
National Aeronautics and
Space Administration
NASA
JSC
Sustainability
Engagement
Strategy
www.nasa.gov

JSC's Commitment to Sustainability

The Agency's sustainability policy is to execute NASA's mission without compromising our planet's resources. Sustainability involves taking action now to provide a future where the environment and living conditions are protected and enhanced. As many great leaders have stated, "we, the present generation, shall not steal quality of life from future generations."

In October 1946, we saw the first grainy, black and white photograph of Earth from beyond our atmosphere taken from a small camera attached to a missile launched from the White Sands Missile Range. It wasn't until December of 1972, that we first saw the entire Earth, in color, photographed during the Apollo 17 mission. To the astronauts, the Earth had the appearance of a 'glass marble', which resulted in the famous name 'Blue Marble' that embodies the concept: we must protect the resources our fragile planet has to offer.

In support of the Executive Order 13514 "Federal Leadership in Environmental, Energy, and Economic Performance," the Johnson Space Center (JSC) is committed to balancing environmental, social, and economic concerns with NASA's mission obligations in space exploration. We are committed to preserving, enhancing, and strengthening NASA's ability to perform its mission by supporting NASA's Strategic Sustainability Performance Plan (SSPP) and other Federal mandates.

This JSC Sustainability Engagement Strategy is a tool intended to assist employees in understanding what sustainability at JSC actually means, and offer ways to incorporate sustainability into personal and professional activities wherever possible. As Joel Walker, our Center Sustainability Officer (CSO) envisions, "Sustainability should be something we don't even think about; it should be engrained in our thinking. We just do it."

We are asking the JSC employees and contractor personnel to assure NASA maintains the 'Blue Marble' – the only place we know that will support life as we know it, through the following:

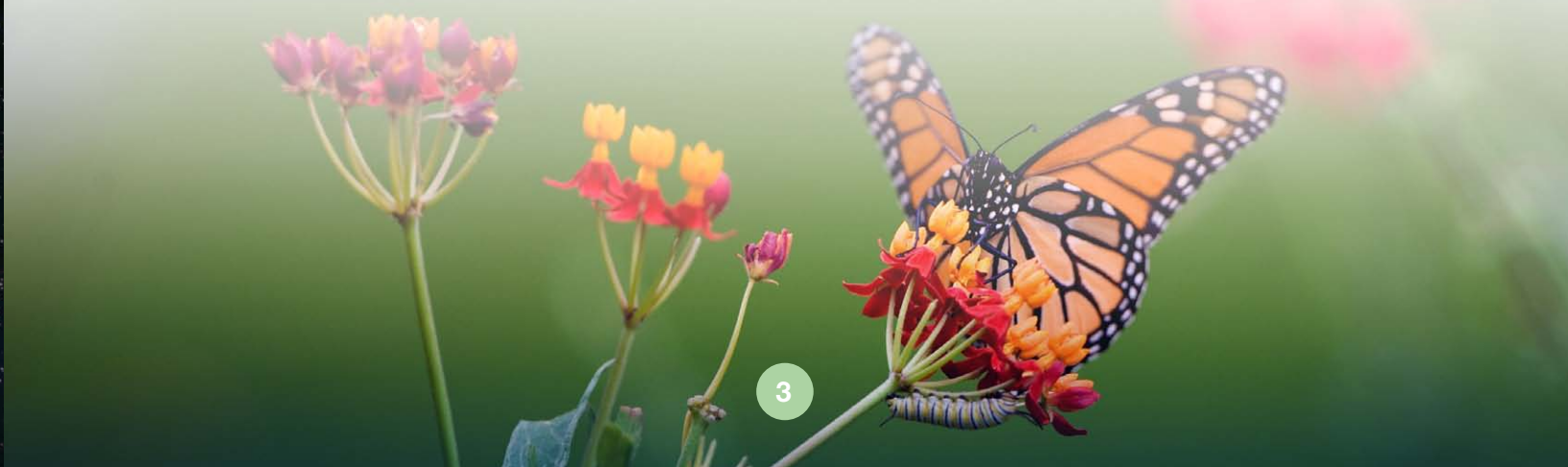
1. Increase energy efficiency and the use of renewable energy.
2. Measure, report, and reduce NASA's direct and indirect greenhouse gas emissions.
3. Conserve and protect water resources through efficiency, reuse, and storm water management.
4. Eliminate waste, prevent pollution, and increase recycling.
5. Leverage Agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services.
6. Design, construct, maintain, and operate high-performance sustainable buildings.
7. Utilize power management options and reduce the number of Agency data centers.
8. Support economic growth and livability of the communities where NASA conducts business.
9. Evaluate Agency climate change risks and vulnerabilities and develop mitigation and adaptation measures to manage both the short- and long-term effects of climate change on the Agency's mission and operations.
10. Raise employee awareness and encourage each individual in the NASA community to apply the concepts of sustainability to every aspect of their daily work to achieve these goals.
11. Maintain compliance with all applicable Federal, state, local or territorial law and regulations related to energy security, a healthy environment, and environmentally-sound operations.
12. Comply with internal NASA requirements and agreements with other entities.

We empower you to begin working with your management at JSC to participate in sustainability activities at our center, as well as in your day-to-day life.

Joel B. Walker
Center Operations Director
Center Sustainability Officer
NASA Johnson Space Center

Michael L. Coats
Director
NASA Johnson Space Center

Table of Contents



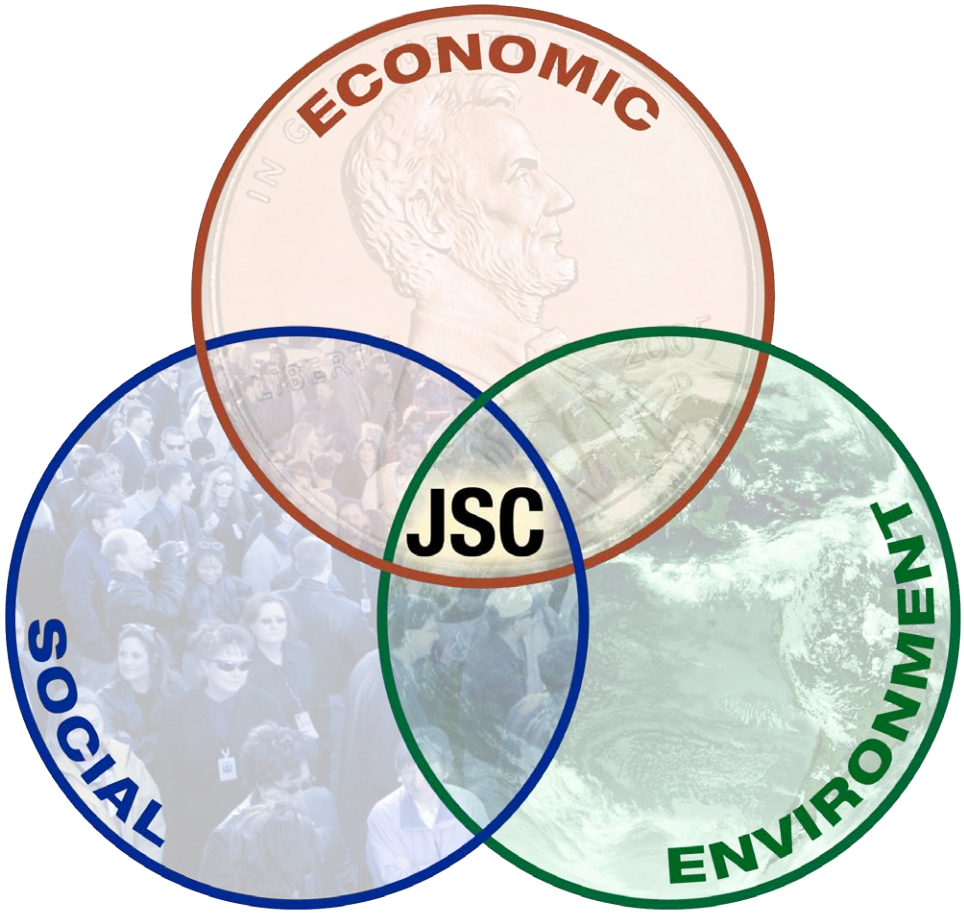
JSC's Definition of Sustainability

NASA's Johnson Space Center (JSC) has made a commitment to sustainability to execute its mission.

What does sustainability really mean?

The most widely accepted definition of sustainability was created by the United Nations World Commission on Environment and Development in 1987. It states that sustainability is "**development that meets the needs of the present without compromising the ability of future generations to meet their own needs**." Achieving sustainability comes from balancing the need for economic vitality, environmental stewardship, and social responsibility to ensure that we have enough resources to meet our needs today and in the future. Similarly, corporate sustainability encompasses strategies and practices that meet the needs of stakeholders today while protecting and enhancing the human and natural resources needed in the future.

The **Triple Bottom Line**, illustrated below, is a way to consider sustainability holistically. For example, because JSC resides in an area where energy is more readily available, often at a lower cost, only considering economic return on investment can lead to unbalanced sustainability decision-making. Considering returns to our environment as well as society, help make more balanced strategic decisions moving forward. We will always face this balance of what makes the most sense economically, environmentally, and socially.



Why Choose Sustainability?

Individuals have many reasons to implement sustainable efforts in their every day activities. No matter what the reason, implementing sustainable decision making can have far reaching, positive results. From space we can view the Earth as a planet, seeing the interconnectedness of the oceans, atmosphere, continents, ice sheets, and life itself. At NASA we study planet Earth as a dynamic system of diverse components interacting in complex ways (**Summary of the Science Plan for NASA's Science Mission Directorate 2007-2016**).

NASA occupies a leadership position on the world stage because of its unique mission. No other organization can offer the same powerful ability to understand Earth systems as well as NASA can. No other organization has the same level of technical resources to conceive, develop, test, and implement new technologies using some of the best minds in the world. Because of these unique attributes, NASA has an enormous opportunity – and responsibility – to help the world understand and face sustainability risks and opportunities, to make new scientific discoveries, and to develop the new technologies that are needed to meet these challenges.

Here are just a few reasons why JSC employees work towards sustainability.

Requirements

Is this really a requirement?

Through Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance, the Federal government requires all Agencies, including NASA, to accomplish specific sustainability tasks. NASA developed the Strategic Sustainability Performance Plan (SSPP) to identify how NASA would achieve these requirements. To affect change at the Center level, NASA Headquarters designated a Center Sustainability Officer (CSO) at each Center. Joel Walker, Director of the Center Operations Directorate (COD, mail code JA) is the JSC CSO. The specific goals and targets that NASA must accomplish are available in Appendix A with the respective resource group associated with each one.

Vision

JSC Sustainability Vision: Create and maintain a world-class Space Exploration Development and Operations Center, that champions sustainability in all aspects of our mission.

JSC Sustainability Mission Statement: The mission for a sustainable JSC is to develop a flexible and technologically advanced facility that provides an environment for developing next generation spaceflight technology as well as adapting that technology to Earth applications to educate, involve and advance human wellbeing, environmental stewardship, and economic vitality.

JSC Sustainability Guiding Principles:

How Do I Participate?

Even if the U.S. Government, NASA, and JSC had enough money to buy all sustainability-related technology, we still wouldn't ultimately be a sustainable center without behavior change. Behavior change to support sustainability requires awareness at the individual level to understand what it is, and ultimately how to make a difference.

We're asking you to get involved.

Become aware.

Make a difference at an individual level and consider joining one of the JSC Sustainability Teams.

This document is a guide for you to consider in your personal and professional life to help you answer the question, "Is there anything I can do better?" The JSC Sustainability Engagement Strategy gives you three opportunities to get involved.

1. Learn more about JSC Sustainability by reading this, and contacting any subsequent JSC Sustainability Resource Lead or JSC-Sustainability@mail.nasa.gov for additional questions and opportunities to get involved.

And/or...

2. Begin practicing some (or more of) the Individual Sustainability Ideas.

And/or...

3. Join a JSC Sustainability Team.

The following pages detail each of these three options.

Individual Sustainability Ideas

Are you a 'natural champion' already? Perhaps you're the employee that gets irritated when you find an aluminum can or plastic bottle in the trash (especially when it's right next to the recycling bin!). Maybe you already drive an electric car, or perhaps you are the person that always seems to be shutting off the lights in your building's conference rooms at the end of the day. Well, thank you for what you're already doing! Please continue to do so, and more importantly, set an example for your coworkers and encourage them to follow suit. You are our 'embedded sustainability team' within your organization. You are a 'natural champion'.

Your efforts make a difference and can influence those around you as well. If you'd like to contribute in more ways, please join a sustainability team, too. Contact the JSC Sustainability leads at any time directly or through our global e-mail address: JSC-Sustainability@mail.nasa.gov.

JSC is committed to a campaign of awareness that promotes individual employee participation, encompassing many of the ideas listed below.

Is there anything I can be doing better or differently to support sustainability?

These are things that everyone can do to help meet the sustainability goals, regardless of job function or agency.

TRANSPORTATION

Walk or ride a bike to work and between buildings on site.
Telework or teleconference.
Take public transit.
Carpool, vanpool or rideshare.
Combine vehicle trips with co-workers when possible.
Participate in NuRide (www.nuride.com) and get rewards for doing so!

ENERGY

Try to work by natural daylight; turn off your lights.
Use energy efficient bulbs and fixtures.
Turn off lights, computers, speakers and monitors when not in use (every night).
Unplug all electronics and small appliances when not in use.
Take the stairs instead of the elevator.
Use revolving doors when available.
Try to dress for the seasons to avoid the need for space heaters or fans.

WASTE

Bring lunch to work in reusable containers (avoid 'to go' containers).
Limit consumption of cans and bottles.
Bring a cloth napkin to work instead of using paper towels.
Find out where and what to recycle in your facility.
Recycle cans, bottles, cardboard, and paper.

PAPER

Read and edit documents electronically when possible (even in meetings).
Use network printers instead of personal, desk top printers.
Print double sided and set 'narrow' margins.
Reuse cardboard packaging.
Use the backsides of unneeded documents for note taking.
Buy recycled-content paper.
Find out where to recycle paper and cardboard in your facility.

WATER

Turn off the faucet while lathering hands and dishes.
Notify building management of leaks.
Avoid turning the faucet on full blast and make sure it's off when you're done.
Notify building management of irrigation inefficiencies.

Discover additional ideas! http://www.epa.gov/gateway/learn/greenliving.html

Sustainability Teams

There are four sustainability teams that JSC management is encouraging you to join and actively participate with. Each of the four teams highlights different areas of involvement from communication to behavior change to brainstorming technical solutions. An overview of how all these teams fit together into the NASA organization is listed in Appendix B.

Directorate Communication

The Environmental Stewardship Subcommittee (ESS) began in January 2000, and acts as JSC's advocate for conserving natural resources, reducing environmental impact and providing a healthy workplace. As a proactive, problem-solving group, the ESS develops recommended strategies for implementing NASA and JSC's environmental policies and for enhancing compliance. The primary focus is on issues that cross-organizational lines. The ESS will provide bi-directional communication to and expect information from JSC organizations specific to environmental and sustainability issues. The Environmental Management System (EMS) determines yearly what high priority aspects will be focused on for the coming year. These Environmental Management Programs have objectives and targets which are developed, then tracked and reported to the ESS. Executive Order 13514 and the NASA SSPP drive metrics in all environmental areas that this group discusses as it pertains and impacts the Center sites. Please contact **Mr. Alan Amor** to become a member of the JSC ESS.

Encourage Behavior Change

Started in January 2010, the JSC Green Team's charter is to make known, to the entire JSC community, how to personally make 'green' decisions and take 'green' actions. Overall, it is a fun-loving group working to change the behavior of individuals for the better regarding sustainability. Everyone at JSC is asked to participate in sustainability, and for those interested in organizing ways to encourage sustainable behaviors (through events, competitions, education outreach, tours, etc.), please join the Green Team. The Green Team formally interfaces with the JSC Wellness Program, Human Resources, the Employee Assistance Program, Starport, the Gilruth, Public Affairs, and Safety and Mission Assurance. Please contact **Ms. Lindsey Foreman** to become a member of the JSC Green Team.

Brainstorm Technical Solutions

In 2004, the JSC Sustainability Partnership Team (SPT) was formed to integrate technical ideas from the JSC population with solutions to terrestrial applications. The SPT strives to improve environmental sustainability at JSC and increase JSC's exposure to 'dual use' technologies that may be beneficial in both terrestrial and space exploration environments, while engaging the technical workforce in solving JSC's institutional (a.k.a. terrestrial) sustainability problems. The goal is to bring coordinated sustainability projects to JSC management to share the responsibility for environmental sustainability at JSC. The JSC SPT can be considered a 'think tank' for those interested in brainstorming ideas for increasing our technical sustainability using the awesome resources available at JSC. Please contact **Mr. Mike Ewert** or **Mr. Rob Way** to become a member of the JSC Sustainability Partnership.

Contractor Involvement

An additional team that supports sustainability efforts is the Contractor Environmental Partnership (CEP). The CEP includes a collection of JSC contractor volunteers that collaborate on sustainability efforts and external events. The CEP is mainly responsible for the free electronic recycling events hosted by Space Center Houston several times since 2008. These events, open to the public, are run by volunteers and supported through external sponsorship and donations. Please contact **Ms. Jennifer Morrison** to become a member of the CEP.

JSC Sustainability Model

In many cases, efforts that support the concept of sustainability have been underway since the JSC complex first opened. Sometimes, requirements are now driving new behaviors (like Greenhouse gas emissions reductions and sustainable acquisition). The challenge of developing a sustainability program at JSC is **integrating what we're already doing well, with what needs to be done better, and effectively communicating that to the rest of JSC to affect behavior change.**

At JSC, a group of almost fifty employees convened for two days in August 2012 to determine what sustainability actually means to JSC, and what we can all do to have an impact. The outcome of the JSC Sustainability Charrette (a charrette is similar to a facilitated System Requirements Review) is this JSC Sustainability Engagement Strategy you are reading now.

The 'JSC Sustainability Model,' below, was envisioned to represent six of the natural resource areas affecting sustainability. Each resource focal point at JSC is responsible for coordinating a status on the requirements for sustainability (and reporting subsequent metrics), leading outreach efforts, staying aware of and evaluating technology advancements, and addressing JSC questions respective to that resource.

Additional detail is provided for each resource area of the 'JSC Sustainability Model' on the following pages to help you understand what it encompasses and how you can contribute to 'doing better' in all areas of sustainability. In the following 'resource' sections, three major areas will be detailed to give the JSC community full awareness of what the resource (or pie slice) is and how to get involved. Those three areas of detail are:

Overview, Roles and Responsibilities, and Metrics. Mapping was completed to ensure that all sustainability goals outlined in EO 13514 and the subsequent NASA SSPP are being addressed by the six teams. See Appendix A for that delineation.

People (Ms. Laurie Peterson) is the focal point for sustainability awareness and works hand-in-hand with the JSC Green Team for behavior changes specific to sustainability within the JSC population.

Air (Mr. Kirk Hummel) is the focal point for air, which includes air emissions (gasses and particulates) at both point and non-point sources, Greenhouse Gasses, indoor, and outdoor air quality, etc.

Land (Ms. Sandra Tetley) is the focal point for land, which includes all elements of 'real property,' such as land, buildings, other structures, as well as historic preservation, wildlife, and vegetation.

Water (Mr. Doug Conover) is the focal point for water, which includes all elements of water use and disposal, including drinking water quality, water use, wastewater, and storm water.

Materials/Waste (Ms. Michelle Fraser-Page) is the focal point for materials and waste, which includes all components of materials and waste from material procurement efforts and buying green (sustainable acquisition) to all elements of waste (municipal, construction, and industrial/hazardous waste) and recycling.

Energy (Mr. Rob Way) is the focal point for energy, which includes all components of energy use and optimization (including electricity, natural gas, renewable, transportation, etc.).

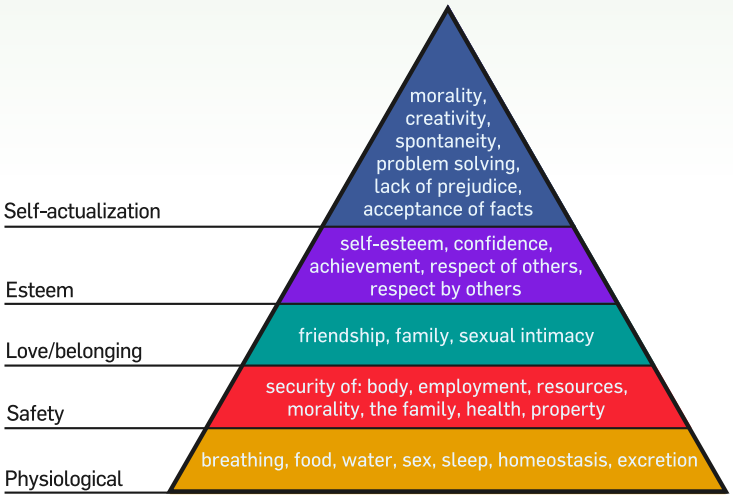
Resource: People

Overview

The People resource primarily represents 'behavior change' when it comes to sustainability at JSC. People affect absolutely every element of sustainability at JSC. Whether it's remembering to turn off lights and equipment in your offices or labs, to purchasing sustainably (i.e., following sustainable acquisition regulations), to carpooling, teleworking, or taking alternative transportation to/from work, and ultimately to incorporating sustainable thinking into what you do both at work and at home.

There are two elements to behavior change for sustainability. One element is being aware of what needs to be done. Information, such as this JSC Sustainability Engagement Strategy, upcoming Annual Sustainability reports, websites, announcements, and others will be covered for sustainability within the People resource. In addition to communicating with the JSC community, the People resource focal point will communicate with the external community for benchmarking, awards, opportunities for collaboration, etc.

The other element of behavior change is a little more discrete. There is an idea of 'whole-listic' sustainability, focused on incorporating the emotional health and desires of every participating individual. This enables the motivation necessary to meet our sustainability requirements. **Maslow's hierarchy of needs** shows this emotional health relationship to our ultimate actions. If we're stuck in the lower rungs of safety and security, focused primarily on employment, resources, and 'just getting by' in our lives each day, it is very difficult for us to become aware of our impact on others and the environment. Self-actualization is the point which we tend to stop focusing solely on ourselves and our own comfort level, and focus on the world around us (including both present and future generations). Only through that level of freedom can we 'wholly' participate. The ability to self-actualize is our source of creativity, innovation, and purpose in our lives. Luckily, there are a plethora of programs at JSC that beautifully weave together to enable such 'whole-listic' accomplishment.



Roles & Responsibilities

There are many existing programs at JSC to help our population adjust to transition. Those programs are the JSC Wellness Program (sponsored by AH and SD), which has a specific behavior change element, in addition to nutrition, exercise, and stress management. The Occupational Health (SD) sponsored Employee Assistance Program (EAP) and the JSC Clinic, the JSC Human Resources directorate (AH), the JSC Process Improvement program (NA), and internal communication within JSC (AD) are additional programs. This is not an inclusive list.

Ms. Laurie Peterson is the 'focal point' connecting each of these Center-wide services together to evoke the most effective sustainability program JSC can muster. She is responsible for Marketing, Awareness, Communication, Outreach/Education, Networking, Benchmarking, Behavior Change, Personal Growth/ Happiness (helping employees to make a difference and have a sense of purpose), Recognition/Awards, and Documentation Integration. Laurie works hand-in-hand with the JSC Green Team to affect behavior change for a more sustainable future.

Metrics

The primary metric for people is calculating the JSC Sustainability Program's reach of awareness, outreach, and ultimately behavior change for sustainability at JSC. This may be done through surveys, in addition to analytics for websites related to sustainability. The NASA Environmental Tracking System (NETS) is used to track many of the requirements from the other sustainability resources, which will be investigated for use as a tracking system for people-related requirements as well.

Resource: Air

Overview

Air is a worldwide 'shared blanket of life' that cannot be compartmentalized. The sharing is literally on the whim of the wind. We all know things that go into the air eventually make way to our lungs or rise into the atmosphere, sometimes having an effect on the 'thin blue line' that allows us all to survive on our 'Blue Marble'.

The Environmental Protection Agency (EPA) defines emissions as "gases and particles which are emitted by various point and non-point sources". Point sources are stationary and clearly identifiable (e.g., backup diesel generators, industrial boilers in the Central Heating and Cooling Plant at JSC). Non-point sources are harder to identify and can be mobile (e.g., cars, lawn mowers, etc.)

We've all heard a lot about Greenhouse gases (GHGs). What are they? The EPA defines GHGs as "gases that trap heat in the atmosphere." Principle GHGs and sources include: Carbon Dioxide (CO2) , Methane (CH4) , Nitrous Oxide (N2O), and Fluorinated Ozone Depleting Substances (ODS). Combustion of hydrocarbons is the greatest source of GHGs. NASA must reduce GHG intensity by 1% annually or 9% total by fiscal year (FY) 2015, per Executive Orders 13423 and 13514 and NASA SSPP Goals.

Roles & Responsibilities

Outdoor air quality and regulations are tracked and managed by the JSC Environmental Office (JE), Mr. Kirk Hummel specifically. The Occupational Safety and Health Administration (OSHA) regulates indoor air quality and workplace exposure through the Occupational Health Branch (SD). They both interface with JSC employees and contractors on a regular basis to understand what emissions are allowable and how to mitigate the quantity and type of pollutants from both the expected and unexpected sources of emissions in order to protect the environment and human health.

Metrics

Annually, NASA prepares an emissions inventory based upon the use of chemicals, the combustion of fuels, and the inadvertent release of chemicals into the environment. Because JSC is a major source located in a severe non-attainment area for acceptable air quality, JSC must continually install equipment with state of the art emissions controls. Since 2009, JSC has reduced Nitrogen Oxide (NOx) emissions by 30% and Volatile Organic Compound (VOC) emissions by 40%.

Resource: Land

Overview

The Land resource is comprised of the actual property which JSC, Ellington Field (EFD), and Sonny Carter Training Facility (SCTF) sit upon, but also the structures, buildings, and utilities included at each site, termed "real property." JSC is approximately 1,580 acres, EFD is approximately 37 acres, and SCTF is approximately 13 acres.

Land also includes master planning. The JSC Master Plan was approved in 2010 and lays out the general structure for demolition and construction of all real property over the next 5, 10, 20, and 50 years. Additionally, Land includes preservation of historic assets, wildlife, agriculture, landscaping, and vegetation (wild flower fields, orchards, trees, wetlands, fields, etc.)

The JSC complex has 375 buildings and over three million square feet of office space. We have two National Historic Landmarks (NHL): Building 30 Christopher C. Kraft, Jr. Mission Control Center and the Building 32 vacuum chambers A and B, as well as sixteen additional buildings that are eligible for listing on the National Register of Historic Places (NRHP). An archeological survey of JSC has just begun. From a sustainability perspective, there are currently eight Leadership in Energy and Environmental Design (LEED) certified buildings.

Building	Certification Level
27	Certified
265	Gold
20	Platinum (NASA's first ever LEED Platinum building)
29	Silver (waiting for the final certification)
207A	Silver
2N	Gold
26	Gold
12	Striving for Gold (In Progress)

Many of the existing facilities at JSC were constructed for specific Apollo era technical functions which are no longer performed.

Because of the relative inflexibility of the original building designs, many of these facilities have been converted into usable space; yet these facilities still tend to be outmoded for research, design, testing, and administrative uses.

Roles & Responsibilities

Ms. Sandra Tetley, of the Center Operations Planning and Integration Office (JP), is the focal point for the Land resource of sustainability. She works closely with representatives from all utilities, LEED construction, facility and building managers, and the Environmental Office. With respect to master planning, Sandra interfaces with the JSC Master Planner, Walter Ugalde, who also interfaces with the JSC Strategic Opportunities and Partnership Development (SOPD) Office. Sandra Parker (JE) coordinates wildlife and vegetation efforts, and the Grounds Contract maintains landscaping through COD.

Metrics

Sandra updates NETS with historic preservation data demonstrating land requirements are being met.

Resource: Water

Overview

Water at JSC is comprised of three elements: potable water, storm water, and wastewater. In the very near future, the potable water line will be split from fire water minimizing lost water due to line flushing necessary to maintain required disinfectant residuals. Water is supplied to JSC by Clear Lake City Water Authority (CLCWA) from the City of Houston Southeast Water Purification Plant (SEWPP). The water goes through a supplemental disinfection treatment once as needed once on site, which includes chloramine disinfection produced from sodium hypochlorite and ammonium hydroxide. Water is stored on site, as well as supplied to all buildings by a 12" pipe main distribution system.

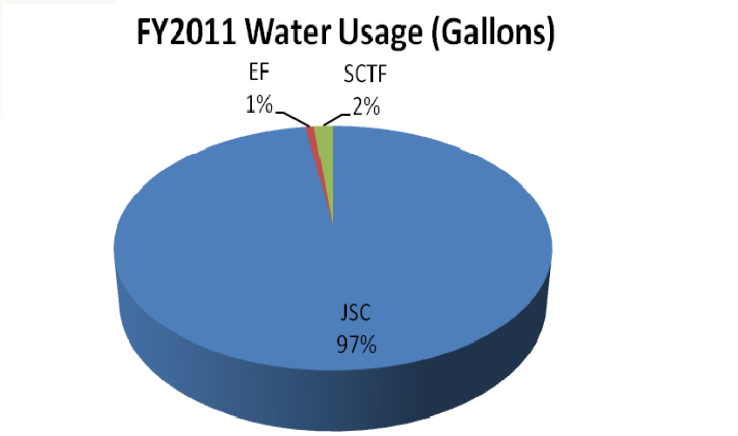
Similar to energy, water use at EFD and SCTF are paid for by the Center Operations Directorate (JA). The chart below shows a representative amount used and price for water at all three facilities. The JSC main site has a significantly lower price based on the contract mechanism used to purchase water.

It has been said that when fossil fuel energy runs out, water will be the next greatest demand. SEWPP Surface Water is supplied from Lake Houston and the Trinity River. JSC has a backup source using two on-site water wells, and the supplemental disinfectant capabilities at JSC allows flexibility between the surface water line and the water wells.

Potable water use at JSC is characterized by the following: drinking fountains, janitorial and restroom use, laboratories, cafeterias, plant uses, including make up for cooling towers, boilers, chillers, cooling for air compressors, fire protection, and turf irrigation.

Underground systems convey flows of waste-water offsite for treatment to the CLCWA Sewage Treatment Plant (STP) located north of JSC.

JSC's storm water is conveyed via underground storm systems in populated areas and open flow ditches in outlying areas that eventually flow offsite to Armand Bayou and into Clear Lake. Pollution prevention measures are strictly followed to preclude polluting and silting of the JSC System, which eventually flows into local watersheds.



	Dollars	Gallons
JSC ($0.63/1000 gals)	$218,483.36	335,104,000
EF ($3.62/1000 gals)	$9,543.90	2,590,000
SCTF ($2.28/1000 gals)	$9,894.40	5,789,000

Roles & Responsibilities

Mr. Doug Conover is JSC's water resource focal point. Doug works in the Utilities Branch (JM5), and supports Melissa McKinley (Chief) directly. Doug works closely with Rob Way, the JSC Energy Manager, because Rob is responsible for water conservation reporting at JSC.

Doug also works closely with facility and building managers across JSC, EFD, and SCTF to ensure water is being utilized most effectively. Doug also works with the Environmental Office contact Alan Amor (JE) to ensure all water systems regulations are met.

Metrics

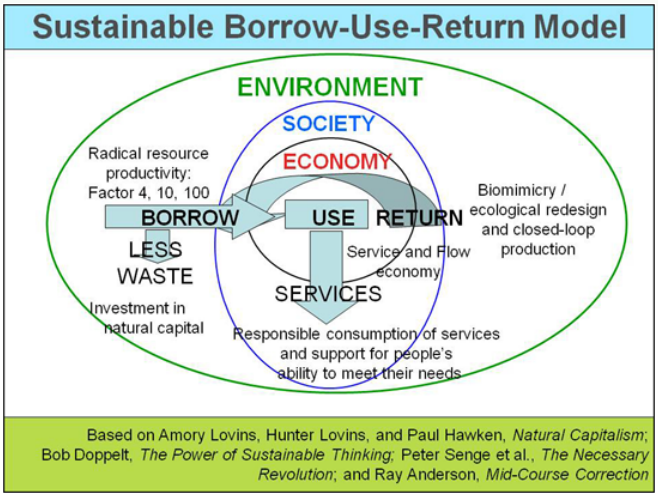
Between all these relationships, the NETS is updated quarterly with water data to demonstrate requirements are being met.

Resource: Materials and Waste

Overview

Materials and waste includes all purchases made by government and contractors, via Purchase Requests (PRs) and credit cards, as well as everything that is discarded. Items brought on site are used (typically changing form, fit or function) and then discarded in one of many ways. They can be recycled (see list of what JSC recycles below), sent to Redistribution and Utilization (R&U), composted (if applicable), sold to other parties (through GSA) or thrown away (waste). Waste removal is paid for by the Center Operations Directorate (JA) by weight. In the last year, JSC has earned revenue of approximately $30,000 from the sale of recyclables and avoided approximately $220,000 in landfill tipping fees, and recycled 2.9 million pounds.

Recycling feels good, and the number of people who recycle is rising. Of course, recycling is encouraged and this link lists all the items JSC recycles (http://www6.jsc.nasa.gov/ja/ja13/recycling.cfm). The only problem is that recycling just slows down the inevitable. Eventually, we'll get to the point where we don't have enough raw materials to easily make items we use once and throw away. In addition, recycling usually means downcycling, meaning the material is not as useful as it was in its first life. That's why we emphasize reducing and reusing before recycling. Below is a diagram of an unsustainable 'take-make-waste' model versus a sustainable 'borrow-use-return' model. For an easy and entertaining way to describe this process, see the video at http://www.storyofstuff.com/. Can we work more sustainably instead of buy and toss away?



Call the Redistribution and Utilization (R&U) help desk at 281.483.7947 before you buy to make sure we do not already have it in R&U, especially if it's a business office item. You can make an appointment to walk through the R&U warehouse to see what they have. You can also sign up for NASA's Freecycle program (http://freecycle.gsfc.nasa.gov/) to get office products for free.

Roles & Responsibilities

Ms. Michelle Fraser-Page (JE) is in charge of the JSC Recycling and Waste Management Program. She interfaces with multiple other divisions and directorates to accomplish the role of 'focal point' for materials/waste at JSC. Primarily, JSC tracks items purchased through the Procurement Office as well as through its on-site contractors. Finally, our on-site cafeterias make up a large portion of what's purchased and thrown away. Karen Schmalz (AH) is the point of contact for the cafeterias, Starport, and the Gilruth.

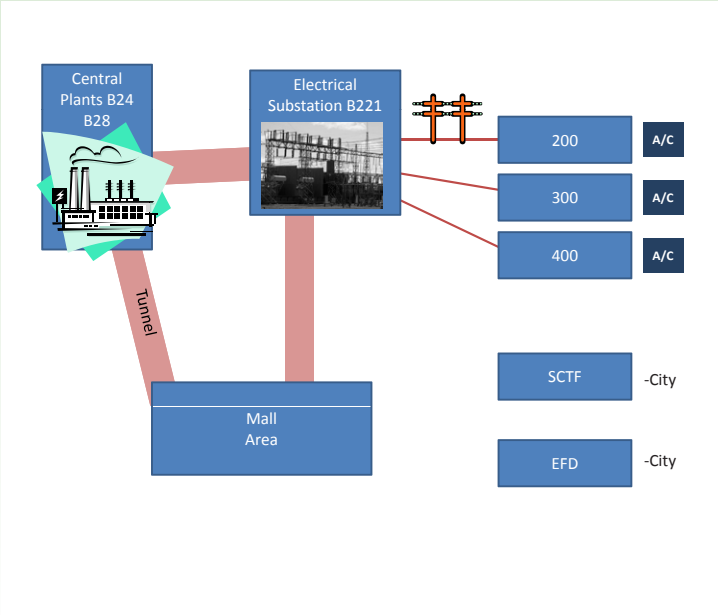
Metrics

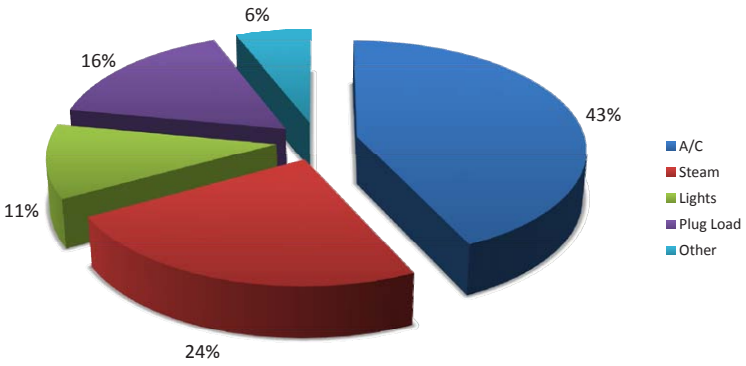
Ms. Fraser-Page is responsible for collecting annual recycling, waste, and green purchasing metrics and inputting them into the NASA Environmental Tracking System (NETS) as well as reporting to the Environmental Stewardship Committee and JSC management.

Resource: Energy

Overview

JSC receives natural gas from Atmos Energy Marketing and electricity from Reliant Energy. Natural gas is primarily used on site to feed the boilers in Buildings 24 that then provide steam (see diagram, right). Steam and electricity are used to power chillers that provide air conditioning to the mall buildings. Electricity is provided to all facilities on site as the main power source. In FY2011, JSC used 187,641,925 kilowatt hours (kWh)/year, 15.64 million kWh/month (Average annual home 12,000 kWh) of electricity and 462,058 million cubic feet (MCF)/year, 38,504 MCF/month (Average annual home 52.5 MCF) of gas. The site currently has 0.31% renewable electricity in the form of wind generators and solar panels. Energy also includes transportation on site, which in combination with purchased electricity contribute to Greenhouse Gasses (GHGs), which the US Government is beginning to monitor.





JSC spends approximately $45,000 per day on electricity, including electricity for SCTF and EFD. The Center Operations Directorate (JA) pays for all utilities on site (gas, electric, and water) with Center Management & Operations (CM&O) funding. At present, only a third of that energy is saved when the center moves to after hours and 'weekend operations' due to buildings that are required to stay in full up operations and personnel not powering down equipment, such as computers and printer, etc.

Roles & Responsibilities

JSC has had an Energy Manager since the mid-1970s. The current Energy Manager is Mr. Rob Way (JP). Rob works in JP, the Planning and Integration Office of COD. Since energy is a utility, Rob works closely with the Utilities Branch of (JM5), headed by Melissa McKinley. Within the Utilities branch also resides the responsibility of the Energy Management and Control System (EMCS) management (headed by Juan Etheridge) to work with the JSC Energy Manager, JSC energy contractor/Honeywell and Facilities contractor/CSC to collect data to maintain energy saving requirements via the building control systems (BCS) and metering. EMCS monitoring and management is critical to insuring that, after installed, energy efficient equipment continues to bring calculated savings. Rob also works with facility and building managers across JSC, EFD, and SCTF to set hours for weekday versus weekend operations, so that we can decrease energy usage in each building when we do not need it.

Metrics

Rob is responsible for collecting quarterly energy and metrics and inputting it into the NASA Environmental Tracking System (NETS) as well as reporting monthly energy and gas metrics to JSC. The energy dashboard is accessible to all JSC employees off the JA homepage to allow them to monitor each building's (over 5000 square feet) energy usage http://www6.jsc.nasa.gov/ja/jp/energymgmt.cfm.

What's Next?

JSC is challenging all Federal Employees and contractors to apply these sustainability principals in their daily activities as well as their lives. To get involved or find out more information, please contact JSC-Sustainability@mail.nasa.gov. Together we will accomplish the vision of Mr. Joel Walker, JSC Director, Center Operations Directorate, "Sustainability should be something we don't think about; it should be engrained in our thinking. We just do it." Together we can secure the future of JSC and our 'Blue Marble!'

The JSC Sustainability Program will continue to mature each year. This is the 'first line in the sand' of integrating and promoting the program for all to see. We'll use the 'spiral design philosophy,' in that we will develop our infrastructure and run it for a year, then make modifications based on lessons learned the next year.

As William McDonough, co-author of "Cradle to Cradle," reflected in his recent lecture in Houston, when asked by clients how 'long' developing a sustainable world would take "it will take the rest of our lives… and isn't that the point?"

There are two primary sustainability related documents that will be delivered to the JSC Center Sustainability Officer (CSO), Joel Walker, each year: an update to the JSC Sustainability Engagement Strategy and a JSC Sustainability Annual Report. The Annual Sustainability Report will be compiled for the first time in 2012. Details will include the metrics listed in each resource section of this report, as well as a status of the SSPP requirements (from Appendix A). To avoid redundant work, existing metrics, tracking systems, and documentation will be utilized where ever possible.

In addition to those two documents, the sustainability organization will run behind the scenes by continuing full engagement efforts throughout the JSC community with existing teams. We will focus on increasing awareness and outreach of JSC sustainability data, and providing a firmer understanding for all of JSC how to get involved and who to contact for more information.

In support of continual improvement, sustainability at JSC will be evaluated to determine areas where there appear to be gaps or redundancies. In FY2013, we will also be investigating ways to ensure inclusion of the White Sands Test Facility (WSTF). A communication plan to allow information to be exchanged between all interested parties may be formally documented. Finally, efforts already underway within the JSC Strategic Opportunities and Partnerships Development (SOPD) office will be integrated with sustainability efforts.

We encourage your ideas, questions, and comments. Please feel free to connect with any of the resource leads or team leads at any time to share your passion for sustainability.

We'd like to hear from you!

We would like to hear what you are already doing that contributes to sustainability. The JSC Green Team has many ideas for engaging your feedback through the upcoming fiscal year. In the meantime, let us know what you are already doing! Please send your accomplishments to **JSC-Sustainability@mail.nasa.gov**.

Please take a moment to reflect on at least one thing you'll do differently because of this awareness!

Thank you!

E-mail: JSC-Sustainability@mail.nasa.gov

Find us online: http://www6.jsc.nasa.gov/ja/ja13/index.cfm

Appendix A Strategic Sustainability Performance Plan Goals & Requirements

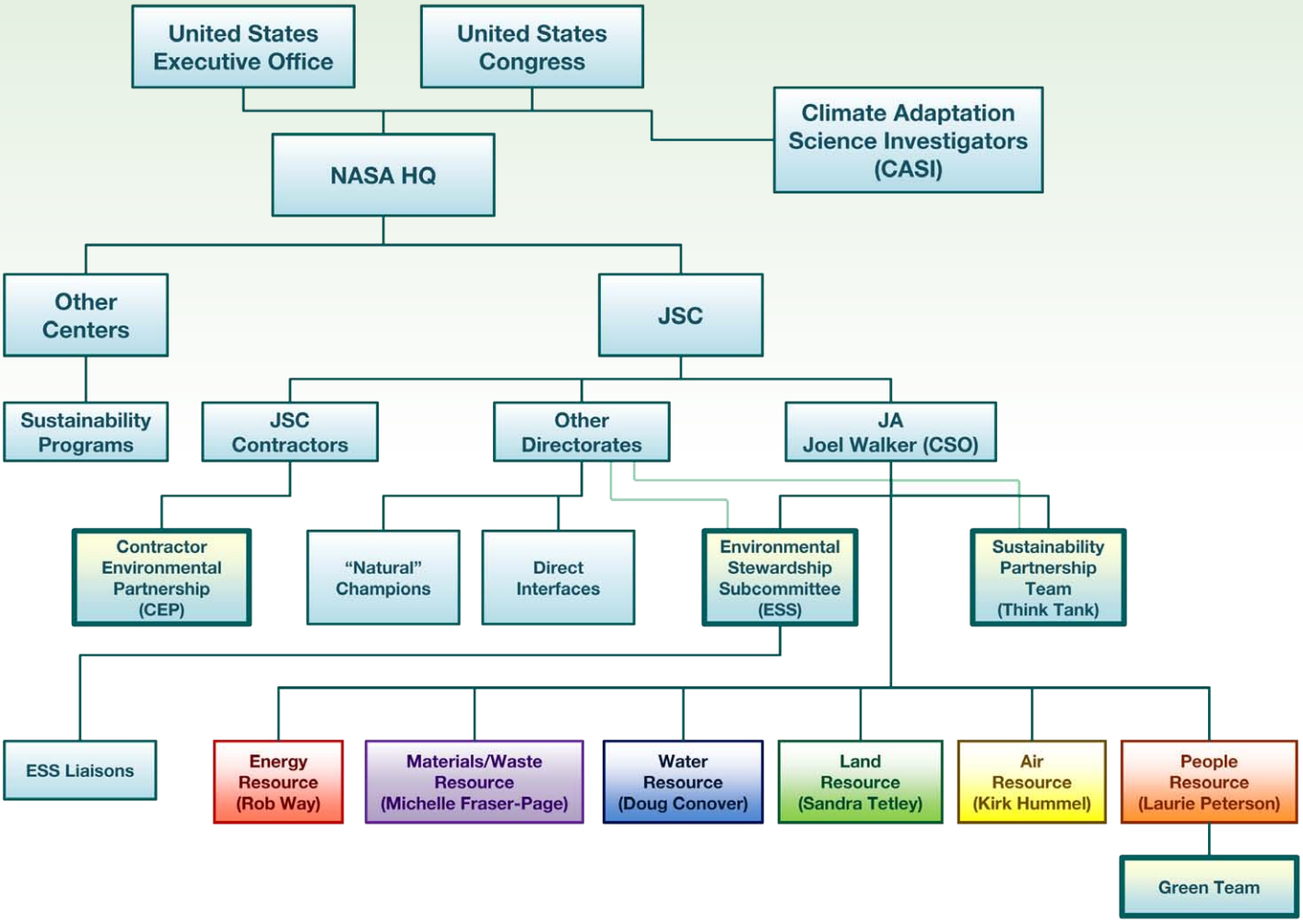
People (i = influence through advertising)	Air	Land	Water	Materials (M) & Waste (W)	Energy	Req't #	NASA SSPP 2012 Goals *Key: C = Control, I = Influence*
							Goal 1: Greenhouse Gas Reduction and Maintenance of Agency Comprehensive Greenhouse Gas Inventory
							Scope 1 includes greenhouse gas emissions from sources that are owned or controlled by a Federal agency.
							Scope 2 includes greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency.
							Scope 3 includes greenhouse gas emissions from sources not owned or directly controlled by a Federal agency but related to agency activities, such as business travel and employee commuting.
							1. Scope 1 & 2 Greenhouse Gas Emissions
I	I	I			C	1.a	a) Reduce Scope 1 & 2 GHG emissions by 18.3% by FY 2020, from an FY 2008 baseline.
I	I	I			C	1.b	b) Greenhouse Gas Emissions Intensity - Reduce Agency's Scope 1 and 2 GHG Emissions by 1% annually or a total of 9% by FY 2015 from FY 2003 energy intensity baseline (Originally EO 13423 Toxic & Hazardous Chemical Plan Goal set internally by NASA. Now subsumed under the targets and reporting required under EO 13514).
							2. Scope 3 Greenhouse Gas Emissions
C				(W) C	I	2.a	a. Reduce Scope 3 GHG emissions by 12.6% by 2020.
i				(W) C		2.b	b. Reduce Scope 3 GHG emissions associated with contracted waste disposal by 23.1% by 2015, excluding C&D waste.
i					C	2.c	c. Reduce Scope 3 GHG emissions associated with T&D losses from purchased energy by 15.1% by 2020.
I				(W) I	I	2.d	d. Discuss methods used by NASA to calculate its Scope 3 GHG emissions and to continually improve data accuracy and overall data collection and analysis methods.
C						2.e	e. Track Federal employee travel (business travel and commuting) and other emerging Scope 3 GHG emission sources to identify opportunities for future reductions.
I						2.f	f. Complete annual NASA comprehensive GHG inventory and discuss development of NASA's FY 2010 GHG inventory.
C		I			I	3	**3. NASA commitment to evaluate, update, and strengthen internal data bases, such as NETS, undertake targeted energy reduction projects, and take other actions, where appropriate, such as trend analysis over time.**
							Goal 2: Buildings, ESPC Initiative Schedule, and Regional & Local Planning
							EB) Energy and Buildings
C	I	I			C	2.EB.a	a) Reduce facility energy intensity – Reduce energy consumption per gross square foot of building area by 3% annually from FY 2003 baseline for FY 2006 – FY 2015 (30% Total) (EO 13423) following the per FY reductions mandated in EISA 2007.
							b) Increase Renewable Electricity Installation & Use.
i	I	I			C	2.EB.b.i	i. Increase percentage of total electricity from renewable sources (3% FY 2007 – FY 2009; 5% FY 2010 – FY 2012; 7.5% FY 2013+).
i	I	I			C	2.EB.b.ii	ii. Strive for at least half of the renewable energy from new renewable sources (placed into service after January 1, 1999).
C	I	I			C	2.EB.c	c) Reduce per capita energy consumption through space management.
							GB) High-Performance Sustainable Design / Green Buildings
i	I	C			C	2.GB.a	a. Beginning in FY 2020, all new Federal buildings are to be designed to achieve zero-net energy by FY 2030.
i	I	C	I	(M) I	C	2.GB.b	b. Comply with the, "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles)," in all new construction, major renovation or repair and alteration of Federal buildings.
i	I	C	I	(M) I	C	2.GB.c	c. Assess and demonstrate that at least 15% of Agency's existing government-owned buildings, Agency direct leased buildings, delegated authority leased buildings, and FRPP-reported leased buildings meet Guiding Principles by FY 2015 [5,000 GSF threshold for existing buildings and building leases].
i	I	C	I		C	2.GB.d	d. Demonstrate annual progress toward 100% conformance with Guiding Principles for entire building inventory by 2015 and thereafter.
i	I	C	I	I	C	2.GB.e	e. Incorporate sustainable practices into Agency policy and planning for new Federal facilities and leases, and into lease renewal strategies.
i	I	C	I	(M) I	C	2.GB.f	f. Demonstrate use of cost-effective, innovative building and sustainable landscape strategies to minimize energy, water, and materials consumption and decrease fertilizer, herbicide, and pesticide application.
i	I	C	I		C	2.GB.g	g. Operate and maintain, and conduct all minor repairs and alterations for existing building systems to reduce energy, water and materials consumption in a manner that achieves a net reduction in Agency deferred maintenance costs.
i		C				2.GB.h	h. Optimize performance of the Agency's real property portfolio – dispose and consolidate excess and underutilized property, co-locate field offices, consolidate across metropolitan and regional locations.

People (i = influence through advertising)	Air	Land	Water	Materials (M) & Waste (W)	Energy	Req't #	NASA SSPP 2012 Goals *Key: C = Control, I = Influence*
C	I	C			I	2.GB.i	i. Reduce need for new building and field office space by utilizing technologies to increase telework opportunities and expand delivery of services (over the internet or electronically).
I		C				2.GB.j	j. Conserve, rehabilitate, and reuse historic Federal properties, using current best practices and technology.
i		C			C	2.GB.k	k. Align Agency space actions (new leases, new construction, consolidation) with Agency Scope 1&2 and Scope 3 GHG reduction targets.
							RLP) Regional and Local Planning
I		C				2.RLP.a	a. Incorporate timely consultation with local and metropolitan planning organizations regarding the impact, or potential impact, of Federal actions on local transportation infrastructure and local development plans into existing policy and guidance.
i		C	I			2.RLP.b	b. Align Agency policies to increase effectiveness of local planning efforts regarding transportation, energy resources and the environment.
i		C	I			2.RLP.c	c. Align Agency policies and actions to increase the effectiveness of regional measures that enhance integrity of local ecosystems and watersheds.
i		C				2.RLP.d	d. Update Agency policy and guidance to ensure that all Environmental Impact Statements (EIS's) and Environmental Assessments (EA's) required under the National Environmental Policy Act (NEPA) for proposed new or modified Federal facilities identify and analyze impacts associated with energy (including alternative energy sources) and climate change, where appropriate and practicable.
I		C	I	(M) I		2.RLP.e	e. Integrate methods and practices necessary to achieve the goals of this plan into Agency master planning documents (i.e., high-performance, sustainable building goals, pollution prevention and waste reduction goals, water use reduction goals, sustainable acquisition goals, electronic stewardship and data center consolidation, etc.).
I		C	I			2.RLP.f	f. Update Agency policy and guidance to ensure timely coordination and (where appropriate) consultation with Federal, State, Tribal and local management authorities regarding impacts to local ecosystems, watersheds and environmental management associated with proposed new or modified Federal facilities.
I		C	I			2.RLP.g	g. Discuss Agency participation in critical local and regional efforts and initiatives (e.g.., Executive Order on Chesapeake Bay Protection and Restoration, Executive Order on Stewardship of the Ocean, Our Coasts, and the Great Lakes).
							GOAL 3 - Fleet Management
C	I				I	3.1	1) Reduce Petroleum Use in Fleet Vehicles – Reduce petroleum use 2% annually from FY 2005 baseline for FY 2005 – FY 2020 (30% Total).
i					I	3.2	2) Increase Use of Alternative Fuels in Alternative Fuel Vehicles (AFVs) and Flex-Fuel Vehicles (FFVs) – Increase alternative fuel use by 10% annually from 2005 baseline for FY 2005 – FY 2015.
C	I				I	3.3	3) Optimize Use of Vehicles and Right-Size Fleet.
i					C	3.4	4) Increase Use of Low Emission and High Fuel Economy Vehicles.
i					C	3.5	5) Replace conventional senior executive fleet with low-GHG emitting, highly-efficient vehicles.
I					C	3.6	6) Agencies operating shuttle buses should discuss challenges related to consolidation of and/or sharing of transportation services with other agencies.
I					C	3.7	7) Discuss Agency's efforts to implement sustainable transportation options by: acquiring low GHG emitting vehicles such as hybrids and AFVs; optimizing the number of vehicles in the Agency's fleet, using alternative fuel in AFVs and FFVs; developing alternative fuel infrastructure; direct spending on training; and procurement of environmentally preferable motor vehicle products. Identify specific challenges in implementing these or other items related to implementation of sustainable transportation within your Agency.
							GOAL 4 - WATER USE EFFICIENCY AND MANAGEMENT
C		I	C			4.a	a. Reduce potable water use intensity by at least 26% by FY 2020.
i		I	C			4.b	b. Reduce industrial, landscaping, and agricultural water use by at least 20% by FY 2020.
I	I	I	C			4.c	c. Identify and implement water reuse strategies.
I		I	C			4.d	d. Achieve objectives established by EPA in Stormwater Guidance for Federal Facilities.
i		I	C			4.e	e. Incorporate appropriate reduction strategies for non-potable water use into Agency policy and planning.

People (i = influence through advertising)	Air	Land	Water	Materials (M) & Waste (W)	Energy	Req't #	NASA SSPP 2012 Goals *Key: C = Control, I = Influence*
							GOAL 5 - POLLUTION PREVENTION AND WASTE REDUCTION
I	I	I		C	C	5.a	a. Increase source reduction of pollutants and waste.
C		I		(W) C		5.b	b. Divert at least 50% non-hazardous solid waste by FY 2015, excluding C&D debris.
i	I	I		(W) C		5.c	c. Reduce municipal solid waste sent to landfills to assist the Agency in achieving FY 2020 GHG reduction targets [See Goals 1 and 2 above] and discuss Agency strategies and implementation.
i		I		(W) C		5.d	d. Divert at least 50% C&D materials and debris by FY 2015, and discuss methods used to monitor and track progress.
C				(M) C		5.e	e. Reduce printing paper use.
I				(M) C		5.f	f. Increase use of uncoated printing and writing paper containing at least 30% postconsumer fiber.
C	C			C		5.g	g. Reduce and minimize the acquisition, use, and disposal of hazardous chemicals and materials, and discuss how implementation will assist the Agency in achieving FY 2020 GHG reduction targets [See Goals 1 and 2 above].
i		I		(W) C		5.h	h. Increase diversion of compostable and organic materials from the waste stream.
i		I		(M) C		5.i	i. Implement integrated pest management and landscape management practices to reduce and eliminate the use of toxic and hazardous chemicals and materials.
I	C			(M) C		5.j	j. Increase Agency use of acceptable alternative chemicals and processes.
i	C					5.k	k. Report in accordance with Sections (301-313) of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986.
							GOAL 6 - SUSTAINABLE ACQUISITION
i		I	C	(M) C		6.a	a. Ensure 95% of new contract actions, including task and delivery orders under new contracts and existing contracts, require the supply or use of products and services that are energy efficient (Energy Star or FEMPdesignated), water efficient, biobased, environmentally preferable (excluding Electronic Product Environmental Assessment (EPEAT)-registered products), non-ozone depleting, contain recycled content, or are non-toxic or less toxic alternatives.
I		I		(M) C		6.b	b. Update Agency affirmative procurement plans (also known as green purchasing plans or environmentally preferable purchasing plans), policies and programs to ensure that all mandated Federally designated products and services are included in all relevant acquisitions.
							GOAL 7 - ELECTRONIC STEWARDSHIP AND DATA CENTERS
i	I					7.a	a. Ensure acquisition of EPEAT registered, Energy Star qualified, and FEMP designated electronic office products when procuring electronics in eligible product categories.
I	I			(M) I		7.b	b. Establish and implement policy and guidance to ensure use of power management, duplex printing, and other energy efficient or environmentally preferred options and features on all eligible Agency electronic products.
i				(W) I	I	7.c	c. Update Agency policy to reflect environmentally sound practices for disposition of all Agency excess or surplus electronic products.
I				(W) I	C	7.d	d. Discuss how the Agency will increase the quantity of electronic assets disposed through sound disposition practices. Include in the discussion how your Agency is using or plans to use programs such as disposal through GSA Xcess, recycling through Unicor, donation through GSA's Computer for Learning (CFL) or other non-profit organizations, and/or recycling through a private recycler certified under the Responsible Recyclers (R2) guidance or equivalent certification.
I	I				C	7.e	e. Discuss how the Agency will require IT planning/Life Cycle Manager to replace and or waive equipment that does not meet "Green" compliance requirements.
i	I				C	7.f	f. Update Agency policy to ensure implementation of best management practices for energy efficient management of servers and Federal data centers, including how the Agency will meet data center reduction goals included in the Federal Data Center Consolidation Initiative.
							GOAL 8 - AGENCY INNOVATION & GOVERNMENT-WIDE SUPPORT
C	C	C	C	C	C	8	Support innovation in NASA Programs and Institutions to protect and enhance human health and the environment, and share innovations, best practices, and lessons learned with other Federal agencies and international partners.

Appendix B JSC's Sustainability Organization

How does is all tie together so I know how to 'plug in'?




UNITED STATES
UNITED STATES

NP-2012-09-025-JSC