arizona state university

carbon neutrality action plan

Submitted September 15, 2009
Updated January 2010

ASU greening maroon & gold

in 2025, ASU will be carbon neutral.*

*Transportation by 2035

letter from the president

September 2009

On behalf of Arizona State University, I am pleased to present our Carbon Neutrality Action Plan 2009. For more than 30 years, the Center for Environmental Studies at ASU advanced environmental research that served as the foundation for the subsequent establishment of the ASU Global Institute for Sustainability and the nation's first School of Sustainability. This document outlines our institutional efforts in ten key areas toward the single goal of making ASU carbon neutral by 2025. While college and university campuses across the country are, in aggregate, responsible for only about three percent of the total greenhouse gas (GHG) emissions emitted by the U.S., we are educating 100 percent of our future political, business, and social leaders. This fact alone places significant accountability on higher education and its leaders to take action.

Our institutions have the opportunity to serve as transformational catalysts in sustainability education, research, and operational practices. By initiating change from within, we as leaders are empowered to better guide the adaptation of our organizations to the sustainability-related needs and challenges faced by society. To do so successfully requires the ingenuity, participation, and enthusiasm of our university communities at every level. Presidents and chancellors possess the ability to guide policy, encourage and support administrative initiatives, and pioneer best practices in sustainability. Through leading edge curriculums and use-inspired research, faculty can help to create new generations of knowledgeable future leaders and well-prepared workforces. Students can acquire new knowledge, advance forward-thinking enterprises, and work directly in building a sustainable future.

From a climate perspective, research has affirmed that the reduction of GHG emissions is essential to ensuring a sustainable world. However, any meaningful progress in realizing this reduction will require timely

Michael M. Crow, President

action from a broad demographic of stakeholders. Success cannot be achieved with the engagement of only a handful of learning institutions. All of higher education must work together and challenge others to create the change we want. The American College and University Presidents' Climate Commitment (ACUPCC) is a critical mechanism and resource in the attainment of this goal.

As a signatory of the ACUPCC, ASU has committed to becoming carbon neutral, which we intend to achieve by 2025. I invite you to read our detailed plan of action and consider how your college or university may contribute to the responsiveness of higher education to our global climate challenge.

Michael M. Crow
President, Arizona State University
Co-chair, ACUPCC Steering Committee

introduction

There are challenges that many believe place our region, our nation, and our planet in doubt. Our dependence on—and management of—global resources to support the explosive growth and development of the past century is no longer viable from an economic, political, even a social perspective. In his 2002 inaugural address, Arizona State University President Michael Crow noted that,

"We are at a critical juncture in the evolution of our relationship to the environment; and universities must take the lead in addressing issues of sustainability."

Why universities? Universities are uniquely qualified to evaluate, process, and advance the complexities of sustainability, climate change, and carbon neutrality; they leverage the knowledge, talent, and resources of past and future generations of innovative critical thinkers; they influence 100 percent of the students' carbon footprint. The term, carbon neutrality, encompasses a growing set of concepts, but at its core, the goal remains constant: to simultaneously conserve non-renewable energy sources while uncovering and applying new, alternative technologies. This is mitigation and application walking hand in hand. It's about turning off a light switch and installing a solar panel; promoting on-campus living while building hybrid fueling stations; recycling a plastic bottle and composting organic waste; building energy efficient buildings and promoting online learning.

Why universities? Universities are where tomorrow's leaders are trained, where research and technology are born, and where sustainable strategies can transcend abstract theory and become reality. This reality will come in the form of a university community that not only models the broader population but values the goal of carbon neutrality as well. Together, ASU's staff and students are that community. We embrace the challenge. As a leader in sustainability, Arizona State University has the opportunity as well as the obligation to impact the future with a plan that serves as a model for carbon neutrality.

“University leadership has a number of responsibilities to its students, including providing a safe, engaged, and forward-looking campus environment that contributes to their success. This will require a significant financial investment that will result in a significant social, financial, and educational return.”

— Morgan Olsen,
Executive Vice President Treasurer and CFO


ASU

executive summary

where do we start?

Guided by President Crow's design principles for a New American University, ASU is committed to the challenges of environmental, economic, and social sustainability. Illustrative of this commitment, President Crow became a founding member, charter signatory, and chair of the steering committee of the American College and University Presidents' Climate Commitment (ACUPCC) in 2006. In signing this commitment, ASU agreed to:

- Complete an emissions inventory.
- Within the first two years, set a target date and interim milestones for becoming climate neutral.
- Take immediate steps to reduce greenhouse gas (GHG) emissions by choosing from a list of short-term actions.
- Integrate sustainability into the curriculum, making it part of the educational experience.
- Make the action plan, inventory, and progress reports publicly available.

This Carbon Neutrality Action Plan serves as a strategic blueprint for ASU to meet the ACUPCC. The plan builds on our vision for sustainability and the university's history of sustainability leadership, which began with the Center for Environmental Studies and evolved over a period of 30 years into the Global Institute of Sustainability (GIOS). Continuing the tradition of research universities as preeminent catalysts for societal change, ASU established GIOS as a hub for the university's sustainability initiatives—advancing research, education, community outreach/engagement, and business practices for an urbanizing world—in 2004. GIOS is also home to the nation's first School of

Sustainability, which graduated its first class of students in the spring of 2009.

Building on this foundation of expertise and resources, authors of the plan participated in a number of interdisciplinary dialogues. These dialogues garnered input from department representatives, facilities managers, and students on current emissions, practices, and habits. Internal and external experts in the areas of energy, water, buildings and grounds, food services, transportation, waste and recycling, and purchasing and policy were then consulted in the development of each area's emissions reduction strategy. An ASU Carbon Writing Group synthesized the results and drafted the final document.

The plan emphasizes five target areas—energy, transportation, solid waste, agriculture, and refrigerants. A baseline emissions inventory performed at ASU established that in FY07, ASU's 2007 metric ton carbon dioxide equivalent (MT CO_2e) was a total of 308,226 tons for all four campuses. Using this FY07 baseline, projections were made for "business as usual" scenarios to illustrate the projected increase in our emissions. These projections showed roughly a 34 percent increase in our MT CO_2e by 2025, if we continue to grow and develop as forecasted. This approach emphasized the severe consequences of continuing business as usual and identified opportunities to halt this steep projected rise in carbon emissions.

These opportunities, together with goals, milestones, and mitigation strategies were identified and outlined to create a diverse portfolio of options. Full consideration was given to factors such as reduction potential, cost effectiveness, feasibility, additional benefits and burdens, and return on investment. Options include direct and indirect emissions reduction solutions, which make up the core of the mitigation plan. Direct reductions are those that decrease the amount of emissions at a source owned and operated by ASU. Indirect reductions are the result of actions taken by ASU that reduce emissions at a source owned or operated by another entity.

Design Aspirations for a New American University

01. Leverage Our Place
ASU embraces its cultural, socioeconomic, and physical setting.

02. Transform Society
ASU catalyzes social change by being connected to social needs.

03. Value Entrepreneurship
ASU uses its knowledge and encourages innovation.

04. Conduct Use-Inspired Research
ASU research has purpose and impact.

05. Enable Student Success
ASU is committed to the success of each unique student.

06. Fuse Intellectual Disciplines
ASU creates knowledge by transcending academic disciplines.

07. Be Socially Embedded
ASU connects with communities through mutually beneficial partnerships.

08. Engage Globally
ASU engages with people and issues locally, nationally, and internationally.

The Design Aspirations were first proposed in the inaugural policy paper, "A New American University: The New Gold Standard" (November 2002).

By targeting both direct and indirect causes of carbon emissions, we confidently establish emission reduction goals within the contexts of:

- **Energy**
  Energy use is the primary source of ASU's GHG emissions, accounting for 75 percent of total emissions in the FY07 baseline. The major contributor to our total energy emissions profile is the emission of CO_2. This comes primarily from purchased electricity through sources such as Arizona Public Service Company (APS) and Salt River Project (SRP), which use fossil fuel, coal, nuclear, and natural gas as their main power generating sources. Becoming carbon neutral on this front is our greatest challenge. As a result, it constitutes the largest and most detailed portion of the plan. While addressing this considerable emission footprint is more complex and more costly than all other carbon neutral options considered, the results are also the most significant. Eventual elimination of the energy usage component of ASU's total emissions footprint is anticipated to result from changes to both the supply and demand sides of the energy usage equation.

  On the supply-side, a 65 percent reduction is anticipated from a combination of increased onsite energy generation and carefully negotiated purchase agreements from energy vendors. On the demand-side, a reduction of the remaining 35 percent is anticipated from a reduction in direct energy demand. ASU's generation of onsite energy from renewable sources together with partnerships and purchase strategies are projected to increase from 20 percent in the near term to 40 percent in the long term, resulting in even more savings. These benchmarks will be achieved through continuous evaluation of opportunities, technologies, and applications; social shifts such as telecommuting, alternative work schedules, online class offerings, and the promotion of on-campus living; financial considerations such as life-cycle costing; energy-use monitoring, and displays; solar installations and the development of high performance buildings through a combination of using the Leadership in Energy and Environmental Design (LEED) system and implementing additional design guidelines developed by ASU for all campus buildings.

- **Transportation**
  Transportation accounts for 20 percent of our total emissions in the FY07 baseline. As the second largest source of emissions, improvements in this area will generate substantial reductions. Improvements include, but are not limited to, reducing commuter emissions (the primary contributor) a minimum of 50 percent, business travel emissions (the secondary contributor) a minimum of two percent, and diesel emissions from university-owned vehicles 100 percent to reach our carbon neutrality goals in transportation by 2035. These benchmarks will be achieved chiefly through commuting alternatives such as the U-Pass and Zipcar; promotion of programs such as the Undergraduate Student Government's Bike Co-op; adoption of more efficient campus fleet vehicles; use of bio-diesel fuels, including those made from waste oil; and improved access to and increased use of video conferencing to reduce business travel. Throughout the process, ASU will engage its vendors and partners, encouraging them to adopt similar practices. Remaining carbon emissions, both direct and indirect, may be mitigated through verifiable carbon offsets once all other reduction strategies have been put in place.

- **Other Campus Practices**
  Four percent of the total FY07 baseline emissions inventory resulted from agriculture- and refrigerant-related emissions. More than 99 percent of these emissions are refrigerant-related emissions produced on the Tempe campus. The university

School of Sustainability Convocation

is implementing programs and policies to reduce or eliminate emissions from its agricultural and operational practices, as well as looking at other long-term options.

- **Recycling and Waste**
  One percent of the total FY07 baseline emissions inventory resulted from waste-related handling operations. ASU's waste-related strategies leverage both front-end sustainable practices and back-end waste management. This effort will eliminate 100 percent of the last one percent of emissions identified in the FY07 baseline inventory, which totals 2,485 MT CO_2e. Realizing this goal will require a multi-pronged approach involving education and awareness programs, recycling, reuse and repurposing, composting, purchasing, and policy decisions. In real time, this equates to a recycling container next to every trash receptacle on every campus, the reuse or recycling of 50 percent of all waste lab chemicals, and the diversion of half of all campus organic waste for composting and/or gasification.

- **Carbon Offsets**
  The use of verifiable carbon offsets will be necessary to reach net zero carbon emissions at an institution as large and diverse as ASU. However, its use for emissions reductions will be applied through long-term strategies and only as the final measure in meeting our carbon neutrality goals. A thorough and careful examination of financing options such as Renewable Energy Credits will be explored.

In designing this initial plan, we recognized that a university cannot limit its efforts to its campuses alone. Our endeavors must extend to the larger community in the form of education, policy support and development, and real-world strategies for local and state decision makers. The Education, Research, Community Outreach section explores ways to integrate the concepts of sustainability and carbon neutrality or climate-change-based learning and problem solving into all aspects of the university as well as the communities in which we are embedded. It also includes administrative and financing components needed to execute the plan, such as the executive-level review and direction that has helped shape these ever-evolving concepts at ASU and beyond.

ASU no.13 among nation's top 20 "coolest" schools

Sierra magazine's third annual list of America's greenest universities and colleges spotlights those making a true impact for the planet.

The plan is written with the understanding that the strategies proposed are best estimates about what is possible. As ASU and the Carbon Neutrality Action Plan evolve, and as new markets, technologies, and policies emerge, this plan will be revised to include the opportunities they present.

As with all sustainability practices, there is no simple approach, no single strategy that will lead to success. We understand that achieving carbon neutrality will require a continuous effort, but ASU has a strong lead. Recognized as one of the nation's greenest universities, we have made great strides in reducing our carbon footprint, leading by example with 22 Leadership in Energy and Environmental Design (LEED)-certified buildings, and establishing procedures and policies for sustainability practice. Furthermore, we are investing heavily in partnerships for solar projects across all four university campuses, with our ultimate goal being to take full advantage of our position in a sunshine-rich state and tap into key renewable energy resources to support all of the university's operations.

In support of the ACUPCC and the Western Governors' Association call for states to reduce GHG emissions to 2000 levels no later than 2020 and below 50 percent of these levels by 2040—signed by then Arizona Governor Janet Napolitano—ASU's Carbon Neutrality Action Plan will position our university as carbon neutral by 2025, with the exception of our transportation emissions, which will be carbon neutral by 2035. Beyond fulfilling these commitments, through our actions this plan is helping to rewrite the future of Arizona State University, the nation, and the world. Together with the hundreds of other ACUPCC signatories and our communities, we are creating a brighter future for all.

Students paint the "A" green in honor of sustainability.

“Responsibility to society is also good business. Our actions to address carbon neutrality must also be economically sound.”

— Ray Jensen,
Associate Vice President, University Business Services
and Chief University Sustainability Operations Officer

Pavement samples support research to develop materials that reduce the urban heat island effect.

baseline emissions inventory

where do we start?

ASU conducted its first carbon emissions inventory on its Tempe campus in 2006. The following year, the inventory was expanded to include all four campuses. This university-wide inventory has since been adopted as the "baseline" emissions inventory for ASU's Carbon Neutrality Action Plan.

Methodology

The reporting period for the baseline carbon emissions inventory follows ASU's fiscal year (FY), which runs from July to June. The fiscal year 2007 (FY07) inventory data includes:

Energy

- Energy production and use (including purchased and site-generated utilities).

Transportation

- Commuter transportation (including automobile, bus, and shuttle use).
- Vehicle fleet gasoline and diesel fuel usage.
- University business travel.

Solid Waste

- Municipal solid waste production and disposal.
- Recycling and composting.

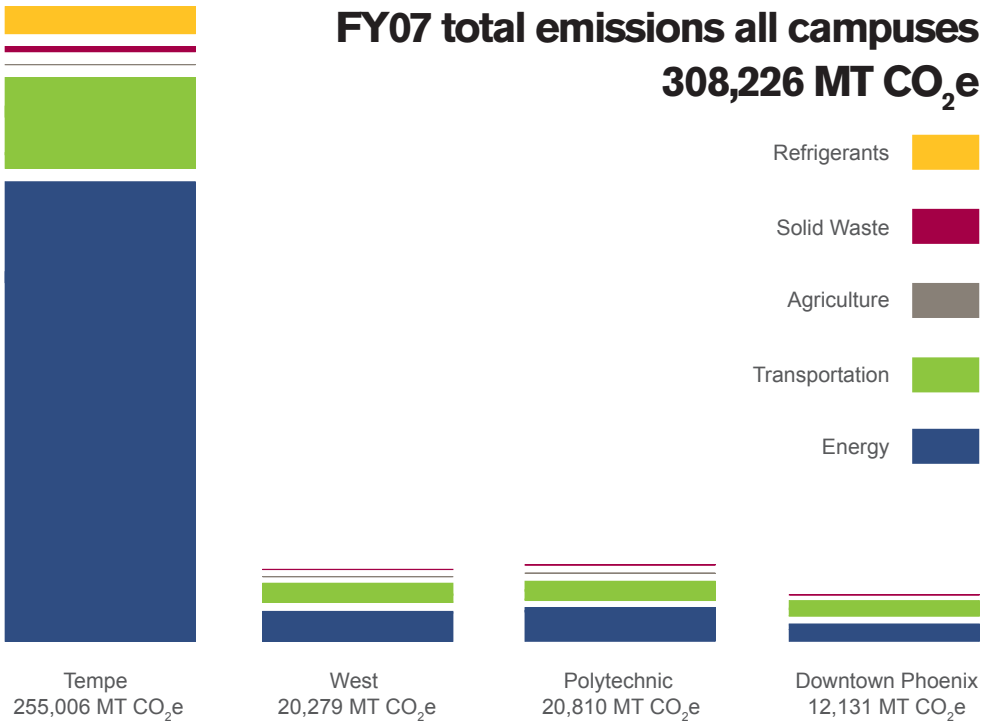
Agriculture

- Use of nitrogen-containing agricultural fertilizers.

Refrigerants

- Fugitive emissions of halogenated refrigerants.

Total GHG emissions, in metric ton carbon dioxide equivalent (MT CO_2e), were reported based on 100-year global warming potentials from the Intergovern-



mental Panel on Climate Change Third Assessment Report (TAR). Calculations were performed using the Clean Air-Cool Planet (CACP) Campus GHG Inventory spreadsheet.

Results

Total FY07 emissions for all four campuses were 308,226 tons MT CO_2e. The major contributor to the FY07 profile was the emission of CO_2 by fossil fuel combustion (primarily coal) to produce purchased electricity, placing energy as a primary focus—and one of the most complex elements—of the Carbon Neutrality Action Plan. Transportation and natural gas usage were also important contributors. Approximate distribution of total emissions was as follows: Tempe campus (83 percent), West campus (6 percent), Polytechnic campus (7 percent), and Downtown Phoenix campus (4 percent).

Each ASU campus showed a significant difference in emissions normalized to its student enrollment. The Tempe campus produced the largest total emissions per student, which may be due to its older building stock and higher concentration of research-intensive facilities.

Table 1: FY07 campus contribution to total GHG emissions

FY07 Campus	Total MT CO_2e	Fall Student Enrollment	MT CO_2e per Student
Tempe	255,006	51,234	5.0
West	20,279	8,211	2.5
Polytechnic	20,810	6,545	3.2
Downtown Phoenix	12,131	6,229	1.9

ASU Anticipates Fall Enrollment Record

In spite of the nation's economic crisis, Arizona State University continues to increase both student access and quality, according to projections released by the university. ASU enrollment will set another record, with overall numbers expected to exceed 68,000.

Last fall's enrollment was just more than 67,000. The 2009 enrollment represents a 25 percent increase in just seven years, from 55,000 in 2002. ASU has grown its enrollment over this time period in order to keep up with rapid growth in the number of eligible high school graduates in Arizona.

In Tempe, 70 percent of freshmen now live on campus, reflecting ASU's emphasis on living and learning communities that help students succeed academically and reach their goals.

"The reputation of ASU and the strength of our academic programs continues to increase, enabling us to enroll not only the top students in the state, but also a very strong representation of talented students from around the country," says Elizabeth D. Capaldi, ASU's Executive Vice President and Provost.

"Since most of our students remain in Arizona after graduation, this represents a tremendous gain for the state. Our goal is to make sure that no qualified Arizona student is denied access to a college degree. We want to increase the number of college-educated individuals who can meet the needs of Arizona's future."

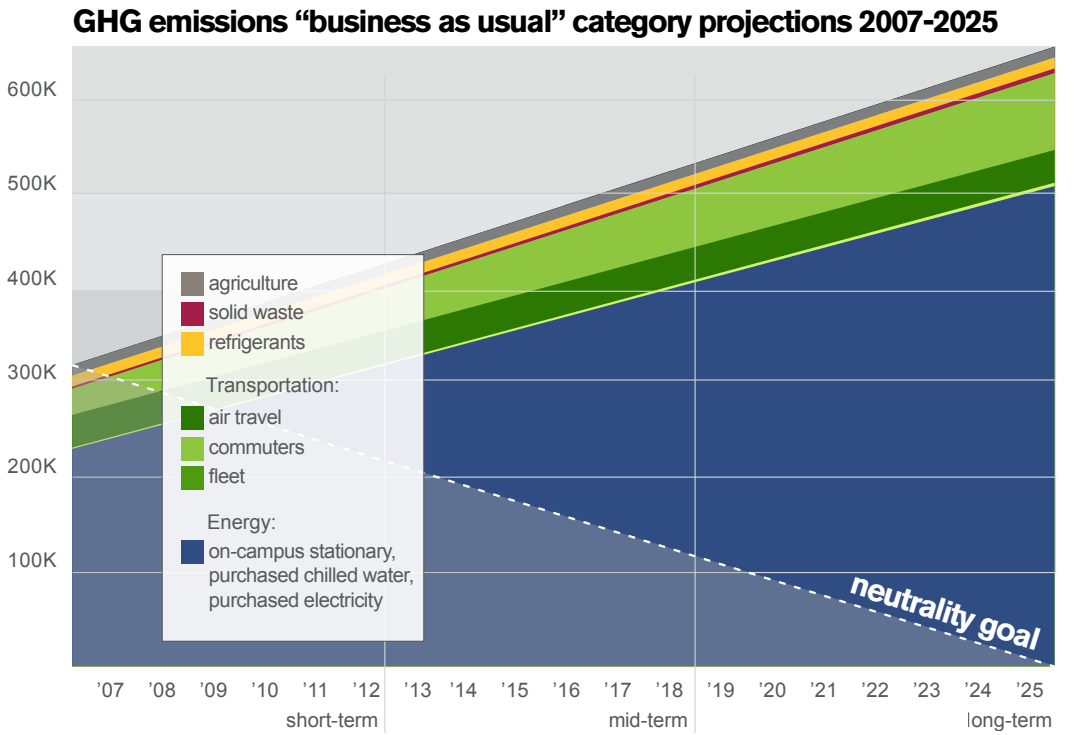
It should also be noted that due to data availability, areas of the inventory have varying degrees of accuracy. The level of accuracy has been estimated as follows: energy (90-95 percent), solid waste (80-85 percent), refrigerants and fertilizers (75-80 percent), transportation (65-70 percent). Understanding the overall emissions relationship and initiating logical first steps in reduction were deemed as the foremost priorities. Over subsequent years the emissions footprint is expected to fluctuate due to the availability of more accurate data. The inventory emissions results should stabilize with significant accuracy for the 2010 evaluation.

Future Projections—"Business as Usual"

To understand ASU's impact on the environment, it is imperative to first analyze the university's carbon emissions under the status quo. Basing projections on a "business as usual" scenario helps us visualize potential impacts into the future and allows us to track improvements from year to year. It must be noted that we recognize these projections are only an estimate of what could happen. As such, this approach is likely to change as more detailed and precise data becomes available.

The rate of growth in the university's gross square footage was considered a reasonable approximation of emissions growth since the majority of our FY07 baseline emissions were derived from electricity use. This use was determined to be primarily dependent upon the size of the institution. Therefore, in calculating future projections for "business as usual," we chose the annual gross square footage rate as a proxy for projecting emissions growth. Exceptions included emissions output related to commuter transportation and refrigerant emissions. Emissions estimates from commuter transportation were kept at a constant due to the university's plans to limit on-campus parking while promoting on-campus living. Emissions estimates from refrigerants were also held at a constant as they are solely a by-product of the number of chillers on campus, which is not expected to increase.

As a result of these calculations, ASU's total MT CO_2e for the next 18 years under the "business as usual" scenario is as follows:



These projections show if no actions are taken to reduce ASU's carbon emissions, our total MT CO_2e will increase roughly 34 percent by 2025. These increases would have major implications not only for ASU but the community at large. Aside from the inherent environmental threats one would expect from such a significant increase in GHG emissions, ASU and the community would incur additional financial and societal threats due to increased stressors on both resources and health care. Furthermore, if the goal is to reduce or eliminate the threat of climate change, any increase in emissions is unacceptable. For ASU, any increase in emissions greatly undermines our commitments to sustainability and the social compact we have with the wider community as well.

Summary of Tangible Actions

In response to the "business as usual" projections, ASU has implemented and achieved several of the ACUPCC short-term goals.

ACTION 01.

Establish a policy that all new campus construction be built to meet the U.S. Green Building Council's LEED Silver standard or equivalent.

Completed (2005)—Expanded with the adoption of new university design guidelines focused on achieving high performance buildings and high quality work, living, and learning space in our arid environment.

SunSET

SunSET—Sun (Devils) Surplus Exchange and Transfer—allows ASU departments to offer or request ASU-owned office or lab supplies, specialty furniture, and other general-use items online for interdepartmental exchange. This reduces waste-handling costs and complies with the university-wide zero waste initiative. The Web site is designed for those items that are too small to be sent to Surplus Property. After five months of planning, the site was rolled out for testing on July 1, 2009. SunSET's site is sponsored by Surplus Property and Purchasing with further support from the Global Institute of Sustainability.

ACTION 02.

Adopt an energy-efficient appliance purchasing policy requiring the purchase of ENERGY STAR certified products in all areas for which such ratings exist.

Completed (1999)—Expanded to a full green purchasing policy and vendor evaluation program.

ACTION 03.

Establish a policy of offsetting all GHG emissions generated by air travel paid for by our institution.

Underway—The "Environmental Impact Fee" will be in place university-wide by May 2010. Initially, funds will support carbon reduction projects on campus, with formal offsets purchased by the university in 2035.

ACTION 04.

Encourage use of and provide access to public transportation for all faculty members, staff, students, and visitors at our institution.

Completed (Ongoing)—Subsidized U-Pass program, ASU's support of Light Rail, Zipcar, and the ASU campus shuttle program.

ACTION 05.

Within one year of signing the commitment, begin purchasing or producing at least 15 percent of our institution's electricity consumption from renewable sources.

Underway—Campus solarization and exploring other forms of power generation.

ACTION 06.

Establish a policy or a committee that supports climate and sustainability shareholder proposals at companies where our institution's endowment is invested.

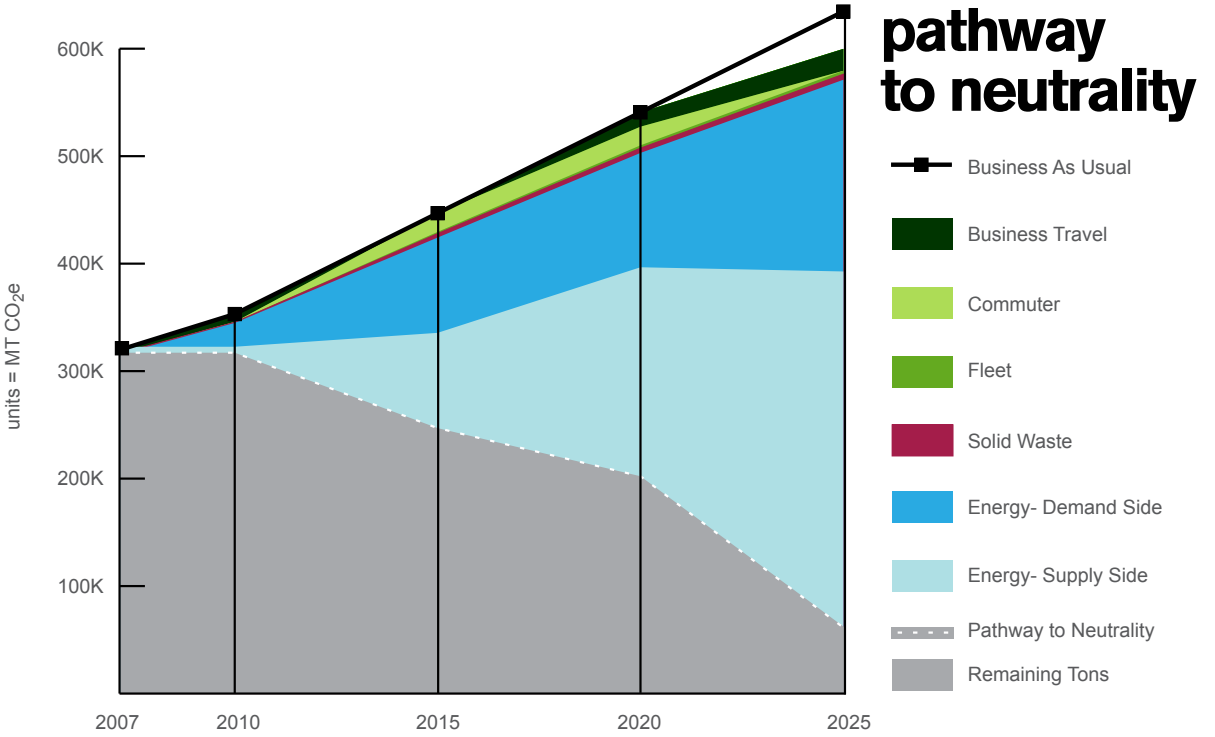
Exploration Phase—Responsibility is with the ASU Foundation. Small advances have been made.

ACTION 07.

Participate in the Waste Minimization component of the national RecycleMania competition, and adopt three or more associated measures to reduce waste.

Completed (Ongoing)—Campus harvest, green-waste composting, bookstore bag recycling and box reuse, the development of the SunSET office-supply trading Web site, waste reduction measures at surplus properties, and our green procurement guidelines are examples of ways ASU is meeting this action and moving toward a zero solid/water waste goal.

Going forward using the methods outlined by this Carbon Neutrality Action Plan, ASU will aim to be carbon neutral by 2025 for all areas except transportation (2035). Interim targets for goals and actions are based on near-term (up to five years out: 2007–2011), mid-term (six to 11 years out: 2012–2017), and long-term (12 to 19 years out: 2018–2025), as well as on a continual basis (2007–2025). The following graph shows the potential impacts of implementing the ASU Carbon Neutrality Action Plan.



“We continue to develop creative, cutting-edge programs that prepare students for meeting the needs of society and succeeding in a global economy. Crossing and expanding traditional academic boundaries not only provides us with new opportunities, it is essential to understanding the complexity of issues associated with sustainability.”

— Elizabeth D. “Betty” Capaldi,
University Provost and Executive Vice President

Students from many academic disciplines create technological solutions to aid in the process of converting algae to fuel.

mitigation strategies overview

how do we focus on solutions?

A Systems Approach

ASU's carbon mitigation strategies were developed using a multi-pronged systems approach that incorporated our existing philosophies on sustainability. This strategy embraced our present efforts as well as our commitment to imbed a university-wide understanding of sustainable practices. The strategy also identified the need for leaders in sustainability at every level of the university, among all four ASU campuses and across myriad issues. In addressing this need, this plan includes strategies to help us attain not only the goal of carbon neutrality, but the goals of zero solid- and water-waste, active engagement, and principled practice.

- Zero Waste—a two-pronged approach, including front-end sustainable practices and back-end management practices to achieve zero solid/water waste, will be used to meet the goal of eliminating waste as well as waste-related emissions.
- Active Engagement—with more than 81,000 potential change agents, ASU has the opportunity to engage the university community and use the campus as a living laboratory.
- Principled Practice—a commitment to demonstrate our sustainability value in the way we run the campus in areas such as cleaning buildings, purchasing products, choosing the food we serve, and creating a quality work, learning, and living environment.

Unlike a linear approach, which tends to create silos that restrict interactions and collaboration between stakeholders, ASU opts for a systems approach to sustainability. This encourages communication and engagement across departments and activities. For example, departments such as capital programs, maintenance, procurement, and university housing traditionally function independently of each other with separate budgets, accounts, leadership, policies, and decision-making structures. In reality, however, every aspect of the university in which we live, learn, and work is interconnected by a single system. A systems approach recognizes this and acknowledges no university entity can reach its full potential alone and takes steps to bridge people and departments. Furthermore, a systems approach enables all stakeholders—students, faculty members, staff, administration, etc.—to incorporate and build upon the strengths of every aspect of the institution. While this is not easy at an institution the size and complexity of ASU, it is essential.

This approach connects diverse entities from education, research, and planning to operations, construction, and public service, opening doors to innovation and collaboration and inspiring new ways of thinking about and addressing problems. Only through an integrated program will each stakeholder be able to recognize his or her integral role in achieving a carbon neutral campus and be encouraged to take ownership of this initiative. The strategies developed under this plan represent a collaborative response to the needs and challenges we face as we strive for carbon neutrality.

Green Purchasing

ASU's Green Purchasing Policy establishes guidelines for procuring environmentally preferred products and services in order to reduce the adverse environmental impacts of its purchasing decisions. To insure compliance with this policy, ASU's Purchasing and University Business Services requires all vendors wishing to do business with the university to complete an 11-point Green Profile Questionnaire. The questionnaire requests information regarding the requesting company's environmental policies, including those related to supply chain management, packaging, and transportation methods, as well as any citations for non-compliance with environmental or safety issues.

The policy specifically addresses the company's policies in nine key areas: energy, water, toxins and pollutions, bio-based products, forest conservation, recycling, packaging, green building, and landscaping. In addition, the policy requires that all companies, whether bidding, proposing, or contracting with ASU, use recycled paper and double-sided copying for every document. All packaging and packing materials have to meet at least one and preferably all of the following criteria:

- Made from recycled materials.
- Recyclable or reusable.
- Non-toxic or biodegradable.

The ASU Green Purchasing Policy is just one of the many ways the university is reducing its carbon footprint.

mitigation strategy 01: energy

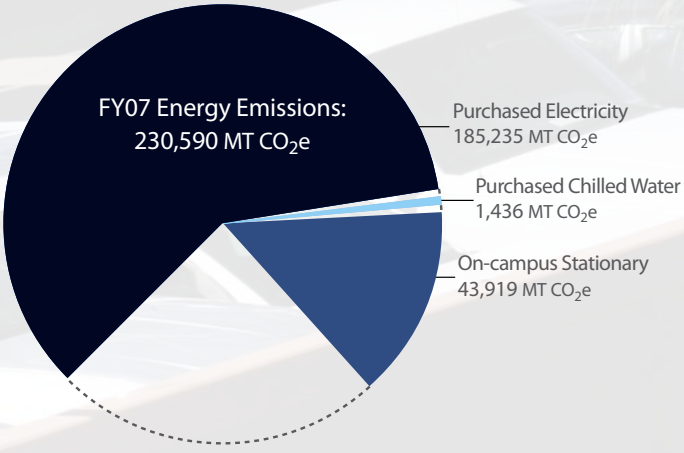
goal statement:

By 2025, ASU will mitigate 100 percent of carbon emissions related to energy, 35 percent of which will come from reductions through demand-side energy, and the remaining 65 percent through supply-side energy (including verifiable carbon offsets) savings.

Parking structure arrays generate energy for internal lights and provide shade for parked cars during the day.

Baseline Emissions

Energy use is the primary source of ASU's GHG emissions, making up 75 percent of total emissions in the FY07 baseline. The major contributor to the total energy emissions profile is the emission of CO_2 from purchased electricity. The breakdown of total energy emissions is as follows:



energy emissions

FY07 total: 230,590 MT CO_2e | **FY08 total:** 222,395 MT CO_2e

Purchased Chilled Water *(Downtown Phoenix campus only)* **FY07 | FY08**

1,436 | 1,469
Downtown Phoenix

On-campus Stationary **FY07 | FY08**

42,398 | 38,669
Tempe

72 | 101
Downtown Phoenix

828 | 770
Polytechnic

621 | 413
West

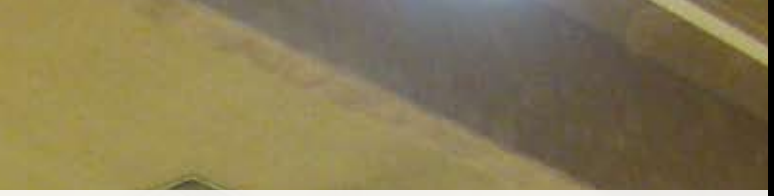
Purchased Electricity **FY07 | FY08**

155,375 | 149,753
Tempe

4,969 | 5,930
Downtown Phoenix

12,952 | 13,664
Polytechnic

11,939 | 11,626
West

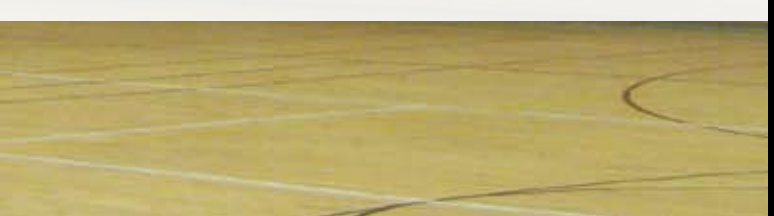


Purchased electricity on all four campuses is supplied by Arizona Public Service Company (APS) and Salt River Project (SRP) power plants. Both vendors use combinations of fossil fuel, coal, nuclear, and natural gas as their primary generation sources. Other sources of energy include natural gas, electricity, steam, and chilled water from on-campus stationary sources such as the Central Plant (CP) and from the Combined Heat and Power facility (CHP).

With more than 300 sunny days per year, Phoenix is a prime location for developing and using solar power.

Current Programs and Accomplishments

In accordance with our commitment to achieving carbon neutrality, the university has already implemented several initiatives for reducing energy-related emissions. Specifically, all new buildings at ASU must conform to the Leadership in Energy and Environmental Design (LEED) building concepts, with a minimum of Silver Certification as the goal. Currently, 22 buildings have achieved LEED certification with 11 additional buildings pending. Of those certified all but one has received a designation of Silver or better. Other building initiatives include significant energy-efficient investments such as: retrofitting buildings and parking structure fixtures with low-energy lamps; replacing electric motors (used for running air handlers, pumps, fans, etc. in buildings) with premium energy-efficient units; requiring all new heating, ventilating, and air conditioning units to be energy efficient as well as upgrading building HVAC controls with Direct Digital Control Systems and VAV retrofit; and installing occupancy sensors,



Energy Performance Contract

ASU is currently upgrading its utilities infrastructure to increase energy efficiency as a part of a performance contract with APS Energy Services. These upgrades will reduce energy consumption in the form of electricity and natural gas as well as chilled water used for cooling. The $70 million investment is being executed over two phases.

Phase one, which was implemented only on the Tempe campus and completed in 2007, included retrofitting lighting systems; replacing motors, chillers, and cooling towers; upgrading heating, ventilation, and cooling systems; insulating steam pipes; initiating a boiler blow down heat recovery system and campus buildings energy sub-metering. In addition, solar photovoltaic parking covers, direct digital control systems for new Central Plant equipment, and thermal energy storage controls were installed.

Annual savings in electricity consumption from these upgrades equate to roughly 53 million kWh with a 13 MW reduction in demand. Encompassing 80 buildings (6.5 million square feet of space), the environmental benefits resulting from these savings include annual emissions reductions of approximately 110,929,000 pounds of carbon dioxide; 2,014 pounds of volatile organic compounds (VOCs); 221,222 pounds of nitrogen oxide; 16,748 pounds of carbon monoxide; 153,700 pounds of sulfur dioxide, 12,243 pounds of PM10 particulates; and 689,954 milligrams of mercury every year.

Phase two, currently underway on all four campuses, involves additional energy efficiency upgrades and retrofits.

LEED Buildings

LEED CERTIFIED BUILDINGS:

1. **Biodesign Institute A**
   LEED Gold, Tempe
2. **Biodesign Institute B**
   LEED Platinum, Tempe
3. **Fulton Center***
   LEED Certified, Tempe
4. **Global Institute of Sustainability**
   LEED Silver, Tempe
5. **Interdisciplinary Science and Technology Building I (ISTB I)**
   LEED Gold, Tempe
6. **Interdisciplinary Science and Technology Building II (ISTB II)**
   LEED Silver, Tempe
7. **Interdisciplinary Science and Technology Building III (ISTB III)**
   LEED Gold, Polytechnic
8. **Polytechnic Academic Complex**
   LEED Gold, Polytechnic
9. **Memorial Union Restoration**
   LEED Gold, Tempe
10. **Cronkite / Eight Building**
    LEED Silver, Downtown Phoenix
11. **Hassayampa Academic Village**
    LEED Silver, Tempe

PENDING LEED CERTIFIED BUILDINGS:

12. **Nursing and Health Innovation - Phase II***
    LEED Silver Anticipated, Downtown Phoenix
13. **Barrett Honors College**
    LEED Silver Anticipated, Tempe
14. **ASU Police Department Facility**
    LEED Silver Anticipated, Tempe
15. **Weatherup Center (Indoor Basketball Facility)**
    LEED Gold Anticipated, Tempe

*Public Private Partnership, Not owned by ASU

among others. Aside from adopting building efficiencies, the university is also committed to testing and developing new energy saving products for large-scale implementation.

ASU is leveraging its position within the solar belt to capture energy-related emissions reductions as well. The university's first installation of solar photovoltaics (PV) was completed in 2004. The system produces approximately 30 kW of electrical energy and shades 44 parking spaces. Since then, the university has completed a total of 2,040 kW or 2.04 MW. A total of 10 MW will be in place on two campuses by the end of 2010 as part of our campus solarization efforts. It should be noted that while solar energy is a critical piece to ASU's energy puzzle, due to the state of Arizona's rebate program and the federal utility reporting structure, ASU (as a state institution) cannot include the carbon reductions attributed to its solar generation directly toward carbon reductions in the short term. It is not expected that this will be a problem in the long term.

"We want high performance buildings that provide great places for people to do their best work."

— Dave Brixen,
Associate Vice President, University Services

Strategies and Proposed Actions

Given the magnitude of the campus's energy related emissions, an aggressive two-pronged approach is being used to fulfill the goal of 100 percent carbon neutrality by 2025. Specifically, 35 percent of future reductions will come from demand-side energy whereas 65 percent will come from supply-side energy. Following are strategies and proposed actions for reductions in both demand- and supply-side energy.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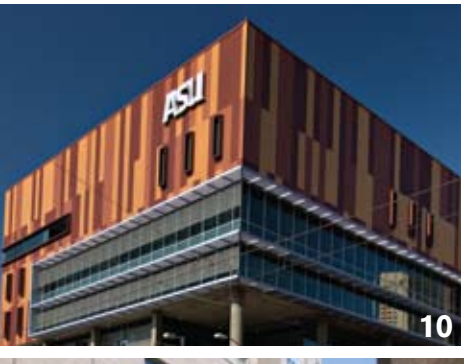

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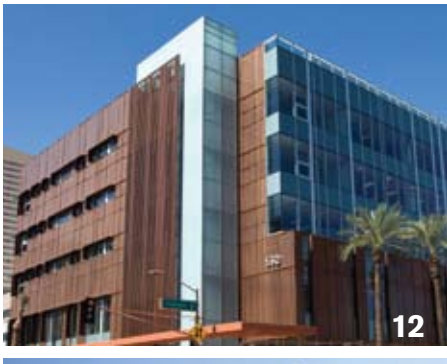
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Demand-Side Energy

D1: ASU will stress conservation and behavior change initiatives to reduce consumption by 10 percent across all four campuses. A combination of the following proposed actions will be used to achieve this objective.

POLICY/PROCEDURE/PURCHASING

ONGOING

Where applicable, allow employees to telecommute and/or adopt alternative work schedules.

NEAR-TERM (2007-2012)

Change building funding policies and processes at state level to adopt life-cycle costing and more stringent design standards.

Consolidate office equipment technology.

MID-TERM (2013-2018)

Require building users to share energy costs and savings.

EDUCATION/AWARENESS

ONGOING

Apply integrated conservation programs using education and awareness to include office and classroom equipment power down and lights out.

NEAR-TERM (2007-2012)

Connect class and research projects to support energy conservation projects on campus.

NEAR TO MID-TERM

Expand Campus Metabolism to all buildings on all campuses to provide real-time and historical energy and other resource use data.

PLANNING & BUILDING DESIGN

NEAR-TERM (2007-2012)

Consolidate summer/holiday building use (classroom, conference space, and residence halls) into fewer buildings. Implement energy surcharge for off-hour usage.

LONG-TERM (2019-2025)

Expand ASU Online education/courses. Focus on allowing more students to attend with fewer facilities.

ALL

ONGOING

Continuously evaluate the latest opportunities, technologies, and applications, and how they might connect into a systemic approach to energy conservation.

Temperature controlled duct work provides the necessary conditioned air for a safe lab environment.

D2: ASU will implement energy-efficiency initiatives to reduce consumption by 15 percent on the Tempe and West campuses, and 30 percent on the Polytechnic and Downtown Phoenix campuses. The university will use a combination of the following proposed actions to achieve these objectives.

POLICY/PROCEDURE/PURCHASING

ONGOING

Prohibit the purchase of new, non-energy efficient systems (appliances/controls) and replace existing non-energy efficient systems.

NEAR-TERM (2007-2012)

Enforce vending machine efficiency, criteria, and location.

Change building funding policies and processes at state level to adopt life-cycle costing and more stringent design standards.

MID-TERM (2013-2018)

Sub-meter food service areas.

EDUCATION/AWARENESS

NEAR-TERM (2007-2012)

Connect class and research projects to support energy efficiency projects on campus.

PLANNING & BUILDING DESIGN

ONGOING

Design buildings to higher level of energy efficiency. Scrutinize Value Engineering recommendations.

Encourage efficient building/space appropriation and use (controls, design, technology).

NEAR TO MID-TERM

Eliminate server rooms. Construct or outsource the development of a single data center.

MID TO LONG-TERM

Upgrade insulation and building envelope. Embrace and embody green building practices (passive solar, thermal mass, low-e glazing).

ALL

ONGOING

Continuously evaluate the latest opportunities, technologies, and applications, and how they might connect into a systems approach to energy efficiency.

SYSTEMS/INFRASTRUCTURE

ONGOING

Maintain ongoing commissioning of building systems.

Replace inefficient HVAC equipment.

NEAR-TERM (2007-2012)

Meter all buildings on all campuses. Expand Energy Information System and Campus Metabolism.

NEAR TO MID-TERM

Complete lighting retrofits.

MID TO LONG-TERM

Develop Power Correction Plan, addressing facilities design and power factor issues. Synch systems.

Supply-Side Energy

S1: Generate ASU's energy onsite from renewable sources—20 percent near-term, 30 percent mid-term and 40 percent long-term.

ALL

ONGOING

Continuously evaluate the latest opportunities, technologies, and applications, and how they might connect into a systemic approach to on-campus energy generation.

EDUCATION/AWARENESS

NEAR-TERM (2007-2012)

Add generators to Student Recreation Complex workout equipment.

SYSTEMS/INFRASTRUCTURE-SOLAR

ONGOING

Expand solar installations to all available parking lots, and new and existing buildings.

NEAR TO MID-TERM

Expand solar installations to all available parking lots, and new and existing buildings.

Cover Sun Devil Stadium, Student Recreation Complex and Mona Plumber Pools with solar roofs.

MID-TERM (2013-2018)

Develop large scale solar domestic water–heating.

SYSTEMS/INFRASTRUCTURE-NON-SOLAR

MID TO LONG-TERM

Investigate using Synthetic Gas (from a waste water treatment facility or Biomass Gasification Facility) as possible Natural Gas substitute for on-campus co-generation plants.

Investigate geothermal heat pump technology for the Tempe and West campuses, and geothermal-based hot water district at the Polytechnic campus.

S2: Obtain a total of 40 percent of ASU's offsite energy from renewable sources through partnerships and purchase strategies. This includes eliminating about 20 percent of the carbon emissions through Green Power Partnership with APS and SRP and through either REC or Carbon offset purchases (Long-term, 10-15 years).

ALL

ONGOING

Continuously evaluate the latest opportunities, technologies, and applications, and how they might connect into a systemic approach to on-campus energy generation.

POLICY/PROCEDURE/PURCHASING

ONGOING

Monitor usage and purchased energy rate structure for best rate.

LONG-TERM (2019-2025)

Purchase green power.

SYSTEMS/INFRASTRUCTURE-SOLAR, GEO

NEAR TO MID-TERM

Investigate off-site renewable energy generation partnerships (State Trust Land).

Solar installation at Tempe campus parking structure.

mitigation strategy 02: transportation

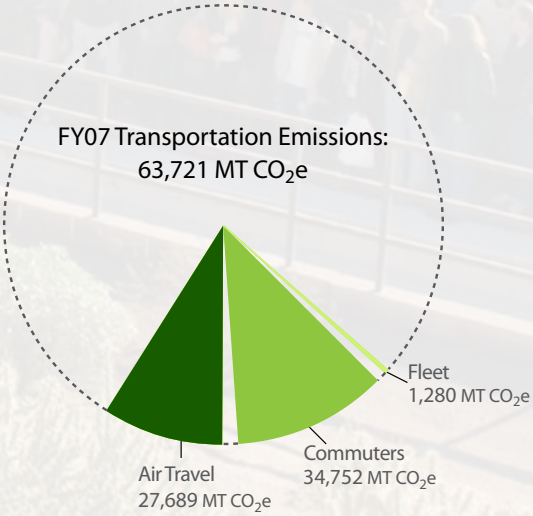
goal statement:

By 2035, ASU will mitigate carbon emissions from transportation by 100 percent.

Tempe Transit Center – light rail station

Baseline Emissions

Carbon emissions from transportation represent the university's second highest source of emissions, making up 20 percent of the FY07 baseline total. Of this, commuter and air travel represent the two largest contributors. The breakdown of total transportation emissions is as follows:



transportation emissions

FY07 total: 63,721 MT CO_2e | FY08 total: 73,033 MT CO_2e

Commuters

FY07 | FY08

26,134 | 25,124	2,756 | 2,625	2,547 | 3,115	3,315 | 3,317
Tempe	Downtown Phoenix	Polytechnic	West

Air Travel

FY07 | FY08

16,614 | 17,436	2,769 | 2,906	4,154 | 4,359	4,153 | 4,359
Tempe	Downtown Phoenix	Polytechnic	West

Fleet

FY07 | FY08

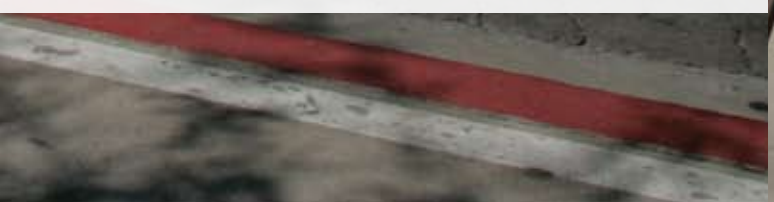
855 | 933	114 | 124	171 | 187	140 | 148
Tempe	Downtown Phoenix	Polytechnic	West

Commuter travel emissions are emissions produced by the daily commute of our students, faculty, and staff. ASU's large student population results in a substantial 55 percent of the total commuter-related transportation emissions. Air travel is another large component of ASU's FY07 transportation emissions; much of this travel was related to research. Fleet emissions, which represent the smallest component of total transportation emissions at two percent, refer to ASU's department-owned vehicles. The Tempe campus is the largest contributor to transportation emissions, as it has the majority of the university's student population and research facilities.

Despite substantial investments and programs supporting student housing, ASU as a whole is still largely a commuter campus. To achieve the greatest reduction in transportation emissions, the Carbon Neutrality Action Plan will address several key factors.

Current Programs and Accomplishments

To date, ASU has made great strides in curbing emissions output from transportation. Leading the charge, Parking and Transit Services' commuter options program provides a number of sustainable transit options for the ASU community, many of which are free or subsidized for users. Notable programs include the U-Pass, which provides discounted bus and light rail passes to students and the faculty; and our partnership with the car-sharing company Zipcar, which encourages the use of public transportation for daily commutes to campus. In addition, the Undergraduate Student Government's Bike Co-op, a community bike program on the Tempe and Polytechnic campuses, allows students, faculty members, and staff to check out bicycles for up to 10 days at no charge. The Co-op also provides low- or no-cost repairs and reduced cost helmets and locks. This program has increased bicycle use for travel to, from, and around campus.



Bike Co-op

Biking represents a sustainable alternative to personal vehicle use and a practical and environmentally friendly transportation option in the ASU community. To encourage students, the faculty, and staff to bike to campus instead of driving, the Bike Co-op provides reduced-cost tools, parts (both new and used), and bicycle repair assistance. The Bike Co-op also houses the USG Community Bikes program, an initiative that allows ASU students, faculty members, and staff to check out one of 15 bicycles for up to 10 days for no charge.

Zipcar

ASU has partnered with Zipcar to provide the university community with a sustainable alternative to personal automobile use. Zipcar is a car-sharing service that allows its members to rent a low-emission, fuel-efficient vehicle for an hourly fee. This rate includes the costs of gas, maintenance, insurance, 24-hour emergency assistance, and campus parking. With convenient locations and hybrid car options, Zipcar represents one of the many ways that ASU is encouraging students, the faculty, and staff to adopt more environmentally healthy transportation habits. In just one year, the Zipcar program reduced ASU's carbon emissions by 28.79 metric tons.

Strategies and Proposed Actions

While ASU has adopted several initiatives to date, there are other areas which offer room for improvement. These include the transition to more efficient fleet vehicles that use alternative fuels and reducing emissions from commuting and business travel.

"The university's transportation programs require that we manage competing values in a large organization. We have to provide efficient access to our campuses, while managing cost and the overall impact on our local community."

— Ray Jensen,
Associate Vice President of University Business Services
and University Sustainability Operations Officer

Commuter

Commuter-related emissions represent the primary contributor to transportation emissions in the FY07 baseline. This is a critical component of the transportation emissions reduction strategy. The university will be more vigilant in providing sustainable commuting alternatives to the ASU community while reducing the need for commuter travel. Specifically, we will reduce total commuter emissions by 50 percent through alternative transportation.

POLICY/PROCEDURE/PURCHASING

ONGOING

Reduce total commuter emissions by 50 percent through alternative transportation (expanded U-Pass usage, bicycle options, and Zipcar membership).

Identify and support telecommuting/ virtual classroom options for students, staff, and faculty members.

NEAR-TERM (2007-2012)

Implement incentive program for carpoolers and owners of hybrid, high efficiency, or alternative fuel vehicles. Discounted parking permits and special parking privileges will be considered.

Create infrastructure to support hybrid and alternative fuel vehicles, such as charging posts and alternative fuel pumps.

MID-TERM (2013-2018)

Implement a ban on campus parking for freshman students who reside on campus.

EDUCATION/AWARENESS

ONGOING

Reduce total commuter emissions by educating students, staff, and faculty members on alternative transportation options.

MID-TERM (2013-2018)

Craft marketing modules to educate staff and faculty memberson how commuting to campus contributes to carbon emissions.

PLANNING AND BUILDING DESIGN

ONGOING

Transition from commuter campus to on-campus living options.

SYSTEMS/INFRASTRUCTURE

ONGOING

Transition from commuter campus to on-campus living options.

NEAR-TERM (2007-2012)

Create infrastructure to support hybrid and alternative fuel vehicles, such as charging posts and alternative fuel pumps.

Fleet

The university will reduce fleet-related emissions by using more efficient campus vehicles. A combination of the proposed actions will address issues in the near and long term.

POLICY/PROCEDURE/PURCHASING

ONGOING

Replace all university–owned vehicles with alternative fuel vehicles.

NEAR-TERM (2007-2012)

Expand staff bicycle usage.

Reduce diesel emissions from university–owned vehicles by 100 percent through waste oil sourced bio-diesel.

SYSTEMS/INFRASTRUCTURE

ONGOING

Replace all university–owned vehicles with alternative fuel vehicles.

Air/Business Travel

Air travel emissions are another major component of overall transportation emissions and an area in need of much improvement. The proposed actions will address this area.

POLICY/PROCEDURE/PURCHASING

ONGOING

Encourage alternative transportation and/or reduced/no emission vehicles for ground transportation.

Reduce environmental impacts for university–affiliated travel through fees, with monies going toward supporting carbon reduction projects on campus (optional years 1 to 2; mandatory going forward).

SYSTEMS/INFRASTRUCTURE

NEAR-TERM (2007-2012)

Improve access and availability of video conferencing capabilities to reduce business travel emissions by 2 percent.

Other Transportation Strategies

In addition to the above mentioned strategies, ASU will engage its vendors and partners in adopting carbon neutral alternatives. Furthermore, and as a last resort, the university will offset remaining carbon emissions through verifiable carbon offsets.

POLICY/PROCEDURE/PURCHASING

NEAR-TERM (2007-2012)

Transition all shuttle vendor contracts to alternative fuels or electric vehicles

LONG-TERM (2019-2025)

Offset all carbon emissions related to university–funded travel and commuter travel through verifiable carbon offsets.

ASU U-Pass

Since 2005, ASU Parking and Transit Services (PTS) has offered students, the faculty, and staff an ASU U-Pass. The U-Pass provides unlimited public transportation to and from all four ASU campuses and throughout greater Phoenix via the Valley Metro bus and METRO Light Rail systems. PTS subsidizes student passes, requiring them to pay only $40 per semester or $80 for the academic year. This saves students between $310 and $440 annually over the discounted rate offered to the faculty and staff.

In spring 2007, the university distributed 14,000 U-Passes, eliminating as much as 176 tons of pollution and saving more than $1 million in fuel costs for the year. From June 2008 to July 2009, the U-Pass reduced ASU's carbon emissions by 1,517 tons.

mitigation strategy 03: other campus practices

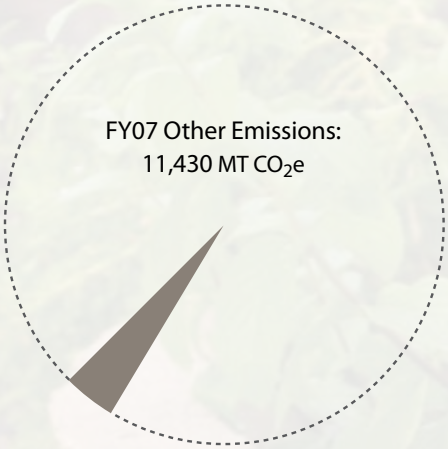
goal statement:

By 2025, ASU will reduce all emissions related to agriculture and refrigerants by 100 percent.

Baseline Emissions

Agriculture- and refrigerant-related emissions make up four percent of total emissions in the FY07 inventory. Of these emissions, more than 99 percent are refrigerant-related emissions produced on the Tempe campus.

This plan addresses both agriculture- and refrigerant-related emissions in order to eliminate these emissions generators.



Strategies and Proposed Actions

The university will implement programs and policies to reduce or eliminate emissions from agricultural practices and industrial chemical releases. The following are specific proposed actions:

POLICY/PROCEDURE/PURCHASING

NEAR-TERM (2007-2012)

Expand use of organic fertilizer obtained from closed-loop recycling of campus green waste.

NEAR TO MID-TERM

Retrofit chillers to reduce coolant loss.

Replace coolants with low/no emission impact or monitor and repair all leaks.

LONG-TERM (2019-2025)

Offset all carbon emissions related to miscellaneous campus practices through verifiable carbon offsets.

SYSTEMS/INFRASTRUCTURE

NEAR TO MID-TERM

Replace coolants with low/no emission impact or monitor and repair all leaks.

Green Waste Disposal—Composting

Since 2007, ASU has partnered with Singh Farms to compost a portion of the organic waste produced on campus. Between July and August of 2007, ASU composted more than 23,000 pounds of organic waste, generating 15,000 pounds of compost that was returned to ASU to use as fertilizer for the university grounds and Arboretum. The composting program now diverts an average of 12 tons of material per month, reducing ASU's emissions of CO_2 by 198 tons. ASU has converted close to a half-million pounds of plant clippings to compost since the start of the program.

mitigation strategy 04: recycling and waste

goal statement:

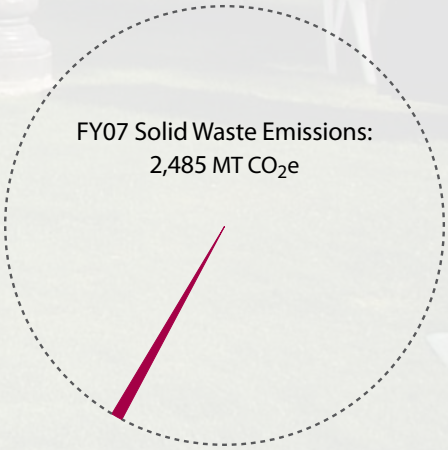
By 2025, ASU will reduce carbon emissions from waste-related sources by 100 percent.

2008 homecoming block party

Baseline Emissions

Waste-related emissions contributed one percent of ASU's total carbon emissions in the baseline year, making it the smallest source of emissions in FY07. Regardless, 2,485 MT CO_2e of emissions cannot be overlooked.

Based on a campus-by-campus evaluation, an overwhelming majority of waste-related emissions comes from activities on the Tempe campus.



solid waste emissions

FY07 total: 2,485 MT CO_2e | FY08 total: 1,752 MT CO_2e

Solid Waste **FY07 | FY08**

2,204 | 1,457	15 | 17	157 | 157	109 | 120
Tempe	Downtown Phoenix	Polytechnic	West

Current Programs and Accomplishments

Several initiatives have already been implemented to address waste-related emissions. Specifically, there has been a large effort on the part of both the university and the students to re-energize ASU's recycling program. A university-wide recycling mandate included evaluations of recycling practices on each campus. As a result, recycling task forces have been set up to revamp or develop recycling programs on the Tempe, Polytechnic and Downtown Phoenix campuses.

In addition to re-purposing waste products through recycling, the university has reinstated the green waste composting program. This program is diverting an average 12 tons of waste from the landfill each month.

Strategies and Proposed Actions

A two-pronged approach will be used to reduce waste-related emissions. First, we will undertake major efforts to reduce waste output overall by leveraging front-end sustainable practices relating to purchasing, policy decisions, and services. Second, we will reduce back-end waste through diversion, recycling, reuse, composting, and digestive energy production. Proposed actions are as follows.

POLICY/PROCEDURE/PURCHASING

NEAR-TERM (2007-2012)

Avert 20 percent waste footprint through procurement practices and front–end avoidance tactics.

Divert 50 percent of "dry" waste footprint through recycling, reuse, and re–purpose programs.

NEAR TO MID-TERM

Divert all organic waste (50 percent footprint landscaping and food) for composting and/or gasification.

LONG-TERM (2019-2025)

Offset all carbon emissions related to solid waste (trash, chemical waste, etc.) through verifiable carbon offsets.

SYSTEMS/INFRASTRUCTURE

NEAR-TERM (2007-2012)

Place a recycling container next to every trash container on all campuses.

Divert 50 percent of "dry" waste footprint through recycling, reuse, and repurpose programs.

NEAR TO MID-TERM

Divert all organic waste (50 percent footprint landscaping and food) for composting and/or gasification.

EDUCATION/AWARENESS

ONGOING

Expand integrated education and awareness program. This includes:

- Conduct routine interactive presentations with staff and faculty members to increase awareness of waste reduction techniques and resources.
- Develop a departmental waste audit process to identify problem areas and work to fix them.
- Provide campus residents with reasonable alternatives to disposable items via campus markets and stores.

NEAR-TERM (2007-2012)

Connect class and research projects to support waste reduction on campus.

Paint Services Reclaimed Paint Program

Since January of 2008, ASU Paint Services has been recycling surplus water-based paint as part of the Reclaimed Paint Program. The paint shop receives surplus paint from a variety of sources, including campus departments and outside contractors. The recycled paint is used for a variety of work, including covering graffiti; painting restrooms, handrails, exterior doors; and as a primer for new construction and accent walls. To date, more than 315 gallons of recycled paint have been used for various projects.

carbon offsets

ASU recognizes that in order to reach net zero carbon emissions, carbon offsets must play a role at some point in the future. However, current carbon offset options and renewable energy credits are being considered only as part of our long-term strategy. Our philosophy is that carbon neutrality must be achieved primarily by mitigating, minimizing, and eliminating the sources of emissions. Accordingly, all available funds are being directed toward actual infrastructure upgrades and programs that support practicable, short- and long-term reduction strategies. It is important to note that the carbon offset market is currently unregulated, lacking market-wide standards, therefore making it risky and unpredictable. Because of this unpredictability and the fact that the majority of carbon brokers support programs and projects outside of the state of Arizona, we as a state agency feel it is important to support the development of Arizona's economy first and promote the use of carbon offsets as a later option.

To achieve this, we have begun exploring a variety of university-based, carbon offset-type activities. Among these are funding mechanisms designed to support on-campus (and eventually regional) projects that not only reduce the environmental impact of our campuses but also support the local economy, and the purchase of green power from our utilities. The final step in our Carbon Neutrality Action Plan will be the eventual purchase of verifiable offsets from an appropriate brokerage if needed.

“The primary driver of our strategy is sound practical investments in creating higher quality and more efficient campuses.”

— Bonny Bentzin,
Director of University Sustainability Practices, Global Institute of Sustainability

Students in front of the Memorial Union after it was renovated in 2008.

“Students have been a catalyst on college campuses across the country to take bold steps toward sustainability and carbon neutrality. ASU students are embracing this challenge.”

— Jim Rund,
Senior Vice President for University Student Initiatives

Student volunteers participating in National Tree Day.

education, research, community outreach

how do we share what we learn?

Carbon neutrality is a long-term goal that encompasses far more than the physical sources of carbon emissions. Becoming carbon neutral requires a paradigm shift in the way we think about and approach sustainability issues. To that end, education, research, and community outreach are extremely important components in achieving this goal.

Education

Based on the principles of the New American University, ASU seeks to provide educational opportunities that promote solutions to real world problems. Our goal is to leverage the university's role as innovator, educator, and facilitator of knowledge exchange to engage the ASU community as well as the local community in supporting widespread reductions in GHG emissions.

One course survey indicates there are more than 222 courses that specifically address climate or sustainability in schools, colleges, and departments across all four campuses with the following breakdown:

- Nine climate courses
- Six climate-related courses
- 97 sustainability courses
- 110 sustainability-related courses
- Six capstone/experiential learning courses
- 122 undergraduate courses
- 100 graduate courses

While this number may be relatively accurate, it is by no means exhaustive. Many courses address these issues as part of their curriculum, but may not be represented here. These statistics do, however, represent the university's commitment to providing sustainability education to all students as well as highlight the diverse array of offerings.

"Sustainability has captured ASU by storm, and we expect its graduates to transform our country."

— Charles Redman,
Director of ASU's School of Sustainability

It is also difficult to identify all school, college, and department activities that deal with these issues. However, general estimates are:

- Five schools/colleges/departments offer climate courses
- Four schools/colleges/departments offer climate-related courses
- 20 schools/colleges/departments offer sustainability courses
- 35 schools/colleges/departments offer sustainability-related courses
- 14 schools/colleges/departments offer four or more direct or related courses

These include, but are not limited to:

- American English and Culture Program
- Applied Biological Sciences
- Applied Mathematics for the Life and Social Sciences
- Barrett, The Honors College
- Center for Biology and Society
- Civil, Environmental and Sustainable Engineering
- Chemical Engineering
- Chemistry and Biochemistry
- College of Public Programs
- Del E. Webb School of Construction
- Engineering Technology
- Environmental Design and Planning
- Environmental Life Science
- Environmental Social Science
- Environmental Technology Management
- Housing and Community Development
- Integrated Studies
- Ira A. Fulton Schools of Engineering
- Justice and Social Inquiry
- Sandra Day O'Connor College of Law
- School of Architecture and Landscape Architecture
- School of Community Resources and Development
- School of Earth and Space Exploration
- School of Geographical Sciences and Urban Planning
- School of Government, Politics, and Global Studies
- School of Historical, Philosophical and Religious Studies
- School of Human Evolution and Social Change
- School of Letters and Sciences
- School of Life Sciences
- School of Public Affairs
- School of Social Transformation
- School of Social and Family Dynamics
- School of Sustainability
- Science, Technology, and Society
- Social and Behavioral Sciences, New College
- College of Technology and Innovation
- Tourism Development and Management

The largest numbers of climate and sustainability courses are offered through the School of Sustainability, the School of Architecture and Landscape Architecture, the College of Technology and Innovation, the College of Liberal Arts and Sciences, and the Ira A. Fulton Schools of Engineering. In addition, the

W. P. Carey School of Business has partnered with the School of Sustainability to offer students an innovative new degree: the B.A. in Business with a concentration in sustainability. Requirements for this degree include the completion of core courses required of all W. P. Carey School of Business majors, plus 18 hours of rigorous course study within the sustainability concentration. The degree program trains future leaders in developing practical solutions to some of the most pressing environmental, economic, and social challenges of sustainability, especially as they relate to urban areas.

School of Sustainability

Established in 2007, ASU's School of Sustainability is the first of its kind in the U.S. The primary objectives of the school are (1) to provide graduate and undergraduate degree programs for a small number of outstanding students while working with a wide variety of other schools, colleges, and departments across ASU and (2) to offer a meaningful education in sustainability to the larger student body.

The school currently offers two undergraduate and three graduate degree programs. These programs are flexible, interdisciplinary, and problem-oriented, and address sustainability challenges in such areas as energy and materials, water, ecosystems, urbanization, international development, social transformations, climate change, and food systems. Undergraduate programs take a comparative approach to introduce students to the problems of sustainability; graduate programs train students for academic, research, and professional roles.

The undergraduate program offers a B.A. and a B.S. in sustainability. These programs were launched in the fall of 2008 with a combined student population of 181. They have seen a steady growth in enrollment since that time with 553 students for fall 2009.

The graduate program was established in the fall of 2007. Students in this program have the option of pursing an M.A., M.S., and/or a Ph.D. in sustainability. The first master's student graduated in December 2008.

Brigitte Bavousett is congratulated for earning the first-ever master's degree from ASU's School of Sustainability.

Other Programs

In addition to sustainability courses available to candidates in the School of Sustainability, the university is committed to incorporating sustainability education across the curriculum. For example, many freshmen are required to take ASU 101. This course features sustainability as one of five core topics. By introducing sustainability concepts early in the college experience, we hope to increase awareness of pressing issues such as climate change while institutionalizing sustainable practices. We also seek to connect the ASU community into campus solutions through internships and coursework focused specifically on campus sustainability. As of spring 2008, 12 courses have integrated campus sustainability-related projects into their coursework in partnership with the University Sustainability Practices Office.

Students will also be able to pursue specific sustainability-related minors and certificates in the near future, such as the minor and concentration in energy conservation engineering and design that are currently being developed. These offerings are being made possible by funding from the Wege Foundation and in collaboration with Professional Supply, Inc. (an Ohio-based engineering firm headed by Thomas Kiser). Both graduate and undergraduate offerings will be available to ASU students in the fall of 2010 through a collaborative effort among the Ira A. Fulton Schools of Engineering, the School of Sustainability, the W. P. Carey School of Business, and the Herberger Institute for Design and the Arts. The intent of this project is for ASU to be a testing ground for the new curriculum; once proven, it will be "exported" to other universities, with a "teaching the teachers" activity centered at ASU.

Graduate students and working professionals also have the option to earn a Certificate in Sustainable Technology and Management (a joint certificate among the School of Sustainability, Fulton Schools of Engineering, and W. P. Carey School of Business). The following chart details a few of the other sustainability-related degrees offered to our students.

School/Department	Degree Offered
School of Geographical Sciences and Urban Planning—*Climate Science Program*	Bachelor of Science Bachelor of Arts Bachelor of Arts in Education Master of Art Doctor of Philosophy Interdisciplinary Graduate Certificate in Atmospheric Sciences
School of Earth and Space Exploration—*Remote Sensing*	Bachelor of Science in Earth and Space Exploration Bachelor of Science in Geological Sciences Bachelor of Arts in Education in Earth and Space Education Bachelor of Science in Engineering in Aerospace Engineering Master of Science in Geological Sciences Master of Science in Astrophysics Doctor of Philosophy in Geological Sciences Doctor of Philosophy in Astrophysics
Department of Chemistry and Biochemistry—*Atmospheric Chemistry and Aerosol Characterization*	Bachelor of Science in Chemistry Bachelor of Science in Biochemistry Bachelor of Arts in Chemistry Bachelor of Arts in Biochemistry Bachelor of Arts in Secondary Education in Chemistry Master of Science in Chemistry Master of Science in Biochemistry Doctor of Philosophy in Chemistry Doctor of Philosophy in Biochemistry
School of Sustainable Engineering and the Built Environment—*Atmospheric Chemistry and Urban Air Quality*	Bachelor of Science Engineering (B.S.E.) Master of Science Master of Science in Engineering Doctor of Philosophy

B.A. in Business Sustainability

The W. P. Carey School of Business offers a Bachelor of Arts in Business with a sustainability concentration in collaboration with the School of Sustainability. The new program offers incoming freshmen the chance to combine a traditional, high-caliber business degree with cutting-edge knowledge of sustainability. This specialization will help answer the serious questions businesses are asking about how they can understand, evaluate, and act on issues related to sustainability while making sensible business decisions for both the short and long term. In addition, the business school currently supports a research center on environmental economics and is launching a new center that will include a focus on sustainability in supply chain management.

Educational Collaborations

- Collaboration with campus research laboratories on facility design, i.e., permeable pavement parking lot and design/engineering collaborative review on the GIOS Building renovation, among others.
- Campus sustainability studio, or Campus Living Laboratory Network (CLLN), offers courses involving applied learning, research, and problem solving for interdisciplinary teams of students and faculty members (seven courses last semester in five different departments).
- Continuing education opportunities for campus practitioners (under development).
- Collaborations with outside entities to test and demonstrate products on our campus (under development).

Next Steps

With the creation of the School of Sustainability and continual development of new majors, minors, and certificates across the university, we are now looking to the next steps. These include myriad activities such as staff training and literacy; formal experiences in sustainability for ASU and community stakeholders; and executive education programs to name a few.

Research

ASU's highly diverse sustainability research programs focus on urbanization, innovations in energy, and biodiversity conservation. These foci are not independent; many of society's most profound challenges lie at the intersections of these domains. Much of ASU's research success in past years has come from the ability to interconnect these complex areas. The university's sustainability research includes projects which have been active for more than 20 years (e.g., photosynthesis-based biofuels; architecture-based solar energy) as well as more recent projects (e.g., policy informatics, nanotechnology and society).

Another way we define ASU's sustainability research program is by distinguishing common characteristics,

rather than specific topics. Some components include stakeholder engagement (e.g., air pollution partnership with the Arizona Department of Environmental Quality), the use of future scenarios (WaterSim at the Decision Center for Desert Cities), visualization as a means of bridging disciplines (Digital Phoenix), an integrated systems perspective on new technology (Solar America Initiative grant with BP Solar), repeated measurements across large spatial and temporal scales (CAP LTER), real-time assessments of new discoveries (Center for Nanotechnology in Society), and the integration of interdisciplinary graduate education with research (IGERT in Urban Ecology). These research approaches constitute a unique style of discovery that reflects the paradigm of the New American University. The Global Institute of Sustainability supports the coordination of sustainability-related research across the university creating a critical nexus for collaboration of university research initiatives and connections to external partners to address and solve issues of global sustainability.

The Institute's research focus areas are:

- Economy and society
- Climate
- Energy, materials, technology
- Water
- Governance and policy
- Biodiversity and habitats
- Urbanization
- International development

Select examples of sustainability related research projects and programs include:

- Sustainable Materials and Renewable Technologies program (SMART)—develops and implements sustainable materials and renewable technologies for local communities through funding from the U.S. Environmental Protection Agency and corporate partners.

Active research projects, FY 08-09—sustainability issue area

Research Grants/Contracts:

Sustainable Urbanization	$10,549,212
Energy Innovations	$16,518,255
Biodiversity	$3,345,854
Behavior Mechanisms	$1,086,607
Public Policy	$3,034,816
TOTAL	**$34,534,744**

- The Sustainability Consortium—a partnership of researchers from leading global universities, non-government organizations (NGOs), governmental agencies, and business partners. The consortium has set an initial ambitious goal of establishing the scientific standards to measure the sustainability of consumer products and is committed to ensuring that the system it establishes is credible, transparent, and user-friendly.

- Central Arizona Phoenix Long Term Ecological Research Project (CAP LTER)—For the past 11 years, the CAP LTER project has studied how patterns of urbanization alter the ecological condition of the city and its surrounding environs and how the ecological consequences of development alter the social systems in urban locations. ASU's CAP LTER is one of only two such urban-focused projects. As a result of this research, ASU has been at the forefront of the new field of urban ecology and studying the interdependency of socio-ecological systems.

- Integrated Graduate Education and Research Traineeship (IGERT) in Urban Ecology—evolved directly from the CAP LTER project to provide

PURL

(Phoenix Urban Research Laboratory—Downtown Phoenix Campus)

The Phoenix Urban Research Laboratory is an extension of the Herberger Institute for Design and the Arts at ASU. Part think tank, part project center, they are pursuing a multi-faceted agenda comprising funded design and research; studios; print and online publications; lectures, exhibitions, and conferences; and pedagogical workshops for mid-career professionals and high-school students.

Operationally, PURL is a link between the university and the city, a forum where the academic, civic, cultural, and business communities meet to discuss and debate multiple scenarios for the future of one of the fastest-growing cities in the U.S. Intellectually, PURL is dedicated to furthering the broad-based inquiry into the complex challenges of 21st-century urbanism and to devising progressive solutions to these challenges.

Having grown phenomenally in the last 50 years, from 17 square miles and 106,000 people in 1950 to 515 square miles and 1.5 million (and counting) today, Phoenix is now grappling with critical issues that confront other cities around the globe. These include issues such as rapid urbanization and infrastructural capacity; sprawl and density; traffic congestion and transportation options; ecological sustainability; and local identity and global connection. PURL builds upon a strong tradition, via sponsored studios and funded projects, of academic engagement in the region to extend and strengthen this engagement, to drive a dynamic and progressive discussion of future development, and to contribute the comprehensive information needed to plan wisely to multiple groups.

Design students at work in PURL.

interdisciplinary graduate education opportunities for students at ASU who are interested in studying the socio-ecological systems of urban environments. Funded by the National Science Foundation, the IGERT has provided opportunities for 65 students since 2000.

Energy Research

ASU has a long-standing reputation in energy research and is looking to expand that expertise through interdisciplinary collaborative research. This expansion is being developed through the Arizona Initiative for Renewable Energy (AIRE). At present there are more than 400 research faculty members and staff working on energy-related issues. Fourteen of ASU's research centers are studying renewable energy solutions. Other energy-related focus areas include: bioenergy (non-cellulose based), photovoltaics, solar thermal, fuel cells and batteries, photovoltaic testing, power systems/grid interface, renewable energy for the built environment, solar supply chain, and solar policy and economics. Examples of collaborative efforts include:

- Solar Power Laboratory—established to advance solar energy research, education, and technology. The laboratory is part of the university's commitment to boost Arizona's economic development prospects in the renewable energy industry.

- ASU LightWorks—coordinates multiple projects including a project to create renewable energy by mimicking photosynthesis and another to commercially develop liquid fuels from algae.

Environmental Technology Program

Students in the environmental technology management program learn critical scientific, technical, and management skills needed to respond to environmental, health, safety, and emergency management challenges faced by professionals. They also study policies, regulations, and laws controlling pollution and how these impact business and economics in the U.S. Some of program's past research has focused on removing arsenic from a water supply, remediating wastewater on a local dairy farm to reduce odor, and assessing land designated as a brownfield site. In addition, the program received a Department of Homeland Security grant aimed at improving college campus emergency management communications. The hands-on learning environment is ideal for those interested in careers ensuring environmental quality and developing environmental policy and regulations, as well as for first responders involved in emergency management and remediation activities.

AZ Smart

Funded by the Science Foundation of Arizona, AZ Smart will create a novel system for management of the electrical grid infrastructure as Arizona builds renewable power generation capacity, storage, and transmission through a variety of decision support mechanisms. This partnership, among ASU, local utilities, and renewable energy industrial leaders will guide the future of power in Arizona and serve as a model for other regions seeking infrastructure solutions as we increase the use of sustainable forms of electrical power.

Decision Center for a Desert City

For many critical sustainability issues, the barrier to a solution is not a shortage of data, but the inability to convert information into knowledge and make decisions based on that knowledge. The Decision Center for a Desert City (DCDC) project studies how water managers make informed decisions about water allocation in the face of persistent uncertainty concerning drought, population growth, and the impacts of climate change on future water resources. DCDC is in its fifth year of funding from NSF and has submitted a proposal for a multi-year, phase II effort.

"ASU remains committed to addressing environmental grand challenges through transdisciplinary, use-inspired research. Our sustainability-focused research crosses every unit at ASU and involves over 400 faculty investigators."

— R.F. "Rick" Shangraw, Jr.,
Vice President for Research and Economic Affairs

Sustainability research factoids:

- ASU's algae/biofuels research, which was listed as one of *Time* magazine's top 50 inventions of the year.
- More than five awards from the Department of Energy's (DoE) Solar America Initiative, one of the highest honors in the nation.
- 44 current projects with the DoE, the Department of Defense, and the National Science Foundation in energy-related areas, totaling more than $10M awards in 2007 and 2008.
- $4M of awards through Science Foundation Arizona and other sources for algae research.

Community Outreach

As part of its vision for a New American University, ASU is increasing access to its educational resources and working with communities to positively impact social and economic development. GIOS coordinates several programs that support exchanging knowledge with the public and private sectors, especially on the need for society to balance environmental, social, and economic stewardship. The institute produces and collaborates in special events, hosts the Wrigley Lecture Series on sustainability, and pro-

vides programs targeted to a variety of audiences. In addition, programs across the university help support additional connections to the community.

- ASU's Decision Theater uses 2- and 3-D visualization to illustrate alternative future scenarios. The theater provides decision-makers—including government officials, corporate officers, water managers, real-estate developers, and others—with simulation, modeling, and collaborative tools necessary for making informed decisions on issues such as land use, water supply, air quality, and transportation. Notably, the theater helped Arizona's Department of Health Services plan a response to swine flu.

- The GIOS educational outreach office brings hands-on ecological and sustainability science into K-12 classrooms, preparing the next generation for the serious challenges to global sustainability. The School of Sustainability develops and delivers sustainability curriculum for partner schools through teacher workshops. Institute outreach staff educate K-12 students through, for example, the Central Arizona-Phoenix Long-Term Ecological Research (CAP LTER) Ecology Explorers activities, the Service at Salado after school clubs, and Decision Center for a Desert City (DCDC) water policy choice scenarios.

- ASU works with city, county, and tribal leaders in the Sustainable Cities Network to strengthen regional sustainability efforts, foster partnerships, identify best practices, provide training and information, and create a bridge between ASU's research and the front-line challenges of sustainability. Partners work together to streamline and green city operations, advance solar energy, mitigate the urban heat island effect, design sustainable neighborhoods, and secure water supplies in a changing climate. Plans call for expansion statewide and beyond in coming years.

- Special events are organized that contribute to the dissemination of information about the issues surrounding climate change for our society, examples include Focus the Nation, Greenbuild 2009, and Campus Sustainability Day.

ASU's Decision Theater

Polytechnic Print Program

ASU's Print and Imaging Lab is an education and production print laboratory that offers hands-on experience for Department of Technology Management students, the faculty, and staff, among others. The lab was awarded two supply chain certifications verifying its use of sustainably managed forest products from the Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC) on July 23 and July 25, 2008, respectively. In addition to monitoring its supply chain for sustainable practices, the lab uses a significant portion of post-consumer recycled paper for all printed pieces, including letterhead, envelopes, business cards, note pads, and note cards. The lab fully funds its operations by providing printing services for ASU clients and vendors.

- ASU's Art Museum offered Defining Sustainability in fall 2009. The semester-long program was a series of dynamic and interactive projects that came together at the ASU Art Museum and its Ceramics Research Center to illustrate sustainability ideas. Each exhibition or project told a simple story—an artist's proposal for green transportation or a designer's solution for recycled shade structures—which together conveyed the complexity of sustaining life on earth. A nontraditional art museum project, artists and designers, the faculty and students engaged the greater Phoenix community in their creative processes and in conversations about sustainability. The diverse projects ranged in materials and format, and were installed throughout the ASU Art Museum to tell stories of environmental, social, and cultural sustainability.

Campus Culture

Students and community members must be actively engaged to effect real changes in behavior. ASU reaches its community through peer-to-peer student organizations, sustainability-themed housing, student-run outreach and awards, and an overall university commitment to sustainability. With a university community comprised of more than 81,000 individual potential change agents, student and employee engagement and leadership is critical to our success. Programs that support this are as follows:

Numerous sustainability-related student organizations, including a recycling awareness group, a vegan/vegetarian support group, a renewable energy advocacy group, a sustainable business association, and others give students the opportunity to participate and contribute to change. ASU's Students of Arizona Network for Sustainability provides an organizational connection, serving as an umbrella organization through which individuals and existing student organizations can collaborate to advance sustainability objectives.

In fall 2008, ASU opened a pilot 50-person, sustainability-themed residence. The new Barrett Honors Complex, Sustainable House at Barrett, completed in 2009, comprises an entire residence hall dedicated to sustainable living and education. Along with sustainable living options are sustainable eating options.

Engrained restaurant is an educational sustainable dining experience. The Serving Sustainability to Sun Devils project is a student-designed program fostering green practices in food service on and around campus through a toolkit, evaluation, and award process.

Finally, Pocket-Change, a sustainability pocket-guide, was developed and distributed to 81,000 ASU community members in fall 2008. The guide offers straightforward sustainability tips and a list of resources that will help our students embrace sustainability.

ASU recycling student leaders.

“At ASU we take our leadership role very seriously, always pushing the edges of what is doable. We envision a future that requires we be innovative with our approaches, systems and technologies, and then do whatever necessary to get there.”

— Jim Buizer,
Executive Director for Strategic Institutional Advancement,
Office of the President and Science Policy Advisor to the President

ASU's Campus Metabolism—
a resource consumption display system
http://cm.asu.edu

tracking progress

how will we know where we stand?

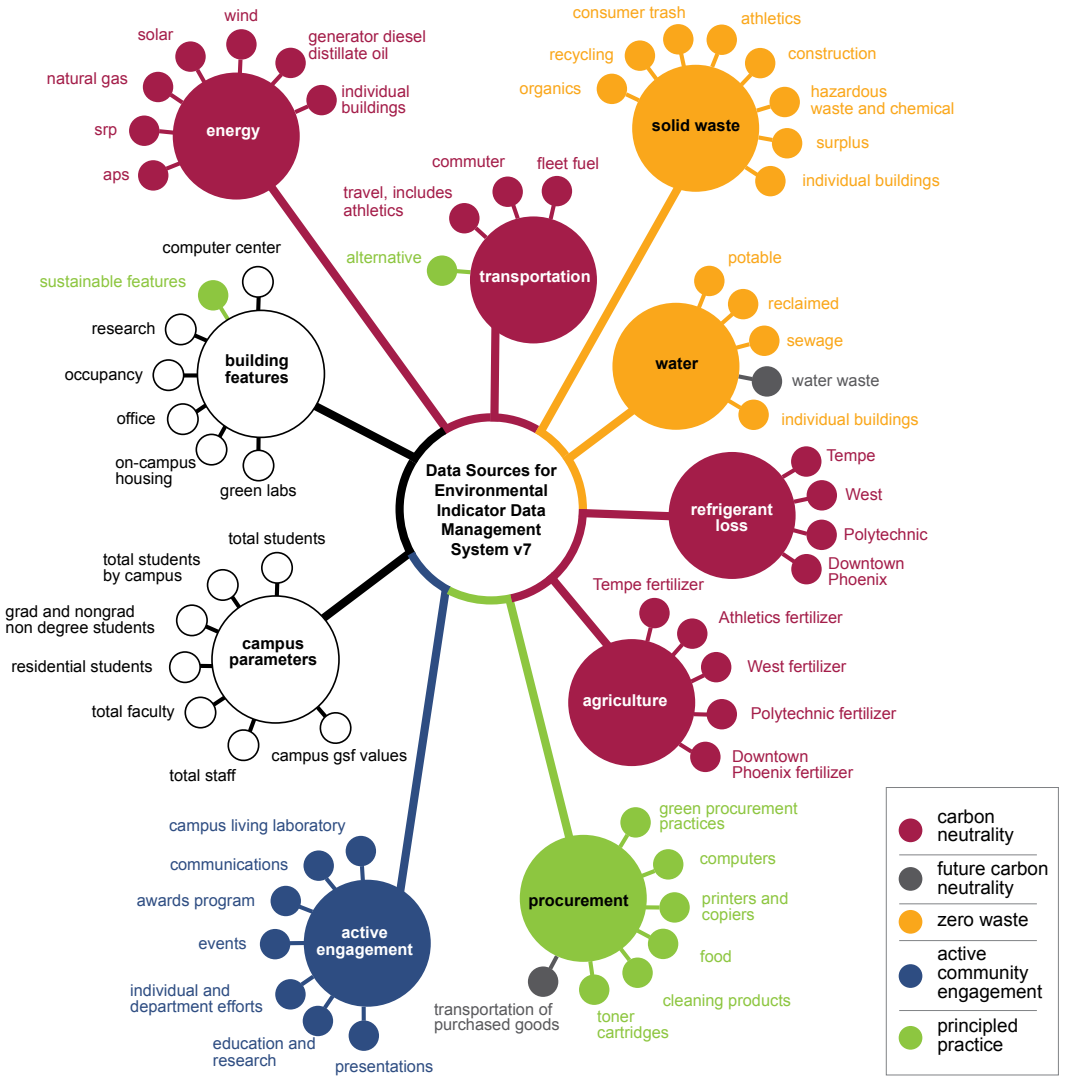
As part of the American College and University Presidents' Climate Commitment (ACUPCC), ASU will formally update its carbon emissions inventory annually and Carbon Neutrality Action Plan every two years beginning in odd years. The results of the inventory will be communicated in the "State of Sustainability Annual Report." In even years, a quick-list progress report will allow for a streamlined approach to assessing progress while meeting ACUPCC requirements.

While the long-term outlook is tremendously positive, we foresee the possibility of university carbon emissions actually increasing over the next few years. This is expected to be due in part to campus growth as well as to the inventory process being fine-tuned and current suspected inaccuracies cleared. As mentioned in the Emissions Inventory section of this document, different areas of the inventory have varying degrees of accuracy due to data availability. The most significant area of inaccuracy is in the transportation inventory. ASU views the availability of accurate data as both its largest hurdle and one of its most anticipated accomplishments. Thus, we are developing a comprehensive, automated Web-based data collection system, Environmental Indicator Data Management System (EIDMS), that will allow real-time tracking of all data related to our sustainability goals.

Method

Each year, an emissions inventory will be calculated

using the Clean Air Cool Planet Calculator. In order to streamline data collection for both the annual carbon inventory and other related sustainability metrics, ASU plans to implement the EIDMS by 2010. The system will provide a secure, accessible, and compatible platform where multiple users can enter both environmental- and operational-related information. Since ASU is a large university with multiple campuses, the EIDMS will capture data based on campus and department groups as well as cost and units of measurement in order to more specifically track the progress of the university's sustainability initiatives. The system will have the additional capacity to graphically display our progress toward meeting all of our sustainability goals, including carbon neutrality, to enable better decision making. The metrics to be used are illustrated in the graphic below.



Governance and Decision Making

In signing the ACUPCC, ASU President Michael Crow reinforced the university's commitment to ambitious, multi-modal advancements in the field of sustainability. His actions insure that support for carbon neutrality will come from the top-down as well as from operations and student activities, or from the bottom-up.

The commitment also calls for the creation of "institutional structures" to guide the development and implementation of a comprehensive Carbon Neutrality Action Plan. ASU has created the Sustainability Practices Network and the President's Working Group on Carbon Neutrality to fulfill this requirement. Both entities use a working group approach. These working groups include high-level university officials in an effort to provide macro-view guidance on topic-specific agendas.

Sustainability Practices Network

The Sustainability Practices Network (SPN) is made up of a collection of thematic groups focused on eight topic areas. These entities work in tandem with four resource groups, in addition to the SPN leadership team (comprised of the group chairs) and an additional advisory council. This synthesis supports a system-wide collaborative effort that allows each group to identify existing connections as well as opportunities that will enable the university to function more efficiently as a whole. Ultimately, the SPN will prepare a report that will be integrated into the overall sustainability plan for the university. On the carbon neutrality front, the SPN represents broad-based participation and leadership that will extend the multi-disciplinary reach of this plan's message and help move the concept of carbon neutrality into a university-wide reality.

The SPN is made up of:

Thematic Groups

- Facilities Operations/Water
- Energy
- Building Design and Planning
- Solid Waste
- Transportation
- Procurement
- Campus Living/Dining/Activities/Events
- Information Technology

Resource Groups

- Communications
- Learning
- Development
- Opportunities and Best Practices

President's Working Group for Carbon Neutrality

The newly established President's Working Group for Carbon Neutrality (WG-CN) focuses primarily on carbon neutrality. The group includes a number of high-level administrators and college, school, and departmental representatives in order to advance the university-wide application of the Carbon Neutrality Action Plan, particularly in the areas of education, research, and outreach.

The WG-CN will meet twice a year to:

- Monitor university progress toward the goal of carbon neutrality by 2025.
- Review and approve updates to the Carbon Neutrality Action Plan (two-year cycle).
- Advise administrative officers regarding operational, educational, research, and community outreach opportunities, needs, and priorities to

satisfy the requirements of ASU's Carbon Neutrality Action Plan and the ACUPCC.
- Report to the university president on a regular basis.

Staffing

The University Sustainability Practices Office, in GIOS, will be responsible for daily management of ASU's Carbon Neutrality Action Plan. This office leverages current resources, programs, and initiatives to build the collaborative university-wide network needed to meet the goals outlined in the plan. Staff members will coordinate annual inventory updates and reports, while key stakeholders in contributing departments will submit data periodically. Ongoing review and advisement on the operational components of the plan will be provided by the SPN leadership team and advisory council and the President's WG-CN.

Financing

Given ASU's growth projections, implementing the full Carbon Neutrality Action Plan will be costly but not insurmountable thanks to a variety of funding mechanisms. We are assessing university-based, socially responsible investments; efficiency-capture opportunities; as well as ways to restructure traditional financing structures for more efficient, sustainable options. We are also continuing to develop greater collaboration between research, academic, and operations of the university to increase our competitive advantage for public and private funding opportunities. The following is a list of proposed funding sources and investment options or estimates that will enable us to meet our carbon neutrality goals.

- To date, we have significantly increased efficiency through Energy Performance Contracts (EPCs) and will continue to develop this source. We are expecting that 10 percent of the investment in our plan will come from EPCs.
- We are actively engaged in phase two of our solarization program, which includes Power Service Agreements (similar to a Power Purchase Agreement). We expect that solar and other renewable energy projects will require about 20 percent of our investment.
- Select fees on specific department activities and redistribution of commuter parking fees will support transportation initiatives. We estimate this funding source will be two percent of our investment.
- ASU has a number of LEED-certified facilities funded through public/private partnerships. Future use of this approach will include investments approaching 10 percent dedicated toward carbon neutrality efforts. Research funding from government and private sectors should make up about 8 percent of the plan's investment.
- We anticipate future projects and programs to attract foundation and other donor investment in our sustainable development. Our objective is to obtain 10 percent of our plan funding from sources such as private foundation, corporate, and alumni grants and gifts.
- ASU will move from evaluating capital projects on an initial-cost valuation to a life-cycle valuation, allowing for total cost of ownership assessments. We expect this will expand traditional project financing sources due to an increase in ROI. This approach will provide about 20 percent of our required investment.
- Maximizing efficient use of resources within the university—such as sharing resources and removing redundancy—will garner savings that will be used to develop a revolving loan fund. The fund will provide 20 percent of the investment required for the plan.

“Universities are in a unique position to address the grand challenges of sustainability in the 21st century. ASU is committed to aligning its research, education, outreach, and business practices with these increasingly urgent and complex challenges.”

— Rob Melnick
Executive Dean, Global Institute of Sustainability

Students participating in ASU's 2009 homecoming parade.

conclusions

are you ready to make a difference?

Challenges

The most significant challenges facing ASU's commitment to carbon neutrality stem from its size, complexity and infrastructure (discussed in detail under energy, building, transportation, and waste management/recycling), and its current system of operations (discussed throughout the sections). Overall, departments at ASU are not presently interconnected, or are minimally connected, and therefore function independently of one another. For the university to successfully reach carbon neutrality by the dates specified in this plan, operational units must work together in a cohesive manner. The most effective means of addressing this is to have all efforts coordinated by a central unit.

The University Sustainability Practices Office in the Global Institute of Sustainability (GIOS) will support these efforts. The office will be supported by the President's Working Group for Carbon Neutrality (WG-CN) and the Sustainable Practices Network (SPN). The University Sustainability Practices Office will be responsible for coordinating university-wide accounting, metering and procurement policies, as well as serving as the catalyst to bridge and facilitate integrated change on all four campuses and changing the prevalent first-cost culture to a life-cycle, multi-pronged approach. The WG-CN and SPN will serve in an advisory capacity with responsibility for maintaining the university-wide vision for this critical effort.

Additional obstacles facing the university range from previous policies made without knowledge of or accountability for carbon emissions to cost and infrastructure considerations in implementing university-wide metering on individual buildings and departments. The current lack of a clear feedback loop make communication and collaboration efforts difficult at best. This will be overcome by developing and implementing a clear communications plan through the University Sustainability Practices Office and the SPN communications group. Beyond these issues is the necessity for immediate and substantial financial investments that, despite long-term returns both financially and in performance, could feasibly generate economic concerns and stresses for individual departments and units.

As demonstrated in this report, no single department or unit can be solely responsible for ASU's carbon emissions, nor can any one individual or unit accomplish the mitigation of all the university's GHG emissions. A university-wide systems approach supported by the University Sustainability Practices Office will enable us to achieve significant reductions that will ultimately deliver carbon neutrality. This approach engages myriad methodologies, processes, and policies emphasizing collaboration not only among ASU stakeholders, departments, and units but also among ASU and the local and global communities.

Despite the many challenges facing our institution, including deferred maintenance, explosive growth, and budget shortfalls, ASU's strengths and accomplishments create many opportunities that are being leveraged in our quest for carbon neutrality. Since LEED Silver certification was mandated university-wide, we have successfully completed 12 silver projects and nine gold projects, and received Arizona's first platinum designation on the second of the Biodesign Institute's buildings—Bldg. B. Our business services unit is taking a national leadership role in reassessing criteria for contract and purchasing, while numerous collaborations are being initiated between units on projects such as recycling/waste management and in campus research projects such as the permeable parking lot. Still, there is a long way to go before we have a fully integrated sustainability program and reach carbon neutrality. We have some tough choices ahead of us, which will require aggressive policies and mandates as well as significant resource investments.

"Taking a large complex university such as ASU carbon neutral is daunting, but our small city of over 81K individuals can be an excellent model for arid climate cities around the world."

— Bonny Bentzin,
Director of University Sustainability Practices, Global Institute of Sustainability

We will face additional challenges managing a university-wide approach to the research, education, and outreach components of this plan. Overcoming long-standing silos, explosive growth, and challenging economic times all present barriers to embracing a common vision. These barriers are not insurmountable. ASU has proven that a desire and market exists for both climate- and sustainability-based education. Our research strengths continue to grow, impacting change through solutions. The university community continues to express their desire to engage. Setting, maintaining, and coordinating the course is paramount to our success. The WG-CN and SPN will help set the course. GIOS, aided by departments across

the university, will continue to support the development and coordination of the vision.

Next Steps

Complex does not begin to describe the hurdles that ASU faces as it presses toward carbon neutrality. Neither does astounding, fulfilling, ambitious. Yet, these monikers acknowledge that while some emissions areas represent ASU's greatest challenges, they also represent some of its greatest opportunities for fiscal, environmental, and social return.

The challenges mix, merge, and fold back upon one another in a matrix. Energy conservation and good building practices go hand in hand. Waste management and recycling provide balance at one end of the spectrum while solar energy production balances the other.

This plan lays a pathway for navigating these challenges. A pathway not only to determine where we've been and where we are going, but also to relay these messages to the local, regional, and global audiences who will help build a global carbon neutral future.

What are the next steps?

The next steps include building on the institutional, financial, and human support networks that can bring our vision to life.

They require rigorous commitments for all new infrastructure construction. Furthermore, we must address critical issues within existing infrastructure, which will provide significant opportunities for emission reduction. These issues demand new levels of commitment from all parties involved.

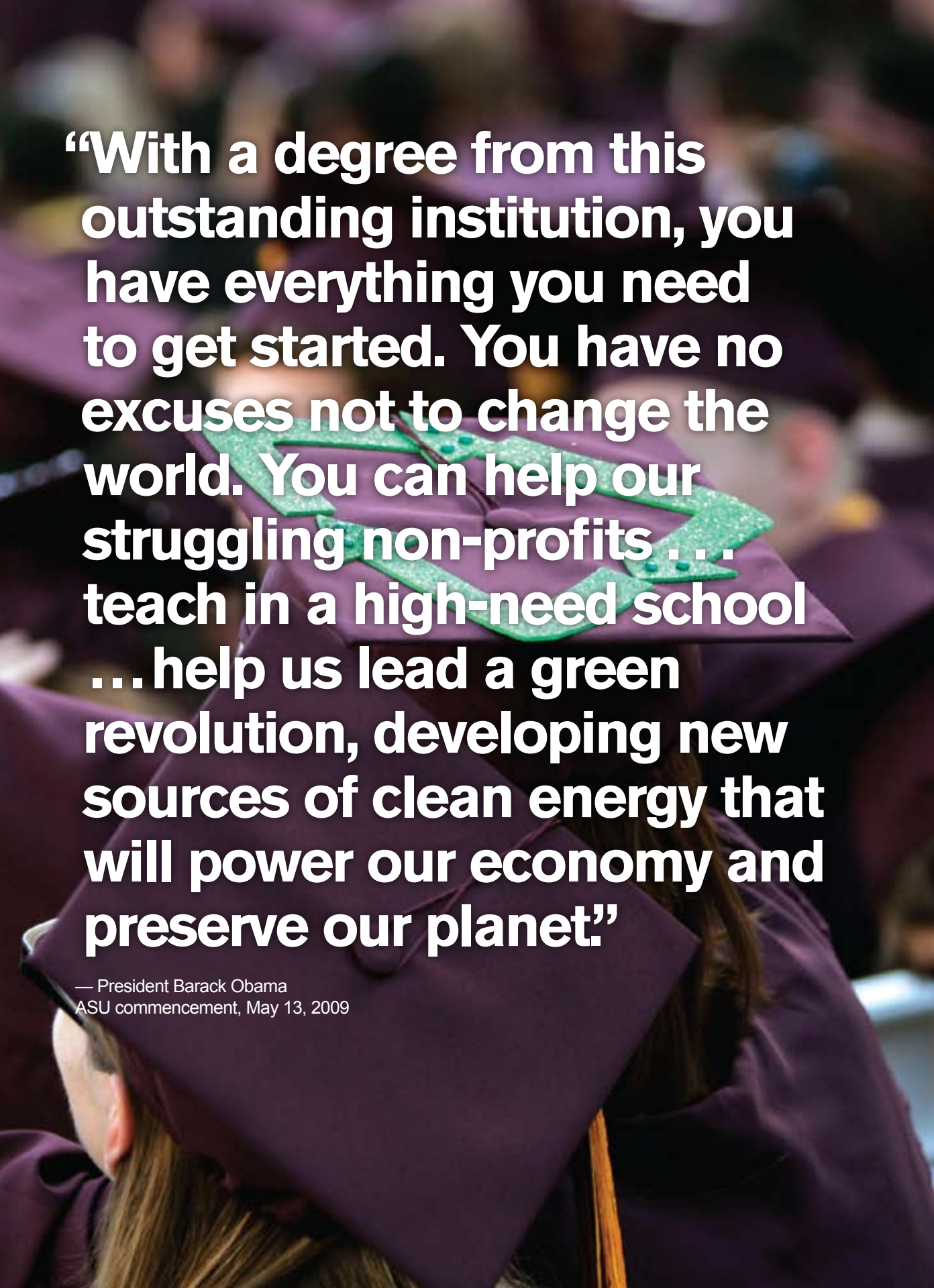
"Low-hanging fruit" such as waste management and recycling offer tremendous return on investment, both in terms of cost savings and reduced emissions. However, they require business, institutional, and social buy-in for success. We must find new ways to engage all stakeholders.

Great strides have been made in sustainable passenger-side processes and convenience within the transportation sector. Only through ongoing policy and process advancements will improvement continue in these areas.

Continuing research, education, and carbon offsetting in the energy sector will provide further means for reducing GHG and meeting carbon neutrality goals.

Diverse areas such as purchasing, food services, and community engagement also present opportunities for finding innovative, progressive, and unique solutions to real problems. These opportunities require a committed university staff, faculty and administration; a creative student body; and engaged private-sector partners willing to advance those programs that bring mere plans to reality.

ASU is addressing the real-world challenges of climate change and carbon emissions through use-inspired research, education, and action. We recognize that we are intricately linked to our local and global communities, and we are using our knowledge capacity to find relevant solutions for the public good. In doing so, we reverently assume our responsibility for the well-being and vitality of the region and beyond.



"With a degree from this outstanding institution, you have everything you need to get started. You have no excuses not to change the world. You can help our struggling non-profits . . . teach in a high-need school . . . help us lead a green revolution, developing new sources of clean energy that will power our economy and preserve our planet."

— President Barack Obama
ASU commencement, May 13, 2009

Plan Development Status

August 17, 2009
Final revisions for document, with the exception of the forward looking components of research, education, outreach and governance.

August 29, 2009
Finalize text for forward-looking components of research, education, outreach and governance.

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Final editing completed.

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