

SUSTAINABILITY INSTITUTE AT OHIO STATE

2022 Annual Report



Faculty Director: **Elena Irwin**
Executive Director: **Kate Bartter**



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Message from the Directors



Kate Bartter
Executive Director



Elena Irwin (CFAES)
Faculty Director
Distinguished Professor of Food, Agricultural, and Environmental
Sciences in Economics & Sustainability

Sustainability is the definitive long-game.

Our collective goal is to improve human social well-being while ensuring the planetary life support systems we all depend upon are protected.

This is not a collection of tasks that will be accomplished in an academic semester. Or year. Or decade.

Innovating and implementing the solutions necessary to balance human and natural resource system needs has been, and will continue to be, the life's work of thousands of individuals across the globe.

We are fortunate to be surrounded by many of those individuals here at Ohio State. Just within 2022, our Sustainability Institute team enthusiastically supported faculty and researchers developing innovations across a broad array of human-focused sustainability challenges ranging from electrifying school bus fleets to improve air quality for young students, to developing new agroforestry techniques in areas already experiencing poverty as rapid climate change further threatens centuries-old ways of life, to assessing the impact of building design and management upon indoor air quality (where humans spend the majority of their time) and related energy use.

These efforts, and many others that launched or progressed throughout the past year will serve as the building blocks for larger solutions in the years to come. What may be the most exciting aspect of the university's mission, is knowing that many of those future solutions will be developed by Ohio State's current students.

With some mature academic and co-curricular student sustainability programs in place, we are already witnessing Ohio State alumni begin to build

their careers in this burgeoning field across the public, private, and non-profit sectors.

This is a dynamic time for the still-relatively young sustainability career field, as employers are increasingly seeking candidates with more professional credentials. To remain competitive and best position our students for success beyond their Ohio State experience, we cannot rest with our existing academic offerings.

Through the Sustainability Education and Learning Committee (SELC), an assembly of interdisciplinary faculty at Ohio State facilitated by the Sustainability Institute, twenty-six separate proposals for new sustainability program or course curriculum development across 17 academic units and three colleges were funded in 2022. These curriculum proposals will continue to broaden the opportunities our students will have to learn about current sustainability challenges, inspire their new creative solutions, and prepare them to implement those solutions in their next career step.

There is no question that work in the sustainability field can be difficult, but we must take care not to burn ourselves out so that we continue to bring our full selves to this work.

By reflecting on the numerous successes, internal and external partnerships and collaborations, and the gaining enthusiasm in this shared work that we have witnessed over the past year, it is easy to be hopeful about what we can continue to accomplish together.

Our thanks to the Ohio State community for collectively taking on these issues in a serious and passionate manner. This approach will help drive the social changes we need next year, the year after, and over the coming decades. We look forward to serving alongside you for the long-term.

Our Mission

The Sustainability Institute integrates, supports and leads sustainability across the university enterprise in ways that:

Promote sustainability and resilience teaching and learning that are integrated across colleges and inclusive of various disciplines and ideas.

Catalyze interdisciplinary research that drives discovery and innovations in sustainable and resilient systems, technologies, policies and actions.

Engage public and private sector partners in Ohio, the nation and around the world to develop and apply sustainable solutions that improve well-being and equity.

Integrate sustainability scholarship with campus activities, including opportunities for students from diverse backgrounds and disciplines to engage in research and experiential learning using the campus as a living laboratory and test bed.

Provide a competitive advantage in attracting exceptional new talent, students, partnerships and resource investments to the university.

Building a more sustainable and resilient future for all

General Overview

The conclusion of Fiscal Year 2022 (FY 22) marked another successful 12 months of sustainability accomplishments at the Ohio State University. The Sustainability Institute at Ohio State (SI) has collaboratively partnered with organizations within and outside of the campus community to create new learning and research opportunities and help ensure campus is a greener and more environmentally friendly space.

Students represent one of the most central aspects of a university, and with 59 available undergraduate core sustainability programs (including 29 majors, 22 minors, and 8 certificates), Ohio State students have the opportunity to increase their knowledge in everything ranging from agricultural systems management to earth sciences to environmental engineering.

Liang Chen, a Ph.D. Candidate in the City and Regional Planning Section at the Knowlton School, utilized an SI student grant to investigate the relationship between vacant urban land and disorder in neighborhoods, specifically focusing on how they are associated and what urban planners can do to create solutions that benefit the local ecology and society. Through use of the grant funding, his research work is now published in the *Journal of Urban Affairs*.

Audrey Hollerich, an undergraduate in Plant Bioscience, served as the primary student coordinator for the Smith Lab student garden, an offshoot of the larger Ohio State Student Farm based at Waterman Agricultural and Natural Resources Laboratory. Hollerich has worked to ensure the garden, partially funded by the Sustainability Institute, acts as a bridge between main campus and Waterman and provides learning opportunities to visitors about pollinators, edible plants and other urban agriculture topics.

Cade Capper, an undergraduate studying Forestry, Fisheries and Wildlife, has spent his Ohio State career researching monarch butterflies as well as wildlife populations in local rivers. He received two SI student grants and utilized the funding to examine bioretention cells, a specific form of rain gardens that naturally remove pollutants from runoff water. These cells, established by the City of Columbus in area neighborhoods, also function as hatching grounds for monarchs, allowing Capper to focus on both areas of his investigations at once.



The Smith Lab student garden displayed edible plants in an urban setting in 2022.

To continue to meet societal needs and student interest, SI worked with the interdisciplinary Sustainability Education and Learning Committee to support the development of new and expansion of existing academic programs and course offerings. As those programs are approved by the university's Council on Academic Affairs, Ohio State's breadth of academic offerings will continue to expand.

Beyond the classroom, SI has also worked to engage Ohio State's external stakeholder communities, both through new research and operational support collaborations, as well as service on 13 international, national, state and local sustainability organization boards and committees.

Matt Griffin, Sustainability Program Coordinator of Education and Learning for the Sustainability Institute, had the opportunity to serve as one of Ohio State's representatives on the City of Columbus' Green Spot Advisory Board (GSAB). The GSAB is made up of businesses, community groups and other organizations that are working to incorporate sustainability into more central Ohio entities. On the Board, members work to increase Green Spot participation and develop an outreach plan for engaging K-12 and college students with the City's sustainability initiatives. They have also created videos that teach people how to live sustainably and developed a strategy for increasing the number of sustainability jobs in Central Ohio.

- 59 undergraduate core sustainability programs
- 11 sustainability projects implemented by student organizations, Learning Communities, and Scholars programs with SI involvement
- 13 international, national, state and local sustainability organizations with SI representation

SI GOAL 1:

Establish Ohio State as a leading public institution of sustainability research and applications

Nearly 700 Ohio State faculty and researchers conduct work on sustainability topics, of which 310 were affiliated with the Sustainability Institute in FY22. This included the addition of a new SI core faculty member, Yanlan Liu, during the year, bringing that total to 28.

The Sustainability Institute's affiliated faculty received 142 externally funded research proposal awards in FY22, totaling more than \$100 million in award value. Additionally, SI supported three seed grants, four sustainability proposal development grants, and an interdisciplinary research scaling grant, generating a total investment of \$162,543 in seeding research projects and large-scale proposals. With those awards, researchers are now investigating topics ranging from electric school buses to agricultural work with local farmers in Africa.

In the realm of sustainable electricity, battery load management for a fleet of electric school buses shows considerable potential. Principal Investigator Qadeer Ahmed has examined how to handle the heating and cooling loads of both the road and the body of the bus. Ahmed's team constructed a five-task proposal to meet its goals: loads analysis, concept exploration and definition, energy management scheme, fleet composition, and fleet management. In addition to Ahmed, research team members come from the Center for Automotive Research (CAR), the Center for Urban and Regional Analysis (CURA), the Department of Mechanical and Aerospace Engineering, Department of Geography and City and Regional Planning.

Shifting gears, Principal Investigators Leah Bevis and Yanlan Liu have taken their research across the globe, focusing on the Sahel, an area of immense biodiversity and transition within Africa. Their team will examine Forest Gardens, a type of climate-smart technology that can increase adaptability and durability of rural and agricultural communities in areas of poverty or climactic disadvantage.

The researchers will expand this into irrigation optimization, capacity for carbon sequestration and potential for profit.

- \$100 million externally funded research awards to SI affiliated faculty
- 310 SI affiliated researchers and faculty
- 859 peer reviewed publications on sustainability topics in relevant journals



Assistant Professor Yanlan Liu became the newest SI core faculty member in 2022. She holds joint appointments with the School of Earth Sciences and the School of Environment and Natural Resources, focusing her research on ecohydrology. This includes a collaborative project in the Sahel region of Africa with Associate Professor Leah Bevis, Department of Agricultural, Environmental, and Development Economics.



SI GOAL 2:

Educate and empower Ohio State students to become leaders, professionals and engaged citizens



The student sustainability experience at Ohio State spans across classroom teaching and co-curricular learning. In addition to funding proposals for six new academic undergraduate sustainability programs in FY22, SI also funded faculty-led efforts to establish 20 new or revised courses as a part of the new general education sustainability theme.

In addition to supporting that curriculum development across academic units, SI provided foundational materials, guest lectures, and ongoing small group student project support to

Ohio State President Kristina Johnson's spring 2022 class, "Pathways to Net Zero Carbon Neutrality." This project-based course was President Johnson's first classroom teaching experience at Ohio State and provided students an opportunity to explore the sources of the university's operational carbon emissions and develop proposals to further reduce those emissions.

Beyond formal coursework, SI helped students explore their own sustainability interests through the facilitation of six SUSTAINS Living Learning Community (LLC) projects, 14 sustainability campus events, and 12 student grant awards throughout FY22.

Overall, the SUSTAINS LLC was composed of 33 students, 17 freshmen and 16 sophomores this year. They participated in 20 events and activities over the course of both semesters, and attended a professional development trip to Cincinnati, meeting and networking with sustainability organizations. Further, SUSTAINS members continued to develop and implement sustainability projects on campus such as plastic bag recycling, an indoor aquaponics system and a thrift swap.

One of the SUSTAINS projects helped scale a significant sustainability program across the university. As Scott

House student residents, the SUSTAINS LLC continued the first residence-hall composting program at Ohio State. The lessons learned from this project were incorporated into the university-wide composting rollout in the fall of 2022. SUSTAINS and other student residents created a composting education program, distributed bins and removed contamination from collected material; successfully offering composting throughout the Mendoza-Norton-Scott student residential complex.

The Sustainability Institute student grant program helped students of varying academic disciplines propel their respective research and implementation projects forward. Ranging from chemical engineering to soil science, each project has the potential to lead to advances in environment, energy, natural resources, economy and community resilience areas.

- 20 new or revised sustainability theme GE courses funded by SI
- 12 student sustainability grants awarded
- 11 sustainability projects by student organizations, Learning Communities, Scholars programs, or other student groups with SI involvement



SUSTAINS LLC students hosted a thrift swap to extend the life of usable clothing and help educate attendees about the environmental impact of the fashion industry.



SI GOAL 3:

Accelerate campus sustainability progress and living lab opportunities

The university advanced its resource stewardship goals throughout FY22, including SI's funding support to assist the Wexner Medical Center in reducing its landfill waste through a collaborative research grant, and the enhancement of the university's landscape through a separate grant to Knowlton School of Architecture faculty for teaching students ecological landscape design and establishing an on-campus seed bank for growing native plant species.

Given Ohio State's diverse facilities and landscapes, SI is committed to establishing living labs that help students learn within their surrounding environments, researchers utilize available data and test new innovations, and help the university operate more sustainably. Throughout FY22, SI funded or supported 26 living lab projects, helped facilitate a living lab component of seven separate classes and programs and helped establish seven community-based experiential learning projects.

One such lab is run by Zhazozhe Chen, a 2022 student grant winner and current PhD candidate. The lab is located in the Milliron Research Wetlands at Ohio State's Mansfield campus and focuses on studying the potential of artificial floating islands for water quality improvement of residential wastewater. Specifically, excess nutrients in marshes and swamps can lead to several aquatic problems, including a decrease in dissolved oxygen levels and eutrophication. The islands would absorb these excess nutrients, removing them from the water column, thus acting as natural pollution preventors.

Additionally, one of the broader community-based experiential learning projects established in 2022 targets



Artificial floating islands in use as a living lab project at the Milliron Research Wetlands at Ohio State Mansfield.

enhancing student learning by bridging classroom and summer activities. The Sustainability Institute sponsored and assisted two students' summer internships with the Mid-Ohio Regional Planning Commission (MORPC). Delaney Horton and Derek Holston, third- and fourth-year students at the university respectively, worked as local government interns, learning about the intricacies of Ohio sustainability policy implementation. Each intern collaborated with a community partner to maximize their impact locally.

- 26 living lab projects supported or facilitated by SI
- 7 classes and programs with living lab component supported or facilitated by SI
- 7 community-based experiential learning projects supported or facilitated by SI



SI GOAL 4:

Grow the resources available to support sustainability and resilience research, teaching, outreach and engagement

SI seeks sustainability collaborations with the public, private, and nonprofit sectors that leverage Ohio State's research, teaching and operational assets to help solve sustainability challenges.

For example, a new collaboration with Rumpke Waste and Recycling will support advances in circular economy research, teaching and practices at a time when population growth in central Ohio is expected to bring new challenges to managing waste. The company will invest in the university's zero-waste goal by funding expanded efforts to improve recycling and waste elimination on campus. Additional funds will support engineering research and teaching to unlock ways that artificial intelligence and automation can improve the effectiveness of recovering recycled material from the waste stream. Rumpke is also endowing an undergraduate scholarship to support Ohio State's Scarlet & Gray Advantage program, which will empower students to earn their bachelor's degree debt-free.

In FY22, SI also elevated student-focused initiatives through its engagement of the private sector. Specifically, Honda supported both graduate student work and undergraduate capstone projects focused on sustainable aviation research. In addition, the Marathon Petroleum Foundation supported SUSTAINS Living Learning Community projects and School of Environment and Natural Resources diversity and inclusion student scholarships.

In addition to supporting student research, Honda sponsored a forum to delve into the obstacles to shifting the



Ohio State University and Rumpke Waste and Recycling personnel celebrate the groundbreaking of Rumpke's new recycling center located in Columbus, which will take university recyclables and provide space for students and researchers to study the recycling process and materials.

aviation industry, which accounts for nearly three percent of global carbon emissions, to a low-carbon future. SI worked with seven other university units to plan the sustainable aviation forum, which was held at The Ohio State University Airport. Presenters explored facets of sustainable aviation including aircraft propulsion, navigation systems, airports and ground operations, and social justice. The dialog sought to foster learning and sharing among the participants, better define the main challenges and serve as a first step toward designing research to develop potential solutions.

- \$476,000 from external sources for sustainability teaching and learning
- \$740,000 from external sources for sustainable campus operations



SI GOAL 5:

Catalyze a culture of sustainability

For Ohio State and SI, sustainability is more than a field of study. It is a culture and a lifestyle that requires nurturing across the university community. As our community grows, and the sustainability challenges and opportunities change, there is a perpetual need for dialog and reflection across disciplines and stakeholder groups.

To help foster opportunities for community conversation and involvement, during FY22, SI organized events such as the fourth annual Women in Sustainability seminar and monthly “Flow & Terroir” discussions.

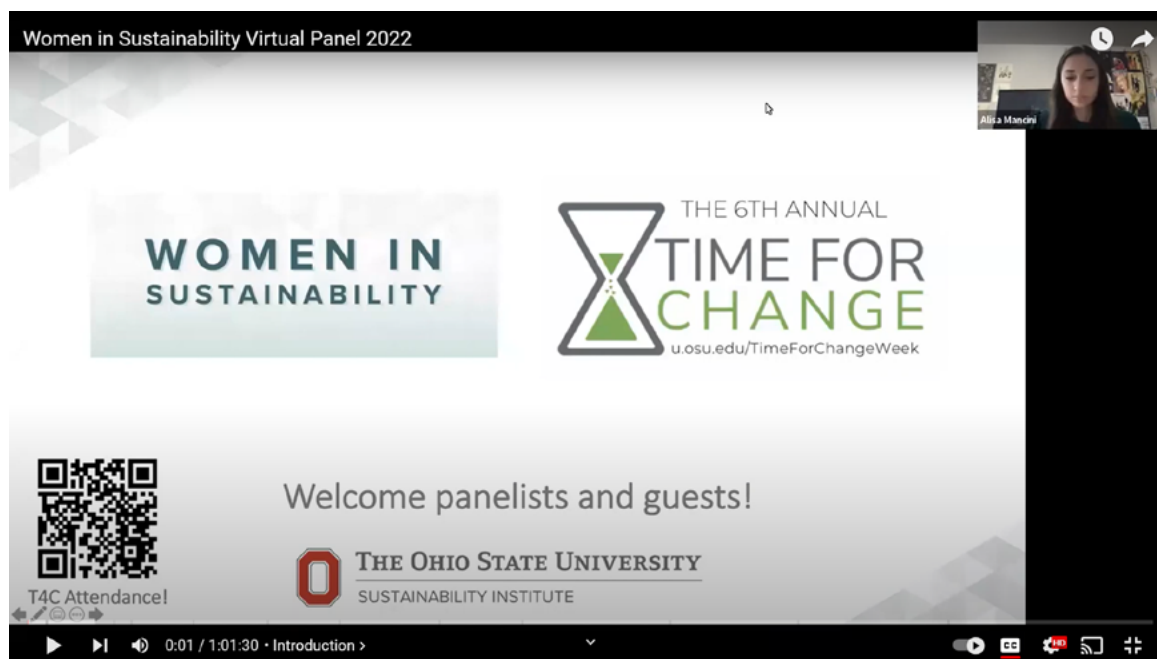
The Flow & Terroir discussions were hosted by the Healthy Air, Land and Water (HALW) faculty research leads, Jay Martin and Linda Weavers. These events helped maintain connections amongst the HALW research community during the pandemic. Often organized around a topic, these exchanges of ideas encouraged information sharing and discussions. Topics ranged from Exploratory Research Group updates to proposal and grant writing to cultivating feedback on a new web resource featuring water research across the university (h2o.osu.edu).

The Women in Sustainability online seminar welcomed 82 attendees and featured panelists from American Municipal Power, MAD Scientist Associates, and the

Ohio Environmental Council. Aiming to celebrate women in fields of sustainability and environmental work, the seminar provided an opportunity for student leaders in the field to engage with professionals in their specific area of interest as well as create meaningful connections through networking.

Beyond events like these that were intended to spark enthusiasm and deeper engagement, SI put considerable effort into daily programming to increase the educational reach of sustainability communications pieces. In FY22, this included writing 22 original stories on sustainability topics pertinent to the university community, expanding the content offerings on SI’s website and social media channels, publishing 17 newsletters for the university’s internal community, and another four newsletters for audiences external to the university.

- 4 external sustainability collaborations focused on diversity, equity and inclusion
- 94 faculty and staff serving on university-level sustainability committees and boards
- 15,858 SI website users



The annual Women in Sustainability seminar was held virtually, and featured a panel of speakers from the private and non-profit sectors. Ohio State student Alisa Mancini moderated the panel discussion.



SI Core Faculty

Yongyang Cai, Food, Agricultural, and Environmental Sciences

Chen Chen, Engineering

Zhenhua Chen, Engineering

Jordan Clark, Engineering,
Joint Appointment with: Food, Agricultural, and Environmental Sciences

Karen Dannemiller, Engineering,
Joint Appointment with: Public Health

Scott Demyan, Food, Agricultural, and Environmental Sciences

Grant Donnelly, Business

Sean Downey, Arts and Sciences

Jennifer Eaglin, Arts and Sciences

Bartow Elmore, Arts and Sciences

Jonathan Fresnedo-Ramirez, Food, Agricultural, and Environmental Sciences

Daniel Gingerich, Engineering,
Joint Appointment with: Engineering

Matthew Hamilton, Food, Agricultural, and Environmental Sciences

John Horack, Engineering,
Joint Appointment with: Public Affairs

Natalie Hull, Engineering

Huyen (TK) Le, Arts and Sciences

Eden Lin, Arts and Sciences

Yanlan Liu, Arts and Sciences,
Joint Appointment with: Food, Agricultural, and Environmental Sciences

Daniela Miteva, Food, Agricultural, and Environmental Sciences

Joel Paulson, Engineering

Judit Puskas, Food, Agricultural, and Environmental Sciences

Christopher Rea, Public Affairs

Christo Sevov, Arts and Sciences

Nicole Sintov, Food, Agricultural, and Environmental Sciences

Christine Thomas, Arts and Sciences

Xiaoguang (William) Wang, Engineering

Mark Weir, Public Health

Ryan Winston, Food, Agricultural, and Environmental Sciences,
Joint Appointment with: Engineering

SI Faculty Advisory Board

Alan Randall, Food, Agricultural, and Environmental Sciences

Bhavik Bakshi, Engineering

Darla Munroe, Arts and Sciences,
Joint Appointment with: Food, Agricultural, and Environmental Sciences

Dave Cole, Arts and Sciences

Harv Miller, Arts and Sciences

Jay Martin, Food, Agricultural, and Environmental Sciences

Karen Dannemiller, Engineering,
Joint Appointment with: Public Health

Katrina Cornish, Food, Agricultural, and Environmental Sciences

Mike Bisesi, Public Health

Piers Turner, Arts and Sciences

Robyn Wilson, Food, Agricultural, and Environmental Sciences,
Joint Appointment with: Arts and Sciences

Faculty Awards and Recognition

SI core and affiliated faculty members were honored with the following prestigious awards in FY 2022:

Bhavik Bakshi (ENG) – Ohio State Distinguished Scholar

Jill Clark (JGCPA) – ESC Excellence in Faculty Community Engagement Award

Darryl Hood (CPH) – Ruth C. Bailey Award for Multicultural Engagement

Elena Irwin (CFAES) – Fellow of the Association of Environmental and Resource Economists

Harvey Miller (ASC) – Fellow of the American Association for the Advancement of Science,
Ohio State Community Engaged Scholar

Brian Roe (CFAES) – Fellow of the Agricultural & Applied Economics Association

Sustainability Institute (SI) Staff Members

Kate Bartter, Executive Director

Elena Irwin, Faculty Director,
Distinguished Professor of Food, Agricultural and
Environmental Sciences in Economics & Sustainability

Brian Cultice, Graduate Research Associate

Matt Griffin, Program Coordinator, Sustainability Education and Learning

Kathy Jackson, Program Assistant

Gina Jaquet, Director, Sustainability Education and Learning

Tim Jaquet, Postdoctoral Researcher

Josh Knights, Director of Partnerships

Kim McIlwaine, Executive Assistant

Courtney Price, Research Program Manager

Mike Shelton, Associate Director

Joan Wall, Editor

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