

National Aeronautics and
Space Administration



FY2017

NASA JSC
**Sustainability
Engagement
Strategy**

Insight From the Center Sustainability Officer

NASA employees have a very difficult challenge ahead of us. As we continue planning and preparation for a trip to Mars, we know that making the best use of every resource we have on our spacecraft is vital to a successful mission. Reusing water means more mass is available for other things. Creative packaging of supplies can save weight and waste; novel electrical distribution schemes can save precious energy for other uses, etc. We need to apply this same thought process to how we do business on Earth. We can use our knowledge and understanding of how to do long-term spaceflight missions to be a better steward of precious resources on our home planet. We are uniquely positioned to help lead this country to a better, cleaner, more efficient way of living every day. After all, what is Earth, but just one big spacecraft spinning around the sun? Let's take the challenge that the Mars journey gives us and use that expertise to change wasteful behaviors, discover new technologies, and set the standard for the rest of the Nation to follow today.

Joel Walker

Center Operations Director
Center Sustainability Officer
NASA's Johnson Space Center

Table of Contents

Introduction	
Goals	1
Air	2
Land	4
Water	6
Materials	8
Energy	10
People	11

Front cover: In this view of the central and north Gulf Coast of Texas, San Antonio Bay, Matagorda Bay and Galveston/Trinity Bay are clearly seen. Small sediment plumes at the tidal passes are visible.

This page: Construction and Demolition (C&D) material was incorporated into a privacy barrier at the astronaut memorial grove.

What is Sustainability?

NASA Goals

Sustainability Targets



“NASA’s sustainability policy is to execute the mission without compromising our planet’s resources so that future generations can meet their needs.... taking action now to provide a future where the environment and living conditions are protected and enhanced.... NASA manages risks to mission, risks to the environment, and risks to our communities. To this end, NASA seeks to use public funds efficiently and effectively, promote the health of the planet, and operate in a way that benefits our neighbors.”

–NASA Strategic Sustainability Performance Plan

More on NASA’s Strategy for FY17 at <http://www.nasa.gov/content/strategic-sustainability-performance-plan-sspp>

How we target sustainability at JSC

The 10 Executive Order goals are categorized at JSC in 5 main resources. These are managed to sustain People, symbolized at the center of the sustainability logo. The JSC strategy is to create a working environment where JSC employees feel happy, comfortable, and productive to support our mission. Your sustainability efforts can affect and benefit the mission. See impacts you can make in “Takeaways” to follow.



**Sustainability—
we just do it.**

Executive Order 13693 Planning for Federal Sustainability in the Next Decade NEW TARGETS

- 
Goal 1: Greenhouse Gases
 - Reduce direct GHG emissions (onsite or offsite) by 47% and reduce indirect GHG emissions (e.g., commuting, travel) by 32% by FY 2025, compared to 2008
- 
Goal 2: Sustainable Buildings
 - Reduce energy use/GSF by 2.5% annually through FY 2025, compared to FY 2015
 - 1% of the agency’s existing buildings above 5,000 gross square feet intended to be energy, waste, or water net-zero buildings by FY 2025
 - At least 23% of buildings, or 30% of Gross Square Footage, will meet Guiding Principles by FY 2025
- 
Goal 3: Clean & Renewable Energy
 - At least 10% of agency’s total electricity consumption is from renewable energy sources, for FY 2016 and FY 2017
 - At least 10% of agency’s total electricity consumption and thermal energy is from clean energy sources, for FY 2016 and FY 2017
- 
Goal 4: Water Use
 - Reduce potable intensity (gal/sq ft) by 2% annually through FY 2025, compared to 2007; reduce use for industrial, landscaping, and agricultural by 2% annually through FY 2025, compared to 2010; install appropriate green infrastructure to improve storm water and wastewater management
- 
Goal 5: Fleet Management
 - Reduce per-mile GHG emissions by 4% by 2017, 15% by 2021, 30% by 2025, compared to 2014
- 
Goal 6: Sustainable Acquisition
 - Ensure that environmental performance and sustainability factors are considered to the maximum extent practicable for all applicable procurements
 - Award 1,100 contracts with Biopreferred and biobased criteria, with estimated value of \$1,000,000, to be delivered in FY 2016
- 
Goal 7: Pollution Prevention & Waste Reduction
 - Divert 50% of solid waste (excluding construction and demolition debris); divert 50% of construction and demolition debris
 - Reduce acquisition, use, and disposal of toxic and hazardous materials, particularly when helpful in meeting GHG reduction goals
- 
Goal 8: Energy Performance Contracts
 - Award \$73.9M investment value in Energy Savings Performance Contracts and Utility Energy Services Contracts by the end of 2016
- 
Goal 9: Electronic Stewardship & Data Centers
 - Ensure 95% of monitors, PCs, and laptops acquired meet environmentally sustainable electronics criteria (EPEAT registered)
 - Ensure 100% of computers, laptops, and monitors have power management features enabled; follow environmentally sound methods for disposal
- 
Goal 10: Climate Change Resilience
 - Evaluate climate change risks to identify and manage the effects of climate change on the agency’s operations and mission in both the short and long term

Goal 1 Greenhouse Gases

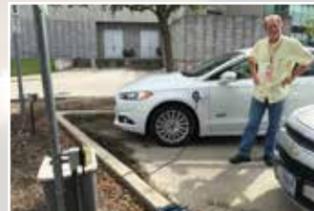
environmental impact

Building 24 is seeing new changes that will help reduce its environmental impact. In September 2016, Boiler 24-4A was replaced with a state-of-the-art energy-efficient burner assembly that will substantially reduce combustion byproducts. Unlike the current system, which is an antiquated flue gas recirculation system, this replacement will decrease carbon monoxide and nitrogen oxides, both of which are precursors to smog formation.



Boiler 24-3A being moved into Building 24

Moreover, Boiler 24-3A is being moved into Building 24. The installation and start-up of the Combined Heat and Power (CHP) Facility in this building will reduce NASA-JSC's carbon footprint by approximately 29,000 metric tons of CO2 annually. The steam will be used to operate the existing steam-powered chillers. The associated "net reduction" in greenhouse gases to operate JSC is equivalent to eliminating the exhaust of approximately 3,500 automobiles. The CHP is expected to be online by mid-2017.



A meter and chord set for the Ford Fusion at B20 are contained in a rainproof box, set up by Eric Kimball and Dave Hanson. (Source: Dave Hanson)

Estimated Benefits of Vanpooling Source: MetroStar

Reporting Criteria:	Yearly Impacts	Yearly Impacts	Yearly Impacts	Yearly Impacts
Number of Vanpools	1	25	50	100
Number of Riders	10	250	500	1,000
Parking Spaces Saved	9	225	450	900
Gallons of Fuel Saved	3,154	78,853	157,706	315,412
Vehicle Miles Traveled - Reduction	82,007	2,050,176	4,100,352	8,200,704
Emissions Reduction (Tons)*				
Hydrocarbons	0	2	5	9
Carbon Monoxide	1	18	36	72
Oxides of Nitrogen	0	2	3	7
Carbon Dioxide	38	939	1,878	3,756

Goal 5 Fleet Management

transportation alternative

Two Government Owned Vehicle (GOV) plug-ins arrived in FY16! Civil servants and contractors with third-party liability insurance can use the Ford C-Max Energi, located at building 419. The other, a Ford Fusion (upper right), is for SAIC contractors. Six charging posts are planned for installation near building 21, and additional plug-in hybrid electric vehicles (PHEVs) are expected. NASA HQ plans to provide guidance for on-site Privately Owned Vehicle (POV) charging by December 2016.

Vanpooling is another transportation alternative that reduces emissions. See the other benefits (right) and read a JSC employee's narrative of using this service in "People" on page 11.

TAKEAWAYS: Bike, vanpool, or drive electric to work.

On-site Mobility

"free range"

JSC actively promotes cycling to reduce travel mileage. Logistics personnel and cycling enthusiasts have grown the "free range" bike program to over 200 bicycles, which you can use as an alternative form of transportation on-site. Look for air pumps and racks to maintain the bikes.



Bike to Work Day



Kirstyn Johnson brought her cycling lifestyle and passion to Houston. She, with the support of the Green Team, led JSC's first employee designated Bike to Work Day on May 19, 2016 and is photographed with her Power of One Award. (Source: Teresa Shurtz).



"life-style" change

Concurrent with National Bike Month, the first JSC employee "Bike to Work Day" was in May of 2016 and included a gathering of 40 participants. The event was well-organized, as each registrant was assigned a Bike Route Champion to make the ride from as far as downtown Houston. The Gilruth was the morning gathering spot where multiple organizations supported the event; snacks, bike mechanics, and showers were available. New buildings and major upgrades to existing buildings are now incorporating showers within restrooms to promote "exercising" this alternative form of commuting. Participants communicated with their teams to get home before the eventual late afternoon downpour. Employees became more aware of the larger cycling community and even met weeks after the event to discuss the City

of Houston proposed Bike Plan. You can participate in 2017 and even organize the event with the Green Team at monthly meetings.

TAKEAWAYS: Join the organizing team for Bike to Work Day.

Goal Sustainable 2 Buildings

Goal Climate Change 10 Resilience

September 2015



November 2015



January 2016



March 2016



May 2016



June 2016



August 2016



LEED Silver standards
Construction continues on Building 21, the Human Health and Performance Laboratory. It is designed to LEED Silver standards, which include:

- o Alternative Transportation: Storage for 24 bikes and 19 low-emitting/fuel-efficient parking spaces
- o Native Landscaping
- o Water Use Reduction: Low-flow plumbing fixtures
- o Optimize Energy Performance: Projected 30% energy savings
- o 75% Construction Waste Recycled
- o Low-VOC-Emitting Materials: Adhesives, sealants, paints, flooring systems

B231, one of 200 area buildings scheduled for demolition in the coming year.



Out with the Old and in with the New

green space
Several 200 area buildings (222, 228, 229, 230, 231, 232) are scheduled for demolition next year. These high-maintenance, energy inefficient, 50-year-old facilities will return 36K square feet of developed area to green space!



Are you BAFFLED by climate change?

View of Little blue heron in nest in the JSC rookery and pond area. (Source: NASA-Lauren Harnett)

happening right now

Climate change is complex, happening right now, and is already affecting JSC; the location of new building construction is determined, in part, by elevation due to predictions of rising sea level and JSC's proximity to Clear Lake. Climate.nasa.gov provides articles, research, video, etc. to assist the public in understanding both the issues and solutions. Read the blog article featuring JSC Center Operations sustainability initiatives, and keep an eye out for another in the coming year!

In order to help develop guidelines for the City of Houston to address climate change, the Council on Environmental Quality (CEQ), will continue to collaborate with NASA-JSC. They will post the Houston-Galveston region's case study describing both climate threats and adaptation (adapt2climate.org).

(Source: climate.nasa.gov/blog, Laura Tenenbaum)

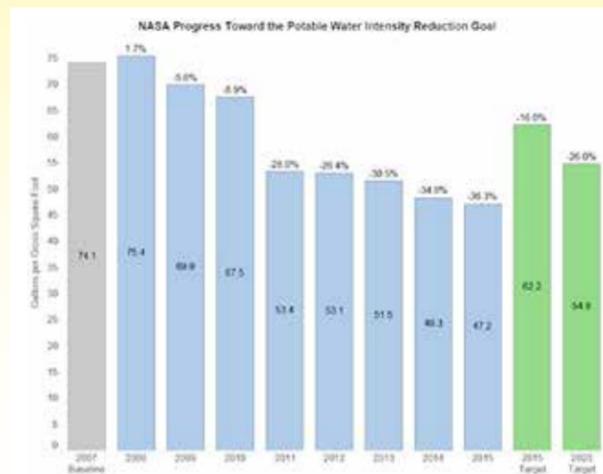


Water

Goal Water 4 Use

assess water usage

- o New Neptune water meters help detect leaks in the system and assess water usage at each building.
- o Splitting the potable and fire suppression water services is near completion. This will help minimize required disinfection residuals throughout the potable water system.
- o Corrective water conservation actions onsite will be initiated, including wasteful practices of water use; this includes personal use or equipment that may be leaking water or using water for cooling. Systems may be installed to recirculate cooling water for the equipment.
- o Refund the reuse of flush water from JSC wells for irrigation.
- o Reporting leaks or irrigation equipment that are in need of repair. Reporting spills that may enter inside and outside drains that enter into the JSC water systems.



Goal Sustainable 2 Buildings

collects rain water

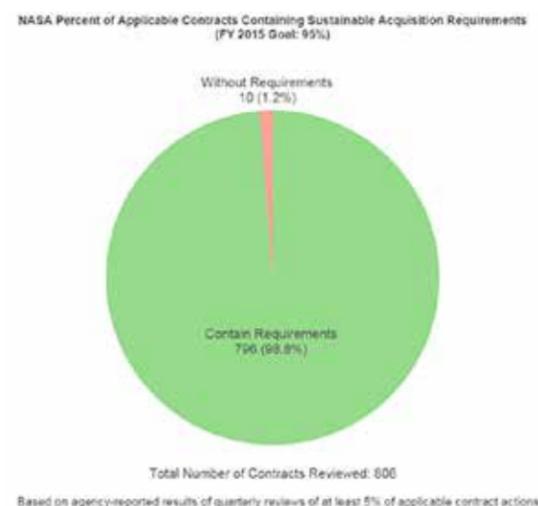
- o Buildings 12, 20 and 21 have reduced water usage in bathrooms.
- o The new JSC clinic collects rain water in a catchment system to allow gradual percolation into the soil and controlled discharge. This reduces storm water discharges into local estuaries.
- o New sustainable buildings at JSC include rain water catchment basins to collect and reuse rain water.



Goal Sustainable 6 Acquisition

reduce water usage

- o To help meet NASA mandates for procurement, as well as reduce water usage, JSC will acquire equipment that is both energy and water efficient.



TAKEAWAYS: Report water leaks; include sustainable acquisition requirements in contracts

and procure equipment that is both energy and water efficient.

JSC Materials

Goal Sustainable 6 Acquisition

environmental impacts
Purchasing sustainably may not only help reduce environmental impacts, but also reduce overall operational costs. In order to identify sustainable purchasing requirements for goods and services, JSC uses the Sustainable Facilities Tool (www.sftool.gov/greenprocurement). It helps in selecting compliant and environmentally friendly products and services when developing contracts and making purchases. Select compliant and environmentally friendly products and services when developing contracts and making purchases. Make sure to report the purchase of compliant and designated items to the JSC Environmental Office by December 1st each year.



Goal Pollution 7 Prevention and Waste Reduction

recycling, reuse, and composting
JSC diverts over 30 waste streams from landfill through recycling, reuse, and composting. Help JSC meet Goal 7 by using less toxic materials, reusing material, and recycling whenever possible. Do you need office supplies or equipment? Check with JSC's Redistribution and Utilization (R&U) Branch. They may already have what you need! Be sure to participate in all of the JSC recycling programs. Use JSC Form 845 to report your recycling efforts to the JSC Environmental Office to make sure your efforts are counted.

You can put plastic bottles, plastic drink bottles, and aluminum cans together into one recycling container. This helps JSC meet Goal 7 by increasing diversion from the landfill.



TAKEAWAYS: Recycle #1 and #2 plastic bottles and aluminum.

Goal Electronic Stewardship 9 and Data Centers

electronics recycling

JSC responsibly recycles electronics through the R&U Branch. R&U has agreements in place to make sure items are reused or recycled properly. Help JSC ensure proper disposal of electronics and equipment by excessing NASA-owned electronics and equipment through R&U. For personal electronic recycling, use the U.S. Postal Service's BlueEarth program, which will help NASA and JSC meet waste diversion goals. NASA is also working to consolidate Data Centers wherever possible to improve efficiency.

Goal Water 4 Use

Participate in the Coffee-to-Compost Program by collecting used coffee grounds for JSC's compost program.

Helps Goal 4 by reducing how much water JSC has to use for irrigation.

Get a container.



Helps Goal 6 by reducing how much fertilizer JSC has to purchase.

Fill it up.



Helps Goal 7 by diverting organic waste from landfill.

Drop it off.



Designated "Coffee to Compost" bins are located at B326 or loading docks behind B3 and B11.

TAKEAWAYS: Compost your coffee behind B326 or loading docks behind B3 and B11.

reduce energy intensity

The Combined Heat and Power (CHP) Plant

For cleaner, more efficient energy usage, JSC is installing a CHP to reduce energy intensity from 212,716 BTU/GSF to 103,616 BTU/GSF.

This will provide increased energy surety with approximately 11.9 MW of onsite power generation, as well as provide “Island Mode” for situations when JSC could otherwise be cut off from the grid. Additionally, it will power around 70% of the site base electric load, and the “waste heat” from the generators will be converted into steam. It will provide all site steam load, and 40-60% peak chilled water load.



low-e glass

FY 17 Window Wall Replacement: \$3.7M

Replacing windows and solid panels beneath windows with low-e glass and better insulation will save \$411,000 in energy per year! This is similar to the building 1 window replacement and includes 4N, 31, 44 and 45.

Goal 3 Clean and Renewable Energy

Goal 8 Energy Performance Contracts

What can you do?

turn off lights

- o Adjust window coverings to reduce direct sunlight and close window coverings at the end of the work day. Only raise blinds 12-inches from the top. Raising them all the way up can make lowering them difficult. For window covering repair, etc., submit an electronic request to jsc-furniture@mail.nasa.gov.
- o Participate in the Super Flex (“Flex Friday”) schedule.
- o Remove energy-using equipment from your work areas, particularly refrigerators, heaters and printers.
- o Turn off lights in unoccupied rooms.
- o Use task lighting in your work areas, and coordinate with your Building Facility Manager to reduce unnecessary lighting.
- o Report energy and water wasting problems to PAE Work Control or your Facility Manager.

TAKEAWAYS: Unplug at the end of the day; report energy inefficiencies to work control or your facility manager.

Green Team

The Green Team organizes the employee bike to work day in May and participates in events, such as the annual trash bash in order to engage more JSC employees to take sustainable action.

[Centerops.jsc.nasa.gov/sustainability/greenteam](https://centerops.jsc.nasa.gov/sustainability/greenteam)

Sustainability Partnerships Team

In this group, the technical workforce solves environmental problems that benefits space and Earth, and increases JSC’s exposure to ‘dual use’ technologies.

[Centerops.jsc.nasa.gov/sustainability/sustainabilitypartnershipsteam](https://centerops.jsc.nasa.gov/sustainability/sustainabilitypartnershipsteam)

Contractor Environmental Partnership

Onsite and offsite volunteers work together to find solutions to contractor’s common problems. Collaboration leads to pilot projects and community outreach programs, such as the electronic recycling events at Space Center Houston and the Coffee-to-Compost Program.

Environmental Stewardship Subcommittee

This group provides bi-directional communication between the JSC Environmental Office and JSC organizations on environmental issues that affect the Center.



Nathan Moore continues to resource from the Redistribution and Utilization (R&U) branch for a variety of projects. Contact us to find out how you can benefit from R&U materials. (Source: NASA)

People Making a Difference

“About six years ago I accepted an opportunity with NASA and began riding a STAR vanpool. The only potential problem with coming to work was the long distance of my commute. It would require a daily long drive on Southwest Freeway (59) and Sam Houston Freeway (Beltway 8), and sometimes traffic could be horrible. Fortunately, the perfect solution to this problem was the opportunity to join a STAR vanpool.

The monthly fees for the vanpool is way cheaper and more efficient as opposed to riding my personal car since I am saving time, money, wear and tear, and substantially lowering my stress levels. Not only that, but also avoiding the potential traffic tickets. I am really enjoying my vanpool opportunity since on the way of my commute, I have the option to nap, work or read. My wife and kids even happier for me joining the vanpool because without the set afternoon departure times, I would be lured to work late way too often.

I would not be able to survive the commute if it was not for riding in a STAR vanpool because it made the difference over the last six years. By joining the vanpool, I am able to commute safely, economically efficient, time-saving, environmentally friendly and stress-free.”

--Adam Kalil

TAKEAWAYS: Advocate for NASA on a sustainability team. Send in your champion story, and sign-up for the distribution list at <https://lists.nasa.gov/mailman/listinfo/jsc-sustainability>

JSC Sustainability

Internal: [Centerops.jsc.nasa.gov/sustainability](http://centerops.jsc.nasa.gov/sustainability)

External: <http://www.nasa.gov/centers/johnson/about/sustainability/index.html>

Learn about climate change and NASA climate news at climate.nasa.gov

