

Arizona State University

Creating a sustainable future



Creating a sustainable future

The genesis of sustainability at ASU



Michael Crow

Michael M. Crow
President,
Arizona State University



Julie Ann Wrigley

Julie Ann Wrigley
President and CEO,
Wrigley Investments, LLC



S. Robson Walton

S. Robson Walton
Retired Chairman of the Board,
Walmart

More than a decade ago, in 2004, Arizona State University President Michael M. Crow convened a meeting in Temozón, Mexico, that mobilized a small but distinguished group of intellectual leaders who were exploring a new idea – sustainability science.

These scientists and practitioners gathered to consider how a large, public research university could best commit itself to sustainability as a core value in its teaching, research and outreach activities. That discourse has guided the course of sustainability at ASU to this day, and includes these goals:

- Teach students the ideas and tools they will need to solve sustainability problems.
- Identify and connect ASU faculty and staff concerned with sustainability as an academic field and a value.
- Brand ASU as a university that is committed to sharing ideas that will help solve sustainability challenges on local and global levels.

Today, the Julie Ann Wrigley Global Institute of Sustainability is the hub for ASU's efforts in sustainability education, innovation and operations. We are shaping the field and transforming the world. Please join us.

ASU Charter

ASU is a comprehensive public research university, measured not by whom it excludes, but by whom it includes and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves.

Creating a sustainable future

Universities have always played a special role in finding answers to critical issues, but to solve highly complex, global-scale sustainability challenges, universities must fundamentally change. At Arizona State University, we are committed to this goal.

We restructured our academic organization and established the Julie Ann Wrigley Global Institute of Sustainability. As part of the institute, we established the first-ever School of Sustainability in the United States. We believe that: sustainability should transcend all academic disciplines, the pace of discovery has to accelerate, and our institutions must educate leaders capable of solving sustainability problems across the world.



A handwritten signature in black ink that reads "Gary Dirks".

Gary Dirks
Director,
ASU Wrigley Institute



A handwritten signature in black ink that reads "Christopher Boone".

Christopher Boone
Dean,
School of Sustainability

As we focus our efforts on sustainability education, outreach, research, solutions and operations, we know that:

- Innovative thinking requires **transdisciplinarity** – giving equal value to natural, built and social systems, along with human ideals.
- Collaboration and successful partnerships need structure, engagement and **a central place to convene**.
- Research must be **solution-focused and participatory**, involving stakeholders in the co-production of knowledge and embracing system innovation rather than optimization.
- To **build human capacity**, the next generation of scholars and practitioners must receive training and professional development, from K-12 through executive leadership and beyond.

Sustainability at ASU spans every discipline, every department and every campus. Sustainability is a core value of the university.

Universities alone, however, cannot create a sustainable future. Sustainability will require the efforts of individuals and leaders at every level of society, from government and business to philanthropy and science. Together, we can change the world's trajectory, creating pathways to a better, more sustainable future.

History of sustain



Michael M. Crow becomes 16th president of Arizona State University



School of Sustainability awarded charter by Arizona Board of Regents

College of Nursing building rededicated as headquarters for Global Institute of Sustainability



School of Sustainability awards nation's first master's degree in sustainability



Undergraduate minor in sustainability launched

2002

2004

2006

2007

2008

2009

2010

Global sustainability leaders convene in Temozón, Mexico, to design ASU's sustainability initiatives



Global Institute of Sustainability established with \$15 million gift from Julie Ann Wrigley

First semester begins for School of Sustainability



School of Sustainability honors its first class of 13 graduates



Four new professorships established with \$10 million investment from Julie Ann Wrigley

Sustainability @ ASU



Rob and Melani Walton Sustainability Solutions Initiatives launched with \$27.5 million investment



Julie Ann Wrigley Global Institute of Sustainability
Arizona State University

ASU renames Institute to Julie Ann Wrigley Global Institute of Sustainability in honor of founding benefactor

School of Sustainability celebrates 10 years of leading the way



ASU Polytechnic campus offers degrees in sustainability

Global Futures Initiative launched



Community of Sustainability Scientists, Scholars and Fellows exceeds 500 members

2011 2012 2013 2014 2015 2016 2017 2018

Global Institute of Sustainability headquarters renamed Wrigley Hall



ASU formalizes community of Sustainability Scientists and Scholars

First cohort begins Master of Sustainability Solutions

Executive Master of Sustainability Leadership launched



First fully-online programs, Master of Sustainability Leadership and Bachelor of Arts, launched



Swette Center for Sustainable Food Systems established with gift from Kelly and Brian Swette



ASU's sustainability commitment reaches across all colleges and institutes

Sustainability @ ASU

Biodesign Institute

W. P. Carey School of Business

Herberger Institute for Design and the Arts

Mary Lou Fulton Teachers College

Ira A. Fulton Schools of Engineering

School for the Future of Innovation in Society

Thunderbird School of Global Management

Graduate College

College of Health Solutions

Barrett, the Honors College

Walter Cronkite School of Journalism and Mass Communication

Sandra Day O'Connor College of Law

College of Integrative Sciences and Arts

College of Liberal Arts and Sciences

New College of Interdisciplinary Arts and Sciences

College of Nursing and Health Innovation

Watts College of Public Service and Community Solutions

School of Sustainability

University College

As the hub of ASU's sustainability initiatives and the world's leading sustainability laboratory, the Julie Ann Wrigley Global Institute of Sustainability is enabling better lives through solutions, engagement, education and research.

Solutions The institute connects researchers with each other and with practitioners from business, industry, municipalities and government to collaborate on solutions for sustainability challenges of urban growth, environmental protection, resource management, and social and economic development.

Engagement Sustainability partnerships and innovative outreach activities connect the university with diverse stakeholders locally, nationally and globally to engage individuals and communities in projects and dialogues to address sustainability challenges.

Education Arizona State University's School of Sustainability is the first of its kind: a comprehensive degree-granting program with a transdisciplinary focus on finding real-world solutions to social, economic and environmental challenges.

Research Arizona State University conducts use-inspired research, developing practical solutions to some of the most pressing social, economic and environmental challenges of sustainability, especially as they relate to urban areas.

Operations Guided by the goal to have the greatest possible positive impact, Arizona State University is a model for sustainability operations and practices around the country.

Solutions



“Global Futures is a platform from which to take a broad look at the trajectory of our planet and the role of global society in shaping it, to gather and synthesize knowledge from many frameworks and to fundamentally alter how we manage the planet in ways that achieve sustained habitability.”

—Peter Schlosser,
Vice President & Vice Provost of Global Futures



Global Futures Initiative

In January 2018, President Michael M. Crow announced the launch of Global Futures at Arizona State University. As a university-wide initiative, its goal is to harness the innovative capacity of ASU and academia as a whole to develop options for proactive, forward-looking management of our planet.

Global Futures is a far-reaching platform that seeks to keep Earth habitable for humans in the long term and improve human well-being. Led by Peter Schlosser, one of the world's leading earth and environmental scientists, Global Futures envisions ASU as a world hub where prominent scientists from across the globe come together to address the most critical issues related to human society and the future of our planet.

Global Futures synthesizes the knowledge and expertise already at ASU while breaking new intellectual ground and forming new alliances. Global Futures connects related academic endeavors to maximize innovation, shapes debate about pathways towards a sustainable future and develops and advances new research initiatives.

Using a holistic systems approach, Global Futures explores which critical interventions will steer us toward a sustainable, globally connected future. Under the core theme of planetary management, Global Futures' research agenda includes focal areas such as the dynamics of societal structures and their stability, new energy systems, new economies (such as a carbon economy), food security, land degradation, health delivery systems, depletion of natural resources, water scarcity, future cities and extremes.

Global Futures is being developed as a university-wide activity in partnership with the Julie Ann Wrigley Global Institute of Sustainability.

global.asu.edu/global-futures-initiative



Rob and Melani Walton Global Sustainability Solutions Service

Established in 2012, the Rob and Melani Walton Global Sustainability Solutions Service co-creates customized, actionable and scalable solutions to help businesses, governments, nonprofits and communities define, analyze and solve the sustainability challenges they face every day.

Through its work with external partners, the Walton Solutions Service strives to educate audiences, discover solutions and implement practices that help people drive the transition to a sustainable world. In addition, the program functions as an access point to more than 500 sustainability scientists and scholars across the university.

The Walton Solutions Service offers expertise and services in circular economic planning, greenhouse gas and natural resource mapping and assessment, international development, national energy strategies, waste and energy innovation, sustainable business practices and systems analysis.

RISN

Recognizing the opportunity to transform trash into an economic resource and to help the city of Phoenix meet its goal to divert 40 percent of its waste from the landfill by 2020, ASU partnered with Phoenix to establish the Resource Innovation and Solutions Network. RISN focuses on developing solutions and providing research that creates value and economic development opportunities from solid waste streams.

resourceinnovation.asu.edu

The Rob and Melani Walton Global Sustainability Solutions Service is made possible by a generous investment by the Rob and Melani Walton Fund of the Walton Family Foundation.
sustainabilitysolutions.asu.edu



GlobalResolve

GlobalResolve is a social entrepreneurship program that helps communities around the world solve challenges through sustainability research and development. Established in 2006, the program involves Arizona State University students in semester-long projects that directly improve the lives of people in underdeveloped nations throughout the world.

Through GlobalResolve, ASU students and faculty collaborate with international universities, residents of rural villages, local governments, financial institutions and non-governmental organizations to develop and disseminate no-tech, low-tech and high-tech solutions that address pressing public health or environmental needs.

Because solutions developed by GlobalResolve are designed to be replicable locally, regionally and internationally, the solutions also create the potential for profitable new business ventures that generate sustainable income streams for impacted populations.

Providing clean water in Peru, Dominican Republic and Bangladesh

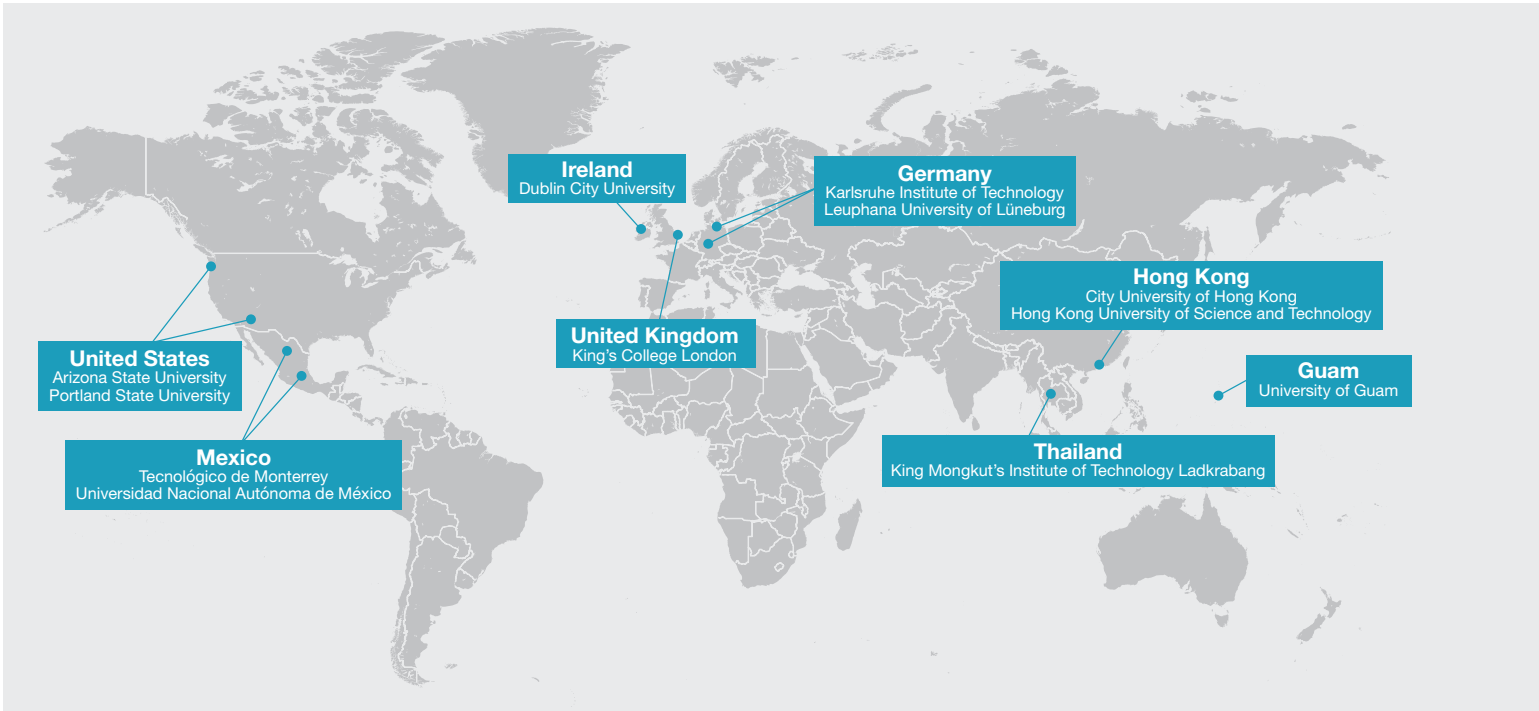
33 Buckets began as a GlobalResolve student project in 2010. Since then, the expanded program has provided safe water to thousands of people in three countries by partnering with local communities to launch clean water franchises. These franchises are long-lasting solutions that put community residents in charge of independently maintaining their water systems.

GlobalResolve is a unit of Barrett, The Honors College, in partnership with the Julie Ann Wrigley Global Institute of Sustainability.

globalresolve.asu.edu



Accelerating sustainability outcomes worldwide



“What GCSO brings to the table is the fact that we are forced to now start looking outside [the university]. We actually need to go beyond the frontiers of the university and start tackling the real-world problems.”

—Alberto Mendoza, Tec de Monterrey



Global Consortium for Sustainability Outcomes

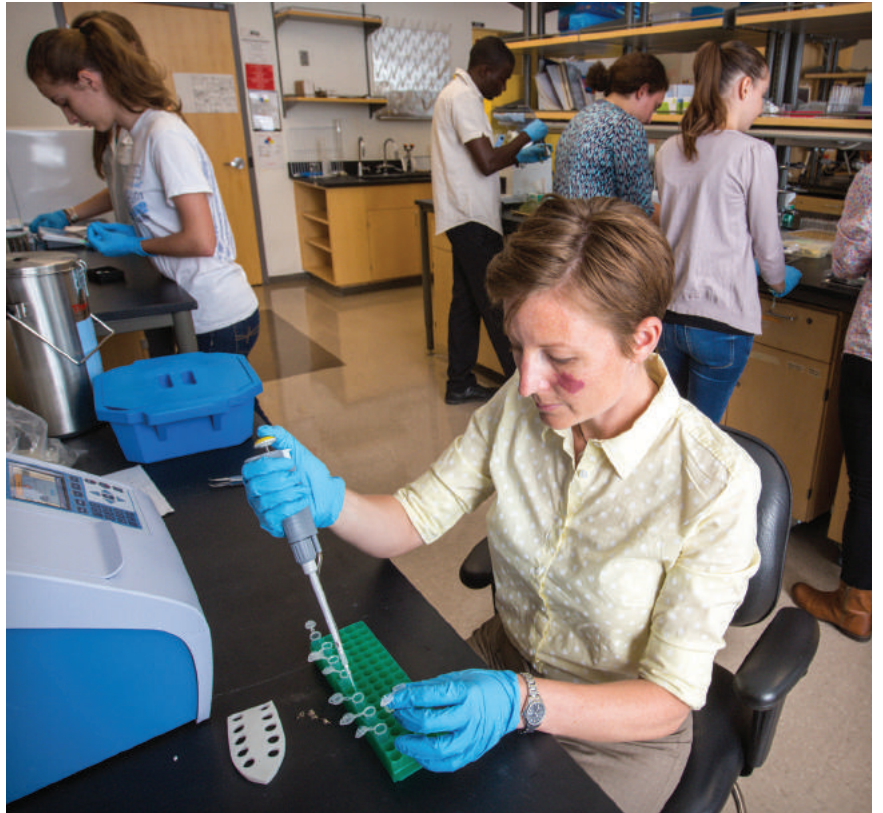
The Global Consortium for Sustainability Outcomes is a unique network that advances solutions to sustainability problems through research, development and capacity building. ASU's Julie Ann Wrigley Global Institute of Sustainability manages and is a member of the consortium, which generates and tests a wide range of solutions including technologies, policies, economic incentives, social changes and cultural practices.

GCSO includes diverse global members such as universities, research institutes and corporate sponsors that can transform ideas into action. The consortium builds capacity through education and transfers evidence-based solutions to implementers, with the goal of achieving sustainability outcomes on multiple continents. GCSO's success is measured by evidence-based, positive outcomes and impacts on sustainability issues worldwide.

Working together, GCSO's member institutions will deliver solutions that overcome the pace at which sustainability challenges are jeopardizing human well-being and the ecosystems on which the world depends.

Global Consortium for Sustainability Outcomes is a private, nonprofit unit of ASU's Research Collaboratory and is governed by consortium members.

sustainabilityoutcomes.org



Global Locust Initiative

ASU's Global Locust Initiative engages key actors in locust research and management to develop research, partnerships and solutions for transboundary pest management in agricultural ecosystems around the world.

Locusts and grasshoppers have a long history of coexisting with humans, but acridid outbreaks and their management continue to have devastating impacts on human livelihoods and the environment. Locusts are among the most economically significant crop pests on many continents.

To help fight locust plagues and improve farmer livelihoods around the world, the Global Locust Initiative facilitates fundamental and applied research, creates and maintains a global network, and develops on-the-ground solutions with local collaborators.

Cease Lab

The Cease Lab envisions a world without hunger and with economically viable, sustainable solutions to insect-driven hardships among human populations. Run by Arianne Cease, director of the Global Locust Initiative, this laboratory is an incubator for research that the GLI team can use to develop in-the-field solutions.

Center for Biodiversity Outcomes

The mission of the ASU Center for Biodiversity Outcomes is to enable the discoveries and solutions needed to sustain Earth's biodiversity in a time of rapid biophysical, institutional and cultural change. The center draws on the innovative power of ASU to create pioneering, practical solutions in biodiversity conservation by partnering with NGOs, corporations, governments and other academic institutions while training the next generation of conservation leaders. biodiversity.asu.edu

The Sustainability Consortium

This global nonprofit organization works to transform the consumer goods industry by partnering with leading companies to define, develop and deliver more sustainable products. Comprised of more than 100 members from around the world — including corporations, nonprofits and academic institutions — The Sustainability Consortium is jointly administered by ASU and the University of Arkansas. sustainabilityconsortium.org

ASU Entrepreneurship + Innovation

Entrepreneurship is a mindset that is infused in every school and department at ASU and extends into the community. E+I serves as a connecting and collaborating resource for entrepreneurs across ASU and the greater Phoenix area to launch new products, services and ideas. Through courses, competitions, faculty and funding, E+I empowers and supports entrepreneurs at every stage across demographic groups and business sectors. entrepreneurship.asu.edu

Kyl Center for Water Policy

The Kyl Center for Water Policy at the Morrison Institute for Public Policy seeks to generate policy proposals for public evaluation and subsequent consideration for possible action or adoption. An ASU resource, the Kyl Center promotes research, analysis, collaboration and open dialogue to identify opportunities for consensus to ensure sound water stewardship for Arizona and the Western region for generations to come. science.asu.edu/kyl-center-water-policy

SolarSPELL

SolarSPELL is an initiative housed at ASU with the goal of providing relevant, localized educational content to resource-constrained locations around the world using “Solar-Powered Educational Learning Libraries,” or SolarSPELLs. These portable, digital libraries come with their own offline Wi-Fi hotspots, are packed with thousands of educational documents and videos, and are ready to be deployed with minimal training or maintenance required for start-up and continued operation. solarspell.org

PlanetWorks

PlanetWorks is a faculty-led university initiative dedicated to developing solutions for the planetary-scale challenges of the Anthropocene — the Age of Humans. PlanetWorks bridges the natural and social sciences to help Earth’s first intelligent planetary species develop the capacity to design and manage the complex, interwoven systems of our planet. planetworks.asu.edu

Stardust Center

The Stardust Center for Affordable Homes and the Family was created to address the urgent need for well-designed affordable housing, which is critical to healthy, sustainable communities. The center uses the tools of research, community engagement, education and public forums to raise awareness and build capacity to address the needs for quality affordable homes. stardust.asu.edu

Food Systems Transformation Initiative

The FSTI’s mission is to optimize the resilience of food systems and personal health outcomes through innovative technological, cultural and behavioral efficiencies, from food production through consumption. The initiative forges unique partnerships to deliver cutting-edge, real-world solutions for individual, public and planetary health. foodsystems.asu.edu

Sustainability Solutions Festival

Each February, the Sustainability Solutions Festival unites people, organizations and events to discover, explore and celebrate how we can individually and collectively reimagine our lives and our planet to make a better world for all of its inhabitants.

During the festival, Arizona becomes the epicenter of the sustainability universe as business leaders, students, families and creative thinkers gather to celebrate and honor solutions to the world's toughest issues. The festival includes conferences by partners — such as GreenBiz, Second Nature and Global Reporting Initiative — that convene leaders in sustainability theory and practice, along with a diverse array of other events at locations around Phoenix and Tempe.

The festival engages 30,000 people of all ages and backgrounds annually and is active in competitions and events throughout the year, partnering with programs and organizations across the globe to encourage innovation and creativity among students and entrepreneurs who are developing solutions to Earth's challenges.

GreenBiz Forum

A regular partner and signature event of the Sustainability Solutions Festival, GreenBiz Forum brings together vast networks, insights and domain expertise for several days of impactful stage presentations, workshops and networking opportunities. The brightest thinkers and most influential leaders in business and sustainability provide an unparalleled in-depth look at the key challenges and opportunities facing sustainable business today.

The Sustainability Solutions Festival is made possible by a generous investment by the Rob and Melani Walton Fund of the Walton Family Foundation.

sustainabilitysolutions.asu.edu



Engagement



Ecology Explorers

Ecology Explorers gives local K-12 teachers and students opportunities to scientifically study our Phoenix area urban ecosystem from their own schoolyards. More than 50 schools throughout the Phoenix metropolitan area participate in the program.

Participating students learn to study local ecology and connect their activities with research from the Central Arizona–Phoenix Long-Term Ecological Research program. By learning about this ongoing scientific study of trends and processes in our local urban ecosystem, students develop real world understandings that are relevant to their daily lives.

Teachers can take advantage of workshops, lesson plans and other resources developed by the program to tie in with academic standards. ASU undergraduate and graduate students also participate in the program by sharing Ecology Explorers lessons and activities, both in classrooms and through afterschool programs, especially in underserved communities.

Teacher Toolbox

The Ecology Explorers program provides teacher materials developed in collaboration with scientists, graduate students and other education partners. These resources are designed to help students develop skills for planning and carrying out investigations, analyzing and interpreting data, and communicating evidence-based information.



Ecology Explorers links Phoenix-area K-12 teachers and students with exciting opportunities to study their schoolyards, backyards and neighborhoods.



Sustainable Cities Network

ASU's Sustainable Cities Network endeavors to advance and implement sustainability as a core value within communities throughout the Valley of the Sun in planning, development, policy and operations.

Through its steering committee, municipal partnerships and workgroups, the network connects local stakeholders to share best practices in sustainability, provides training and information, and bridges ASU's research with front-line sustainability challenges facing cities to explore and implement solutions.

The Sustainable Cities Network collaborates to streamline city operations, advance solar energy, mitigate the urban heat island, create more sustainable neighborhoods and promote greater water conservation measures in a changing climate.

Project Cities

Project Cities is a university-community partnership in which sustainability faculty and students pair with a city to co-create strategies for better environmental, economic and social balance in the places we live. Students from multiple disciplines research difficult problems chosen by the city and propose innovative sustainability solutions that enable the city to make progress toward a better future.

projectcities.asu.edu



“With help from the network, City of Mesa has been able to make educated decisions on current energy efficiency projects and move forward on a \$1 million streetlight retrofit program.”

—**Scott Bouchie**, City of Mesa Director of the Environmental Management and Sustainability Department



Sustainable Phosphorus Alliance

The Sustainable Phosphorus Alliance is a member-funded nonprofit that serves as North America's central forum and advocate for the sustainable use, recovery and recycling of phosphorus in the food system. The alliance collaborates with members and supporters to innovate and implement evidence-based solutions to phosphorus sustainability issues and shares this information with the global community.

All life requires phosphorus. It is a key ingredient in many fertilizers and is present in recyclable organic wastes, including food waste, manure and sewage. Its inefficient use and the inadequate management of organic wastes often result in environmental discharges that pollute our rivers, lakes and coastal oceans, creating toxic algal blooms and dead zones. In addition, while people need phosphorus to grow crops for a booming global population, the world's remaining phosphate rock reserves often contain contaminants and are non-renewable, finite and concentrated in a small number of countries, posing geopolitical vulnerability.

The alliance envisions a food system that manages phosphorus more sustainably to provide abundant, nutritious food while protecting the health of rivers, lakes and oceans.

Biosolids and Manure Task Force

The alliance has partnered with the manure management and biosolids industries to complete a state-by-state analysis of regulations that impact the sustainable recycling of organic wastes in agriculture. A graphical online tool will help users navigate the complex patchwork of regulations and develop regulatory scenarios that foster nutrient recycling while protecting our waters.



UREx Sustainability Research Network

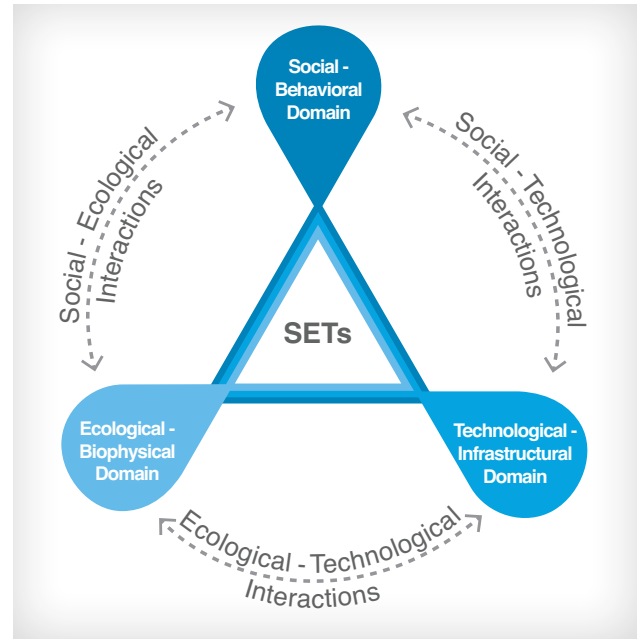
The Urban Resilience to Extremes Sustainability Research Network (UREx SRN) focuses on integrating social, ecological and technical systems to devise, analyze and support urban infrastructure decisions in the face of a higher incidence of extreme events, more culturally diverse communities and continued urbanization pressure.

The current infrastructure of urban areas is aging and proving inadequate for protecting city populations. Infrastructure must be resilient, provide ecosystem services, improve social well-being and exploit new technologies in ways that benefit all segments of urban populations and are appropriate to the particular urban context.

Working with 10 U.S. and Latin American cities that are affected by floods, heat waves or droughts, the UREx SRN has established a diverse network of researchers, municipal professionals and local residents to co-create a novel set of decision-support tools that tackle resiliency challenges. Through collaborative workshops, we explore possible transition pathways that will enable more sustainable futures for cities.

UREx Scenario Workshops

The workshops convene diverse groups and organizations, both civic and private, to envision positive futures that prioritize resilience to extreme events and sustainable transformations. The goal of these workshops is to develop alternative long-term future (e.g. 2080) scenarios and explore the implications and tradeoffs of implementing different strategies from these scenarios. This interdisciplinary process also identifies gaps in information, knowledge, and data coordination between jurisdictions and improves the understanding of existing problems that plague our cities.



Wrigley Lecture Series

Funded through the generous support of Julie Ann Wrigley, the Wrigley Lecture Series brings internationally known thinkers and problem-solvers to ASU to engage directly with students and the larger sustainability community.

Sustainability Series

Sustainability Series speakers discuss a range of environmental, social and economic topics at these events, sponsored or co-sponsored by the Julie Ann Wrigley Global Institute of Sustainability.

Water Future Series

This series is a collaboration between ASU departments, cities and nonprofits bringing awareness to the growing need for sustainable water management in the Phoenix area. Recognizing that the future of water is at stake, presenters aim to educate audiences about steps they can take to save water.

Future of Food Series

Hosted by the Swette Center for Sustainable Food Systems, this series explores a variety of topics including global food security, ecosystem services, new industry dynamics and agricultural technology innovations. These events are designed to provide insights for policymakers and facilitate conversations about transforming the food and agriculture sector.

Case Critical

Local experts engage in solution-based discussions focusing on high-stakes threats and breaking news issues.

Sustainability After School

School of Sustainability students and alumni learn from career experts and industry leaders who offer tools, knowledge and experiences for working in sustainability in the real world.

Sustainability events take place across the university and are often sponsored or co-sponsored by the Julie Ann Wrigley Global Institute of Sustainability.

sustainability.asu.edu/events



Education



School of Sustainability

Established in 2006, Arizona State University's School of Sustainability is the first of its kind in the United States: a comprehensive degree-granting program with a transdisciplinary focus on finding real-world solutions to social, economic and environmental challenges.

The face of our world is changing every day, and sometimes it seems that problems are growing faster than solutions. Climate change, food insecurity, ocean acidification, loss of biodiversity, water shortages, energy affordability, poverty, disease and many other challenges to sustainability are negatively impacting human well-being. The School of Sustainability prepares students to view complex problems and solutions systemically, work collaboratively with people of differing perspectives, and create strategic solutions for a desirable, more sustainable future.

To educate tomorrow's leaders, the School of Sustainability offers majors, minors, certificates and professional development programs for undergraduate, graduate and doctoral students.

Areas of study

Biodiversity and ecosystems
Climate change and adaptation
Economics and natural capital
Energy, materials and technology
Ethical business practices
Food systems
Future and systems thinking
International development
Policy and governance
Social and behavioral change
Urbanization
Water quality and quantity

The School of Sustainability is a unit of the Julie Ann Wrigley Global Institute of Sustainability.

schoolofsustainability.asu.edu



“Our mission in producing this course was to create something that would engage teachers-in-training deeply enough that they would want to teach this when they go out in the field. We need somehow, in the course of a semester, not only to get them engaged and interested, but also to see the relevance of sustainability for their own classroom.”

—Lee Hartwell,
Director, Biodesign Institute Pathfinder Center



Sustainability Science Education Project

The Sustainability Science Education Project, housed in the Biodesign Institute's Pathfinder Center, aims to empower educators with an understanding of how science, technology, design and effective governance can create a sustainable society, and to inspire educators with the ability to translate these concepts to their students.

Since its start in 2011, the SSE team has designed three undergraduate courses — two in the Mary Lou Fulton Teachers College and one in the School of Sustainability — and has created a successful Pinterest account that makes engaging, free materials accessible to educators. The team is also working on a suite of professional development courses.

The SSE Project's educational materials are intended to be flexible and adaptable as the team learns more about its audience's needs, wants and use patterns. The team has taken a transdisciplinary approach to develop the materials, collaborating across various domains and fields of study. Strategically mobilizing its team, SSE serves two primary goals: producing courses that propel real-world topics through high-quality curated content, and evaluating its learners' experiences to share insights and best practices.

Integrating Sustainability Science into the Classroom

This online professional development course cultivates the skills and strategies necessary for incorporating sustainability science topics across common K-12 curricula. Launched in late 2017, the ultimate goal of this course is to prepare K-12 educators to advance the next generation of scientifically literate and globally minded citizens who are ready to tackle any challenge.

The Sustainability Science Education Project is a partnership between the Mary Lou Fulton Teachers College, the Biodesign Institute and the School of Sustainability.

sse.asu.edu



Executive Master of Sustainability Leadership

The Executive Master of Sustainability Leadership is a unique curriculum designed to teach organizational leadership skills through the lens of sustainability, providing mid-career professionals and executives with practical, actionable tools to incorporate sustainability into their organizations.

The 13-month program combines in-person, virtual and international learning experiences that focus on strategy, leadership, global context and communication skills. The program's curriculum was created in partnership with academic and industry leaders, and is a truly distinctive experience that includes real-world scenarios, case studies and interaction with sustainability leaders from around the globe.

This graduate degree enables participants to embed sustainability concepts within the core of their workplaces. Students engage with an elite network of peers and mentors — like-minded professionals with diverse backgrounds who support each other beyond graduation to create positive outcomes locally and globally.

The Executive Master of Sustainability Leadership degree is granted by the School of Sustainability and was one of seven Sustainability Solutions Initiatives seed-funded by founding donors Rob and Melani Walton.

leadersinsustainability.asu.edu

Sustainability Storytelling

A film documentary course co-listed in the School of Sustainability and the Walter Cronkite School of Journalism and Mass Communication is taught by Peter Byck, director of the critically acclaimed documentary Carbon Nation.™ cronkite.asu.edu

Community Solutions

The Watts College of Public Service and Community Solutions offers a Creative City Certificate focusing on cultural innovation, placemaking, and social and economic entrepreneurship. The college also offers a master's degree in sustainable tourism.

publicservice.asu.edu

Environmental Design

Herberger Institute offers a doctoral program in design, environment and the arts that addresses sustainable design challenges and interdisciplinary research. The institute also offers a master of science in the built environment degree with a concentration in energy performance and climate-responsive architecture.

herbergerinstitute.asu.edu

Sustainability Connect

The Sustainability Connect website brings together individuals from Arizona State University with professionals in the community to work collaboratively on sustainability issues, while providing students with internships and applied projects.

sustainabilityconnect.asu.edu

Study Abroad

The ASU Study Abroad Office administers more than 500 programs in nearly 70 countries. Students have studied sustainability in South Africa, Cuba, Australia, Brazil, Chile, China, Ecuador, England, France, Germany, Guatemala, Italy, Morocco, New Zealand, the United Arab Emirates and more.

studyabroad.asu.edu

Professional and Custom Education

The School of Sustainability offers custom education and training programs to help companies, governments and non-governmental organizations achieve their sustainability goals. Custom programs can be administered to small or large groups, online or through face-to-face instruction.

sos.asu.edu/sustainabilityskills

Global Sustainability and**Cultural Transformation**

Longtime collaborators ASU and Leuphana University of Lüneburg, Germany, formalized their partnership in 2015, establishing the Center for Global Sustainability and Cultural Transformation. The center focuses on transdisciplinary projects in teaching and research with an emphasis on transforming society and engaging globally. Together, ASU and Leuphana have created a “Global Classroom” project along with a dual degree that incorporates study abroad — the Master of Science in Global Sustainability Science.

complexity.asu.edu

Global Development Research Program

In partnership with the U.S. Agency for International Development's Global Development Lab, ASU offers top graduate students the opportunity to work in developing countries on solutions to development challenges. **gdr.asu.edu**

Sustainable Engineering

The Ira A. Fulton Schools of Engineering incorporate sustainability knowledge and concepts into many programs and courses, including management of environmental resources, biomedical engineering, humanitarian engineering, energy and materials science, and construction engineering and management. engineering.asu.edu

Business Sustainability

Students in the W. P. Carey School of Business can learn about sustainability as it applies to supply chain management, resource economics, entrepreneurship and more. The school also offers an undergraduate concentration in sustainability. wpcarey.asu.edu

Interdisciplinary Arts and Sciences

The School of Mathematical and Natural Sciences offers a degree in life sciences with a concentration in environmental science, available to students at the West campus and through ASU@Lake Havasu. newcollege.asu.edu

Geographical Sciences and Urban Planning

The School of Geographical Sciences and Urban Planning offers sustainability-related degrees, including bachelor's and master's degrees in urban and environmental planning, a master's in geography and doctoral degrees in urban planning and geography. sgsup.asu.edu

Applied Biological Sciences

The College of Integrative Sciences and Arts offers undergraduate and graduate degrees in applied biological sciences, with focus areas such as natural resource ecology and sustainable horticulture.

cisa.asu.edu

Kamehameha Schools Virtual Field Trip

An educational partnership between ASU's School of Earth and Space Exploration and Kamehameha Schools in Hawai'i resulted in a virtual field trip that enables learners to explore culturally significant sites at Kahalu'u Ma Kai in Kona. This virtual field trip allows Kamehameha Schools to share its cultural resources without disturbing the sacred sites, which supports the schools' mission to improve the capability and well-being of Hawaiians through education. ksdl.ksbe.edu/kahaluumakai

Swette Center for Sustainable Food Systems

Established in 2017, this center develops innovative ideas and solutions to the many challenges of current food systems. The Swette Center takes a holistic approach, encompassing water and energy use, carbon footprint and nutrition, innovations in food policy, and the well-being and livelihood of farmers and others working in food systems. The center will educate the next generation of changemakers through innovative degrees and executive programs in sustainable food systems.

sustainability.asu.edu/food

Sustainability Scientists, Scholars and Fellows

Arizona State University formalized its community of sustainability scientists, scholars and fellows to accelerate innovation and discovery in the field of sustainability. Experts from across the university integrate practical experience with knowledge and action drawn from the spectrum of disciplines in natural and social sciences, medicine, engineering, mathematics, humanities and the arts.

Initiated in 2011 with 215 faculty members, ASU's community of sustainability scientists and scholars is continuously expanding and now numbers more than 500. In fiscal year 2018, these experts utilized \$120 million in grants and funding on research expenditures worldwide to work toward sustainability solutions to our planet's challenges.

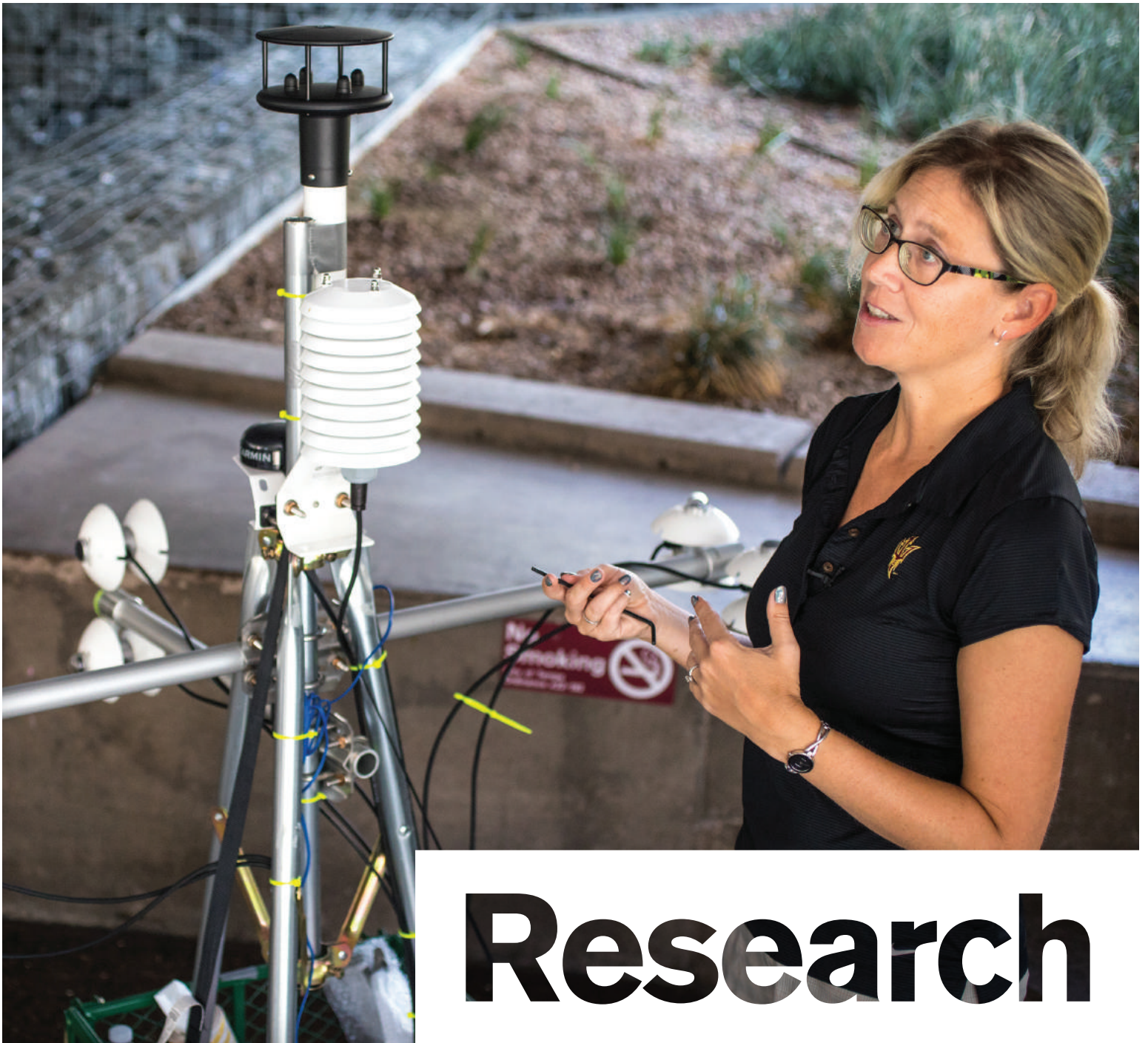
To optimize collaboration among ASU's growing number of sustainability scientists and scholars, the Julie Ann Wrigley Global Institute of Sustainability provides research proposal services, meeting spaces, telecommunications facilities, data management, technical and communications support and general administrative assistance.

Sustainability Headquarters

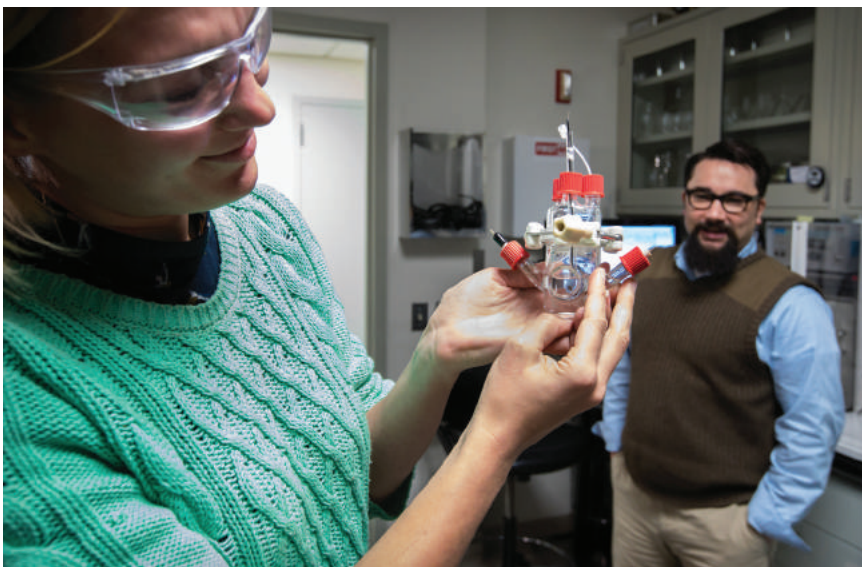
Headquarters of the Julie Ann Wrigley Global Institute of Sustainability, Wrigley Hall is the convening spot for sustainability scientists and scholars from across the university. The building offers videoconferencing space, private offices by appointment, a quiet coffee lounge for informal conversations and a concierge to arrange services as needed. Renovated in 2007-08, Wrigley Hall is a LEED silver-certified building.

The community of sustainability scientists, scholars and fellows continues to grow. To learn more about services available, or to nominate a scientist or scholar, visit:

sustainability.asu.edu/concierge



Research



Central Arizona– Phoenix Long-Term Ecological Research

The Central Arizona–Phoenix Long-Term Ecological Research Program advances research and education on urban social-ecological system dynamics and urban sustainability. Launched in 1997, it is one of only two LTER sites funded by the National Science Foundation that have specifically studied urban ecology.

CAP LTER brings together eight interdisciplinary research teams to investigate the complex dynamics of the Phoenix metropolitan area and surrounding Sonoran Desert. Current CAP research is focused on urban ecological infrastructure and the ecosystem services it provides to the city's residents. CAP LTER serves as a platform from which many other research initiatives have been launched and is a model for interdisciplinary collaboration.

Educating the next generation of urban ecologists and residents is a core mission of CAP LTER. The Ecology Explorers program engages K-12 students and teachers, while undergraduate and graduate students are active researchers whose work is regularly published in leading scientific publications.

Tres Rios Wetlands

The Tres Rios wetlands, constructed by the city of Phoenix as an alternative to engineered tertiary wastewater treatment, are a living laboratory for CAP LTER scientists. Researchers investigate how these wetlands treat wastewater in an arid environment through understanding various structures and functions of the ecosystem. These studies involve high school, undergraduate and graduate students in field and lab work. Research results are communicated to the city of Phoenix.

The Central Arizona–Phoenix Long-Term Ecological Research project is a unit of the Julie Ann Wrigley Global Institute of Sustainability.

caplter.asu.edu



Decision Center for a Desert City

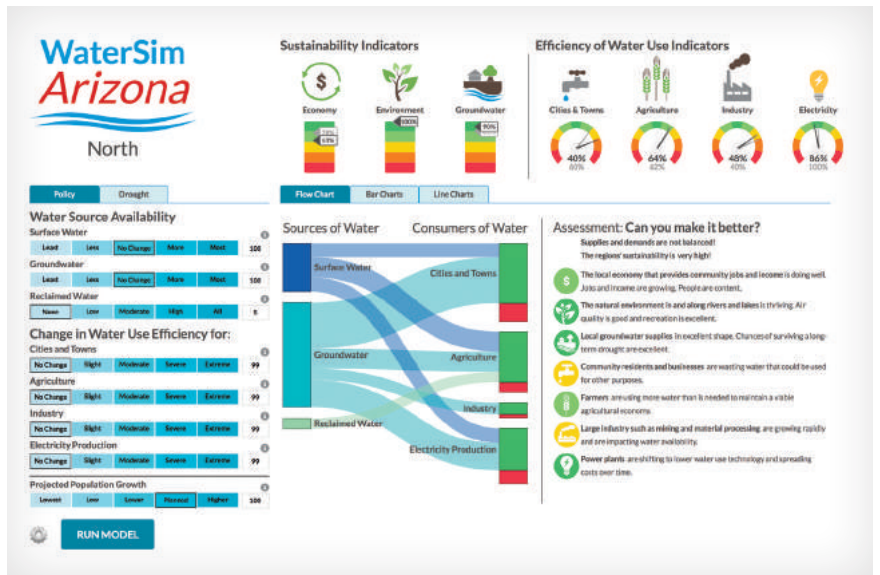
The Decision Center for a Desert City's mission is to advance knowledge about decision making under uncertainty in the context of water sustainability and urban climate change adaptation. Established in 2004 with funding from the National Science Foundation, DCDC conducts climate, water and decision research and develops innovative tools that bridge the gap between scientists and decision-makers.

DCDC's integrated research, education and outreach activities have advanced scientific understanding, trained a new generation of scholars, and informed policy and decision-making processes, especially at the city and regional scale. DCDC has expanded its geographic scope to include cities dependent upon Colorado River water in states such as Colorado, Nevada and California to explore transformational solutions that will be necessary to sustain water supplies well into the future.

WaterSim America

WaterSim America is a state-of-the-art immersive visualization tool used to explore the complexity of water supply and demand. The model allows the public to explore water issues on a state level and has been implemented as an exhibit within Smithsonian's Museum on Main Street *Water/Ways* exhibition.

Beginning in June 2018, WaterSim America was modified to become WaterSim Arizona, which mimics the water supply and water use dynamics for five distinct regions of the state of Arizona for the *Water/Ways* two-year tour in Arizona. Acting as a water manager, users may manipulate management policies pertaining to water availability and use specifics associated with each region. DCDC offers to teachers of grades seven through 16 a companion WaterSim Arizona and WaterStories training, access to the model and curriculum for their classrooms.



Environmental Humanities Initiative

The Environmental Humanities Initiative explores how history, literature, philosophy, religion, anthropology, ethnic studies, film, art and music each serve as entry points to vibrant discussions about the complex relationships between people, place and planet.

Networked through the Julie Ann Wrigley Global Institute of Sustainability, the EHI brings together faculty from more than 22 different schools and departments from all of ASU's campuses. The EHI seeks to facilitate broad participation of faculty, research scholars and students from across disciplines in research and discussions.

The EHI questions what it means to be human among other species and explores how we define our obligations to future generations of life on Earth.

“Environmental humanists raise questions: Must we continue on this path? Can we imagine a shift in course? They encourage us to understand biogeophysical systems, cultivate broader multicultural perspectives, envision auspicious futures, and participate imaginatively in shifting the narrative about who we are, where we are going and how we will get there.”

—Joni Adamson,
Director, Environmental Humanities Initiative



LightWorks

Since its inception, ASU LightWorks has provided solutions to the world's most pressing global energy challenges through a simple idea: energy from sunlight. LightWorks discovers and invents sustainable energy solutions to the world's fuel, electric and social challenges.

Pulling light-inspired research at Arizona State University under one strategic framework, LightWorks is a multidisciplinary effort to leverage ASU's unique strengths, particularly in renewable energy fields including artificial photosynthesis, biofuels and next-generation photovoltaics.

LightWorks revolutionizes how energy is conceptualized, produced and used. The initiative supports the discovery and design of energy systems that convert sunlight into useful and sustainable products. LightWorks encourages research, development and education that critically engages the social, historical and cultural dimensions of evolving energy systems as well as the ecological contexts in which they operate.

NEPTUNE

This partnership was established between the U.S. Navy and the ASU Pat Tillman Veterans Center with the goals of helping the Navy and Marine Corps discover ways to improve energy conservation by generating renewable energy and implementing energy-efficient technologies while giving military personnel and veterans the chance to immerse themselves in university-level research.



Using light to solve societal challenges



Photo courtesy of Sandia National Laboratories

With around 300 sunny days each year, Arizona has the potential to be the nation's leader in solar energy.

**Swette Center for
Environmental Biotechnology**

The Biodesign Swette Center for Environmental Biotechnology manages microbial communities that provide services to society, such as generating renewable energy, cleaning polluted water and soil, and improving human health. Center researchers combine molecular microbial ecology, chemistry, microscopy and mathematical modeling to gain an understanding of how microbial ecosystems work in order to optimize their use in environmental sustainability. environmentalbiotechnology.org

Global Biosocial Complexity Initiative

This initiative focuses the university's growing interdisciplinary strengths on solving complex global challenges – in areas such as health, sustainability, security and education – where a novel approach is required and an integrated effort is essential. complexity.asu.edu

**Center for Environmental Economics
and Sustainability Policy**

This center develops research in environmental and resource economics that is relevant to policy needs, paying special attention to issues of sustainability in the context of environmental, energy, climate and resource management.

research.wpcarey.asu.edu/ceesp

Center for Law, Science and Innovation

The first and largest academic center focused on the intersection of law with science and technology, this center explores innovations in law and policy, fostering the development of legal frameworks for a world of rapidly changing technologies and advancing the informed use of science in legal decision making.

law.asu.edu/lsci

Consortium for Science, Policy & Outcomes

This intellectual network aims to enhance the contribution of science and technology to society's pursuit of equality, justice, freedom and overall quality of life. CSPO creates knowledge and methods, cultivates public discourse, and fosters policies to help decision makers and institutions grapple with the immense power of science and technology as society charts a course for the future. **cspo.org**

National Center of Excellence on SMART Innovations

Providing climate and energy system solutions to governments and industries around the globe, this center seeks to quantify complex climate-energy system interactions throughout all lifecycle phases of a product or technology and to develop cost-effective solutions to reduce any negative impacts. **ncsmart.asu.edu**

Biomimicry Center

A collaboration between ASU and the consulting and training firm Biomimicry 3.8, the Biomimicry Center seeks to enhance our ability to address a variety of sustainability challenges using methodologies inspired by natural systems. By asking the question "How would nature do this?", the center works to create products, processes, companies and policies that are well adapted to life on earth over the long haul. **biomimicry.asu.edu**

Center for Biology and Society

The Center for Biology and Society promotes research, education and engagement related to study of the life sciences and their interconnections with society. Many of the center's research and educational initiatives touch on sustainability fields such as ecoservices, fire and history, conservation studies and environmental ethics. **cbs.asu.edu**

Global Drylands Center

The Global Drylands Center engages key actors of dryland stewardship to develop use-inspired research, training and solutions for arid ecosystems around the world. The center's vision is to become the world leader in discovery and education ensuring a sustainable future for drylands. globaldrylands.asu.edu

Urban Climate Research Center

The Urban Climate Research Center's core mission is to advance fundamental knowledge of processes in the urban atmosphere and related interactions among urban systems by facilitating interdisciplinary research activities led by ASU faculty. The center integrates social and physical science to develop and test urban design and management strategies that enhance the productivity, health and sustainability of urban populations. urbanclimate.asu.edu

Future H₂O

Building a future of water abundance and opportunity, Future H₂O's goals are to engage the private sector with big data to design more resilient watersheds with green infrastructure, to invent new materials that treat water while allowing recovery of byproducts that improve energy and food sustainability, and to broker knowledge to coalitions of public, private and philanthropic stakeholders that turn opportunity into change. Under this initiative, ASU researchers are training the next generation of water leaders through innovative online curricula, exploring the intersection between the humanities and water technology, and communicating fresh narratives about water that move us from crisis to solutions. futureh2o.asu.edu

Global Security Initiative

As ASU's hub for global security research, the Global Security Initiative leverages the world-class expertise of ASU faculty and connections with the defense, security and diplomacy communities. The GSI develops practical mission-relevant approaches and effective decision-oriented tools to address some of the world's most complicated security challenges.

globalsecurity.asu.edu

Center for Environmental Health Engineering

This center works to protect human health and critical ecosystems by detecting, minimizing and ultimately eliminating harmful chemical and biological agents through early detection and engineering interventions. It sits at the link between the environment, human health and security to meet critical real-world needs to promote public safety. **biodesign.asu.edu/environmental-health-engineering**

Center for Negative Carbon Emissions

Rising to the challenge of transitioning to a carbon-negative energy economy, CNCE is advancing carbon management technologies that can capture carbon dioxide directly from ambient air in an outdoor operating environment. Utilizing this technology, CNCE aims to reduce the buildup of carbon dioxide in the atmosphere and become a leader in the field of sustainable energy infrastructure design.

cnce.engineering.asu.edu



Operations



Vision for Sustainability Operations

Arizona State University is a leader in sustainability operations and practices among its peers across the country. The university is committed to leading the world by its example, achieving ambitious internal sustainability goals and fulfilling its external commitments.

Sustainability is embedded into departmental goals and operational practices across ASU, involving many departments and initiatives. Three major partners coordinate sustainability practices across the university and beyond.

University Sustainability Practices

Coordinates ASU operational sustainability, internal engagement, measurement and reporting, and celebration of achievement. cfo.asu.edu/sustainability

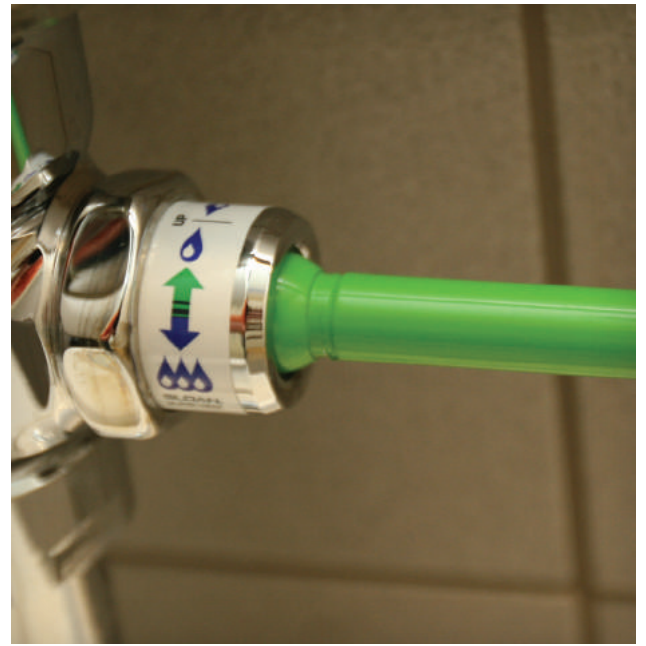
Facilities Development and Management

Coordinates renewable energy, energy efficiency, zero waste, green building, sustainable landscaping and other activities. cfo.asu.edu/fdm

Julie Ann Wrigley Global Institute of Sustainability

Coordinates solutions, engagement, education and research to enable better lives. sustainability.asu.edu

The goal of a university is not to have the least impact possible, but rather the greatest positive impact possible.



Circular Resources

Arizona State University is committed to implementing a circular resource system across all campus operations. A circular resource system achieves Zero Waste by adapting the goods we consume to maximize their use before sending them back into the economy for the most productive use possible.

Zero Waste

The university is working to reduce its landfill waste by 90 percent, averting some waste through reduced consumption and diverting the rest back into the economy through recycling, composting, and reusing or repurposing.

In addition to its general-purpose recycling program, ASU collects soft plastics, scrap wood and metal, lab glass, electronics, batteries, and many other specialty items. Recycling these items often costs less than sending them to the landfill, and sometimes the university collects an income for their sale. Composting is financially competitive with landfill disposal, too.

ASU's sustainable purchasing policies promote recycled content products, recyclable packaging, packaging take-back programs, biodegradable and compostable products, bio-based products, Forest Stewardship Council-certified or salvaged wood, and reusable and durable products.

zerowaste.asu.edu

Optimized Water

Optimizing water includes reducing the need for water, eliminating water waste, and using the most appropriate quality of water for the right use. ASU is actively researching methods to extract water, chemical energy and nutrients from its wastewater, reducing the amount of water, energy and fertilizers currently imported onto campus.

ASU is designing new buildings with water-efficient fixtures and equipment, retrofitting existing buildings with water-efficient fixtures, analyzing campus water infrastructure for savings opportunities, enacting low impact development practices, and implementing new landscape irrigation controls for improved efficiencies. **cfo.asu.edu/optimized-water**



Conserving and Generating Energy

The goal of a university is not to have the least impact possible, but rather the greatest net positive impact possible. ASU is committed to climate-neutral operations by 2025 for greenhouse gas emissions from its buildings, and complete climate neutrality, including the elimination of emissions related to travel and other sources, by 2035.

ASU has the largest solar capacity of any university in the U.S., with over 82,000 on-campus solar panels that generate about 50 percent of ASU's daytime peak load. An off-campus installation, the Red Rock Solar Project, brings the university's solar generating capacity to over 50 megawatts. Solar installations can be found on all four campus locations and the ASU Research Park and include panels that shade thousands of parking spaces, hundreds of stadium seats and busy walkways in front of the Memorial Union and along Gammage Parkway.

During the course of a decade of growth — in both enrollment and gross square footage — the university has nearly cut in half its emissions per student and per gross square foot. Because energy use is the largest component of ASU's emissions, the university made a significant impact on its carbon footprint by implementing numerous energy conservation measures, including heating, lighting projects and ventilating and air conditioning renovations and upgrades.

Along with behavior change to reduce energy use, energy efficiency projects continue with improvements to mechanics, electrics, infrastructure, utilities and overall building renovations. Energy monitoring is essential to identifying wasteful practices and inefficient operations, as well as determining progress toward energy efficiency goals.

ASU's Solarization program is administered by Energy Innovations within ASU Facilities Development and Management. It is responsible for planning, design, installation and operation of ASU's solar systems.
asusolar.asu.edu



Food Reconnection

A strong relationship with nutritional food, with knowledge of its sources and impacts on our planet's health, is fundamental to our health, productivity and connection with nature. Through education and engagement programs spanning health, well-being, resilience, carbon emissions, water and circular resources, ASU works to empower its students, faculty and staff to eat as healthy, local, organic and low on the food chain as possible.

ASU also aims to reduce waste and close food loops in order to transform our food system to create a positive impact on the environment. Starting in Sun Devil Dining and incorporated across the university, ASU's wide array of tools and programs help campus restaurants transition to a sustainable food system.

On the Tempe campus, Sun Devil Dining's signature location is Engrained Café, serving locally grown and harvested food made to order. Organic produce, fair-trade coffee, cage-free eggs, all-natural chicken and sustainable seafood are available from a seasonal menu. Engrained works with local farms and producers to bring local ingredients to the menu.

A program called Campus Harvest engages the ASU community in planting and harvesting food from ASU's extensive urban campus to provide fresh, local produce for campus kitchens, for charity and for sale. Seville sour orange trees on the Tempe campus produce tons of fruit each spring. The university harvests dates each fall.

On the Polytechnic campus, a community garden offers the opportunity for students and employees to grow and harvest organic vegetables in an urban garden setting. Thousands of volunteer hours are logged each year, and hundreds of pounds of produce are sold at farm stands or donated to a local food bank.

Sun Devil Dining is committed to making environmentally responsible decisions at Arizona State University to minimize the university's impact on the environment while providing quality food and service at all dining locations.

sundeildining.asu.edu



Alternative Transportation

Alternative transportation options reduce traffic congestion, air pollution and personal automobile fuel and maintenance expenditures. ASU offers many options for alternative transportation.

Available at ASU for a discounted rate, the student U-Pass and the Platinum Pass for faculty and staff provide unlimited access to all four campuses and Greater Phoenix on Valley Metro bus routes and the METRO light rail. Free intercampus shuttles and several shuttle routes around the Tempe campus make it easy to get from one location to another.

Transit users who need the option to drive to campus periodically can purchase an Eco-Pass, which allows for 30 days of parking per year. For drivers with only an occasional need for a car, ASU offers a discounted car-sharing subscription. Individuals who regularly commute by car can use ride-matching services and take advantage of carpool-reserved parking spaces.

Cycling on campus benefits the entire campus community by reducing traffic congestion, minimizing the use of valuable campus space for parking and providing cleaner air for all. Cyclists at ASU can take advantage of free bike valet service, card-access parking facilities and space-saving storage racks. Bicycle co-ops on three campuses offer expert maintenance and repair in addition to discounted parts and bicycle accessories.

ASU's transportation initiatives are administered by ASU Parking and Transit Services; it is responsible for parking, carpooling, public transit, campus shuttles, bike and pedestrian travel and travel for business.

cfo.asu.edu/transportation



Individual and Collaborative Action

ASU can only achieve its operational and societal sustainability goals through the active involvement of all individuals in the ASU community. It begins with awareness and education, but the urgency also calls for rapid individual and institutional behavior change. ASU provides a wide array of opportunities for individuals to get involved.

The university certifies green athletic teams, events, event coordinators, offices, classrooms, housing, labs and shops that integrate sustainability into their daily operations. Through the President's Award for Sustainability, students and employees are recognized every year for their active role in sustainability at ASU.

ASU has student groups and volunteer activities to match every sustainability interest. Student ambassadors representing the Zero Waste department engage with students, staff and visitors at athletic venues and other large events.

Employees can earn a certificate for sustainability literacy, and staff evaluations include a sustainability component. The university's Green Devil Network for faculty and staff promotes a culture of sustainability across the university.

A Sustainability Initiatives Revolving Fund invests in projects that foster and enable sustainability efforts and provide an economic return on investment. SIRF support is available to all ASU community members.

To maximize sustainability's benefits, it must be embedded into the fabric of our institution as a practice and a value, and the university must reflect the intellectual, ethnic and cultural diversity of our nation and world. ASU continues to prioritize sustainability in its goals, policies, procedures, decisions and daily activities throughout the university.

University Sustainability Practices within ASU University Business Services is responsible for managing various engagement programs, conceiving and championing operational sustainability strategy and initiatives, coordinating inter-departmental action, and reporting progress on sustainability goals.

cfo.asu.edu/sustainability

Greening Maroon & Gold

Arizona State University has made an institutional commitment to lead by example. One example is printing this brochure on recycled papers that are manufactured using 100% renewable energy. Another example is printing a limited number of brochures, being selective with who receives printed copies and posting the brochure online as a PDF download: sustainability.asu.edu/prospectus.

ENVIRONMENTAL SAVINGS

We printed 500 of these brochures on Neenah Environment® Papers, processed chlorine free, and manufactured with electricity that is offset with Green-e® certified renewable energy certificates. Both the cover and text pages are made from 100% post consumer recycled paper. In total, we used 410 pounds of paper. These premium, post-consumer papers are manufactured using sustainable practices. By using this paper over non-recycled paper, we saved the following resources:

trees	water	energy	solid waste	greenhouse gases
4.91 fully grown	400 gallons	2,070,000 BTUs	16 pounds	2,120 pounds

Calculations based on research by Environmental Defense Fund and other members of the Paper Task Force.



sustainability.asu.edu

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