growing evidence that consumers also value home retrofits for the non-energy benefits, such as comfort and aesthetic enhancements. Unfortunately, these benefits are not often included in the most common cost-effective and cost-benefit analyses conducted by auditors and regulators due to the challenges in quantifying their value (ACEEE, 2006).

Conventional rental unit leases are not structured in a way that facilitates energy and monetary savings (Green Lease Library, 2013). To address the misaligned split incentives, regardless of who pays the utilities, green leases ensure mutual understanding between tenants and property owners with each side committing to take action to reduce energy consumption. Ensuring equitable distribution of costs and benefits from energy efficiency and other green investments through a signed, green lease is a critical step to reinventing the rental market.

For example, New York University publishes a green lease guide that provides student renters with tools and sample provisions to proposing and entering into a green lease. Potential green lease provisions may include ensuring a comfortable home, energy efficient appliances, and programmable thermostats. Other guidelines focused on service and utility may fall under

categories like electrical energy, energy system alternatives and upgrades, utility metering, lighting, HVAC and air quality, and water conservation (NYU Green Lease Guide, 2011).

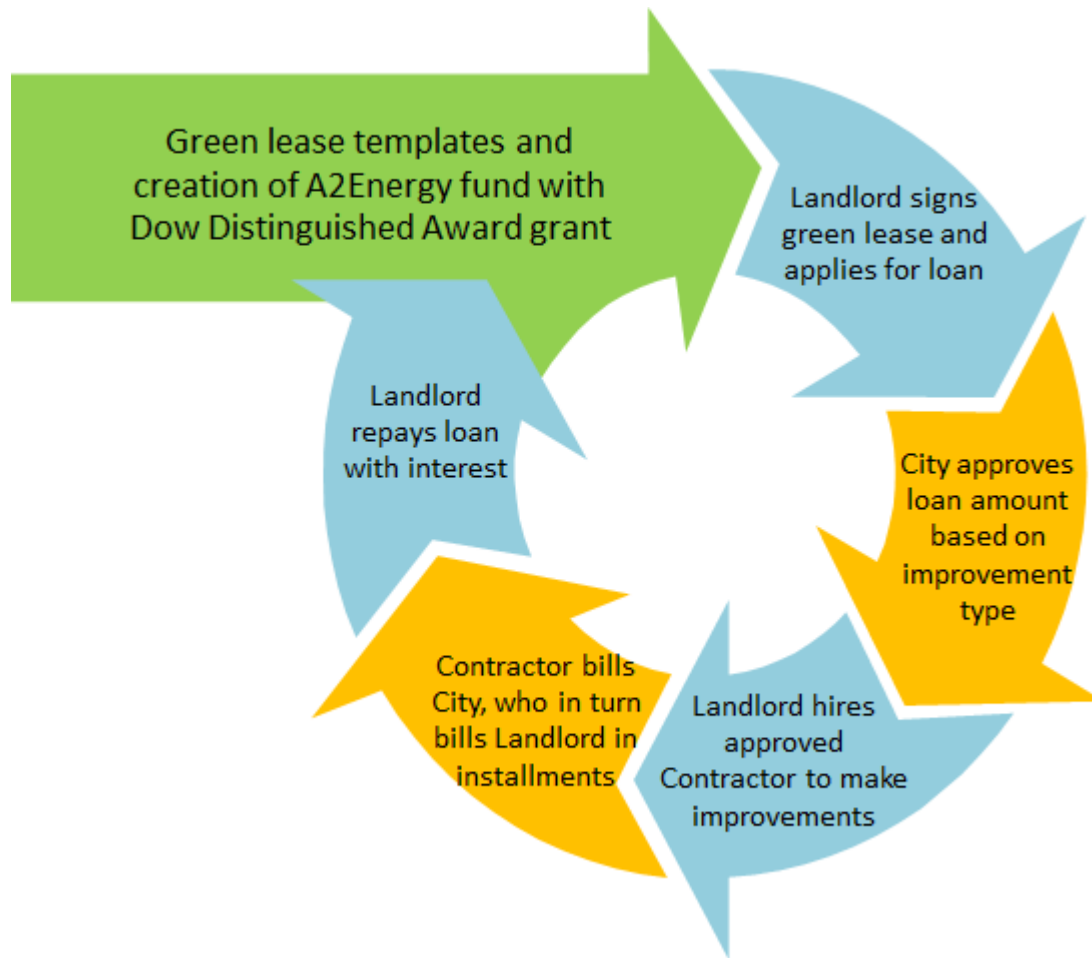
Creating a link between the green lease and the *A2Energy Rental Fund* is critical to ensure both parties come together to co-create a greener rental experience. We propose formalizing the green lease as a prerequisite for property owner access to the *A2Energy Rental Fund*, fostering greater communication, education, and engagement in the process. This pilot, as a main deliverable, will facilitate the distribution and signing of a green lease template that broadly fits the needs of Ann Arbor rental residents and property owners.

### ***A2Energy Rental Fund***

Green leases will resolve the issue of split incentives, while the grant money received from the Dow Distinguished Award will be used to create a revolving loan fund to provide landlords with easier access to low-interest capital. The *A2Energy Rental Fund* will offer loans with interest rates less than those offered by current federal and state programs (likely less than 2%) to incentivize landlords to make energy efficiency improvements to their properties. Though all residential rental properties will be eligible to receive loans from the fund, preference will be given to a segment of the rental market that is currently ineligible for many federal and state incentives, namely the multi-family buildings with less than 4 units that are extremely common in Ann Arbor.

The fund will enable larger energy efficiency improvements that may be too costly to repay over the term of a typical green lease, which is likely to be 1 year, based on frequent turnover of student renters. Our fund would offer favorable financing to encourage some of the most effective energy efficiency improvements, in terms of money saved per dollar spent, that landlords and renters are unlikely to perform themselves. Examples of these improvements include adding insulation, sealing air leaks, and replacing existing windows, furnaces, water heaters and appliances with EnergyStar® certified counterparts.

We will solicit quotes from local contractors to determine accurate estimates for the cost of each energy efficiency improvement including the installation by a pre-approved contractor. The amount of each loan will be set to a certain percentage of the estimated total installed project cost per improvement. The percentage financed with an A2Energy Fund loan will be determined based on the results of our focus groups with landlords and will be designed to ensure that the terms of our loan are favorable enough to incentivize landlords' participation. Funding only a percentage of each project with the A2Energy loan will allow for a greater number of projects to be funded simultaneously. An additional method to build fund reserves over time might include an optional buy-in collected in conjunction with the bi-annual inspection fee that would allow landlords to access loans from the fund (Figure 1).



**Figure 1:** Enabling energy efficiency in rental properties through green leases and revolving loan fund

Based on meetings with the City of Ann Arbor, we believe that this revolving loan fund has great potential to encourage participation in green leases and kick start energy efficiency in rental properties. For that reason, we have revised our budget and are requesting an updated amount of \$60,000 to establish our A2Energy Rental Fund. Based on an average installation cost of about \$5,000 to \$10,000 per project and 75% of each project being financed with a loan from the *A2Energy Fund*, this amount should be enough to fund approximately 10-15 projects at a time. The number of projects would be halved if we are awarded 50% of our request amount. Based on our discussions with Jamie Kidwell (Sustainability Associate for City of Ann Arbor), there is also the potential for the City to supply matching funds from their HUD grant to our newly created revolving loan fund, which would allow for a greater number of efficiency improvements to be simultaneously funded.



Along with the City of Ann Arbor and based on input from landlords, our team of Dow Fellows will establish the basic logistics for the launch and long-term operation of the *A2Energy Fund* (loan application, repayment terms, methods to verify completion of energy efficiency improvements, etc.). We will coordinate the hand off to the City in May 2014 prior to graduation. Representatives from the City have stated that they are enthusiastic to work with us to ensure the fund's longevity, as energy efficiency is one of their strategic initiatives and they currently lack the capital to start a revolving loan fund.

## **VI. Detailed implementation timeline**

Our project has two main work streams: the revolving loan fund for landlords and the renter empowerment component.

### ***Landlord Loan Fund***

Program engagement with landlords will begin November 2013. Open information sessions and focus groups will explain green leases, the benefits of energy efficiency, and the possibility of a revolving loan fund. These information sessions will help gauge participation interest, as well as provide important feedback for how to improve the program by making it more attractive to landlords. Through additional research and interviews with technical and financial experts, in partnership with the City of Ann Arbor, we will determine the appropriate loan amount and rate. As there are currently no special terms for energy efficiency project loans, we will need to identify which improvements to support (such as attic insulation and air sealing, which provide the largest return on investment), and set the terms for applicants.

Additionally, we will work closely with the City to define the operational logistics of the fund. Based on the operational logistics, efforts will continue to develop energy efficiency resources, recruit certified installers to support the retrofits in properties of those awarded a loan, and fill administrative needs.

In March 2014, we will complete the fund strategy and begin advertising the loan opportunities to rental property owners. In April, we will make the loan application available and support the City of Ann Arbor with initial application review and the management of the fund launch. The City of Ann Arbor is fully aware that our direct involvement with the launch of the program will end as of May 2014, and has prepared city staff to dedicate their time following this turnover to ensure the long-term success of the *A2Energy Rental Fund*.

### ***Renter Empowerment***

Through October 2013, the Dow Fellows will be focused on holding the education sessions on energy efficiency for Zingerman's and solidifying its renter resources and education tools. We will use feedback from those sessions to improve and modify the workbook and tools for the City of Ann Arbor. As a part of this effort, we may also create instructional videos based on our

Zingerman's education sessions that would be available to Ann Arbor residents on YouTube. These resources will be able to go live on the Ann Arbor website by January 2014. In addition to energy efficiency activities, we will create a conversation-starting guide, green lease information sheet, and green lease template for renters to use when engaging landlords.

## **VII. Conclusion**

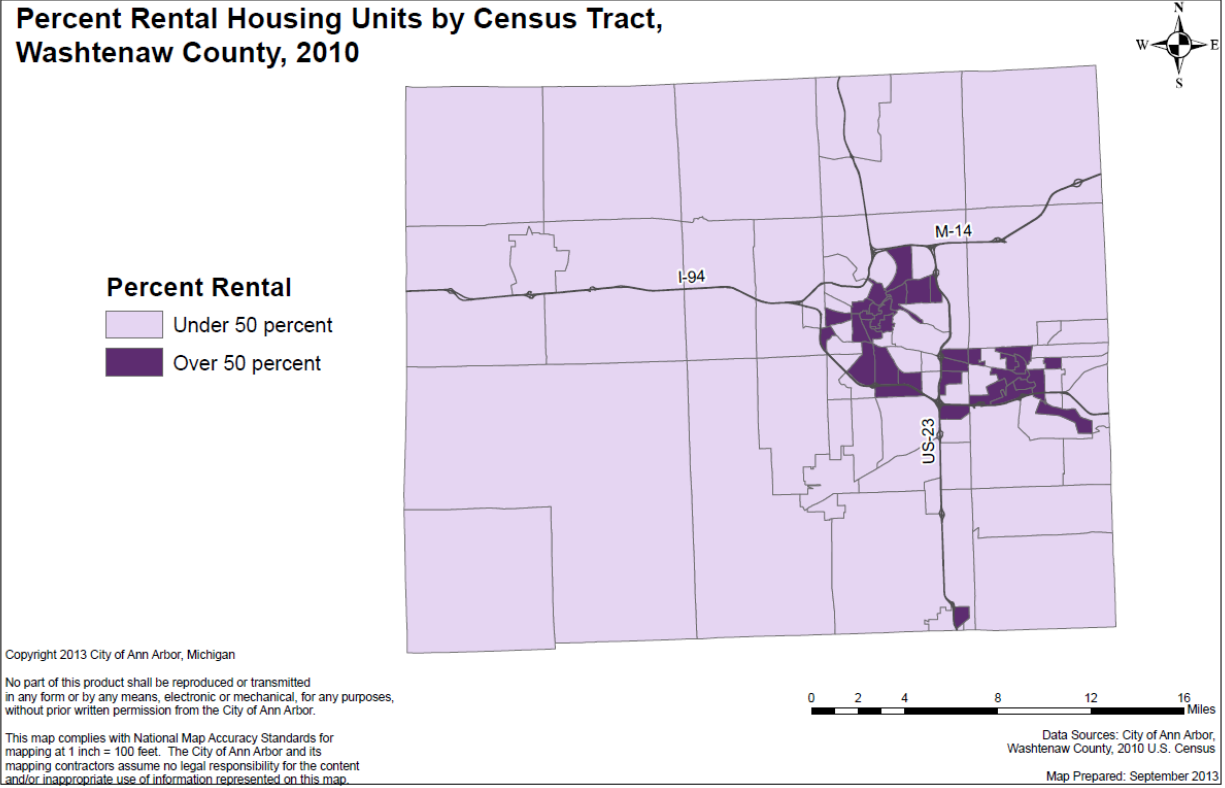
Despite their promise, energy efficiency programs have often stalled due to lack of education and the need for funds to overcome the initial energy efficient implementation costs. In Ann Arbor, this inertia has been particularly acute for rental properties. A twofold challenge, it requires the empowerment and education of renters coupled with landlord engagement to encourage energy efficient improvements.

Support from the Dow Fellows Distinguished Award will enable a successful implementation of both educational and financial efforts to enhance the energy efficiency of Ann Arbor's rental properties. This will not only help establish sustainable program within the town of Ann Arbor, but will positively impacting the town's overall energy footprint. Thank you for your consideration.

## VIII. Appendix

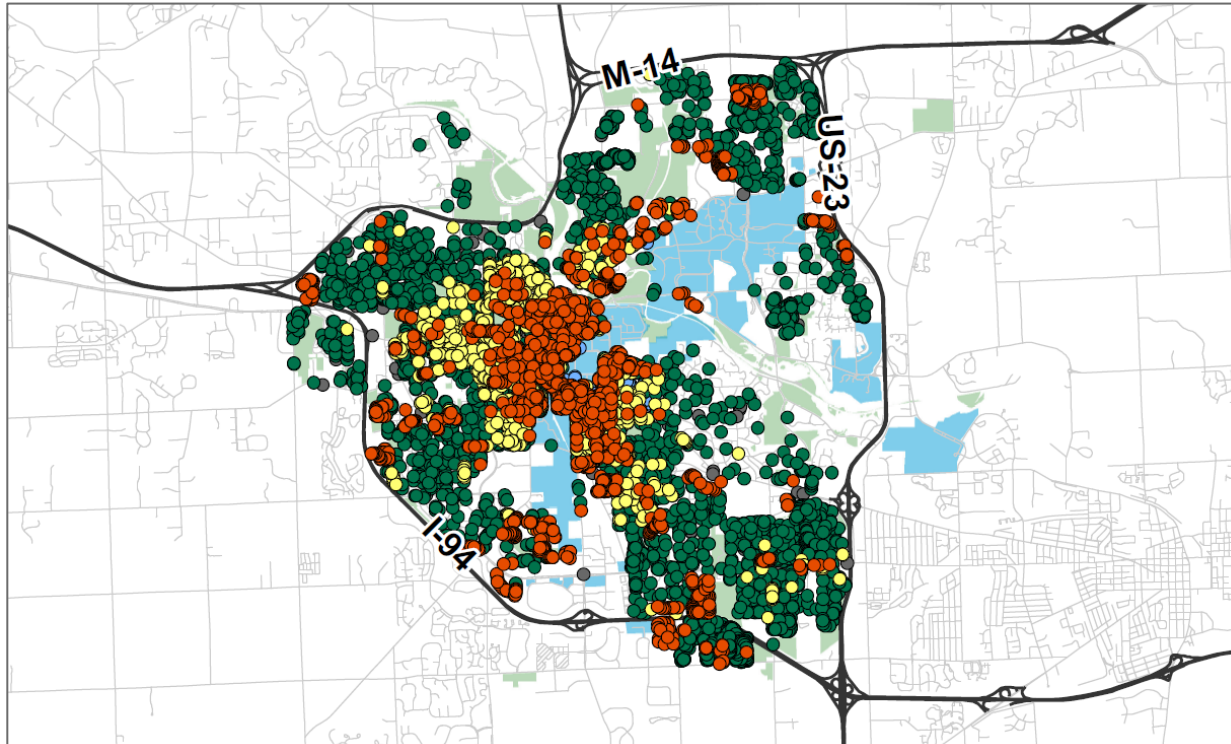
### Attachment A: Percent Rental Housing Units by Census Tract, Washtenaw County, 2010

Source: City of Ann Arbor



## Attachment B: Rental Housing Inspection Permits by Permit Subtype, City of Ann Arbor, 2013

Source: City of Ann Arbor



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### **Biographies of Our Dow Team (All are 2013 Dow Fellows, Resumes to Follow)**

*Cassarah Brown* has a Master of Science in Nuclear Engineering and is pursuing a Master of Public Policy, specializing in science and technology policy.

*Alicia Chin*, LEED AP, is currently pursuing an MBA to better understand how to create change within organizations at the intersection of business and environment.

*Amy Eischen*, P.E., is pursuing an MBA to develop her strategy and finance skills, required for a future career in renewable energy and clean tech.

*Efrie Friedlander*, LEED AP BD+C, is pursuing a Master of Architecture degree with a focus on environmental design and sustainable technologies.

*Emily Taylor* is pursuing a dual MBA/MS Natural Resources and Environment degree through the Erb Institute, focusing on systems thinking and sustainability strategy for businesses.

# Cassarah R. Brown

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## EDUCATION

**University of Michigan**, Ann Arbor, MI

*Master of Public Policy*, Gerald R. Ford School of Public Policy (Expected 05/2014)

- Systematic Thinking On Problems of the Day, Prof Paul Courant. Graduate Student Instructor (Fall 2013)
- Seminar in Science, Technology and Policy, Prof Jim Duderstadt, Graduate Student Instructor (Winter 2013)

*Master of Science*, Department of Nuclear Engineering and Radiological Sciences (04/2012)

Science Technology and Public Policy Certificate, Gerald R. Ford School of Public Policy (Expected 05/2014)

**State University of New York at Geneseo**, Geneseo, NY

*Bachelor of Arts* in Physics & Political Science, Cum Laude, Phi Beta Kappa (05/2010)

## EXPERIENCE

**Center for Local State and Urban Politics (CLOSUP)**, Ann Arbor, MI

Policy Analyst (09/2013-present)

- Lead and coordinate analysis of the shale gas related questions from Great Lakes Basin public opinion survey
- Develop report assessing public opinion regarding shale issues in the Great Lakes Basin region

**Dow Sustainability Fellows Program**, Ann Arbor, MI

Dow Fellow (01/2013-present)

- Interdisciplinary, team project to educate property owners and renters on energy efficiency improvements
- Proposed funding to establishing revolving loan fund to fund energy efficiency upgrades for rental properties

**National Conference of State Legislatures**, Denver, CO

Intern, Energy, Environment, and Transportation Group (05/2013-07/2013)

- Responded to state legislators information requests for a range of energy issues
- Published bipartisan reports assessing state policies on issues including natural gas production taxation, smart grid policy development, energy efficiency financing legislation, and electricity transmission policy

**University of Michigan, College of Nuclear and Radiological Engineering**, Ann Arbor, MI

Graduate Student Research Assistant, Radiation Measurement Group (09/2010-12/2012)

- Researched and analyzed results from a CdZnTe detector system to safely find and locate radioactive sources
- Presented work at IEEE 2012 Nuclear Science Symposium

**Lawrence Livermore National Lab**, Livermore, CA

Summer Intern, HEDP Program (05/2009-08/2009); National Ignition Facility (NIF) (05/2010-08/2010)

- Gained extensive knowledge about the goals and challenges of fusion research for energy production
- Calculated neutron yield from activated indium foils to predict yields at the NIF for fusion energy research
- Analyzed neutron time of flight diagnostics and neutron imaging detector simulations

**SUNY Geneseo, Department of Physics and Astronomy**, Geneseo, NY

Undergraduate Research Assistant, (01/2010-05/2010, 01/2007-05/2009)

- Presented work at 49<sup>th</sup> and 50<sup>th</sup> APS Meeting of Plasma Physics

## SELECTED COURSEWORK AND EXTRACURRICULARS

**Institute of Nuclear Materials Management**, President (03/2012-present), Vice President (09/2012-03/2012),

**Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century**, Brookhaven National Lab (06/2012)

**Nuclear Material Safeguards Nondestructive Assay Techniques**, Oak Ridge National Lab (11/2012)

## SKILLS

*Professional*: Comparative Analysis, Data Analysis, Nuclear Nonproliferation & Security Policy, Energy Policy (e.g. nuclear, shale gas, energy efficiency), French (basic)

*Technical*: Advanced Excel, Matlab, Visual C++, LaTeX, Radiation Detection Systems

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<b>EDUCATION</b>	<b>UNIVERSITY OF MICHIGAN</b> <b>Stephen M. Ross School of Business</b> Master of Business Administration, May 2014 <ul style="list-style-type: none"><li>• Emphases in Corporate Sustainability Strategy and Operations Management</li><li>• Awarded: Dow Sustainability Fellowship</li><li>• Elected: Director of Fund Development, Social Venture Fund; Sustainability Chair</li><li>• Selected: VP of Careers, Ross Net Impact; Ross Student Ambassador</li><li>• Member of Kraft Foods Group supply chain metrics student project consulting team</li><li>• Active member of Michigan Business Women and Retail &amp; Luxury Goods Club</li></ul>	<b>Ann Arbor, MI</b>
	<b>GEORGETOWN UNIVERSITY</b> Bachelor of Arts in Government with minor in Environmental Studies, May 2008 <ul style="list-style-type: none"><li>• Graduated Magna Cum Laude, 3.71/4.00</li><li>• Selected: NJ State Chair, Georgetown Admissions Ambassador Program; Editor, GU Journal of the Environment</li></ul>	<b>Washington, DC</b>
<b>EXPERIENCE</b>	<b>H&amp;M</b> <b>Energy Smart Supply Chain Intern</b> <ul style="list-style-type: none"><li>• Led cross-functional effort, collaborating with sustainability and regional production teams, to evaluate supplier energy efficiency pilot program</li><li>• Analyzed energy data and efficiency activities of 170+ suppliers to assess pilot program results and quality of metrics</li><li>• Developed next phase recommendations for engaging suppliers on energy to ensure effective management, stronger engagement, global alignment, and impactful KPIs</li></ul>	<b>Stockholm, Sweden</b>
<b>Summer 2013</b>	<b>ANN INC.</b> <b>CSR Researcher</b> <ul style="list-style-type: none"><li>• Presented overview of hazardous chemical landscape in the apparel supply chain to VP of CSR, resulting in executive buy-in for new chemical supply chain strategy</li></ul>	<b>New York, NY</b>
<b>2009-2012</b>	<b>PRICEWATERHOUSECOOPERS, LLP (FORMERLY VIRIDIS STRATEGY GROUP)</b> <b>Senior Research Associate, 2012</b> <ul style="list-style-type: none"><li>• Managed Viridis Strategy Group marketing program by creating marketing strategy, promoting social media presence, and coordinating 10-person team to develop collateral and execute multi-channel plan</li><li>• Initiated and managed \$25,000 comprehensive sustainability strategy project for FT500 pharmaceutical company, leading to client presenting recommendations to CEO</li><li>• Advanced sustainability thought leadership by leading research and white paper development on employee engagement strategy and goal setting best practices</li><li>• On-boarded and mentored five new hires, enabling efficient integration into company</li></ul> <b>Research Associate, 2009-2011</b> <ul style="list-style-type: none"><li>• Produced sustainability action plans and provided implementation support for clients to strengthen corporate-wide sustainability programs, resulting in client promotions, increase in program budget, and national recognition</li><li>• Conducted market research and competitor analysis on sustainability products for global mining company, informing go-to-market strategies for all business units</li><li>• Designed global sustainable paper supply chain management system implemented by FT500 personal care products company to track progress against goal of sourcing 100% of paper from sustainable sources</li><li>• Recognized as internal subject matter expert for greenhouse gas reporting and Leadership in Energy and Environmental Design (LEED) certification, essential to projects bringing in \$270,000+ in revenue</li></ul>	<b>Washington, DC</b>
<b>2008-2009</b>	<b>FIRST ENVIRONMENT</b> <b>Environmental Specialist</b> <ul style="list-style-type: none"><li>• Led and managed greenhouse gas consulting and verification projects, contributing to 20% of revenue</li></ul>	<b>Boonton, NJ</b>



**AMY EISCHEN, P.E.**  
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<b>EDUCATION</b>	<b>UNIVERSITY OF MICHIGAN</b> <b>Stephen M. Ross School of Business</b> Master of Business Administration, 2014 <ul style="list-style-type: none"><li>• Awarded 2013 Dow Fellowship by Graham Environmental Sustainability Institute; worked with interdisciplinary team to enable energy efficiency in rental properties</li><li>• Member of VMware student consulting MAP team; made the business case for corporate sustainability</li><li>• Selected Finance VP for Net Impact Chapter and Marketing VP for Energy Club</li><li>• Elected Treasurer of MBA Class Section</li></ul>	<b>Ann Arbor, MI</b>
	<b>UNIVERSITY OF NOTRE DAME</b> <b>School of Engineering</b> Bachelor of Science, Civil Engineering, May 2004 <ul style="list-style-type: none"><li>• Dean's Academic Honors List</li><li>• Performed research project to reduce water usage at local zoo by \$150,000 annually</li><li>• Elected President of Residence Hall &amp; Executive Cabinet Member</li></ul>	<b>South Bend, IN</b>
<b>EXPERIENCE</b> Summer 2013	<b>GENERAL ELECTRIC CO. POWER &amp; WATER</b> <b>Renewable Energy Leadership Program Intern</b> <ul style="list-style-type: none"><li>• Identified ways to improve quality in increasingly rapid new product introduction (NPI) process for wind turbines</li><li>• Conducted 40+ interviews and case study analyses of recent GE wind product releases to gain understanding of NPI process and weaknesses</li></ul>	<b>Schenectady, NY</b>
2006-2012	<b>GZA GEOENVIRONMENTAL, INC.</b> <b>Assistant Project Manager (2011-2012), Engineer (2006-2011)</b> <ul style="list-style-type: none"><li>• Supervised exploratory drilling and excavation projects to assess soil and groundwater conditions and prepared geotechnical reports with subsurface design and construction recommendations for infrastructure development, including wind turbines</li><li>• Prepared site-specific geothermal feasibility reports to educate clients and promote geothermal systems as a financially viable alternative for energy efficiency; oversaw successful installation of over fifty 500-foot-deep geothermal wells for heating and cooling system at Massachusetts' first state-owned zero net energy LEED building</li><li>• Facilitated discussion among stakeholders for timely resolution of issues on large construction projects; notable projects included 26-story W Hotel in downtown Boston and foundation rehabilitation of historic Boston buildings</li><li>• Developed bid specifications for private developers, architects, and state entities that detailed materials and processes related to subsurface work for accurate budget estimation and successful project execution</li><li>• Managed budget, staff, and client communication for foundation underpinning projects to complete tasks on schedule within budget; mentored junior field staff</li></ul>	<b>Boston, MA</b>
2004-2006	<b>APEX COMPANIES, LLC</b> <b>Environmental Engineer</b> <ul style="list-style-type: none"><li>• Oversaw monthly maintenance of stormwater systems at 80 Wal-Mart stores in New England to ensure compliance with state and federal regulations pursuant to \$1,500,000 annual contract; managed facility repair projects with budgets up to \$30,000 for deficient elements of systems</li><li>• Performed bathymetric surveys and water quality monitoring during harbor dredge projects to assess environmental impact and adjust construction procedures accordingly</li><li>• Prepared design and construction cost estimates for marina development projects to provide clients with economic assessment of alternatives</li></ul>	<b>Boston, MA</b>
<b>ADDITIONAL</b>	<ul style="list-style-type: none"><li>• Licensed Professional Engineer since 2010 (Massachusetts Registration No. 48786)</li><li>• OSHA HAZWOPER 40-Hour Certification</li><li>• Planned largest annual networking fundraisers as Treasurer of Boston Society of Civil Engineers (2007-2012)</li><li>• Completed a Half Ironman Triathlon and six marathons since 2009</li></ul>	

**Elizabeth "Efrie" Friedlander**

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**SKILLS**

**Computer Skills**

- GIS, SimaPro, R, Python, AutoCAD, Revit, Rhino, Grasshopper, RhinoScript, Ecotect, DesignBuilder, MasterCAM, Adobe Creative Suite.

**Language Skills**

- Proficiency in French and Spanish, basic Italian, basic Mandarin.

**Accreditation**

- LEED AP for New Construction, Certified February 2010. Updated to LEED BD+C in 2011.
- NCARB IDP requirements completed as of July 2013.

**EDUCATION**

**University of Michigan Taubman College of Architecture and Urban Planning, Class of 2014.**

- Master of Architecture. AIA member, TCAUP Campus Board Representative.

**Yale School of Forestry and Environmental Studies, Class of 2011**

- Master of Environmental Management in Urban Ecology, with honors. Class Secretary.

**Yale University, Class of 2007**

- B.A. in Architecture, concentration in Physics.

**EXPERIENCE**

**University of Michigan, Head Graduate Student Instructor and Guest Lecturer, 2012-2014.**

- Lead discussion sections, lectured, amended the syllabus, and graded for ARCH/UP 357: *Architecture, Sustainability, and the City* and ARCH 506, the graduate level equivalent.
- Lead discussion section and graded for ARCH 589: *Site Planning*.

**Kieran Timberlake Research Group, Intern, Summer 2013.**

- Conducted environmental research with specific applications to architecture for the topics of life cycle assessment, post-occupancy evaluation, and ecosystem impact. Coordinated database development for the RTEI/Avie tool for Revit.

**University of Michigan, Professor Douglas Kelbaugh, Research Assistant, 2011-2014.**

- Researcher and editor in graphics preparation and publication preparation.

**Ximan Climat Color, Beijing, China, Intern, Summer 2012.**

- Authored a project documenting color and material use in Beijing for the urban color planning firm.

**University of Michigan, Spatial and Numeric Data Lab- Consultant, 2011-2012**

- GIS and statistics consultant. Mapping consultant and infographic specialist.

**Yale University, Professor Thomas Graedel, Research Assistant, 2009-2011.**

- Criticality Group Research Team coordinator. Research and coordination assistant for United Nations Environment Programme work.

**The Energy and Resources Institute, New Delhi, India, Intern, Summer 2010**

- Team leader of GRIHA for Large Developments, an eco-assessment system for developments in India with a population greater than 5,000; comparable to LEED Neighborhood Development.

**Horowitz Architects-New York, NY, Junior Architect, 2007-2009**

- Primary designer and project manager on several projects, with a focus on specialized health care facilities. Secondary designer for residential, corporate, and scholastic projects.

**SIGNIFICANT PAPERS, PUBLICATIONS, PRESENTATIONS, AND EXHIBITIONS**

**On Topics of Urban Ecology and the Environment:**

- "Laboratory Design Implications of Manufactured Nanoparticles: Applying the precautionary principle to cutting-edge scientific research." March 2010. White paper utilized by Perkins+Will Architects.
- "Productive Urban Landscapes." Presented as a part of the Yale Sustainable Food Symposium, in partnership with NYRP and AECOM New York. May 12, 2010.
- "The Methodology of Metal Criticality Determination," authored by the Criticality Group at Yale. Published in *Environmental Science & Technology* vol. 46, January 2012.
- "Criticality of the Geological Copper Family." authored by the Criticality Group at Yale. Published in *Environmental Science & Technology* vol. 46, January 2012.
- "Industrial Ecology and Material Flow Analysis for Hawaii Island: 1850-1950." A part of the NSF Urban Long-Term Research Area Exploratory Annual Report under supervision of Marian Chertow.

**On Topics of Architecture and Making:**

- *Morphaux...recovering plaster as architectural substrate*. Plaster research shown as part of the Research Through Making Exhibition at the University of Michigan. Work completed with Steven Mankouche, Joshua Bard, and Matthew Schulte. Exhibition opened in Ann Arbor January 21, 2012. Awarded 2013 R+D First Award Winner by ARCHITECT Magazine.
- *ThermalNews*. Biodegradable insulation made from 92% locally-sourced recycled content for \$0.40/SF for application in rural China. Included in B.A.S.E. WRAP Exhibition; published in *Rurolipolitan Artifacts* by B.A.S.E. in Beijing, China. Work completed under supervision of Mary Ann Ray and Robert Mangurian of StudioWorks. Exhibition opened in Beijing June 30, 2012.

**SCHOLARSHIPS  
AND AWARDS**

- Dow Sustainability Fellow at the University of Michigan, 2013-2014
- Taubman College, Clarence L. and Ruth M. Roy Scholar 2012-2013
- Taubman College, Architecture Alumni Scholar 2011-2013
- Michigan Architectural Foundation, Kenneth Neumann Scholar 2012
- American Council for an Energy Efficient Economy, Linda Latham Scholar 2012
- Taubman College, James A. van Sweden Scholar 2011-2012
- Yale School of Forestry and Environmental Studies, Merit Scholar 2009-2011
- Academic All-American (Yale Field Hockey) 2004-2007

# EMILY S. L. TAYLOR

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<b>EDUCATION</b>	<b>UNIVERSITY OF MICHIGAN</b> <b>Ross School of Business / School of Natural Resources</b> MBA/MS, Erb Institute for Global Sustainable Enterprise, April 2014 <ul style="list-style-type: none"><li>• President, Erb Institute Student Advisory Board, January 2013 - present</li><li>• President, School of Natural Resources and Environment Student Government, April 2012 - March 2013</li><li>• Awarded Dow Sustainability Fellowship, which supports interdisciplinary, team-based sustainability problem solving (\$20,000)</li><li>• Member of ITC Limited - ITLD Division student consulting MAP team in Guntur, India, March-May 2013</li></ul>	<b>Ann Arbor, MI</b>
	<b>SMITH COLLEGE</b> Bachelor of Arts, May 2008 <ul style="list-style-type: none"><li>• President, Student Government Association</li><li>• National Scholar Athlete, Women's Varsity Rowing 2007 – 2008</li></ul>	<b>Northampton, MA</b>
<b>EXPERIENCE</b>	<b>MCKINSEY &amp; COMPANY</b> <b>Summer Associate</b> <ul style="list-style-type: none"><li>• Developed industry-changing strategy to position agriculture client at forefront of technology development through advanced analytics and big data</li></ul>	<b>Detroit, MI</b>
<b>2013-Present</b> <b>Summer</b>		
<b>2011-Present</b>	<b>WORLD'S WINDOW, INC.</b> <b>Vice President, Board of Directors</b> <ul style="list-style-type: none"><li>• Initiated and oversee scholarship program reassessment process and expansion for non-profit funding high school education for rural students in Belize.</li><li>• Launched student mentorship program to mitigate student under-performance, resulting in increased student engagement and performance.</li></ul>	<b>Albany, NY</b>
<b>2012</b>	<b>WORLD RESOURCES INSTITUTE</b> <b>Climate Finance Intern</b> <ul style="list-style-type: none"><li>• Developed communication strategy, including audience segmentation and targeted messaging to 2,000 contacts; presented to director for implementation approval.</li><li>• Co-authored paper on World Bank Group's financing of low-carbon development projects, analyzing 2005 data to identify preliminary best practices to influence future development bank project financing; presented at UN Conference in Qatar.</li></ul>	<b>Washington, DC</b>
<b>2010-2011</b>	<b>SKIDMORE COLLEGE</b> <b>Annual Fund Gift Officer</b> <ul style="list-style-type: none"><li>• Directed 24 student callers to solicit alumni gifts, resulting in over \$240,000 raised through calling program, 35% increase from the previous year.</li><li>• Managed portfolio of 55 individual prospects and 12 alumni classes, developing strategy and leading communication, cultivation, and gift solicitation efforts.</li></ul>	<b>Saratoga Springs, NY</b>
<b>2008-2010</b>	<b>SMITH COLLEGE</b> <b>Board of Trustees Member &amp; International Advancement Officer</b> <ul style="list-style-type: none"><li>• Served on Board of Trustees' External and Student Affairs, Technology, and Investor Responsibility committees, maintaining fiduciary responsibility of \$1.5 billion endowment.</li><li>• Launched new program, including overseeing annual budget of \$200,000, visiting Europe and Asia to meet with alumnae and parents; efforts resulted in gifts totaling over \$700,000 in program's first year.</li></ul>	<b>Northampton, MA</b>
<b>2012-Present</b>	<b>THE DOW CHEMICAL COMPANY</b> <b>Student Consultant</b> <ul style="list-style-type: none"><li>• Evaluating corporate water risk mitigation strategies as part of team master's thesis; presented preliminary findings at national ecosystem services conference.</li></ul>	<b>Ann Arbor, MI</b>
<b>ADDITIONAL</b>	<ul style="list-style-type: none"><li>• National Ski Patroller, New York State Certified Whitewater Rafting Guide</li></ul>	