

GOAL: design

types of waste



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# ESW

## Annual Report

### 2015-2016



## A MESSAGE FROM THE

## Acting Executive Director

**ESW is an organization with a mission to build a better world. We're making progress.**

As we strive to inspire and educate the next generation of engineers, ESW has continuously grown throughout the past 12 years. This year was no different. We have celebrated a number of milestones in the past year, and I invite you to celebrate with us as you read this Annual Report.

From solar chargers to rain gardens and beyond, ESW members have been making a sustainable impact in their communities. Chapters at schools like the University of Texas, Austin and Illinois Institute of Technology are building aqua- and hydroponics systems to produce local food for their campuses. The University of Kentucky, Paducah chapter has been hard at work running and testing a biodiesel system they built from scratch to power city buses. Our members are working hard to build a more sustainable world, and they're using the skills they honed in their student chapter after they graduate.

ESW cares about linking students with partners in their community, so we launched the Resilient Communities Design Challenge. It encouraged students to take time to think about community stakeholders before diving into a project, and 3 teams did just that. Finalists from California State University, Long Beach, University of California, San Diego, and Georgia Institute of Technology shared their months of work with the ESW community at our Annual Conference, and Georgia Tech won a \$3,000 grant to implement their tested organic weed killer in local community gardens.

In April we had our largest Annual Conference to date. More than 250 people joined us in Berkeley, California to learn about entrepreneurship and public policy (and how engineers fit into those topics). This conference is the biggest opportunity for members to show off their projects and meet people from around the country while learning more about sustainability topics they care about. We're extremely thankful for all the work the student team at Berkeley put in to make this conference a success, and we're looking forward to next year's conference already.

We have always put ESW projects first, which is why we established key partnerships that allow ESW to encourage and support the brilliant design ideas from our chapters. We are thankful for IBM's continued support for ESW and our student projects.

Thank you for being a supporter of ESW. We welcome your thoughts and comments as we continue to grow and work towards our goals.

Sustainably yours,

Brittany Bennett

## VISION

**A world of environmental, social, and economic prosperity created and sustained by local and global collective action.**

## MISSION

**To forge innovative, lasting solutions to local and global sustainability challenges. We:**

- **Design** and implement sustainable projects through our student and professional chapters.
- **Educate** and train individuals and organizations on sustainable policies and practices.
- **Build** a global network of communities with a shared culture of sustainability.



# by the numbers

## 8 NEW CHAPTERS

ESW grew to 56 chapters

## LARGEST ANNUAL CONFERENCE

267 attendees

204 students members

63 professional members

## 1,500 ACTIVE MEMBERS

WORKING ON 20 PROJECTS

5 small project grants

\$8,200 AWARDED

## 4 SHORT COURSES OFFERED

228 STUDENT-HOURS



## MEET A CHAPTER LEADER

Josh Spaulding



Joshua is the current president of the ESW chapter of Rose-Hulman Institute of Technology in Terre Haute, IN. He became interested in campus sustainability in his freshman design class, where he worked on a lighting efficiency project, and he soon joined forces with an existing sustainability club to create Rose Hulman's ESW chapter in 2013. He put his lighting efficiency knowledge to good use and partnered with the facilities department to replace old metal halide lighting with LEDs, which resulted in an 88% decrease in energy consumption.

Throughout his three years at ESW, Joshua is proud of the work he and the other members of his chapter have done to promote sustainability on campus, and he's excited to use the leadership skills he's developed as president to work in engineering management after he graduates.

# MEET A RECENT GRAD

## Jimmy Luong

Jimmy recently graduated from the University of California, San Diego, and his experience leading the ESW chapter there has prepared him for his life after college. He started with ESW his freshman year - he was looking for a club to join, and after his family's farm got hit hard by the drought in Los Angeles, he was looking for a way to address sustainability problems.

During his first ESW meeting, he joined a team working to design and build a solar cooker. Soon after, he got involved with leading the chapter. Jimmy loved supporting his friends' projects and helping them get from a sketch on a whiteboard to a fully-fledged product, and he says loved the culture of his chapter: "We operate differently from other engineering organizations I've seen - we're a little more open, a little more goofy, and we're proud of it!"

Now that he's graduated, Jimmy's bringing the teamwork and leadership skills he developed at ESW to his career - he's even thinking about the possibilities of an eco-startup.



# BIODIESEL REACTOR

The University of Kentucky, Paducah's biodiesel reactor is a great example of what's possible when a chapter pulls together resources and knowledge from their members, campus, community, and beyond. Over five years ago, a faculty member conducting research in alternative fuels connected with their ESW chapter to help them create a small-scale plant for converting waste fuel into biodiesel. With funding secured through the school, grants, and a business in the community, the chapter members were able to get the plant up and running and started optimizing production to improve the yield of usable biodiesel. They've encountered challenges along the way, especially with figuring out how to incorporate dry washing the fuel into the process, but they're hoping to start testing the fuel on a diesel engine in the next year. Long term plans include partnering with the city of Paducah to run city busses with a 2-10% biodiesel blend. It's been a long process, but the entire chapter has been able to contribute to the project, and they're excited to be working on a project that will make their community more sustainable in the future.





# EDUCATE

## WPSI

In 2015-2016 we continued to offer Wicked Problems in Sustainability Initiative (WPSI) courses. Students from multiple disciplines looked to develop solutions to *food waste across the supply chain* at universities across our network including: Rochester Institute of Technology, University of Pittsburgh, Rensselaer Polytechnic Institute, Rose-Hulman Institute of Technology, and University of South Florida.

## SHORT COURSES OFFERED

**Lifecycle Assessment** - LCA is a critical tool for better product and process design. We focus on setting up LCA questions and interpreting results rather than using software, aiming to help students and professionals become 'LCA literate' and comfortable with a new way of thinking.

**Ecological Economics** - In contrast to traditional economics, ecological economics considers ecosystem services, measuring development without GDP, and new economic ideas at all levels. Both an overview of theory and case studies for change, this course provides a different way to think about the modern economy.

**Industrial Decarbonization** - Industrial activities (manufacturing, chemicals, etc.) comprise more than 21% of global GHG emissions. This course – drawing on the work of the Deep Decarbonization Pathways Project (DDPP) – dives into our current options for addressing this slice of the carbon pie, including the underutilized design principles of Industrial Symbiosis.

**Energy Efficient Building [Re]Design** - We all spend lots of time in buildings, and they consume 40% of our energy. Looking at both new and existing buildings, high-tech and low-tech approaches, this course covers the basics of energy use, how we assess and model usage, and a variety of ways to improve designs and retrofit structures to improve efficiency.



# CommUnity

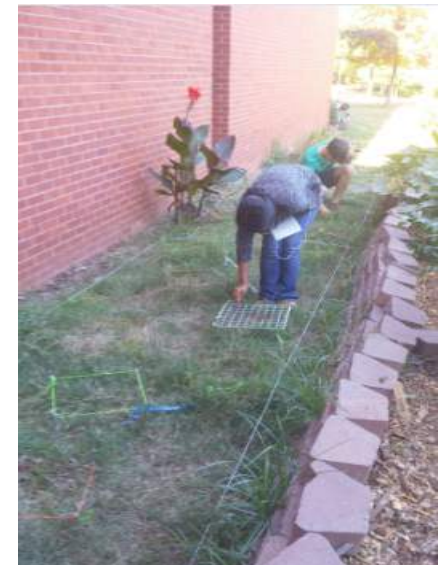
At our conference this year, we showcased three finalists of our first Resilient Community Design Challenge (CommUnity for short). It took us time to get here – the ESW Leadership Team and Board of Directors have been discussing this initiative in one form or another since 2013 – and we are proud of the work that our student chapters have done in their communities as a result of this program.

In September 2015, ESW invited teams to join CommUnity, challenging students around North America to work with local community organizations and individuals to assess the resilience – both physical and socioeconomic – of local infrastructure and jointly propose improvements in one area. The challenge was designed to help participants build long-term relationships between their chapter and their community, allowing the students to learn from the community's rich history before applying their technical skills to solve sustainability problems. Nineteen chapters responded, and the challenge officially took off.

During the challenge, ESW supported the teams through live online sessions with professionals. One session featuring Aaron Lande from StarCommunities focused on socioeconomic design considerations. The second, tackled working with stakeholders and managing risk with ESW Advisory Board

members Devon Hartman from CHERP and Kristin Kielich from the University of California, San Diego. Judges from ESW's professional network chose three finalists to present their projects at our 2016 conference: California State University, Long Beach (CSULB), Georgia Institute of Technology, and University of California, San Diego (UCSD).

Congratulations to Georgia Tech the winners of the first Resilient CommUnity Design Challenge! A huge thank you to IBM, the judges, members of the Big Idea Committee, and to the ESW Board of Directors and Advisory Board for making this first year a success. We look forward to seeing how participating teams continue to work within their community to implement sustainable and resilient solutions!





The winning CommUnity team, Georgia Tech, partnered with the Atlanta Community Food Bank and looked how the lack of access to clean water and fresh food affected low-income communities in Atlanta. The team then used their previous research into optimizing natural herbicide solutions to educate community gardeners on organic weed control. The natural herbicide, a mixture of acetic acid and d-limonene, replaces products like Roundup and can be made with readily available ingredients. The Georgia Tech team attended Atlanta Community Food Bank's Garden Leadership Program meetings to teach local growers how to make and use the herbicide themselves. In the future, the team plans to continue this outreach, expand their training sessions to schools throughout Atlanta, and work directly in a community garden to continue to optimize the herbicide.



# ANNUAL CONFERENCE @BERKELEY



Over 250 students and professionals joined us in Berkeley to explore how entrepreneurship and policy and engineering go hand in hand. Attendees engaged in two full days of panels, technical talks, and interactive workshops around topics such as Human Centered Design, Climate Change Mitigation and Localized Air Pollution, and How to be Agents of Change. Students had a chance to test their design skills in ESW's Inter Chapter Challenge, where teams prototyped ways to transport a week's worth of waste. The conference also marked the summit of ESW's nation wide design challenge, CommUnity. Teams presented their work with local community partners, and ESW awarded the grand winner with a grant to seed their project.



# AQUA-HYDRO-PROJECTS



Food access is a major topic for our chapters in urban areas - it can be difficult to find fresh produce near campus, and nearby neighborhoods are often classified as food deserts. Two chapters, Illinois Institute of Technology (ESW-IIT) and University of Texas at Austin (ESW-UT), have come up with different ways to increase food production on campus.

ESW-IIT built a hydroponics system for comparison to regular urban farming techniques (top photo). Their apparatus is built at a 45 degree angle vertically, allowing for more direct sunlight and the use of taller and larger plants. They were able to get the materials paid for through a number of small grants from IIT, ESW-HQ's small project grants, and a local machine shop. While they had to do some experimentation to make sure the PVC pipe was cut correctly and the pump provided the right flow of water through the system, it's now up and running! ESW-IIT donates all of their produce to a local food pantry, and they're hard at work to develop new parts of the system, including a sand filter, sourcing soil from their composting system, and powering the pumps using solar panels.

ESW-UT started producing produce with an aquaponic system that combines hydroponics with aquaculture, or the

raising of fish in tanks, in a closed loop cycle (bottom photo). Water runs through fish tanks to the grow beds, fish waste is used for plant fertilizer, and the plants clean the water that is returned to the fish. They encountered some problems with maintaining water quality and pH, especially with Austin's basic tap water, and discovered that the hot temperatures over the summer led to evaporation from the system. While they are currently using filters to address these issues, they hope to install a solar purifier soon. ESW-UT has partnered with the UT Farm Stand to sell their produce on campus, increasing awareness of the project and funding future improvements to the system such as adding solar power and replacing their goldfish with more durable tilapia.

Both ESW-IIT's hydroponics system and ESW-UT's aquaponics system have increased visibility of sustainability on campus and have successfully produced local food for the community. They've both tackled urban agriculture in innovative ways, and they're both planning to create self-sustaining, closed-loop food systems in the future. It's exciting to see these two projects evolve, and we hope other chapters are inspired to solve food issues surrounding their campuses and communities!



## revenue

	FY15	FY16
<b>Dues</b>	\$13,300	\$18,350
<b>Registration</b>	\$16,098	\$18,905
<b>Sponsorships</b>	\$12,000	\$9,145
<b>Donations</b>	\$11,535	\$11,532
<b>Merchandise</b>	\$694	\$1,002
<b>TOTAL</b>	<b>\$53,627</b>	<b>\$58,934</b>

## expenses

	FY15	FY16
<b>Travel</b>	\$10,875	\$24,383
<b>Event Costs</b>	\$15,116	\$18,169
<b>Grants</b>	\$2,970	\$11,465
<b>Payroll</b>	\$18,336	\$11,631
<b>Insurance</b>	\$1,944	\$2,559
<b>Office Expenses</b>	\$1,605	\$1,470
<b>Technology</b>	\$3,076	\$1,017
<b>Other</b>	\$5,739	\$7,155
<b>TOTAL</b>	<b>\$59,661</b>	<b>\$77,849</b>

# OUR FINANCES

While we experienced a lot of growth, our revenue model wasn't growing along with us. Securing our financial stability is our top priority moving into the 2016-2017 year. We are committed to building upon our success in the past to engage in more partnerships, expand our professional networks, and win key grants. Detailed finances are available via our 990: <http://bit.ly/ESWLegalDocs>



# board members

Kyle Gracey, Board Chair, Project Architect, PreScouter  
Alexander Dale, PhD, AAAS Science & Technology Policy Fellow, US EPA  
Brian Lange, Data Scientist, Datascope Analytics  
Maple Zhang, Senior Strategic Planning Analyst, Walt Disney Studios  
Marilyn Waite, Green Economy Leader, PWN Global  
Paulo Lopes, Environmental Attorney  
Rena Chen, HR Director, Eucatrium Ventures

# advisory board

Devon Hartman, Executive Director, CHERP  
Ilana Aldor, Research Scientist, Bridgestone  
Karen Paczkowski, AAAS/GSA/USGS Congressional Science & Technology Fellow  
Karin Dykeman, Technology Education Teacher, Liverpool, NY  
Kristin Kielich, Operational Strategic Initiatives Senior Business Analyst, UC San Diego  
Mark Silberg, Executive Director, Spark Clean Energy  
Melissa O'Mara, Found & Chief Catalyst, i3Activate  
Michael Frey, Development Officer, Association for Energy Affordability



# 2015-2016 leadership team

**EXECUTIVE DIRECTOR:** Nichole Goldsmith  
**DEPUTY DIRECTOR:** Brittany Bennett

## CHAPTER RELATIONS

Chris Thai, Chapter Relations Director  
Nichole Heil, Chapter Relations Coordinator  
Yamit Lavi, Chapter Relations Coordinator  
Nicholas Daniel Phillips, Chapter Relations Coordinator  
Jessica Damicis, Chapter Relations Coordinator  
Moosa Zaidi, Chapter Relations Coordinator  
Rebecca Quinte, Chapter Relations Coordinator  
Candace Grogg, Chapter Relations Coordinator

## PROJECTS AND EDUCATION

Rob Best, Projects and Education Director  
Erin Lennox, Projects Director  
Andrew Beck, Education Coordinator  
Brittany Bennett, K-12 Coordinator  
Sarah Seraj, WPSI Coordinator  
Tim Hoang, Project Coordinator

## DEVELOPMENT

Jordan Croll, Development Director  
Shira Zingman-Daniels, Development Coordinator  
Johnny Sompholphardy, Development Coordinator  
Mike Alcazaren, Development Coordinator

## COMMUNICATIONS AND TECHNOLOGY

Karen Kaminsky, Communications and Technology Director  
Alexandria Julius, Technology Coordinator  
Berlyn Hubler, Branding Coordinator  
Alyssa Recinella, Events Coordinator  
Matt Kozuch, Events Coordinator  
Tricia Hogan, Social Media Coordinator

## NETWORKS

Erin Rose Briggs, Networks Director  
Christopher Vega, Outreach Director  
Alyssa Hubert, Chapter Development Coordinator  
Derek Chung, New Chapter Development Coordinator  
Patrick Eells, Professional Relations Coordinator

# SPONSORS



# INDIVIDUAL DONORS

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# **Engineers for a Sustainable World**

DESIGN • EDUCATE • BUILD