Building Sustainability into Municipal Facilities

A Fall 2018 Collaborative Report
with Arizona State University's
Project Cities & the City of Glendale

ASU Sustainable Cities Network
Arizona State University

Project Cities

Glendale
ARIZONA

This report represents original work prepared for the City of Glendale by students participating in courses aligned with Arizona State University's Project Cities program. Findings, information, and recommendations are those of students and are not necessarily of Arizona State University. Student reports are not peer reviewed for statistical or computational accuracy, or comprehensively fact-checked, in the same fashion as academic journal articles. Project partners should use care when using student reports as justification for future actions. Text and images contained in this report may not be used without permission from Project Cities.

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On behalf of the ASU Wrigley Institute and the School of Sustainability, we extend a heartfelt thank you to the City of Glendale for enthusiastically engaging with students and faculty throughout the semester. These projects provide valuable real-world experience for our students and we hope that their perspectives shine light on opportunities to continuously improve Glendale's future livelihood and community well-being.

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To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCGlendaleSustainableFacilities

ABOUT PROJECT CITIES

Arizona State University's (ASU) Project Cities program is a university-community partnership. For an entire academic year, faculty and students work with a single city to co-create strategies for better environmental, economic, and social balance in the places we live. Students from multiple disciplines research difficult problems chosen by the city and propose innovative sustainability solutions. Project Cities is a member of the Educational Partnerships for Innovation in Communities Network (EPIC-N), a growing network of more than 30 educational institutions partnering with cities throughout the United States and the world.

ABOUT SUSTAINABLE CITIES

Project Cities is a program of ASU's Sustainable Cities Network. This network was founded in 2008 to support communities in sharing knowledge and coordinating efforts to understand and solve sustainability problems. It is designed to foster partnerships, identify best practices, provide training and information, and connect ASU's research to front-line challenges facing local communities. Network members come from Arizona cities, towns, counties, and Native American communities, and cover a broad range of professional disciplines. Together, these members work to create a more sustainable region and state. In 2012, the network was awarded the Pacific Southwest Region's 2012 Green Government Award by the U.S. EPA for its efforts. For more information, visit *sustainablecities.asu.edu.*

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Project Cities

Sustainability Through Local Action

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ABOUT GLENDALE

The City of Glendale is located in Maricopa County, roughly nine miles northwest of Downtown Phoenix. Glendale's population is about 250,000, comprised of diverse communities, including large Hispanic populations, retirement communities, local businesses, and event-goers. Glendale is home to attractions such as the State Farm Stadium, Westgate Entertainment District, the Gila River Arena, Glendale Community College, and the ASU West Campus. With abundant attractions and temperate climate, Glendale has something to offer for its residents and tourists all year round. In August 2016, 71% of voters supported Envision Glendale 2040, a plan that signaled the City's commitment to sustainability. Glendale has chosen to pair up with Project Cities to find new ways to promote sustainability and engage with their communities to better serve their diverse needs.

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Glendale
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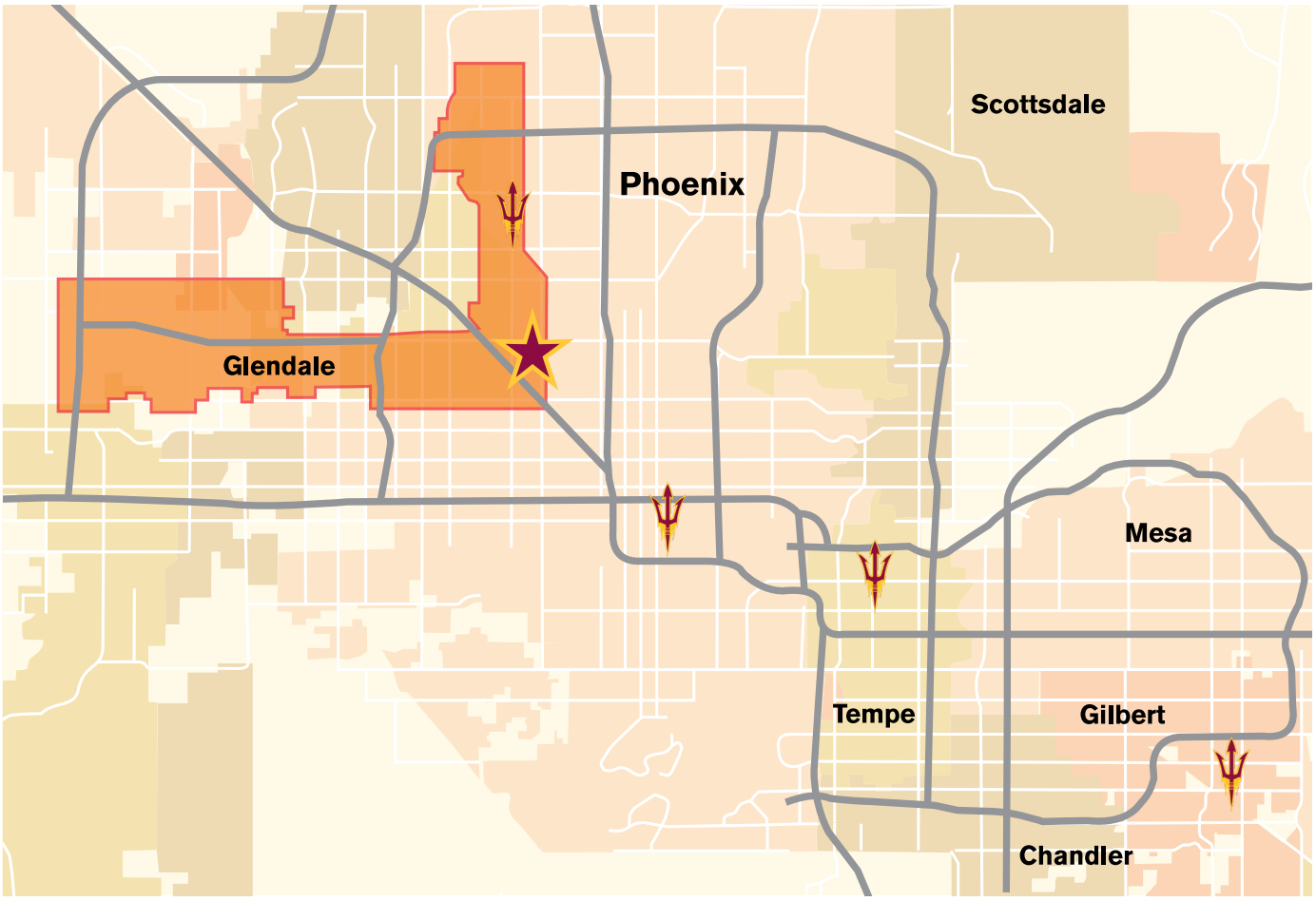
MAP OF GLENDALE & GREATER PHOENIX, ARIZONA



A Message from the City Manager

In 2018, the City of Glendale entered into a partnership with Arizona State University to participate in the Project Cities Program. The goal of this program is to deliver sustainability research, education, and solutions with practical, measurable and meaningful impact to local government. It is a university-community partnership in which ASU students work on research projects that will inform programs or services related to the city's strategic objectives and which have a sustainability component. These projects may include co-creating implementation frameworks or solution pathways for environmental, economic, or social improvement projects all of which will help Glendale prepare for the future.

The leadership team and I can proudly say that ASU's Project Cities program has provided a value-added experience for our staff and fulfilled the need for research on key organizational issues. We have been extremely impressed with the professionalism and relationships our city has developed with the students and ASU's Project Cities staff. They have brought a fresh and unique perspective to challenges that affect our city.

The projects chosen are aligned to the City of Glendale's mission and values and are intended to help advance several of our strategic objectives, initiatives, and existing programs. We specifically sought to gain insights around communication to include social media management and multi-generational engagement, as well as sustainable asset management for the city fleet, facility master plan, and above ground chemical storage tanks.

This valuable experience has been a tremendous learning opportunity for our city as well as for the dedicated students who exhibited their unique skill set. One of the surprising benefits has been for our staff liaisons who were refreshed and invigorated through their interactions with the next generation of leaders, and found the students to be very thoughtful, intelligent, and inquisitive. The opportunity to expose students to potential careers in local government also aids in developing a pipeline of future talent in local government.

In closing, we truly strive to improve the lives of the people we serve every day and these projects have provided us with insights that will help guide actions and future recommendations for our City Council. We are excited about the strategic direction for Glendale and have set the bar high for success. We feel extremely fortunate to have experienced a great partnership through the ASU Project Cities program which will play an integral role in achieving our goals.

Sincerely,

Kevin R. Phelps
City Manager
5850 W. Glendale Avenue, Glendale, AZ 85301
623.930.2870

The following report summarizes and draws highlights from work and research conducted by students in SOS/PAF 545: Organizations, Sustainability & Public Policy, for the Fall 2018 partnership between ASU's Project Cities and the City of Glendale.

To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCGlendaleSustainableFacilities

EXECUTIVE SUMMARY

Urban activity is one of the largest contributors to climate change, accounting for 70 percent of global carbon emissions (Burks and Fields-Austin, p.3). Due to their large local footprint, cities can be significant contributors to climate change. This also means that cities have a unique opportunity to implement sustainability actions at scale rather quickly. If not addressed proactively, cities will be subject to many of the negative externalities of climate change. As the impacts of climate change intensify, many Southwest cities, including Glendale, are likely to suffer the effects of extreme heat, extended drought, more frequent flooding, burgeoning urban heat island effect, and more. As local governments become more aware of these impending realities, they are turning their focus on re-tooling internal operations to be more sustainable, beyond regulatory measures and saving money. Cities across the country are integrating sustainability into city culture, creating Climate Action Plans to mitigate their impact on climate change and to create opportunities for residents.

Growing a culture of sustainability throughout a city can be logistically difficult without hiring a sustainability director, but cities can begin making strides within their current operating systems. With the planned renovation of the Field Operations Campus, Glendale is currently presented with a unique opportunity to decrease its impact on climate change while creating new avenues for cost-savings and visibility for Glendale's sustainability initiatives. Through its partnership with Project Cities and graduate students from SOS/PAF 545: Organizations, Sustainability & Public Policy, Glendale decided to develop plans to incorporate sustainability into the renovation plans for its Field Operations Campus. The students spent the past semester researching best practices and analyzing data to devise cost-effective solutions for this renovation and other municipal buildings. Students focused on four key areas of opportunity: green buildings, energy, landscaping, and purchasing.

These strategic areas offer a wide array of urban sustainability opportunities. While using green building practices and on-site renewable energy is a highly visible and symbolic way for local governments to display their commitment to sustainability, it also indicates to local taxpayers that Glendale is consciously saving money by way of reducing energy costs and using tax dollars more efficiently. Sustainable landscaping is a low-cost strategy to increase the aesthetic and functional value of the facility, improving the employee experience and optimizing the quality of the local environment. Sustainable purchasing

is a low-visibility, yet critical action for a municipality to internalize sustainability policies and operations. Sustainable purchasing enables the city to engage employees in everyday sustainability practices, harness new and innovative business partnerships, and save taxpayer dollars.

Recommendations were informed by interviews with Glendale elected officials, academic research, and best practices gleaned from case studies of other sustainable cities. With critical self-reflection and strategic planning, the students believe Glendale can become an exemplary sustainable city in the Valley. An exemplar sustainable city is specifically defined in this context as being a municipality that leads by example, making an outstanding commitment to long-term sustainable practices across city-wide practices. These recommendations can be found in the following section. The remainder of the report includes individual student report summaries, highlighting research methods, data and analysis, and a full list of their recommendations.

Figure 1 *Students and Glendale city staff discuss project scope and opportunities during an initial meeting*

GOALS & TOP RECOMMENDATIONS FOR CREATING SUSTAINABLE MUNICIPAL FACILITIES

The goal of this project was to help Glendale leverage an existing renovation project to incorporate sustainable building practices and develop a culture of sustainability across all governmental departments.

Recommendations Timeline

Term	Recommendation	Dept./Division	Product	Case Study	ROI (years)	Annual Cost Savings
Short	Require the purchase of reused and recycled toner cartridges	Purchasing; all departments	Remanufactured toner cartridges	King County, WA	1	$77,000
	Expand energy efficient lighting	Purchasing; Field Ops; Engineering; Transportation	LED Lighting	Alameda County, CA	<4	$350,000
Medium	Require the purchase of reused and recycled paper and reduce overall consumption	Purchasing; all departments	100% PCR paper	Alameda County, CA	5	$120,000
Long	Require the purchase of EPEAT or Energy Star certified electronics	Purchasing; Field Ops; Innovation & Technology	EPEAT Desktops	Portland, OR	6	$256,000
	Transition to more electric vehicles and expand EVSE infrastructure	Purchasing; Transportation; Field Ops	Conventional to Electric	Portland, OR	8	$1000 per vehicle

Table 1 *Summary of recommendations for initial execution, along with payback times (Delvinne and Wyke, p.17)*

RECOMMENDATIONS FOR CREATING SUSTAINABLE MUNICIPAL FACILITIES

Green Building Recommendations
Strive for Leadership in Energy and Environmental Design (LEED) standards for the Field Operation renovation. Proceed with the long-term intent of using LEED as a first step toward eventual participation in Living Building Challenge (LBC). Strive for LEED Silver as a starting point, based on current standing and experience with LEED construction (Alexander and Jennings, p.8).
Track energy and water usage through a facility-monitoring software, such as Energy CAP, to identify opportunities for saving money and reducing consumption. The measurement capacity provided by such software would also enable the city to participate in green-building programs such as Energy Star and LEED, which require detailed metric reporting (Alexander and Jennings, p.18).
Conduct a lifecycle analysis for all purchases and proposed construction to increase return on investment (ROI) and promote efficient use of resources (Alexander and Jennings, p.18).
Employ a local company to conduct an energy audit of the Field Operation facility and other municipal buildings to find ways to reduce energy consumption and lower energy bills (Alexander and Jennings, p.18).
Strive to power the Field Operations Campus by solar to the greatest extent possible (Alexander and Jennings, p.12).
Before new construction, engage in an energy efficiency audit offered by the local energy provider, to assess areas where the facility could use the most improvement (Alexander and Jennings, p.13).
Invest in sustainability-based activities while developing financial models to explain the benefits and justify sunk cost spending to the City's communities (Alexander and Jennings, p.13).
Connect with urban sustainability networks such as The Urban Sustainability Directors Network, City Energy Project, or the Global Covenant of Mayors (Alexander and Jennings, p.16).

RECOMMENDATIONS FOR CREATING SUSTAINABLE MUNICIPAL FACILITIES (CONT'D)

Energy Portfolio Recommendations

Incorporate requirements into the sustainable facilities plan to purchase energy-efficient office equipment such as Energy Star rated appliances (Burks and Fields-Austin, p.13).

Upgrade the building envelope, incorporating materials such as Cool Roofs, which can lower roof temperature by 50 to 70%, lowering energy bills (Burks and Fields-Austin, p.14).

Install a solar carport to provide values to employees during hot summer months and save on electricity bills. This installation will serve as a highly visible signal of the city's commitment to sustainability (Burks and Fields-Austin, p.15).

Install rooftop solar on buildings that have an expected lifespan of over 30 years, considering the ROI of the panels. Seriously consider installing solar on all new builds (Burks and Fields-Austin, p.15).

Consider a power purchase agreement from a third party to assist in financing a solar system (Burks and Fields-Austin, p.15).

Landscaping Recommendations

Identify the resources and context of the Field Operations Campus, considering where rainwater falls from the roof, areas where irrigation can be effectively used, which parking spots could be converted, and where employees gather and pass through most frequently (Harmon, p.16).

Incorporate native, drought-resistant, shady trees into landscape designs (Harmon, p.16).

Add bioswales near the onsite drains leading to the water retention basin to filter out pollutants from the building and parking lot before running into stormwater drains (Harmon, p.16).

View the water-retention basin as an opportunity for sustainable landscaping and as a community beautification project (Harmon, p.16).

Engage employees in creating artistic shade structures (Harmon, p.16).

RECOMMENDATIONS FOR CREATING SUSTAINABLE MUNICIPAL FACILITIES (CONT'D)

Sustainable Purchasing Recommendations
Develop regional partnerships, then leverage these partnerships to take advantage of cooperative purchasing that may promote discounted rates (Delvinne and Wyke, p.15).
Transform the city fleet by setting targets for electric vehicles (EV) and the number of electric vehicle supply equipment (EVSE) needed to support electrification (Delvinne and Wyke, p.15).
Expand energy-efficient lighting across departments, as a solution with proven economic benefits. This supports Glendale's vision of having functional, agile and energy efficient buildings for the future (Delvinne and Wyke, p.15).
Integrate sustainability standards and ecolabels into technical specifications of contracts and solicitations for chemical products and services (Delvinne and Wyke, p.16).
Purchase reuse-recycle office supplies. Restrict toner cartridges purchases to remanufactured, and reduce paper consumption to reallocate the generated savings toward the purchase of 100% Post-Consumer Recycled (PCR) paper. Integrate quality assurance standards into contracts to assure quality standards in the purchase of remanufactured and recycled products (Delvinne and Wyke, p.16).
Develop inventories of office supplies at the department level and cut down unnecessary purchases (Delvinne and Wyke, p.16).
Require purchase of Electronic Product Environmental Assessment Tool (EPEAT) or Energy Star certified electronics (Delvinne and Wyke, p.16).

FACULTY
DR NICOLE DARNALL

PAF/SOS 545: ORGANIZATIONS, SUSTAINABILITY & PUBLIC POLICY
SCHOOL OF PUBLIC AFFAIRS & SCHOOL OF SUSTAINABILITY

Sustainable Facilities

Advancing a Culture of Environmental & Community Stewardship through the Built Environment

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INTRODUCTION

Field operations employees are integral to the success of any large organization. They are the behind-the-scenes people who work to serve others, ensuring that day-to-day activities run smoothly. Of Glendale's 2,533 city employees, 412 people work at the Field Operations Campus, including 73 contract/temp workers (Harmon, p.6).

Recently, the City Council approved a Facility Master Plan for the Field Operations Campus and another new municipal facility in their Capital Improvement Plan in the upcoming years. City officials identified the Field Operations Campus as an opportunity for Glendale to incorporate/practice innovations that can help Glendale move towards a more sustainable future. To bring impactful change to the facility and the greatest return on investment, the City partnered with ASU Project Cities and Dr. Nicole Darnall's class, SOS/PAF 545: Organizations, Sustainability & Public Policy to research and make recommendations on four topics: green building, energy, purchasing, and landscaping.

The students pursued a variety of research methods, including literature reviews, data gathering, expert interviews with city officials and staff, facility tours, and investigating best practices for increasing sustainability practices through the Field Operations Campus while considering geographical and financial constraints. The student teams also considered methods for increasing employee engagement in the process and gaining social investment from the surrounding community.

Through the facility renovation, the City can show their appreciation toward their employees who work there and demonstrate to the community that they are stewards of sustainability. The following recommendations will help Glendale accomplish their sustainability initiatives. It is up to Glendale, however, to identify the most promising recommendations and determine how to incorporate them into the renovation.

RESEARCH METHODS

Students interviewed over 15 individuals, representing industry professionals, experts in the field, Glendale employees, and officials from neighboring communities and other west coast cities. Some of these said interviewees included the Glendale City Manager, staff at the Field Operations Campus, teachers from the Glendale Unified High School District, and representatives from Nashville, Tennessee and Hayward, California. The interviews with Glendale community stakeholders established the City's interest in doing more than merely implementing green building practices into the Field Operations renovation. They saw the renovation as an opportunity to establish sustainability policies and procedures for future builds. The interviews with representatives from peer cities and additional research provided unique insights from cities that have highly developed sustainability initiatives.

GREEN BUILDINGS

Topic Overview

Human activity is rapidly degrading the global environment and cities are a large contributor. According to the US Department of Energy's Buildings Energy Data Book, buildings account for 40% of CO2 emissions per year in the US (Alexander and Jennings, p.5). With the federal administration's withdrawal from the Paris Climate Accords, local governments are realizing that cities need to step up and lead the transition to a more sustainable, safer, and healthier planet. The City of Glendale is no exception. In August 2016, 71% of voters supported Envision Glendale 2040, a plan that signaled the City's commitment to sustainability (Alexander and Jennings, p.6).

The City of Glendale has 35 energy accounts with the Arizona Public Service (APS) for its city-controlled buildings. Within these accounts are 28 different addresses, which means some municipal facilities are divided by multiple accounts. Conversely, the City receives only one monthly water bill for all facilities, and there are no metering systems in place to determine how much water an individual building consumes. These systems make it difficult for the City to measure the energy and water usage of individual buildings, a necessity for tracking resource and energy consumption and—ultimately—advancing sustainability. It is essential to measure building efficiency, in order to improve it. Any city that strives for more efficient buildings needs to first establish measurement tools and protocols, before they can meet, let alone set—their sustainability goals.

Reacting to these constraints, this section recommends best practices and strategies in green building practices for renovating the Field Operations Campus.

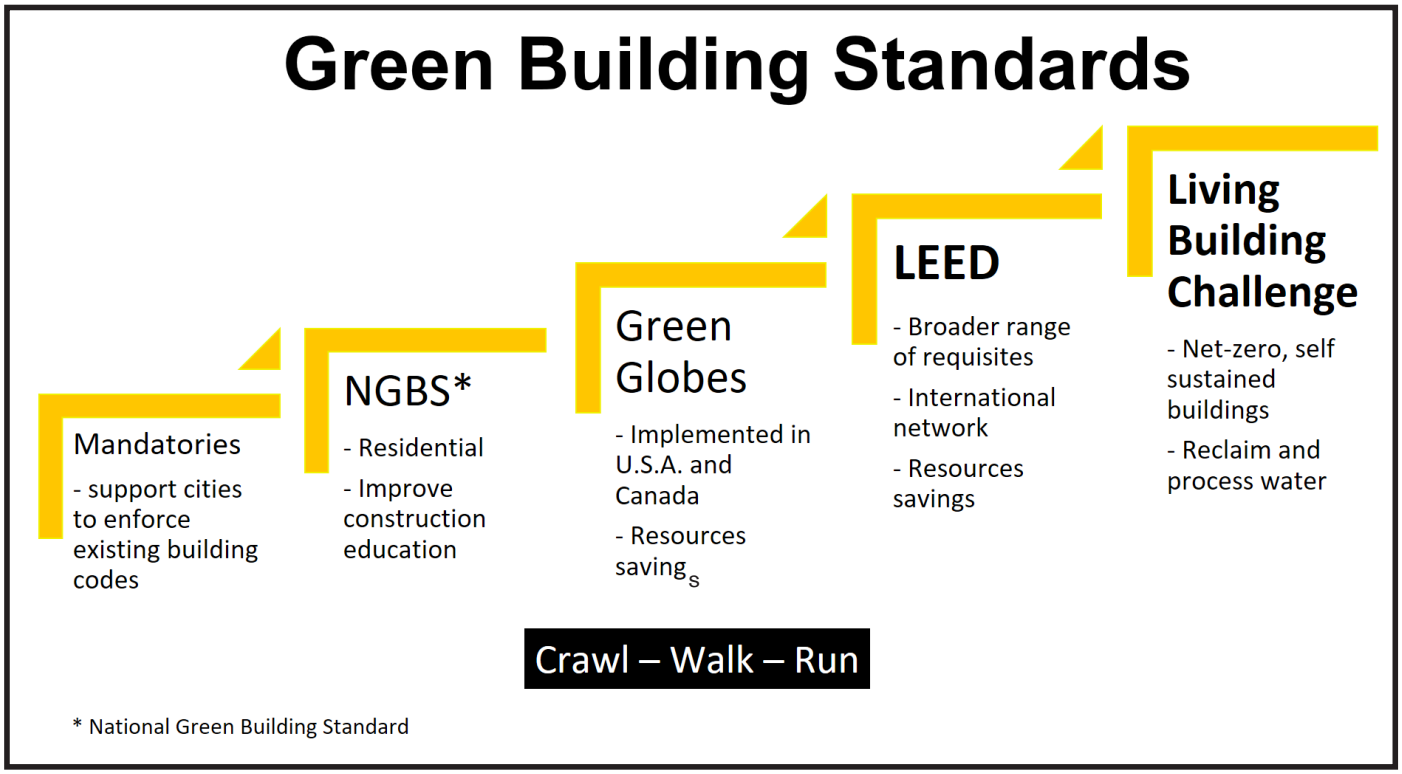


Figure 2 *A visual aid created by students to aid in illustrating the effectiveness of each green building standard*

Research Findings & Analysis for Green Building

Leadership in Energy and Environmental Design (LEED) certification is the most widely accepted green building program in the U.S. To attain a LEED certification, entities score a building on a list of prerequisites for building quality and efficiency which, if attained, earn points toward that building's LEED score. There are four levels for LEED scoring and certification: a building can earn a Certified, Silver, Gold, or Platinum award.

Students found LEED would be the optimal green building program for the City of Glendale's Field Operation renovation. Because LEED is flexible with a multi-level scoring system, Glendale could incorporate LEED into its budget and goals. Glendale could eventually benefit from participating in other green building programs like Energy Star and the International Organization for Standardization (ISO). However, at the moment, the City does not track its energy/water consumption, which is required for Energy Start. Additionally, the ISO requirements go beyond

the scope of the Field Operation renovation project. Students did not recommend pursuing other similar programs to LEED, such as Green Globes, because these programs are not as detailed and as specific as LEED.

By incorporating LEED-certified building standards, the City will yield significant financial savings for its taxpayers over the long run while acting as a good steward for the global environment.

Based on the students' research, LEED is the most suitable green-building program for Glendale's budget and scope, and offers great opportunities to expand the city's sustainability initiatives. If Glendale chooses to implement LEED practices in their facilities, the City may then be able to participate in the Living Building Challenge (LBC). This green building certification signifies that a building produces more renewable energy than energy it consumes from the grid, among other criteria. A building that already has some level of LEED certification will have an easier time obtaining other certifications like LBC. LEED also opens doors to urban sustainability networks, which Glendale could use to learn about and incorporate additional green-building programs for future projects.

Editor's Note
It may be necessary for Glendale to employ a Sustainability Manager / Director in order to access the urban sustainability networks associated with LEED.

One of the students' interviewees, Mick Dalrymple, is the leading expert at ASU on green building practices. Dalrymple is also a LEED Accredited Professional and Living Building Challenge Ambassador with extensive background in other green building techniques and programs. In the students' interview with Dalrymple, they discovered that the use of tracking measures, especially in water and energy consumption, is vitally important in assessing the sustainability of a green build. Tracking enables an entity to establish a building's baseline of greenhouse gas emissions that, in turn, enables the entity to identify the actions they need to take to reduce emissions. Dalrymple is of the strong view that some form of federal carbon fee is inevitable for both private and public entities. According to Dalrymple, it is not a matter of "if," but "when" and "how" carbon emissions will be taxed (Alexander and Jennings, p.15). Dalrymple contends that cities will be hit hard financially when a carbon fee is implemented and that cities that make sustainability-based investments now will be in a better position to mitigate this upcoming financial levy.

Green Building Standards

Green Building Standard	International Green Construction Code (IgCC)	Standard for the Design of High-Performance Green Buildings (ASHRAE)	National Green Building Standard (NGBS)	Green Building Assessment Protocol for Commercial Buildings (Green Globes)	Leadership in Energy and Environmental Design (LEED)	Living Building Challenge (LBC)
Mandatory/ Voluntary	Mandatory	Mandatory	Voluntary	Voluntary	Voluntary	Voluntary
Standard Type	Model code	Model code	Rating and certification system	Rating and certification system	Rating and certification system	Rating and certification system
Buildings Types	▪ Commercial: all ▪ Industrial: all, but manufacturing systems and equipment ▪ Mixed use: all ▪ Residential: multifamily with more than three stories	▪ Commercial: all ▪ Industrial: all ▪ Mixed use: all ▪ Residential: multifamily with more than three stories	▪ Mixed use: residential space ▪ Residential: all, except institutional uses	▪ Commercial: all ▪ Mixed use: all ▪ Residential: multifamily	▪ Commercial: all ▪ Industrial: all ▪ Mixed use: all ▪ Residential: all	▪ Commercial: all ▪ Industrial: all ▪ Mixed use: all ▪ Residential: all
Projects Types	▪ New construction ▪ Additions ▪ Alterations	▪ New construction ▪ Additions	▪ New construction ▪ Additions ▪ Alterations	▪ New construction ▪ Additions ▪ Alterations ▪ Existing buildings	▪ New construction ▪ Additions ▪ Existing buildings	▪ All
Subject Areas	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Emissions ▪ Operations and maintenance	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Construction and operations plans	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Operations and maintenance ▪ Building owner education	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Emissions ▪ Project/ environmental management	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Emissions ▪ Operations and maintenance	▪ Sustainable sites ▪ Energy efficiency ▪ Water efficiency ▪ Materials and resource use ▪ Indoor environmental quality ▪ Equity ▪ Aesthetics
Community Adoption/ Use	Communities could incorporate this standard to other code or ordinance. It could work together with other International Code Council model code. Requires adoption by governing jurisdiction to become mandatory.	Communities could use this to enforce other building codes and ordinances that already exists (the ordinance may need to be reviewed to ensure adequately correlate with this standard).	Communities could use this standard as the basis for a voluntary program to encourage construction of greener homes.	Communities could use this protocol as the basis for a voluntary program that encourages construction of green commercial buildings.	Communities could use the rating systems to encourage greener construction of commercial buildings, homes, or neighborhoods.	Communities could use this system as the basis for a green building program.

Table 2 *Characteristics of different green building standards. Shaded boxes indicate characteristics that students felt best suited Glendale's goals.*

Case studies of facilities from Nashville, Washington, DC and Phoenix provide exemplars for Glendale. Each city is considered exemplary, not only for their many LEED-certified municipal buildings, but because each has created ordinances that require new builds of specific criteria to abide by LEED certification standards or higher. Participation in LEED building practices coupled with regulatory policy has created new pathways and standards for advancing citywide sustainability practices. Additionally, through LEED, these cities have been able to measure and track energy savings. Nashville has become a national leader in municipal LEED initiatives, with other cities modeling their policies and practices on this Southern city. Below is the case study of Nashville and a table signifying the ROI for their LEED-certified buildings. Case studies for Washington, D.C. and Phoenix are found on Pages 9-10 in the Alexander and Jennings report.

Case Study: City of Nashville, Tennessee.

Nashville made a public commitment to have all buildings with 5,000 square feet or more achieve LEED Silver Certification. This goal was statutorily required via a 2007 ordinance. To meet the LEED requirements, the City created a new governmental department called Socket, responsible for implementing all sustainability programs regarding water, waste, energy, wellness, food, green space, mobility, and construction. Of note, the city recently built a LEED Platinum fire station. It's photovoltaic system meets 44% of the building's energy needs, feeding energy back into the local electric meter for energy credits. Indoor potable water use was reduced by 33%, and 63% of the waste produced during the fire station's construction was diverted from landfill.

The City publishes annual reports that explain how much their 21 LEED certified buildings save on water and energy consumption compared to non-LEED buildings. These savings are calculated by a financial model that Glendale could replicate. These savings directly benefit Nashville taxpayers. Additionally, Nashville benefits from partnering with national and international networks for sustainable cities, allowing Nashville to share their best practices and innovations with other cities.

Pay-Off for LEED Buildings in Nashville

Building	*Fire Station #19*	*Fire Station #20*	*Bellevue Library*
Construction Cost $	**4,849,059.00**	**8,601,736.00**	**9,554,115.00**
12.5% Extra LEED Sunk Cost $	**606,132.38**	**1,075,217.00**	**1,050,952.65**
Years to Pay OFF at 12.5% Extra LEED Sunk Cost	**9.76**	**15.74**	**21.65**
4% Extra LEED Sunk Cost $	**193,962.36**	**344,069.44**	**382,164.60**
Years to Pay OFF at 4% Extra LEED Sunk Cost	**3.12**	**5.03**	**6.92**

Table 3 *Pay-off time for three LEED Certified Buildings in the City of Nashville. For the expanded table and additional student research, visit* **links.asu.edu/PCGlendaleSustainableFacilities**

Recommendations for Green Buildings

Implementation Steps

1. Pass a sustainability ordinance

Municipalities that passed ordinances mandating sustainability policies tend to have the most success. Glendale should consider passing legislation similar to Nashville that would mandate green practices in building and construction.

2. Designate a team leader

Glendale should appoint a sustainability leader for the Field Operation facility renovation project, and this person should be tasked with keeping track of development stages, accomplishments and promotional activities. This leader should identify opportunities for growth and select potential partners for future projects for the municipality.

3. Recognize efforts and accomplishments

Internally, Glendale should promote best practices in green building and incentivize and reward the efforts and initiatives from employees and leaders. Externally, the City should communicate and leverage media exposure to champion the goals that the City has achieved.

Processes and Practicality

4. Commit publicly/establish goals

Glendale must establish a work timeline and clear goals for the facility renovation. A public commitment demonstrates the project's importance to employees and residents alike and opens channels of communication for transparency and accountability.

Editor's Note
Glendale can increase water savings by installing water conserving fixtures. The EPA has a widely accepted efficiency standard called WaterSense.

5. Monitor the use of resources and energy

Glendale should measure/track energy usage and water consumption to fully implement sustainability practices. Monitoring allows the City to track financial savings that will accrue over time and identify opportunities for further growth and savings. The City should consider partnering with an energy audit company to jumpstart these tasks. Proper monitoring will allow Glendale to participate in other green building programs such as Energy Star.

6. Contract bid process

Glendale should revamp its procurement process to encourage firms with LEED and LBC experience to work with the City. Many sustainable cities have transformed their bid processes to better engage with LEED and LBC knowledgeable firms.

7. Do not use temporary constructions

Temporary facilities cannot be certified, have short lifecycles and have to be replaced and/or fixed constantly. To infuse a culture of sustainability in your City, all purchases and proposed construction must undergo a lifecycle analysis to guarantee a positive ROI and efficient use of resources.

Editor's Note
The Deputy Dean of the School of Sustainability at ASU previously published a sustainable procurement guide which may serve as a valuable resource in guiding Glendale towards more sustainable procurement practices: spa.asu.edu/spri

8. Follow LEED guidance without certification

Cities need not apply for LEED-certification to receive LEED-based benefits. Instead, the City can follow LEED practices while partnering with construction, engineering and architectural firms that have LEED experience. No certification application is needed for this. LEED offers a list of practices that the City of Glendale can execute immediately in order to begin receiving LEED-based benefits. This will allow Glendale to begin to acquire the necessary knowledge and momentum needed for LBC participation, but without paying for certification.

Future Actions

9. Pursue audits

Glendale should choose a local or a regional energy firm to conduct an energy audit of the Field Operation facility and/or other municipal facilities within the City. Many firms conduct audits for marginal fees; such an audit would locate energy inefficiencies and identify solutions (and challenges) as well as establish a baseline measure of energy use and water consumption.

10. Network and organization participation

Participation in networks allows Glendale to learn about current and emerging best practices, grant opportunities, while promoting the City's work.

11. Follow LBC guidance

LBC promotes self-sustained buildings, blocks, and communities. Glendale should begin to LEED construction practices to gain experience and build momentum for future LBC participation. Once this goal is achieved, Glendale can follow LBC guidance for future construction projects within the City.

12. Improve local regulation

As sustainability culture takes hold in Glendale and staff gains experience and capacity, the City can begin to create even more robust sustainability policies and regulations. For instance, Glendale would not have to build to LEED standards if they create standards that go beyond current LEED standards. Glendale would become a leader in the municipal sustainability sector, and the City would save the cost of building certifications.

Editor's Note

LEED is now partnered with the STAR Community Rating System. Glendale can coordinate and build on its success with LEED, creating a more solid overall city sustainability plan with the integration of STAR.

Editor's Note

Glendale should establish a Sustainability Commission and hire a Sustainability Manager or Director, which will spark opportunities for membership in the Urban Sustainability Directors Network and other organizations. The cities of Phoenix and Tempe have both hired sustainability directors. Both communities report this positioin has paid for itself a few times over in ROI.

ENERGY

Topic Overview

The urban heat island effect is both a cause and a symptom of rising temperatures, as higher temperatures require additional energy usage to cool buildings (Burks and Fields-Austin, p.3). These negative externalities impact the human population. According to the US EPA, “Excessive heat events, or abrupt and dramatic temperature increases, are particularly dangerous and can result in above-average rates of mortality” (EPA.gov, n.d.). Due to the local and global concerns, large institutions are recognizing their responsibility to incorporate policies and infrastructure to mitigate negative outcomes.

Like many of its buildings, Glendale’s Field Operations Campus is not energy efficient, which translates into higher costs for daily operations. Municipalities must reduce energy waste through energy efficient infrastructure and practices, such as integrating on-site renewables. The City will face upfront costs and challenges, including barriers to renewables brought by utility regulation, which is why the City needs to be strategic and always make the business case to support energy efficiency. This section explores best practices and recommendations for pursuing more efficient and clean-energy practices.

Research Findings & Analysis for Energy

Renewable Energy

Students researched six US cities that implemented solar-energy systems on municipal buildings or on city grounds. These cities all achieved a positive ROI for their renewable-energy adoption. Rooftop solar was the most common type of installation for these municipalities. Panels were installed on firehouses, city halls, and maintenance facilities. Distributed solar installation is typically the least expensive and easiest to install over other forms of solar installation. Another commonly used form of solar panels is installing them on top of parking structures, such as carports. This form of solar is ideal for Arizona’s climate, as the sun is available year-round and carports serve a dual purpose of saving energy and providing shade, increasing comfort and employee satisfaction.

Because cities do not pay taxes, they do not qualify for federal solar tax credits. Therefore, it makes better sense financially for a city to enter into a PPA or lease from a third-party developer who qualifies for, and can pass on, the tax credit.

Aside from saving taxpayer money, incorporating renewable energy into a city's operations serves to increase public awareness about the topic. In 2006, Cleveland, Ohio attached an educational, public art installation to a wind turbine project. This location became known as the Great Lakes Science Center. This integration of art and operations helped to build public awareness for renewable energy and grow public support for their solar installment the following year, which also integrated interactive, educational aspects. Cities that display a positive vision of renewable energy attract the attention of investors, which can spark future renewable energy projects.

Figure 3 *Great Lakes Science Center in Cleveland, Ohio by Tim Evanson via Flickr*

Many cities pair their renewable energy efforts with Climate Action Plans. These strategic, time-based plans help cities to envision their sustainable future and include goals for reducing citywide Greenhouse Gas (GHG) emissions and fossil-fuel dependency, as well as improving environmental quality and building equity. Climate Action Plans instill a sense of urgency for pursuing projects that offer sustainable solutions and increased livability. A fully engaged public-planning process will foster partnerships with local nonprofits, universities and community colleges, and local businesses—all seeking to achieve community-minded goals.

One significant barrier to installing municipal solar is the up-front cost. Cities can employ multiple strategies for lowering initial costs and cutting back the payback time on the panels.

Pay-Off Times for Solar Financing Methods

Type of Financing	Payoff Time
Federal Bonds	Long-term
Power Purchase Agreement	Long-term
Grants	Up-front
Utility-Provided Rebate	Up-front

Table 4 *Financing strategies employed by cities (Burks and Fields-Austin, p.9)*

Cities that added solar to their portfolio found many "spillover benefits" of an activity not reflected on its price tag. These cascading benefits are generally unforeseen or difficult to quantify. One example is the valuable experience gained by building, electrical, and fire-code staff when solar arrays are installed (Burks and Fields-Austin, p.5). The cities of Denver and Lancaster noted spillover effects on their policies as they crafted more favorable rules and regulations for private solar installations, reduced permitting and licensing requirements, and streamlined processes. The City of Minneapolis, Minnesota is currently saving $32,000 in energy costs and diverting 170 metric tons of GHG emissions each year due to their solar investments.

Energy Efficiency

Students provided case studies of cities that incorporated energy-efficient buildings into their building plans. On the following page is one example of such a build for the Southeast Service Center in Tucson.

Case Study: Southeast Service Center in Tucson, AZ

This project aimed to construct a city building that showcased energy-efficiency and sustainable building techniques in a community of 500,000 people (SWEEP 2018). This building incorporates the Sustainable Energy Standard (SES) building code, designed to surpass the 1995 Council of American Building Officials Model Energy Code. Incorporating renewable-energy sources and energy-efficient infrastructure, these land-use regulations promote a 50% increase in energy-efficiency within building codes. The following SES requirements were incorporated into the building construction:

- high efficiency HVAC system with setback controls and after-hours override;
- insulation at R-38 for the roof, R-19 for the walls and R-3 for the glazing;
- duct-leakage control;
- energy-efficient lighting; and
- air-leakage control for the shell.

Additionally, the City incorporated other features to surpass the compliance requirements. The projected energy savings by including the energy-efficient features exceeded $3,000 per year. With initial costs of $24,000, the payback time was eight years.

Cities can increase energy efficiency in existing builds as well. Retrofitting involves making modifications to existing commercial buildings to improve energy efficiency or decrease energy demand. Energy-efficiency retrofits can reduce the operational costs for cities, particularly in older buildings (Burks and Fields-Austin, p.5). Retrofitting current infrastructure can include energy saving features, depending on its feasibility and the municipality's budget. Covering windows with reflective film, for instance, helps cool down a building during the day by blocking the sun's rays without preventing all light from entering, making the building feel cool while still well-lit. **With their solar investments, Minneapolis is saving $32,000 in energy costs and diverting 170 metric tons of GHG emissions each year.**

Editor's Note
Consider adopting higher energy and construction codes to international standards: www.iccsafe.org/products-and-services/i-codes/2018-i-codes/igcc/

Recommendations for Energy

1. Install a solar carport that serves the dual purpose of harnessing the sun's energy and providing shade for city employees.
2. Build all new buildings with sufficient load-bearing capacity to support rooftop solar units
3. Consider financing a solar energy system with a power purchase agreement (PPA) to reduce the overall cost of the system.
4. Consider how a solar power system could benefit the City, including spillover effects and long-term benefits.

LANDSCAPING

Topic Overview

Staff at the Field Operations Campus is acquainted with sustainable landscaping concepts. The Campus includes a limited amount of xeriscaping, but while the landscaping may require little supplemental water, it lacks the social/environmental benefits that result from truly sustainable landscaping. Examples of these benefits include: mitigating the urban heat island, diverting pollutants from stormwater runoff, improving community well-being, and increasing worker productivity. Additionally, City employees and the surrounding community can gain capacity and expertise from the strategic placement of sustainable landscaping.

Benefits of Landscaping	Benefits of Sustainable Landscaping
▪ Carbon sequestration ▪ Temperature cooling ▪ Decreased air pollution ▪ Reduced stress/anxiety for workers ▪ Increased worker productivity ▪ Increased property values ▪ Improved social equity (if fairly distributed)	All general landscaping benefits, plus… ▪ Reduced water consumption ▪ Enhanced ecosystem services ▪ Reduced stormwater pollution ▪ Improved stormwater management ▪ Greater sense of place ▪ Reduction of chemical and other inputs ▪ Reduced waste ▪ Reduced maintenance time and costs

Figure 4 *Benefits of incorporating landscaping into the Field Operations renovation (Harmon, p.6)*

Research Findings & Analysis for Sustainable Landscaping

For this report, we define a sustainable landscape as one that requires minimal capital inputs, prioritizes native plants, increases carbon storage and oxygen production, supports local ecosystem functions, and is designed, installed, and managed by people in ways that improve human health and well-being (Harmon, p.5).

Glendale's Field Operations Campus

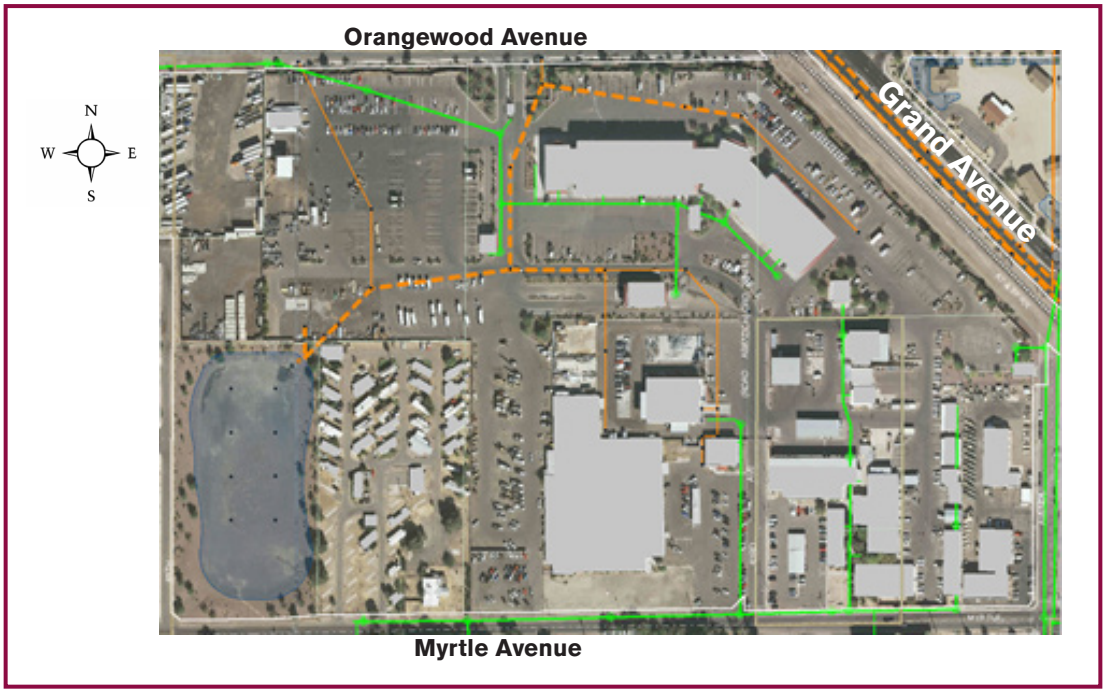


Figure 5 *The orange lines mark stormwater lines that lead to the water retention basin at bottom left. Three black catch basins on campus feed into these lines, as does rainfall on Orangewood Avenue. Screenshot provided by Monica Rabb, Glendale's Environmental Program Manager (Harmon, p.4).*

Water Conservation

Best practices for water conservation include: smart irrigation and smart metering, rainwater harvesting, and xeriscaping. Glendale already practices xeriscaping and passive rainwater harvesting at demonstration gardens at the City's public library. You can easily transfer these practices to the Field Operations renovation. Tucson and Tempe are implementing central irrigation control for their parks to make it easier to detect leaks. Tucson also has passive and active rainwater harvesting at all its ward offices, reducing the use of potable water for irrigation.

Editor's Note
The Sustainable Cities Network has produced an LID Handbook through a collaborative effort of numerous SCN member cities, including the City of Glendale.

Low Impact Development (LID)

Low-impact development is intended to naturally retain stormwater and improve water quality. Simple versions of LID are passive and active rainwater harvesting. Passive harvesting directs water strategically at ground level, while active harvesting stores rainwater. In California, laws require all projects to mitigate at least the first ¾ inches of rainfall (essentially, the water that collects dust, pollution, and other toxins that accumulate on nonpermeable urban surfaces [Harmon, p.10]). Burbank Water and Power EcoCampus has a green street project that demonstrates five types of LID: infiltration, flow-through planters, detention, tree root cells, and rainwater capture (Harmon, p.10). Other LID practices include green roofs, curb cuts, and bioswales.

Glendale and Mesa collaborated in early 2019 to develop an LID Toolkit to supplement the LID Handbook. To retrieve this document, visit the link containing the student content and additional resources.

Native and Climate-Adapted Plants

Water conservation and LID go hand in hand with the use of native or climate-adapted plants. The City of Irvine's Sustainable Landscaping Manual stresses that plants are uniquely suited to the soils and microclimates where they evolved, and so choosing varieties of species that work well together increases their viability (Harmon p.6). The Irvine manual also indicates how incorporating native plants provide greater benefits for nitrogen fixing and wildlife

Refer to SCN's LID Handbook for recommendations on building a "Plant Palette" for landscaping.

Natural Shade

Many cities are turning to trees to combat the urban heat island effect. Harmon interviewed Irene Ogata, urban landscape manager for Tucson. For the last 12 years, Ogata has trained city staff, partners, and adjoining jurisdictions on cooling strategies. Tucson has invested in unique approaches, for example they are replacing trees that have overgrown under power lines with native trees in tall pots. The native tree species did not require additional watering after transplant and matched existing irrigation, which was a huge cost-saving (Harmon, p.6). The City also uses solar power-shade structures, which can be paired with lower-profile landscaping and serve the dual purpose of providing shade (especially at bus stops) and generating local electricity.

Integrated Pest Management (IPM)

Reducing the use of herbicides, insecticides, and fungicides is another sustainable landscaping practice, which prevents pesticide runoff and contamination of the water table as well as reduces health risks to athletes, residents, and their pets. Seattle has committed to reducing the use of herbicides, insecticides, and fungicides in all City landscapes

(Harmon, p.7). Irvine adopted an Integrated Pest Management system in 2016, as did Tempe. This system entails public areas that are considered "pesticide-free landscapes" such as playgrounds, sports fields, water features, picnic areas, and community gardens.

Reuse of Onsite Materials

Reuse of onsite materials can reduce the costs of sustainable landscaping. During the renovation of a courthouse in Santa Fe, New Mexico, 21,000 square feet of discarded concrete sidewalks were recycled and used to make seat walls for visitors while directing stormwater into rain gardens. Not only did this reuse reduce heating, it avoided the cost of new materials and nearly $10,000 in landfill fees (Harmon, p.7). Another option for continued reuse of onsite materials is green waste. Dead trees and other types of vegetation can be turned into mulch to be placed around plants and on turf to improve water retention and reduce heat. The City of Tempe collects green organic waste from residents, creates organic compost, and then spreads the mulch on parks and sports fields to help with weed control, moisture, and nutrients.

Editor's Note
The City of Glendale should recommend all parks staff responsible for pruning trees/ landscape care AND city-contracted landscaping company professionals should be trained as certified arborists and/ or subscribe to sustainable landscaping best practices.

Strategic Maintenance

Pruning and other maintenance can make or break sustainable landscaping. For example, poor pruning strategies (too often or too drastic) result in unnecessary labor, unhealthy plants, and excess waste. Unmonitored or damaged irrigation can result in wasted water or devastated landscapes. Well-planned and executed maintenance is important. Seattle's Parks and Recreation Department has an internal review process at several milestones of design during which people from all areas can review a project and give input. The City can mitigate maintenance concerns before the project is even installed. In addition, Seattle encourages its employees to become Sustainable Landscape Professionals through the statewide certification, EcoPRO.

Partnerships

A common best practice for urban landscaping is to partner with external organizations. For example, the Watershed Management Group won a bid to design and oversee the installation of Avondale's rain garden. Their monsoon maintenance crew also cares for the cisterns at Tucson's ward offices. Tucson has also partnered with the nonprofit Tucson Clean and Beautiful, which maintains neighborhood development projects for three years after implementation. Tucson has further partnered with the Sonoran Environmental Research Institute to administer rebates for stormwater management in lower-income neighborhoods.

Demonstration Projects

Demonstration projects engage the community in their city's urban landscaping projects. Glendale installed a demonstration garden at its library in the 1990s to educate the public on desert landscaping practices. The Burbank Power and Water EcoCampus, while renovating a public right-of-way, created a demonstration project for five types of stormwater management. Not only did the Burbank seek to test best practices in stormwater management, they created an aesthetically pleasing atmosphere and learning opportunity for employees and residents alike. Demonstration projects like these can also be leveraged to seek grant funding, which offsets costs (Harmon, p.7).

Figure 6 *Photos of Burbank Power and Water EcoCampus from before its overhaul (left) and soon after the project was complete (right) (Harmon, p.10)*

Green Roofs and Facades

Green roofs and facades help mitigate stormwater and reduce heat, while requiring trial and error and more maintenance than traditional landscaping. An extensive roof featuring 6 inches of soil and groundcover can cost $15 per square foot. An intensive roof with deeper soil requires more water and weeding may double that cost (Harmon, p.7). Camelback View, a mixed-use development in Scottsdale, incorporated green roofs into its design. An ASU researcher found that incorporating drip irrigation resulted in thriving vegetation, though water usage might be more than is ideal (Harmon, p.7). A good example of the use of green facades can be found in the Valley Metro Rail stops (Harmon, p.7). The success of this practice in the Phoenix metro area still remains to be assessed. At Burbank's Power and Water EcoCampus, green facades were initially ineffective. After additional consultation, however, employees reported enjoying the environment and additional shade of the green facade (Harmon, p.7).

Return on Investment

Three Campus visions of best practices, with varying costs and benefits:

1. **LID First:** Minimal landscaping focused on managing stormwater and improving quality. Curb cuts, bioswales. Possible shaded areas for employees not prioritized. Ideally subsisting on stormwater after a few years.
2. **Campus Overhaul:** Some less-used impervious surfaces removed to locate landscaping around the facilities for employee well-being and to reduce energy needs. Materials reused for infrastructure and seating. Lots more plants. On-site rainwater-storing cisterns installed for water sourcing. Smart irrigation installed.
3. **Public-Facing Demonstration Project along Myrtle Avenue:** Grants used to reduce initial costs. (See Green Street demo that spans three blocks outside of Burbank Power and Water's EcoCampus. Cost was $1.1M, assisted by a grant [Messineo 2018]).

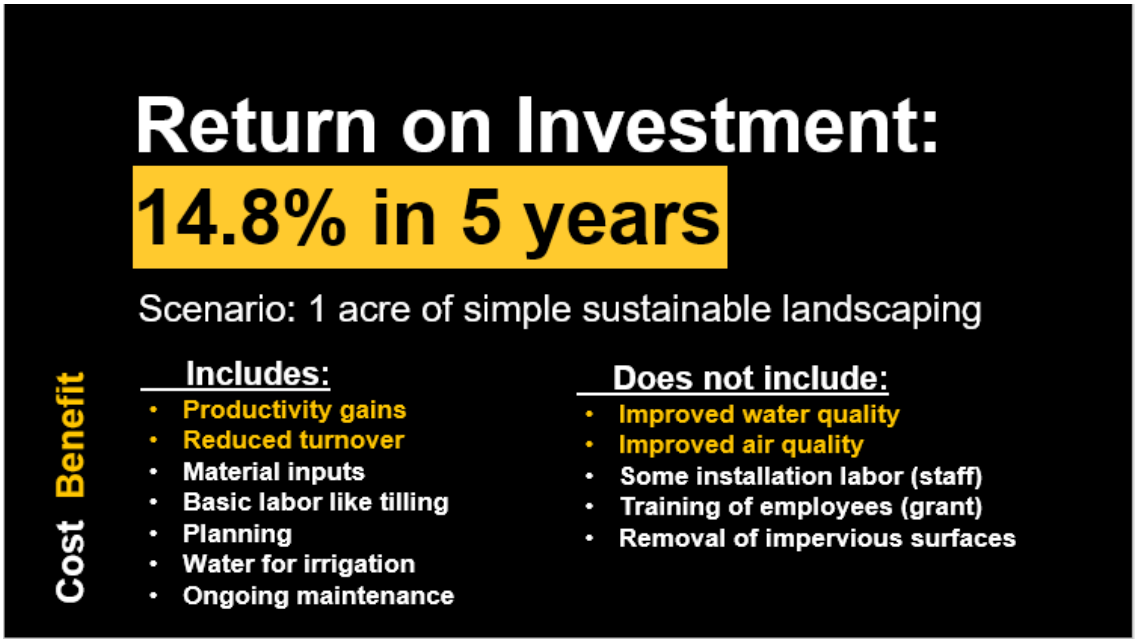


Figure 7 *Cost-Benefit Analysis of incorporating sustainable landscaping for one acre of simple sustainable landscaping (Harmon, p.13). This ROI does not take into account the intrinsic benefits of sustainable landscaping and some variable costs. Therefore, it is important to consider all possibilities when devising a sustainable landscaping plan.*

Editors Note
Figure 7 was derived from the Harmon report. The full student report includes additional benefits such as increased livability, public health, and aestheic value, among other benefits.

Recommendations for Sustainable Landscaping

Strategic Recommendations for the City

Sustainable landscaping looks different depending on the site's context and location and should reflect the values of its city. Glendale will need to develop its own vision of sustainable landscaping for its practices to gain traction and have the greatest benefit. Further, planning and adjusting maintenance will be needed to reflect the context and new needs of this landscaping.

Identify Vision and Leadership

1. Create a cohesive vision for sustainable landscaping for the Field Operations Campus and the City of Glendale and determine and our most urgent issues and environmental/social priorities.
2. **Understand the federal, state, and city policies that relate to sustainable landscaping and consider revising yours.**
3. Create an interdepartmental taskforce to engender collaboration, disperse new knowledge, and create citywide direction. Such departments could include: Water Services; Public Facilities, Recreation and Special Events; Development Services; Transportation.
4. Identify the individual(s) that will implement and maintain the landscaping. Without an advocate/team, any proposal will likely stall.
5. Gain traction and organizational support for citywide sustainable landscaping by engaging with the City Manager and City Council.

Implement in Phases

6. Choose a strategic installation on the Campus that will have the greatest impact.
7. **Identify the most pressing environmental issue and conduct a small-scale pilot. For example, label one park pesticide-free, or choose one site to install LID elements and see what plants and materials do best at retaining water and reducing pollutants.**
8. Look for small wins that motivate employees and spark more projects.

Ensure Ongoing Support

9. Empower employees to invest their hearts and minds in the project. For example, encourage departments to compete for the most sustainable art installation or landscape design.

Build Capacity

10. **Offer training in sustainable landscaping practices, especially maintenance.** This training will empower employees to take on leadership roles and ensure that contract maintenance work is done correctly. City of Glendale Environmental Program Administrator Joanne Toms could be a resource, as could staff at the Desert Botanical Garden (DBG), who can lead workshops.
11. Consider investing in landscaping certifications for employees. In Arizona, the DBG has a well-regarded Desert Landscape School that offers certificates in desert landscaping, including sustainable landscaping. DBG staff have indicated they would be able to provide a discount on these classes to Glendale city staff (Harmon, p.9).
12. Ensure sufficient budget for installing and maintaining new landscaping. Note that sustainable landscaping requires less maintenance and creates less waste in the long run. New plants and systems require an initial investment to succeed over the long-term.

Look for Outside Resources

13. **Seek grant funding for demonstration projects and tree plantings.** Outside funding can offset the costs of new types of projects while creating added value for communities.
14. Look for how other Valley cities have achieved similar visions.

Editor's Note
Consider adding an urban forestry position to your staff, someone whose job it is to care for the health and wellbeing of individual trees and the entire tree canopy, as well as bring resources (grants and volunteers) to increase and preserve shade.

Editor's Note
Note the old Chinese proverb: "The best time to plant a tree was twenty years ago, the second best time is now." Both Tempe and Phoenix have recently adopted goals to double their tree and shade canopy by 2040.

Campus Landscaping Recommendations

These general recommendations represent "on-the-ground" best practices for the Field Operations Campus. These strategies point the City in the right direction, with further direction needed.

1. **Identify the resources and context of the Campus.** Where does water fall from the roof? Where is it easiest to irrigate? Which parking spots are rarely used and can be converted?
2. **Identify where sustainable landscape would be most beneficial.** Consider areas where employees already gather.
3. **Review current maintenance practices.** Is there overlap? What needs to change?
4. **Add shade around buildings** (especially south and southwest walls). Whether trees, shade structures, or green facades, shade reduces energy use, provides aesthetic value, and creates a hospitable gathering place. Trees planted near buildings need room for full growth and beware of uplifting roots.
5. **Add bioswales and/or other LID features by the onsite drains that lead to the water retention basin** to filter out pollutants before stormwater runoff reaches the basin.
6. **Embrace the water retention basin as an opportunity** for sustainable-landscaping and/or community-beautification project.
7. **Reuse materials.** The Campus stores many materials awaiting recycling that could be used to craft creative shade structures or art installations.

Editor's Note
Curated thoughtfully, public art installations can tap into a City's unique character, adding intrinsic value to a location. This is also known as place making.

SUSTAINABLE PURCHASING

Topic Statement

The mission of the City of Glendale's purchasing is to:

> *"Save taxpayer money without compromising on quality, and to augment the effectiveness of the tax dollar in the purchase of materials and services within the requirements of city code and state law."*

For this reason, the City should focus upon high-impact opportunities that create the best value for taxpayers. Glendale can fulfill its sustainability goals of creating a healthy, sustainable, and resilient environment and abide by its current purchasing policy by creating a more sustainable purchasing policy. Support from top management, enthusiasm among employees, and experiences from substantial sustainability initiatives in the past demonstrate the commitment and capacity for sustainable purchasing (Delvinne and Wyke, p.1). Renovation of the 50-acre Field Operations Campus is a unique opportunity to internalize and operationalize sustainable purchasing: creating new avenues for sustainable economic development on a limited city budget.

Research Findings & Analysis for Sustainable Purchasing

The Sustainable Purchasing Leadership Council (SPLC) is a nonprofit that supports and recognizes purchasing leadership, whether they are buyers, suppliers, or other advocates. The student researchers used SPLC's website to identify 13 local governments that had effective sustainable purchasing policies, including: Alameda County, CA; King County, WA; Portland, OR; San Francisco, CA; Seattle, WA; Austin, TX; San Diego, CA; Durham, CA; Los Angeles, CA; and Denver, CO. The Sustainable Purchasing Policy (SPP) documents of these cities were researched to inform the students' analysis and recommendations. They concluded that the areas of sustainable purchasing that would produce the most returns for Glendale are: vehicles and fleet, energy, chemical products and services, electronics, and office supplies. Students created a prioritization tool to phase in sustainable purchasing practices in short-, medium-, and long-term time frames. For the expanded version of this tool and complimenting research, visit:
links.asu.edu/PCGlendaleSustainableFacilities

Recommendations for Sustainable Purchasing

Product	Departments	ROI (years)	Annual Cost-savings
Remanufactured Toner Cartridges	Purchasing; All Departments	1	$77,000
LED Lighting	Purchasing; Field Ops; Engineering	<4	$350,000
100% PCR Paper	Purchasing; All Departments	5	$120,000
EPEAT Desktops	Purchasing; Field Ops; Innovation & Technology	6	$50,000
Conventional to Electric Sedans	Purchasing; Transportation; Field Ops	8	$1000 per vehicle

Table 5 *Summary of recommendations for initial execution, along with payback times (short, medium and long-term)*

Departmental Recommendations

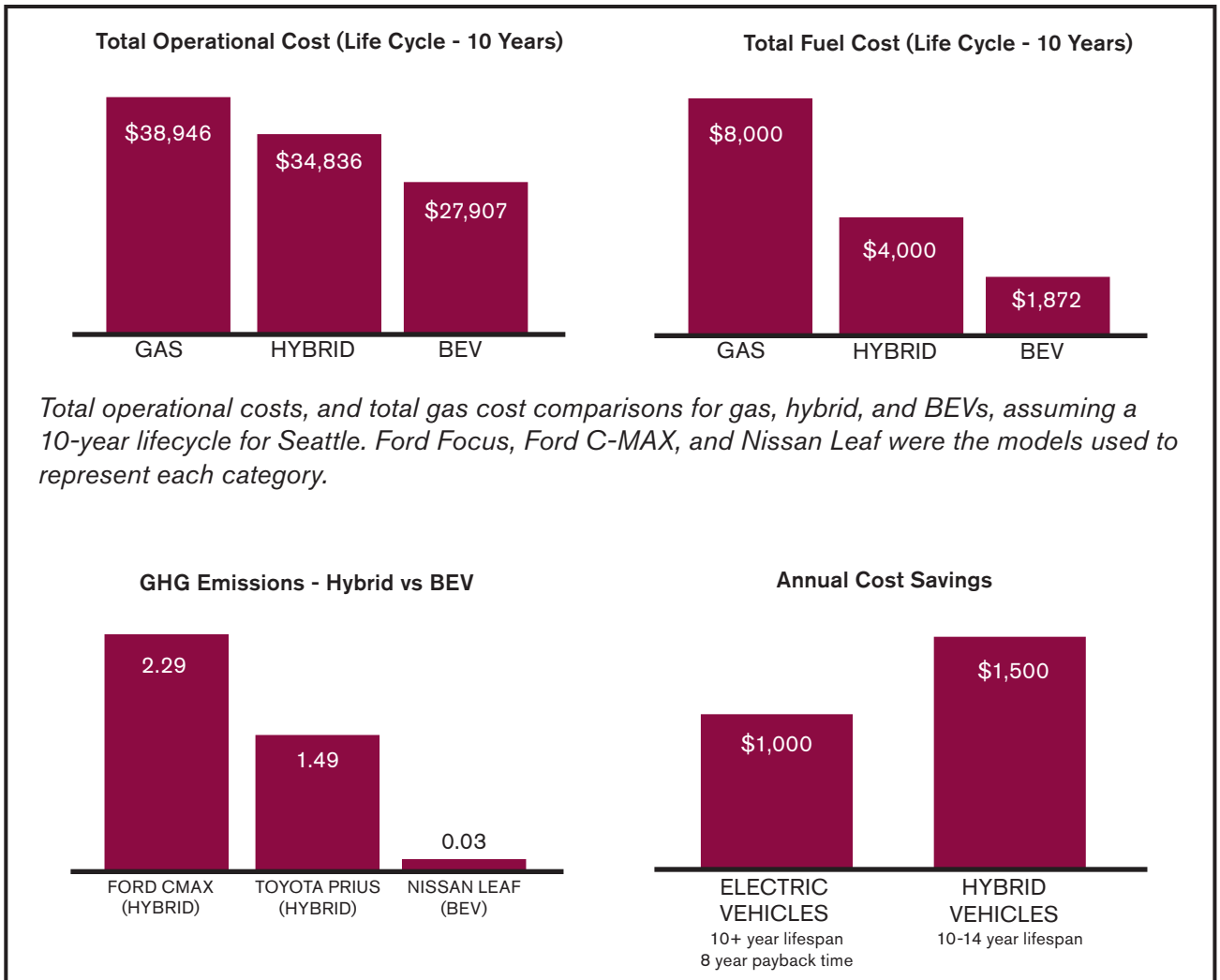
Vehicles and Fleet

Fleet management is an important focus in the Field Operations Campus. The City has already transitioned to biodiesel for the vast majority of heavy equipment. In addition, there are plans to evaluate opportunities to downsize some vehicles to smaller engines to improve fuel efficiency and reduce dependence on gasoline.

When Seattle shifted 300 of their municipal passenger sedans from hybrid to battery electric vehicles (BEVs), they saved over $2M in lifetime operating and maintenance costs. This savings calculation included the costs associated with investing in EV infrastructure/recharge stations (Delvinne and Wyke, p.6). They compared gas, hybrid, and BEVs. The total cost of operation was calculated using the equation: Total Cost of Operation = Acquisition + Life Fuel + Life Maintenance – Salvage.

Editor's Note
Students in Project Cities' Spring 2019 semester courses have also completed research to find best ways to incorporate electric vehicles into Glendale's fleet. Reference Spring 2019 reports for more information.

Long-Term Cost Savings of Municipal Passenger Vehicle Types



Total operational costs, and total gas cost comparisons for gas, hybrid, and BEVs, assuming a 10-year lifecycle for Seattle. Ford Focus, Ford C-MAX, and Nissan Leaf were the models used to represent each category.

GHG emission reduction in the transition from Hybrid to BEV are presented using the transition from Ford C-MAX and Toyota Prius (Hybrid) to Nissan Leaf (BEV). Appendix 4 in the student report presents further analysis on advantages and disadvantages of the above alternatives.

Figure 8 *Cost comparisons for alternative vehcile types*

The City of Portland conducted a similar cost savings analysis and found that their EV fleet would save them $1000 per year compared to hybrid vehicles, which would save $1500 per year. This city has also come up with creative solutions for reducing GHG emissions. **Portland has purchased an electric cargo trike for the distribution of office supplies, which has increased fuel mileage by 50%, resulting in the diversion of 7,700 lbs of CO2 emissions.**

Figure 9 *Electric Cargo Trike. Photo by Artless Wilbury via Creative Commons.*

Energy

Glendale has already taken advantage of low-hanging fruit in regard to reducing energy consumption. For one, they have converted streetlights to LED, and Traffic Operations has converted traffic signals to LED, using the Energy Efficiency and Conservation Block Grant. In addition, the City found ways to incorporate solar-powered infrastructure, including flashing units at school crosswalks and fire stations, and bus-stop shelter lighting.

Portland has found innovative ways to produce their onsite energy. For instance, the City uses anaerobic digester gas (~60% methane), a byproduct of its wastewater treatment plant, to produce biogas. The plant has also tested other technologies to reclaim this biogas for electrical power generation, including fuel cells, micro turbines, and co-generation engines. **Via these initiatives, the city has achieved a 40% energy savings, which amounts to $665,000 annual electricity cost reductions, and $300,000 from sales of excess biogas.**

Chemical Products and Services

Students conducted research on custodial supplies as an important area for sustainable purchasing. However, Glendale currently outsources custodial services. For this reason, this section has been significantly truncated. For more information, refer to page 9 of the Delvinne and Wyke report.

Editor's Note
Consider examining their current contract for custodial services. One way Glendale can incorporate sustainability into their custodial services is by negotiating with their contractor to switch over to green cleaning supplies and practices.

Field Operations, Transportation, and Water Services are key departments for change in the purchasing category of chemical products and services. For example, these departments frequently purchase cleaning products, lubricants and oils, and water-treatment products. At present, Glendale's chemical purchasing policies are departmentally driven and not centrally administered. Custodial services for all facilities in the Campus have been contracted out.

The States of New York and Massachusetts engage in a multistate contract for green cleaning supplies. **This cooperative contract reduces costs significantly for both states, saving them 20% on cleaning supplies – a total of $2M beginning the first year and continuing annually for the contract term.** Additional benefits of this contract include significant toxins avoidance, water conservation, and energy savings. Another notable example of strategic usage of contracts comes from King County. **The county reported that a contract with a bio-based product manufacturer for waterless car washing saved 30 gallons of water per vehicle and 100,000 gallons of water per year by using this bio-based product in combination with microfiber clothing to wash county vehicles.**

One other option Glendale may consider is seeking opportunities to transition to a more centralized purchasing system. Portland switched from purchasing their custodial supplies from a custodial service provider to purchasing those supplies directly, enabling them to improve monitoring and tracking of green cleaning product use, which improved transparency and reduced costs. This policy required the use of: Green Seal certified cleaners, all paper products that meet EPA minimum recycled content guidelines, disinfecting and sanitizing products that meet San Francisco's "Safer Products and Practices for Disinfecting and Sanitizing Surfaces" requirements, and other cleaning supplies that support high-performance green cleaning practices (e.g., microfiber cloths, HEPA vacuum bags). This initiative resulted in a 30% cost savings in custodial supplies.

Office Electronics

Office electronics use 8% of a typical office building's electricity. Moreover, more than 40M tons of e-waste is generated globally per year (Delvinne and Wyke, p.10). Incorporating energy-efficient office electronics results in saved energy and costs, while reducing waste. In Glendale, office electronics are centrally purchased and department-specific, with most purchases made by the Innovation and Technology Department and the purchasing department assisting with these procurements.

The students found that integrating energy standards into purchasing agreements were beneficial to the cities studied. The Electronic Product Environmental Assessment Tool (EPEAT) and Energy Star were the most commonly used certifications. EPEAT environmental criteria cover impacts of the entire product lifecycle, from design to end-of-use. Energy Star standard of the US EPA and the US Department of Energy is a required criterion within the EPEAT standard. San Francisco and Portland reported cost savings associated with EPEAT and Energy Star and EPEAT certified electronics (Table 3). Portland purchased Energy Star and EPEAT certified office electronics as an effort integrated into their LEED certification process. In addition, Portland has developed the Prime Contractor Development Program, which provides a networking system and educational opportunities for local businesses that wish to contract with the City.

Editor's Note
Consider an internal city-wide supply reuse program, or donating surplus office supplies to a local nonprofit such as Treasures for Teachers.

Cost Savings & Benefits of EPEAT Electronics

	Portland	San Francisco
Cost Savings	$256,345 in comparison to non-certified counterparts	$18,600 over the products' lifetime ~$60 less per product relative to the non-certified equivalent
Benefits	2.5 million kWh in energy savings 1,523 MT of CO2 equivalent savings 181 kg of toxic material savings 5,215 kg of hazardous waste savings	179,000 kWh of electricity 31.6 metric tons of GHG emissions 434 kg of hazardous waste

Table 6 *Comparison of Cost-Benefits from EPEAT Electronics*

Office Supplies

Office supplies are not currently centrally purchased at Glendale's municipal buildings, making it difficult to monitor and manage. According to student research, in the past, Glendale has saved on costs by assessing the inventories and cutting down on unnecessary purchases. Glendale has the opportunity to administer more of its operations through their Enterprise Resource Planning (ERP) system for budgeting, finance, human resource management, and procurement, etc. Enhancing the ERP by incorporating more of these operations would provide a massive opportunity for paperless operations and reduced use in office supplies.

The typical office generates 1.5 pounds of paper waste per person per day (Delvinne and Wyke, p.8). Both King County and Ramsey County reported significant cost savings from using remanufactured toner cartridges instead of new cartridges from the original equipment manufacturer (OEM). King County and Alameda County had the goal of achieving 100% post-consumer recycled (PCR) paper. The 100% PCR paper was significantly higher in price, posing a dilemma for starting the transition. However, by pairing sustainable purchasing practices with paper reduction initiatives, the combined effort yielded significant annual net savings for King County and Alameda County (Table 7).

Cost Savings Associated with Sustainable Office Purchases

	Ramsey County	King County	Alameda County
Remanufactured Toner Cartridges	$1,680 for Minolta printers $4,113 for HP Printers, relative to OEM	33.33% cost savings, with $77,000 total annual savings relative to OEM	n/a
100% Post-Consumer Recycled (PCR) Paper with Paper Reduction Initiatives	n/a	Annual net savings of $60,000	Annual net savings of $120,000

Table 7 *Comparison of Cost Savings from Sustainable Alternative Office Supplies*

To address the higher price of PCR paper, both King and Alameda counties made targets for reducing paper use. Their strategies included collaborating with administration for incentives, changing the default settings on copy machines to print double-sided, and transitioning to electronic platforms, such as sending documents through email, instead of printing. Paper consumption was reduced by over 20% for both counties over five years, significantly reducing the need for more paper. With the savings from decreasing paper use, the counties have been able to buy 100% PCR paper.

Alameda County made vendors provide their best price by setting the minimum recycled content level as 100% PCR in their 2014 paper contract. This strategy resulted in a per case cost reduction of over $3 relative to the price in the previous contract. This contract also enabled three other internal departments to transition to 100% PCR paper at the county's price using this contract, along with volume discount pricing and eliminating the need for a competitive solicitation.

To ensure the quality of remanufactured cartridges, King County currently uses National Association of State Procurement Officers (NASPO) value-point contracts and national cooperative contracts that have the quality assurance standards built into the contract.

Editor's Note
Glendale could take advantage of resources such as the Arizona Strategic Alliance for Volume Expenditures (SAVE) purchasing contract:

https://www.mesaaz.gov/business/purchasing/save

or other resources from the Arizona State procurement office:
https://spo.az.gov/other-purchasing-cooperatives

Recommendations for Sustainable Purchasing

General Recommendations for the City

1. Collect comprehensive baseline information on city purchasing
2. **Perform a comprehensive assessment to review its current purchasing efforts (i.e., volume, types of purchases, purchasing structures).**
3. Measure/monitor current purchases to cut down on unnecessary purchases and reduce consumption.
4. Conduct an environmental audit to examine in-house operations relating to purchases, use, and consumption to inform strategic changes for purchasing across departments.
5. **Designate a Purchasing Division employee to coordinate with employees from other departments to collect baseline information on current purchases and determine opportunities for more sustainable alternatives.**

Adopt a Sustainable Purchasing Policy

Adopt a Sustainable Purchasing Policy (SPP) to guide the City's procurement of green products and practices. To establish a successful SPP, the City of Glendale should consider the following:

6. Mandatory requirements for sustainable purchasing to ensure compliance and consistent monitoring.
7. **Establish metrics and track purchases to enable performance monitoring.** The City can then leverage this performance monitoring data to attain grants, special recognitions, and awards.
8. Build relationships with other cities and organizations to share information and best practices. This could also create cooperative purchasing agreements.
9. **Include sustainability criteria in vendor contracts**. For example, the City could include a requirement for minimum recycled-content standards.
10. Designate a principal SPP advocate team, to facilitate the successful implementation of the SPP.
11. Be aspirational in setting SPP standards. Set a practice of revising and increasing SPP standards based on changes in knowledge and best practices, optimally every 2 to 3 years.
12. **Create safeguards to defend the SPP from regression**. Consistent communications and incentives will help integrate the SPP into the organizational culture and values.

Assign Responsibility

13. **Designate a Sustainability Department Director who will collaborate with other cities to develop environmental standards for priority product categories and develop tools to fulfill SPP goals.**
14. Create leadership opportunities at the City level and departmental level to ensure compliance at both levels.

Leverage Collaboration and Take an Innovative Approach

15. **Piggyback on contracts with other internal departments and external entities (Phoenix) in cooperative agreements**, to lower costs and contribute to a successful sustainable purchasing policy.

Recommendations for City Departments - Priority Purchasing Areas

Focus on Key Purchasing Areas

1. Assess sustainable procurement goals to identify categories of goods and services that provide the best co-benefits.

Vehicles and Fleet

2. Transition to an electric fleet and expand EVSE infrastructure.
3. **Set targets for EVs and the number of EVSEs needed to support electrification.**
4. Identify the vehicle location and existing electrical capacity.

Editor's Note
The Electrification Coalition is a network for cities that helps promote city-wide vehicle electrification. www.electrificationcoalition.org

Energy

5. Expand energy-efficient lighting across all departments, envisioning functional, agile, and energy-efficient buildings.
6. **Consult the Department of Energy's Municipal Solid-State Street Light Consortium for invitation bids,** especially the model specifications.
7. Develop regional partnerships to initiate a purchasing cooperative that may promote discounted rates.

Editor's Note
Identify opportunities to replicate the successes of the LED streetlight conversion contract with Phoenix, for future municipal sustainability projects.

Chemicals Products and Services

8. Integrate sustainability standards and ecolabels into technical specifications of contracts and solicitations.
9. **Establish centralized purchasing for common chemical products across departments.**
10. Measure and monitor chemical use to understand and address stakeholder "pain points."
11. Educate and engage stakeholders one-on-one to create lasting change.
12. **Integrate lifecycle costs and eco labels into purchasing documents including solicitations and contracts.**

Office Supplies

13. Purchase reuse-recycle products.
14. **Restrict toner cartridges purchases to remanufactured ones and reduce paper consumption to re-allocate the generated savings toward the purchase of 100% PCR paper.**
15. Integrate quality assurance standards into contracts to assure quality standards in the purchase of remanufactured and recycled products.
16. Develop inventories of office supplies at the department level and cut down unnecessary purchases.
17. **Provide incentives to departments to encourage proper consumption patterns.**
18. Purchase office supplies via linking agreements with the state of Arizona, along with neighboring cities.

Electronics

19. **Require the purchase of EPEAT or Energy Star certified electronics.**
20. Integrate sustainable purchasing of electronics into sustainable construction efforts of the new campus to increase energy efficiency and contribute to building certification standards such as LEED.
21. Designate the Department of Innovation and Technology for centralized purchasing of office electronics and integrate sustainability standards into their technical specifications. Educate other departments to piggyback on existing contracts to save time, funding, and resources.
22. Strengthen vendor relationships to learn about technological advancements in business from the vendor community.

CONCLUSION

The City of Glendale has an opportunity to incorporate sustainable practices into the renovation of its Field Operations Campus. Students in Dr. Nicole Darnall's class, SOS/PAF 545: Organizations, Sustainability & Public Policy, researched creative, engaging, and cost-effective ways for the city to take advantage of private/municipal contracts and build the capacity of city employees in the process.

Please note: these student recommendations are not peer-reviewed and tested by senior researchers. Therefore, we advise that the City use discretion when moving forward with these recommendations. The purpose of this report is to provide background research to city officials and inspire Glendale to incorporate sustainable operations, thereby mitigating Glendale's daily environmental impact, generating financial savings from smart investments, and further advancing the City's sustainability goals.

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To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCGlendaleSustainableFacilities

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