National Aeronautics and
Space Administration

JSC Sustainability Engagement Strategy

FY2014

www.nasa.gov

Do My Efforts Really Matter?

You may be thinking, *"I'm just one person; my actions can't make that significant of a difference. Does buying a couple of water bottles every day, driving my 5-passenger vehicle alone, leaving my air conditioner set to 68°F, or leaving my electronics plugged in have enough of an impact that I should actually change my behavior?"*

A cultural behavior is an acceptable norm that we are able to meet without significant impact on our reputations. However, consider that we are being judged for our cultural norms seven generations from today. From the Great Law of the Iroquois Confederacy, "In our every deliberation, we must consider the impacts of our decisions on the next seven generations." Assuming a generation is about 20 years, that's 140 years from now.

If we think back to 140 years ago (1873-1874) it's obvious how much of a difference each generation has made to our lives today. It wasn't until 1880 that Edison patented distribution of direct current electricity. Around 1873-1874, the American Indian wars were still raging; Levi Strauss began manufacturing denim work pants, and DDT (dichlorodiphenyltrichloroethane) was first synthesized.

Do you remember DDT? DDT is a great example of the dichotomous nature of sustainability. There will always be pros and cons in every decision we make regarding the impacts to human health and the environment.

DDT Pros:
"Many areas of the world are now free of such diseases as malaria purely as the result of DDT used on lice and mosquitoes in the period 1942–1960s. It is estimated that DDT alone was responsible for the saving of tens of millions of human lives." (Cited from the "Hayes' Handbook of Pesticide Toxicology", 3rd Edition, 2010.)

DDT Cons:
"The U.S. Department of Agriculture, the federal agency with responsibility of regulating pesticides before the formation of the U.S. Environmental Protection Agency in 1970, began regulatory actions in the late 1950s and 1960s to prohibit many of DDT's uses because of mounting evidence of the pesticide's declining benefits and environmental and toxicological effects. Rachel Carson's book *Silent Spring* in 1962 stimulated widespread public concern over the dangers of improper pesticide use and the need for better pesticide controls.

A causal relationship between DDT exposure and reproductive effects is suspected. Today, DDT is classified as a probable human carcinogen by U.S. and international authorities. This classification is based on animal studies in which some animals developed liver tumors." (Cited from http://www.epa.gov/pesticides/factsheets/chemicals/ddt-brief-history-status.htm)

Envision the world as you see it in 2153, 7 generations from now. What do you see?

Is your behavior impacting how future generations will live? Do you need to change your behavior right now to create the world as you'd like to see it in 2153?

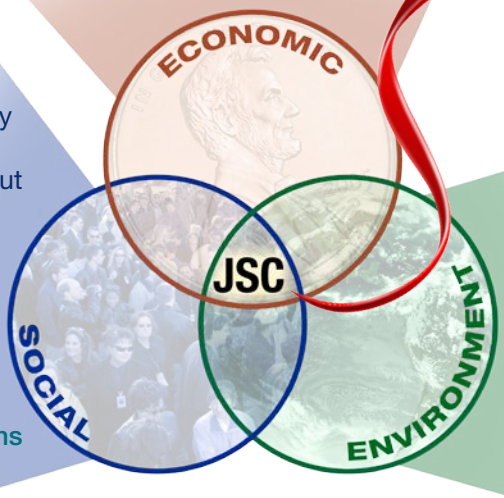
Reality Check:

If this was easy, we would already be doing it. Because sustainable living is not always cheaper, may be harder to implement, and may not be socially accepted, we often choose not to do what has the greatest positive impact to our natural resources.

Ultimately, your JSC Sustainability Leads are trying to make this decision easier for you. Here are examples of how we are supporting you by using the Triple Bottom Line decision-making tool.

Recycling efforts alone saved JSC $228,000 in 2012. Thank you for recycling. Consider how much you could save if you didn't buy things you didn't need, such as bottled water or extra supplies.

> *"My goal as the JSC Center Operations Director is to create a working environment where JSC employees feel happy, comfortable, and productive to support our mission. Similarly, my vision for sustainability is that it's something we don't even think about; it's ingrained in our thinking. We just do it."*
>
> Joel Walker
> JSC Center
> Sustainability Officer



We've given our Sustainability Presentation to over 1,000 JSC employees so far. Without awareness, behavior change likelihood = 0%. Every month, sustainability opportunities are published on the JSC Sustainability Web page. You can also contact your sustainability champions to give a presentation.

Over the past 20 years, JSC reduced hazardous waste generation by 99.9%, saving hundreds of thousands of dollars while preserving natural resources. Please continue helping us identify opportunities.

NASA's Commitment to Sustainability

AGENCY POLICY STATEMENT

Worldwide, people have turned to the National Aeronautics and Space Administration (NASA) for inspiration throughout our history. It is NASA's mission "To drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of the Earth." NASA is an agency that leads by example and will continue to spur profound changes in our knowledge, culture, and expectations.

NASA's sustainability policy is to execute NASA's mission without compromising our planet's resources so that future generations can meet their needs. Sustainability involves taking action now to enable a future where the environment and living conditions are protected and enhanced. In implementing sustainability practices, NASA manages risks to mission, risks to the environment, and risks to our communities, all optimized within existing resources. In executing its mission, NASA's sustainability objectives are to:

- increase energy efficiency;
- increase the use of renewable energy;
- measure, report, and reduce NASA's direct and indirect greenhouse gas emissions;
- conserve and protect water resources through efficiency, reuse, and stormwater management;
- eliminate waste, prevent pollution, and increase recycling;
- leverage Agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services;
- design, construct, maintain, and operate high-performance sustainable buildings;
- utilize power management options and reduce the number of Agency data centers;
- support economic growth and livability of the communities where NASA conducts business;
- 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;
- 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;
- maintain compliance with all applicable Federal, state, local or territorial law and regulations related to energy security, a healthy environment, and environmentally-sound operations; and
- comply with internal NASA requirements and agreements with other entities.

To implement this policy and meet the requirements and targets outlined in this plan, NASA will be practical in the integration of sustainability and sustainable practices. We will look for ways to leverage existing management systems, processes and decision-making, to influence both long-term planning and short-term actions, to enhance and strengthen our ability to perform our mission.

Olga M. Dominguez
NASA Senior Sustainability Officer

The Johnson Space Center proudly mirrors our agency initiatives committed to sustainability. 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 sustainable living into personal and professional activities.

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

Ellen Ochoa
Director
NASA Johnson Space Center

JSC's Definition of Sustainability

If we were completely aware of the impact our behavior had on our natural resources, and the multiplied impact of millions of people behaving in the same way, we would change.

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.

JSC Sustainability Initiatives

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 those needs to the rest of JSC to affect behavior change.** There are some fundamental requirements for sustainability assigned to all federal agencies via Executive Order (EO) 13514, which culminated in our Agency document, the Strategic Sustainability Performance Plan (SSPP). The NASA SSPP allows each Center to implement sustainability into its operations as best fits the existing processes, to meet the EO goals. However, we don't want everything to be a requirement.

The **JSC Sustainability Model** was envisioned to represent the six natural resource areas we are working to sustain. 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 pages 9-14 to help you understand what it encompasses and how you can contribute to 'doing better' in all areas of sustainability.

JSC Sustainability Model

The natural resources we are trying to sustain

Energy: Mr. Rob Way and Mr. Kevin McCue are the focal points for energy, which includes all components of energy use and optimization (including electricity, natural gas, renewable, transportation, etc.).

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.

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.

Land: Mr. Lynn Lefebvre is the focal point for land, which includes all elements of 'real property,' land, buildings, other structures, as well as historic preservation, wildlife, and vegetation.

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

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.

How Do I Contribute?

There are four ways that you can make a difference:

1. **Personally** – understand your footprint
2. **Professionally** – be more sustainable in your office area
3. **Professionally** – be more sustainable in your job function
4. **Professionally** – promote sustainability by joining a JSC Sustainability Team

1 How do I contribute to sustainability PERSONALLY?

For personal engagement, being aware is half the battle. A seed is being planted right now that may immediately bloom, or slowly affect the way you think about consuming Earth's resources. Either way, sustainability initiatives are guaranteed to be a topic of discussion for the rest of our lives. Per William McDonough, "Isn't that the point?"

Here are some things you can do personally to make a difference:

1) Calculate your ecological footprint at www.myfootprint.org. That will give you a baseline to start from regarding personal decisions you can make to live more sustainably.

2) There is a list of actions you can take right now to reduce your footprint under the "Take Action" tab at www.myfootprint.org.

3) Tell all your friends and family what you're doing, and how it's making a difference to YOU! Plant the seed with someone else!

2 How do I contribute to sustainability PROFESSIONALLY *in my office area?*

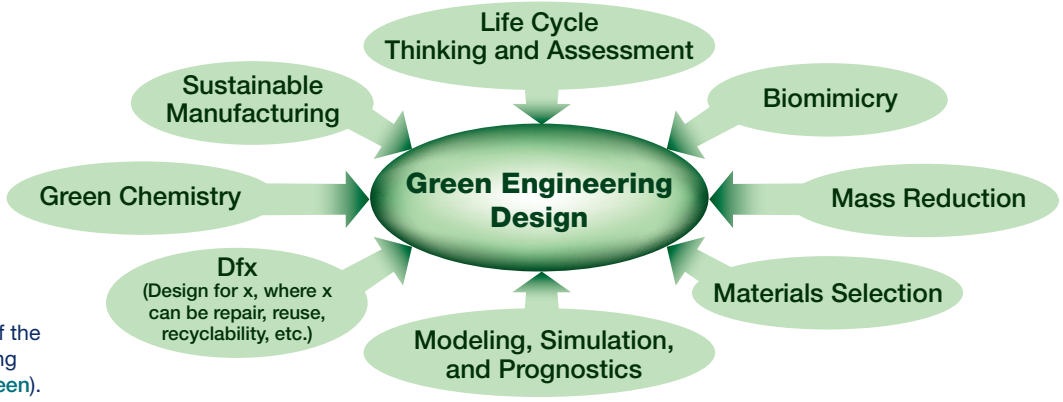
Our JSC sustainability champions can assist you in auditing your office area for ways to be more sustainable. Don't worry; this isn't the type of audit where anyone gets in trouble! It is a great way to compete against a partnering office or organization to see who can be the 'most sustainable'. E-mail JSC-Sustainability@mail.nasa.gov to participate.

3 How do I contribute to sustainability PROFESSIONALLY *in my job function?*

Do you have a job that makes a difference to our Center's Sustainability Initiatives? ***Yes, you do!***

Job Function	Sustainability Initiatives Your Role Supports
Employee	Buy only what you need (check for supplies at Freecycle@Work), buy sustainably (green, recycled, energy efficient), recycle and reuse where ever possible, conserve resources by considering them when you develop your plans. And, consider taking the Green Engineering SATERN class to understand many ways to make a difference.
Project Manager	Check the critical spares database (OSCAR) for hardware needs, and consider water and energy conservation measures in your test and verification plans. Review the Green Engineering philosophies below, and consider taking the SATERN class.
Procurement Specialist	Understand our Sustainable Acquisition buying requirements, so that you can inform your customers. Sign up for the training class on the Environmental Office Training Web Site, and consider taking the SATERN class on Green Engineering.
Engineer/ Scientist	Consider Green Engineering design principles in your efforts (see Green Engineering concepts below). Take the challenge to design your project to meet your space mission requirements as well as leave a positive legacy. Take the Green Engineering SATERN class to learn more.
Facility Manager	You are the eyes and ears of your facility, and your activities tie back to Center Operations. How can we meet your tenants' needs most sustainably? Consider pollution prevention opportunities to reduce regulated waste, and maximize location of recycling bins. You might like the Green Engineering SATERN class to understand life-cycle impacts.
Construction Project Manager	Consider ways that your project can have the least impact on Earth's natural resources. Maximize Leadership in Energy & Environmental Design (LEED) components, purchase green and local building products, and aim for a 90%+ recycling rate. Use the JF 1138 to help you identify and reduce your project's environmental impacts. Take the Green Engineering SATERN class.
Laboratory Technician/ Manager	Think about the processes and material input/output of your lab. Consider Green Engineering design principles in your efforts (see Green Engineering concepts below, and use JF 1138). Take the Green Engineering SATERN class.
Line Manager	Communicate our JSC Sustainability Initiatives by arranging for us to speak at your next meeting. Contact JSC-Sustainability@mail.nasa.gov. Consider a competition in your own organization (who can recycle the most, or who has the most sustainable office?), or have each employee set one major goal that will make a difference, like "I will never drink from a Styrofoam cup." Start your own Green Team. And, consider taking the Green Engineering SATERN class.

Green Engineering includes design philosophies and tools.



Based on an infographic developed by Prof. Sean McGinnis, Program Director of the Virginia Tech Green Engineering Program (www.eng.vt.edu/green).

4 How do I get more involved in sustainability efforts at JSC?
Join a JSC Sustainability Team!

Cross-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. ESS team members provide bi-directional communication to and expect information from JSC organizations specific to environmental and sustainability issues. Members of the ESS can help their organization in understanding when, why, where, and how to use the Environmental Planning Checklist (JF1138).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 that are developed, then tracked and reported to the ESS. Executive Order 13514 and the NASA Strategic Sustainability Performance Plan (SSPP) drive metrics in all environmental areas that this group discusses as it pertains and impacts the Center sites. Please contact the JSC Environmental Office to become a member of the JSC ESS.

Encourage Behavior Change

Started in January 2010, the charter of the **JSC Green Team** 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 interfaces with the JSC Wellness Program, Human Resources, the Employee Assistance Program, Starport, the Gilruth, Public Affairs, the Strategic Opportunities Partnership Development Office, and Safety and Mission Assurance. Please contact the JSC Green Team to become a member.

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 to become a member of the JSC Sustainability Partnership.

Contractor Inclusion

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 held several times at Space Center Houston since 2008. These events, open to the public, are run by volunteers and supported through external sponsorship and donations. The CEP also works on supporting sustainability initiatives, such as the Coffee to Compost Program, sustainable acquisition projects, and outreach efforts to onsite and offsite contractors. Please contact Ms. Jeni Morrison to become a member of the CEP.

Energy

Energy can be split up into four functional areas: Requirements/Mandates, Operations & Contingencies, Sources (electricity, natural gas, renewable energy, and transportation fuel), and Conservation. With 4.2 million square feet of building space JSC requires large amounts of energy for lighting, cooling, heating and powering devices ranging from cell phone chargers to massive test equipment. The center currently receives electricity from Reliant Energy and natural gas from Atmos Energy. Electricity provides power for most equipment on site as well as lighting, heating and cooling by driving electric water chillers. Natural gas is used to generate steam for heating and in steam driven chillers for cooling. The site currently has 0.31% renewable energy in the form of wind generators and solar panels. The use of several sources of energy contributes to the site's ability to avoid and recover from outages.

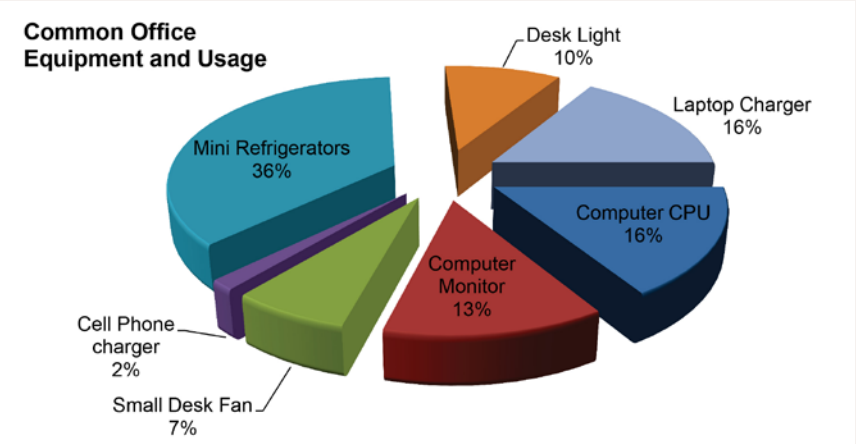
In FY 12 JSC used 177,300,242 kilowatt-hours (kWh) of electricity and 406,270 thousand cubic feet (MCF) of natural gas. By comparison, an average home uses 11,280 kWh of electricity and 630 MCF of natural gas. This energy cost JSC an average of $33,623.83/day. Check your energy usage at the Energy Usage Dashboard.

A combined heat and power (CHP) project in development using Department of Energy (DOE) alternative funding promises to reduce JSC's energy use as well as provide generation of electricity on site, increasing our energy security. Other projects using DOE alternative funding are in work or being planned to provide even more sustainable options for JSC.

Tips for Saving Energy

- Turn off lights in unoccupied rooms when not in use where ever there is a switch.
- Remove energy using equipment from your office, particularly refrigerators, heaters, and extra printers.
- Shut off or hibernate your computers when not in use.
- Use task lighting in your work areas and coordinate with your Building Facility Manager to reduce ceiling lighting.
- Printers and FAX machines – Per IRD don't turn off the large Minolta copier/fax/scanners. For other printers, enable sleep mode during the week and turn off on weekends (this is to minimize on/off cycles but still save energy). FAX machines generally can be turned off every night.
- Unplug (or power off electrical strips) for equipment you've turned off where ever possible. Even if your equipment is off, but still plugged in these still draw a small amount of energy (a.k.a. Energy Vampires).
- Participate in the Superflex schedule, so that we can save facility energy by scheduling some of our JSC buildings in 'weekend ops mode' on alternating Fridays.
- Angle blinds to reduce direct sunlight and close blinds at the end of the work day.
  - For window shades repair, etc., please submit your request electronically to jsc-furniture@mail.nasa.gov.

These are just samples of how you can help. For more ideas check out the JSC Energy Management website.



Questions?

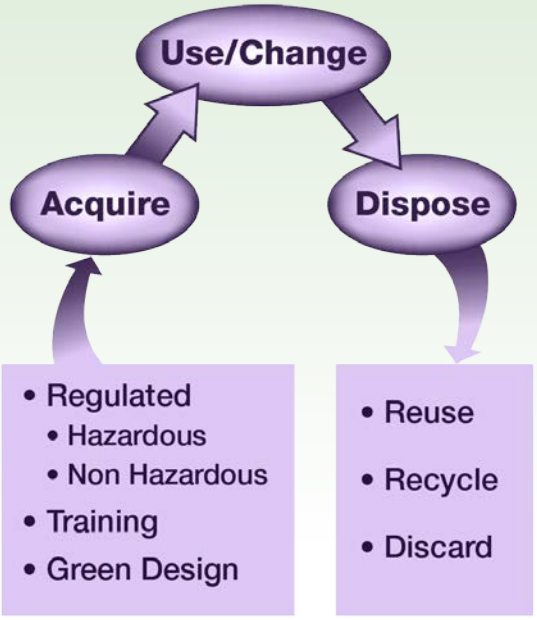
Contact Mr. Rob Way or Mr. Kevin McCue.

Materials and Waste

Materials and waste includes the entire material process from design (with the environment in mind) to purchase, use, and finally disposition of the product once it's no longer needed. This may be the single area where employee actions have the biggest impact on how well JSC meets its goals, because every employee, every day, handles some sort of material. Your choices may be as simple and immediate as recycling a drink bottle instead of placing it in the trash, or you may be involved in a multimillion dollar procurement where you can emphasize recycled content and biobased materials instead of petrochemical-based materials.

Ideally, we first reduce our purchases by dematerializing our processes, for example, using projectors or tablets instead of printing handouts for meetings. Next we will look for ways to reduce the hazards of our workplace by searching for and using less hazardous/toxic materials. When you are finished with an item, it may still have usable life left. At that point, we turn to reuse, utilizing various outlets such as the Redistribution and Utilization Office and Freecycle@Work. Recycling is actually far down on the priority list, as usually an item is downcycled, meaning it has less utility and value than it used to. The final option, and the one least preferred, is discarding in a landfill.

JSC Materials and Waste Balance Process



Tips for Reduction

Waste

- Join and participate in Freecycle@Work.
- Bring lunch to work in reusable containers (avoid 'to go' containers).
- Participate in the coffee grounds composting program as discussed on the JSC Environmental Web page.
- Check out R&U before purchasing new office supplies, especially binders.
- Find out what and where to recycle in your facility on the JSC Materials and Waste Web page.

Paper

- Read and edit documents electronically when possible (even in meetings).
- Use network printers instead of personal, desk top printers.
- Print double sided, set 'narrow' margins, use draft setting to save ink.
- Reuse cardboard packaging.
- Use the backsides of unneeded documents for note taking.

Over the years, JSC employees have found numerous innovative ways to reduce our material footprint. Our composting program is growing by leaps and bounds and won JSC a national award from EPA in 2013. The machine shop in Building 10 switched to a biobased cutting fluid that costs less and lasts longer. Now we're focusing on getting involved earlier in the process and looking at design criteria to emphasize materials that are better for the environment.

As you can see, there is so much more to material and waste than simply recycling. We need to look at the whole process from "cradle to grave," and start to change that process into "cradle to cradle." That's why each functional group needs to have education as part of their core challenge.

For a list of contacts to help with recycling, redistribution, and reuse, see the JSC Recycles Web page.

Questions?

Contact Ms. Michelle Fraser-Page.

Water

Water at JSC is comprised of several functional areas: potable water, storm water, wastewater and re-use water. They are primarily managed within the Utilities Branch of the Facilities Management and Operations Division of CenterOps.

Potable water at JSC is a very essential resource for all employees as the major uses of potable water are for drinking fountains, janitorial and restroom use, laboratories, cafeterias, fire protection (inside and outside buildings – fire hydrants), turf irrigation, and plant uses, including make-up water for cooling towers, boilers, chillers, and cooling for air compressors. New potable water metering recently installed at all buildings will be used for verification of site water usage and will aid in identifying areas for potential water conservation. There are several essential members of the team supporting the site potable water system. First is the maintenance and operations contractor that actually operates and maintains the entire system. Another support member is the Environmental Office that deals with the regulatory aspects of the potable water system. The final support member is the Occupational Health Office that monitors the water quality parameters to verify compliance with the Texas Commission on Environmental Quality.

The second functional area of water is **Storm Water**. Although it may not seem like the storm water system directly touches everyone's life on site, at certain weather-related times, it does play a very important role. During rain events this system is responsible for collecting and conveying rain water from the site. The system is necessary because it effectively collects and removes rain water to have minimal impacts on walkways and vehicular travel ways resulting from the rain event. The Environmental Office supports this effort, as there are regulatory requirements for the quality of water leaving the site in addition to storm water controls on all contractors that perform digging operations on site.

The third functional area of water is **Wastewater**. This system consists of conveyance infrastructures that remove primarily liquid waste streams from restrooms and approved waste streams from equipment. Waste water systems are generally not visible since the collection systems are underground; however, any infrequent malfunctioning of these systems can be an inconvenience to site employees. The Environmental Office also supports this function in assuring site waste streams meet the permitted parameters of local agencies.

Tips for Sustainable Water Use

- Minimize constant water running at work and home while lathering hands, washing dishes, washing cars, and brushing teeth.
- Practice low flow operations during all water use, and be sure to turn off faucets when complete.
- Immediately notify Facility Managers of any water leaks observed inside or outside of JSC facilities.
- Kick the plastic bottle water use and utilize the economical onsite water fountains that provide State Regulated potable water.
- Avoid using storm water and wastewater systems for disposing of anything other than their intended discharges.

The final functional area is a future opportunity that requires funding to implement. **Water Reuse** allows the treated effluent from the local sewage treatment plant to be used for turf irrigation and cooling tower make-up water. (Don't worry! The wastewater is treated several times before it is used for these purposes.)

Questions? Contact Mr. Doug Conover.

Land

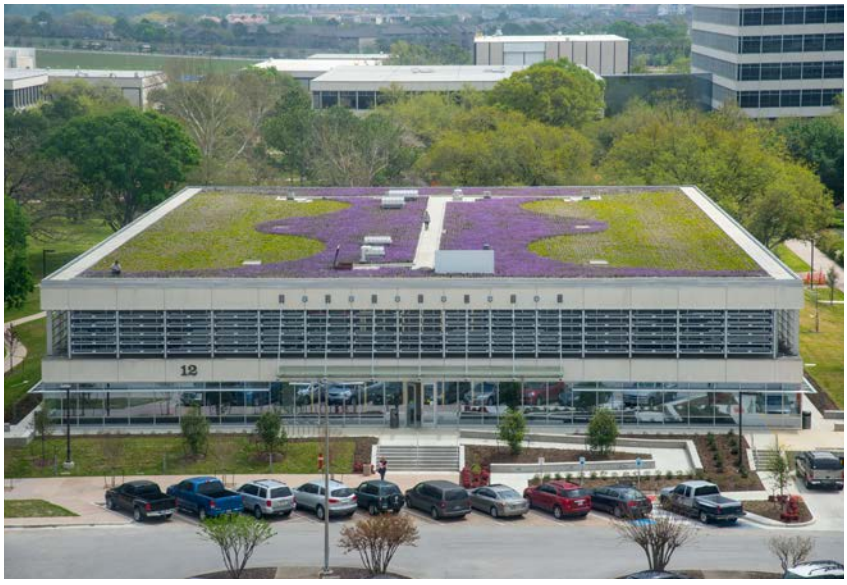
The Land resource is comprised of the actual property that JSC, Ellington Field (EFD), and Sonny Carter Training Facility (SCTF) sit upon, but also the structures, buildings, and utilities included at each site, termed real property. JSC is 1,580 acres. EFD is 37 acres, and SCTF is 13 acres. In regards to sustainability, the Land resource can be divided into three major components: Structures, Grounds, and Master Planning.

The JSC Master Plan, approved in 2010, lays out the general strategy 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. Most of these existing facilities and infrastructure remain from the original construction in the 1960s. Though built with the best practices at the time, the forethought of sustainable structures 50 years later did not exist. Much of this infrastructure is approaching the end of its lifecycle. As the aging infrastructure gets replaced, sustainable practices must be employed to ensure the replacements last for the next 50 years and beyond.

We have two National Historic Landmarks (NHL): The Building 30 Christopher C. Kraft, Jr. Mission Control Center and the Building 32 Space Environment Simulation Laboratory, as well as sixteen additional buildings that are eligible for listing on the National Register of Historic Places (NRHP). An archeological survey of JSC was completed in 2013, and a 50-year site historic survey will soon be under way. From a sustainability perspective, there are currently eight Leadership in Energy and Environmental Design (LEED) certified buildings.

The Building 12 Vegetative Roof includes flowers and other sustainable plants. Benefits of a green roof include increased green space and water absorption with reduced utilities usage.



Questions? Contact Mr. Lynn Lefebvre.

Tips for Land Resource Use

- Build Green. Use sustainable materials and practices for construction, remodels, and landscaping.
- Install a rain collection system. It saves in utility costs.
- Practice sustainable gardening. Use non-toxic solutions for pesticides, herbicides, and fungicides (growsmartgrowsafe.org).
- Backyard compositing replenishes the nutrients of the soil and reduces material to landfills.
- Stop invasive species. Native plants resist many pests and diseases, reducing the risk of garden problems.

Air

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 this '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 (CO_2) , Methane (CH_4) , Nitrous Oxide (N_2O), 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.

Tips for Sustainable Air Quality

- When feasible, use flexible work schedules and carpooling to reduce your driving.
- Plant a tree, or plant many trees!
- When refueling your car, fill the gas tank during cooler evening hours to cut down on evaporation.
- Use low-VOC or water-based paints at home.
- Avoid idling your car in drive-thru lanes. Park your car and go in.
- Keep your desktop and work areas clean simply using wet paper towels to remove dust.

Functional Area Breakdown for Air

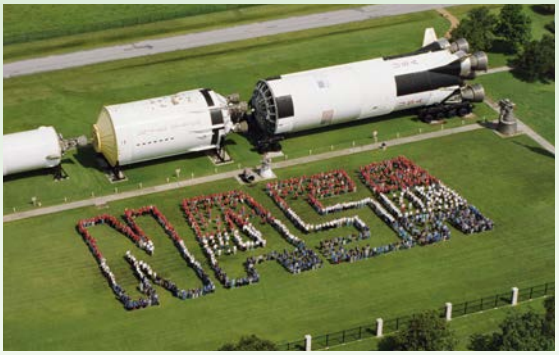
1. **Stationary Sources** - Topics that fall under the Stationary Sources Functional Area include the following:
   - Point Sources (i.e., Stacks) - Point Sources include fixed points that expel air emissions. Most include permitted equipment used in several areas across the site.
   - Fugitive Sources (i.e., "Escapees") - Fugitive Sources are air emission sources that are not from a fixed and easily identifiably point, such as air emissions from chemical use.
2. **Mobile Sources** - Topics that fall under the Mobile Sources Functional Area include the following:
   - Vehicles - Government and personal vehicles generate air emissions. While not all data is captured at this time, reducing these air emissions helps meet sustainability requirements.
   - Aircraft - Burning jet fuel contributes to JSC's air emission sources, and JSC tracks jet fuel usage to better understand air impacts from these activities.
   - Non-Road Equipment - Maintenance equipment, onsite transportation equipment, and others also burn fuel that can produce air emissions. JSC also tracks fuel usage for these vehicles.
3. **Indoor Air Quality** - Topics that fall under the Indoor Air Quality Functional Area include the following:
   - Hazardous Material Usage - Many chemicals used onsite produce air emissions when used; therefore, they require hazard communication and reporting to ensure safe use and proper reporting.
   - Air Conditions and Exposure Assessments - Indoor air parameters, such as oxygen-depleting substances, lead, mold, dust, asbestos, and Nano particulates, impacts worker health and productivity. JSC monitors these conditions to ensure impacts are minimized.

Questions?

Contact Mr. Kirk Hummel.

People

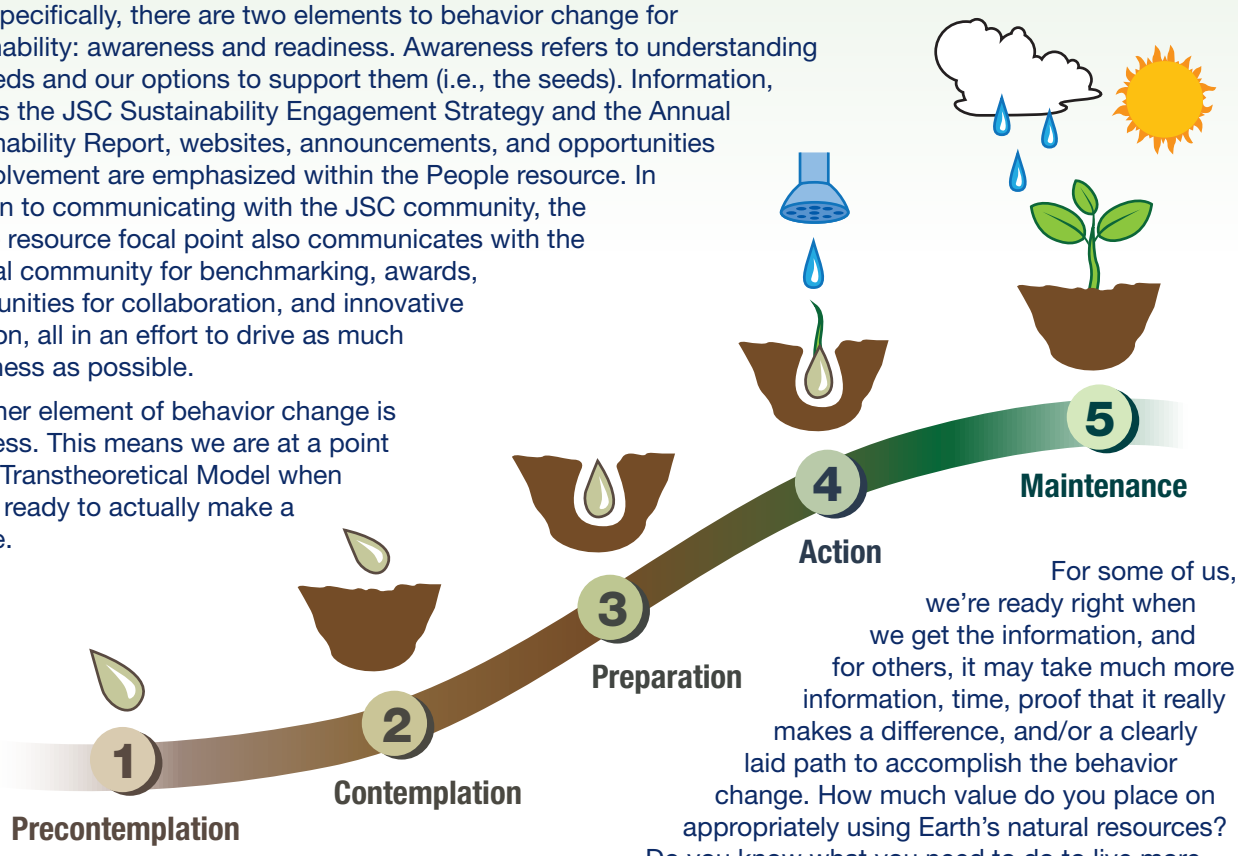
People affect absolutely every element of sustainability at JSC. You use or save natural resources, whether it's remembering to turn off lights and equipment in your offices or labs, following sustainable acquisition regulations, carpooling, teleworking, or taking alternative transportation to/from work. The People resource breaks out into four functional areas: Behavior Change (awareness, personal growth/happiness, and transition), Communication (marketing, outreach/education, and external relations), Recognition/awards, and Documentation Integration.



Behavior change is commonly broken down into five areas based on the Transtheoretical Model as shown below. Essentially, we change when we are ready to. Every seed of information we receive becomes a factor in when we may be ready to do something about the information we're receiving.

More specifically, there are two elements to behavior change for sustainability: awareness and readiness. Awareness refers to understanding the needs and our options to support them (i.e., the seeds). Information, such as the JSC Sustainability Engagement Strategy and the Annual Sustainability Report, websites, announcements, and opportunities for involvement are emphasized within the People resource. In addition to communicating with the JSC community, the People resource focal point also communicates with the external community for benchmarking, awards, opportunities for collaboration, and innovative inclusion, all in an effort to drive as much awareness as possible.

The other element of behavior change is readiness. This means we are at a point on the Transtheoretical Model when we are ready to actually make a change.



For some of us, we're ready right when we get the information, and for others, it may take much more information, time, proof that it really makes a difference, and/or a clearly laid path to accomplish the behavior change. How much value do you place on appropriately using Earth's natural resources? Do you know what you need to do to live more sustainably? How close are you to making a change in your behavior to support your values?

Each of the previous five resources presented in this Engagement Strategy list tips for you to understand what you can do and how to participate more broadly. Please contact any of the resource or team leads at any time with questions, comments, and suggestions. You may also contact JSC-Sustainability@mail.nasa.gov.

Questions?

Contact Ms. Laurie Peterson.

Help us plant more seeds!

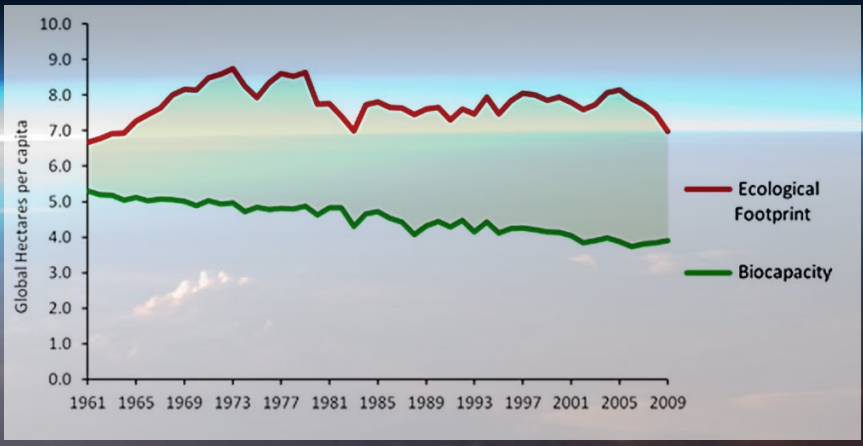
Why should you care?

So why should you care about changing your behavior to protect our natural resources?

On page 6, you read about understanding your own ecological footprint using myfootprint.org. We measure our ecological footprint (a.k.a. – demand) to make sure that our usage rate of Earth's natural resources is equal to or less than the Earth's ability to replenish those resources, known as biocapacity (a.k.a. – supply). There is a reason this sounds like economics; it is your basic supply and demand curve.

At present, based on the research of the Global Footprint Network, the United States has a higher demand than our resources can replenish (a.k.a. – supply). The graph below shows our current usage rate of natural resources versus the biocapacity of our planet to replenish them. We're not on target. The calculations in the National Footprint Accounts are primarily based on international data sets published by the Food and Agriculture Organization of the United Nations, United Nations Commodity Trade Statistics Database, and other data from the UN Statistics Division, the International Energy Agency, and the Intergovernmental Panel on Climate Change. Other data sources include studies in peer-reviewed science journals and thematic collections.

So maybe it won't run out in our lifetime, which is an easy (and perhaps lazy) way to justify not doing anything that might be a little harder, a little more expensive, or a little more inconvenient now – but consider your children, your friend's children, and their extended offspring.



This figure tracks the per-person resource demand Ecological Footprint and biocapacity in the United States of America since 1961. Biocapacity varies each year with ecosystem management, agricultural practices (such as fertilizer use and irrigation), ecosystem degradation, weather, and population size. The Ecological Footprint varies with consumption and production efficiency.

Credit: Global Footprint Network 2012 National Footprint Accounts. Available at the Global Footprint Network Web page.

What can I do?

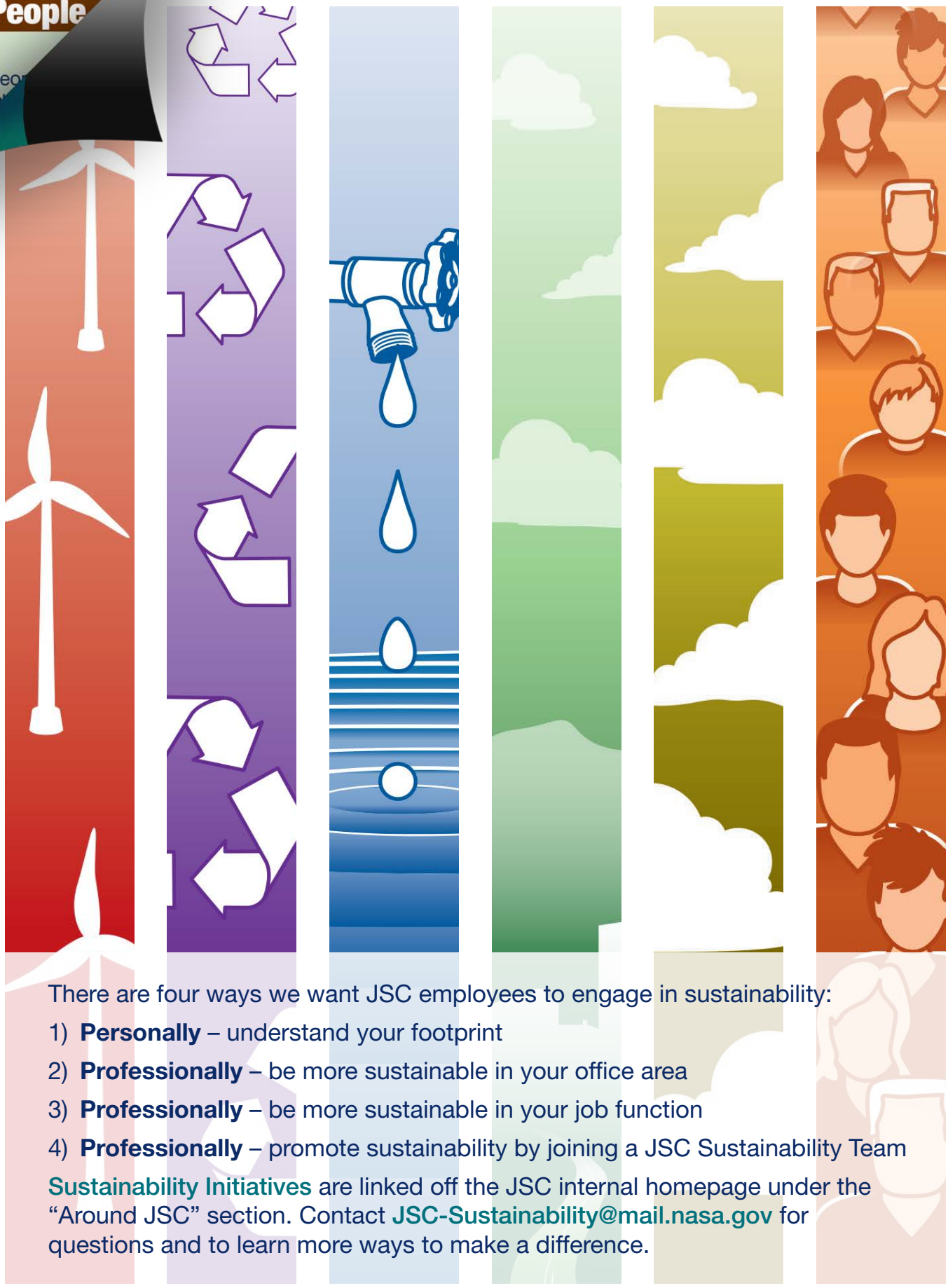
Consider changing just one thing (or more if you're feeling ambitious) about your behavior to decrease your environmental demand. You'll make a difference wherever you choose, whether it's at home or at work. For example, consider monitoring your home's energy usage, and work to decrease that each year. Start a campaign with your coworkers like JSC employee Chris Madden did.

> *"Back a few years ago, our branch had a competition to see who could pull in the lowest kilowatt hour on their home electricity bill. It was great fun, and more importantly raised awareness in my household – and, as a result, we have lowered our electricity bill each year since."*
>
> *- Chris Madden*

Every little bit matters! Leave a positive legacy!

Look inside for more great information!

People



There are four ways we want JSC employees to engage in sustainability:

1) **Personally** – understand your footprint
2) **Professionally** – be more sustainable in your office area
3) **Professionally** – be more sustainable in your job function
4) **Professionally** – promote sustainability by joining a JSC Sustainability Team

Sustainability Initiatives are linked off the JSC internal homepage under the "Around JSC" section. Contact JSC-Sustainability@mail.nasa.gov for questions and to learn more ways to make a difference.