Workshop: Promoting Sustainability Through Net Zero Strategies

COMMUNITY WORKSHOP SUMMARY

Background:

In 2011, EPA's Office of Research and Development (ORD) signed an MOU with the U.S. Army to support the Army's Net Zero initiative. The 17 Net Zero pilot installations aim to produce as much energy as used; limit freshwater use and increase water reuse; and reduce the generation of solid waste. ORD is currently working with the pilot installation at Fort Riley, Kansas, to demonstrate new and innovative technology to help achieve Net Zero goals and also advance the state of the science. Under this transdisciplinary partnership, EPA scientists and engineers are working with the Army, Department of Energy, USACE, USGS, Kansas State University and private industry to identify and demonstrate a variety of innovative technologies that are making a visible difference in the community at Fort Riley, Kansas.

With the success of these partnerships, EPA is now looking to apply Net Zero strategies to communities around the nation. The *Workshop: Promoting Sustainability through Net Zero Strategies* (*Workshop*) is the first step in this process.

Objectives:

The long-term objective of this effort is to help communities become more sustainable and resilient through the development and deployment of Net Zero strategies and technologies. The overall goal of the workshop was to share lessons learned from current Net Zero waste, water and energy efforts in communities, including successes, challenges, and needs. In addition, Federal and State agencies shared information about ongoing community programs and initiatives. Common themes and cross-cutting issues emerged from the discussions and presentations.

The end product of the workshop will be a resource document/roadmap to assist communities and partners in implementing initiatives to reduce their waste, water and energy footprint at a local level.

Format of workshop:

The *Workshop* was held on February 25-26, 2014 and composed of three separate sessions with different targeted audiences. On February 25th, the session was open to participants from Communities, Academia, Private Industry, NGO's and Federal, State and Local Governments. The morning session on February 26th was attended by Government representatives and was

focused on identifying targeted opportunities for Federal partners to leverage their resources for collaboration on advancing Net Zero strategies at the community level. The afternoon session was limited to ORD employees to discuss research needs and opportunities based on the previous day's session, and to develop an action plan for implementation.

On Tuesday, February 25th, the *Workshop* began with opening remarks by Lek Kadeli, the Acting Assistant Administrator of ORD, EPA. Keynote addresses were given by Bob Perciasepe, Deputy Administrator, EPA; the Honorable Katherine Hammack, Assistant Secretary of the Army for Installations and Environment; and Congressman David Price, 4th District of North Carolina, U.S. House of Representatives.

Three panels were followed by discussions. The first panel, *External Perspectives*, consisted of Paul Anastas, Yale University; Dick Jackson, UCLA; Marina Moses, National Academies of Science; Nolan Zail, Carmel Partners; Bob Gedert, City of Austin. The second panel, *Community Lessons Learned*, included panelists Bruce Hendee, City of Fort Collins; David Gard, Oberlin Project; Susan Kaplan, Sustainable Performance Consulting; Jennifer Rawlings, Fort Hood; Bill Ross, Counsel, Brooks, Pierce, McLendon, Humphrey & Leonard, LLP. The final panel, *Federal and State Initiatives Fostering Sustainability*, featured panelists Crystal Bergemann, HUD; Scott Mouw, N.C. Division of Environmental Assistance; John Thomas, EPA. The panel was joined for the discussion by Jay Bassett and Cheryl Coleman of EPA.

Demonstrations of the Storm Water Calculator and C-FERST (Community-Focused Exposure and Risk Screening Tool**)** were given by EPA scientists during the lunch period.

Sandra Connors, Acting Principal Deputy Associate Administrator, Office of Policy, EPA and Jennifer Orme-Zavaleta, Director, National Exposure Research Laboratory, ORD, EPA, summarized the discussions of the Community Workshop.

The Government session of the *Workshop* began with an outline of the Net Zero Framework in the Army by Marc Kodack, Office of the Deputy Assistant Secretary of the Army for Energy and Sustainability. Ardra Morgan, the program manager for Net Zero Partnerships, ORD, EPA summarized the Community Lessons learned – Successes and Challenges from the first day of the workshop. Jose Zambrana, Senior Science Advisor, ORD, EPA led the working session on targeted opportunities for advancing Net Zero in communities. The work sessions resulted in opportunities for Federal partners to leverage their resources in each of the ten regions.

Michael Slimak, ORD National Program Director, Sustainable & Healthy Communities Research Program, opened the ORD session of the workshop with a presentation entitled, "*Opportunities to Integrate Community, Sustainability and Net Zero*" followed by a discussion. The working session for ORD employees identified concrete suggestions that could be developed to inform ORD's research agenda in assisting communities and partners in the reduction of the waste, water and energy footprint at a local level. Ramona Trovato, the Acting Principal Deputy Assistant Administrator for Management, ORD, summarized the session and charged the participants with pursuing the development of the suggestions.

Key note address summaries:

Lek Kadeli, Acting Assistant Administrator of ORD, EPA

The partnership with the Army began in 2011 as a vision to manage natural resources with a goal of a Net Zero footprint in energy, water and solid waste at Army installations. This initiative recognizes sustainability as a more comprehensive approach that empowers us to accomplish more than we would have traditionally expected. These types of approaches can deliver better results - not just in terms of environmental quality, but also in terms of economic opportunity, social equity, and overall quality of life. By producing only as much energy as used; conserving freshwater use and increasing water reuse; and reducing the generation of solid waste, we are fostering economic growth and promoting citizen health and well-being. In short, these efforts produce more win-wins.

We have accomplished a lot through the EPA-Army Net Zero partnership. Some examples of the work we have done at Fort Riley, Kansas include:

- Installation of over 80 advanced water meters to provide near real time water use feedback. This is the first time water meters have been installed in any residential area on Fort Riley. It represents an important step toward establishing an accurate water use/demand profile of family housing areas on Fort Riley. The meters will also allow EPA to measure changes in water demand that result from Net Zero water conservation outreach and education efforts on the installation.
- Fort Riley became the first U.S. military installation to become a WaterSense Partner which gives them access to EPA's WaterSense outreach materials. This partnership program seeks to help consumers make smart water choices that save money and maintain high environmental standards without compromising performance.
- Recruitment of over 30 families living on Fort Riley who have pledged to take simple steps to reduce their water demand and who will serve as a citizen advisory panel for further outreach and water conservation activities aligned with the project.
- A successful working partnership between the Army/Fort Riley, EPA, Kansas Association for Conservation and Environmental Education, and the Fort Riley School District to train teachers about water conservation, and to provide fun, regionally-focused water conservation lessons in elementary school classrooms at Fort Riley.
- Collaboration with Army MedCom and Kansas-State University to better understand soldier's attitudes towards water conservation and reused water in different settings (i.e. when deployed, in training, and at home). These data can be used to create more effective conservation outreach and messaging campaigns that could reduce the number of water convoys needed to supply troops in the field and therefore save lives.

And this is just the beginning. There are many opportunities in addition to this partnership to apply these concepts in communities around the nation. Like the examples at Fort Riley, we can help communities reduce their waste, water and energy footprint, and at the same time promote economic prosperity. What this means is a world where resources are in balance, making our society more resilient to the challenges that face our nation today and into the future.

But how do we do this at a local level? That is why we are here today.

We have passed the tipping point on sustainability. The private sector has played a very important role in making that happen. Public behavior and motivation is a critical point. The public is paying attention to these issues now. We should not miss this opportunity.

You are the leaders that can help forge the approaches, knowledge, and partnerships necessary to empower change. You are the ones that can help enable a more sustainable future for us all. The growing challenges of today's environmental, social and economic problems with finite resources will require the best we have to offer in terms of creativity and ingenuity. Thank you for helping us to attack this challenge.

Bob Perciasepe, Deputy Administrator, EPA

EPA is focused on developing and using creative, flexible, cost-effective, and sustainable actions that deliver significant benefits on the ground in protecting and improving human health and the environment. Cross-cutting fundamental strategies are major components in EPA's strategic plan:

- Working Toward a Sustainable Future
- Working to Make a Visible Difference in Communities
- Launching a New Era of State, Tribal, Local, and International Partnerships
- Embracing EPA as a High Performing Organization

Cross-Agency collaboration is critical to establishing more resilient and sustainable communities and partnerships. Public engagement and stakeholder outreach is essential for building public-private partnerships in support of sustainable communities striving for Net Zero goals in water, energy, and waste.

EPA's Office of Research and Development and the Army signed an MOU on Nov 28, 2011, to jointly develop and demonstrate sustainable technologies and approaches on Army installations in support of the Army's Net Zero initiative. Under this cross-agency, transdisciplinary partnership, EPA scientists and engineers are working with the Army, DOE, USACE, USGS, Kansas State University, and private industry to identify and demonstrate a variety of water technologies and innovations that are making a visible difference in the community at Fort Riley, Kansas. Successful technology demonstrations resulting from this effort will provide real world solutions to the U.S. military as well as communities and municipalities across the country.

With the success of these partnerships, EPA is now looking to apply Net Zero-related strategies to communities. The long-term objective of this effort is to help communities become more sustainable and resilient through the development and deployment of Net Zero strategies and technologies. By pooling Federal, state, and local expertise and resources and, setting specific goals such as Net Zero waste, water, and energy, we anticipate that these strategies can be embraced by communities while simultaneously fostering economic growth and promoting citizen health and well-being.

Net Zero embodies the dream of sustainability. Every community needs to focus on energy, water and waste.

How do we get the interagency partnerships and the different thinking and skills that we have in the Federal Government? Then how do we build the momentum to transfer that joint knowledge base to communities around the country? We need to transfer the huge amount of information and tools that we have to our communities

A strong economy and a safe and prosperous future are critical to all Americans. Building sustainability into everything we do is part of the foundation leading towards that goal.

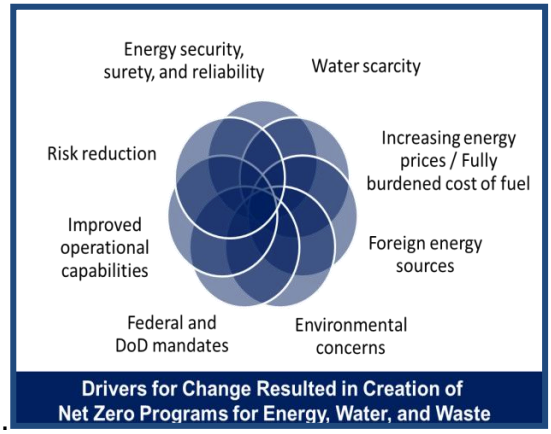
This is about shifting the paradigm from fixing problems to making sure that we minimize them before they happen. What history shows us is that when we do these things, we not only fix problems but create innovation and opportunities. The goal of Net Zero is an amazing goal. It captures the imagination. Most importantly it is doable!

<u>The Honorable Katherine Hammack, Assistant Secretary of the Army for Installations and Environment</u>

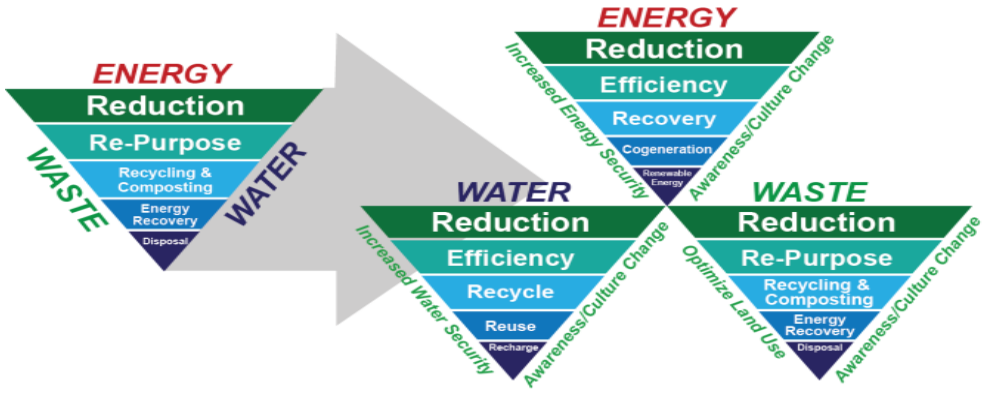
Our first challenge was to reeducate the Army on what sustainability means. In the Army sustainability refers to maintaining equipment. We used the concept of Net Zero as our term for sustainability.

The size of the Army footprint is very large with 152 installations; 108,000 family housing units; 1 billion square feet of building space; and 2.2 million people around the globe. The Army is the biggest facility energy user in the federal government. Fort Bragg is our largest installation with 70,000 people. It is 4th largest in size with 1.5 million acres and 44 million square feet of vertical infrastructure. It is a small city.

Why begin an effort to strive for a Net Zero footprint in water, waste and energy on Army installations? Power outages have risen sharply over the last decade. Drivers for change also included risk factors and competing priorities that provided a strong argument to create the Net Zero Initiative

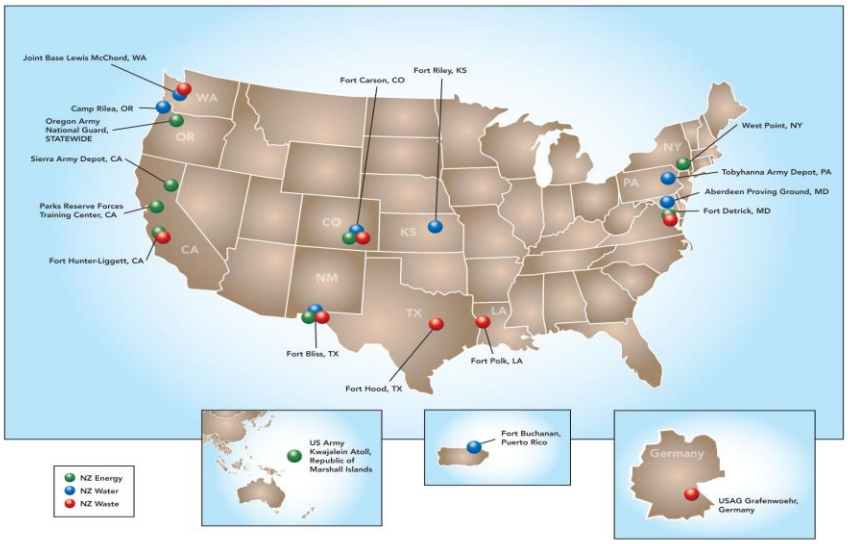


The primary goal is a focus toward Net Zero. When we talk about Net Zero, it is not only Net Zero energy, but it is Net Zero energy, water, and waste. When you look at the term Net Zero or a hierarchy of Net Zero you must start with reduction, then progress through repurposing, recycling, energy recovery, disposal being the last.



A Net Zero ENERGY Installation is an installation that produces as much energy on site as it uses, over the course of a year. A Net Zero WATER Installation limits the consumption of freshwater resources and returns water back to the same watershed so as to not deplete the groundwater and surface water resources of that region in quantity or quality. A Net Zero WASTE Installation is an installation that reduces, reuses, and recovers waste streams, converting them to resource values with zero solid waste to landfill. A Net Zero INSTALLATION applies an integrated approach to management of energy, water, and waste to capture and commercialize the resource value and/or enhance the ecological productivity of land, water, and air.

Seventeen Net Zero pilot installations were selected.



The Net Zero pilots focused on reduction of Energy, Water and Waste. The goal of Net Zero energy is to reduce overall energy use, maximize efficiency, implement energy recovery and cogeneration opportunities, and then offset the remaining demand with the production of renewable energy from on-site sources. A parallel goal for Net Zero water is to reduce overall water use, regardless of the source; increase use of water-efficient technologies; recycle and reuse water, shifting from potable water use to non-potable sources as much as possible; and minimize inter-basin transfers of any type of water, potable or non-potable. And for Net Zero Waste the goal is to reduce, reuse, recycle/compost, and recover solid waste streams, converting them to resource values, resulting in zero landfill disposal.

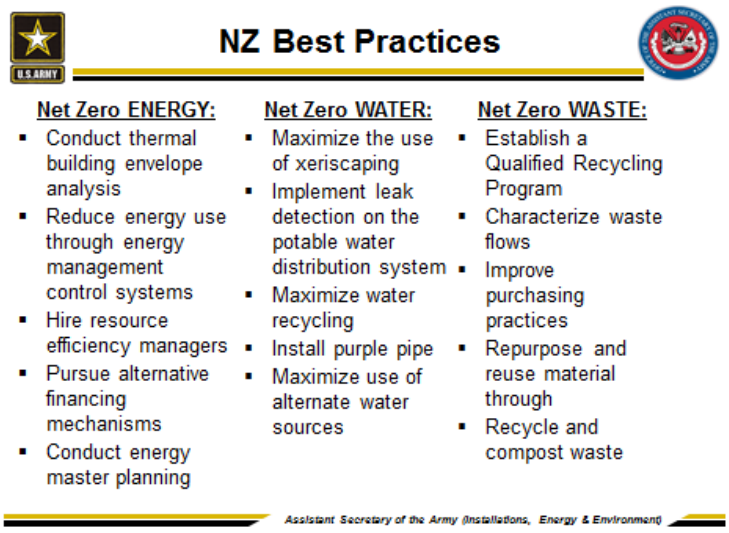
Four overarching actions were taken to execute Net Zero at Army installations.

1. Engage and educate the population impacted.
2. Assess the feasibility and potential after establishing the baseline. Explore partnerships.
3. Build a roadmap. Conduct technology demonstrations and integrate the results into existing programs.
4. Implement. Enact alternate management strategies and use existing funds and programs.

The key to success is to put together a roadmap. The roadmap ties it all together – the project lists, implementation schedules, costs, etc. Follow the roadmap, reassess and do it again. It becomes a guide for future activities. What are your efficiency options? What can you do today? What resources are available? What material reuse options do you have? This is really a master plan on how to get to Net Zero.

External collaboration is critical with local and regional authorities, the Federal and State Governments, and public/private partnerships. Not only has the Army collaborated successfully with EPA, but also with DOE and GSA on Net Zero projects.

Examples from the 17 pilot installations have produced Net Zero best practices.



The Honorable David Price, 4th District of North Carolina, U.S. House of Representatives

Welcome to RTP and this important *Workshop.* We need to promote sustainable growth including renewable energy alternatives. Putting sustainability into practice is not always easy.

Public/private partnerships are important tools for communities. One of the Obama Administration initiatives is *The Partnership for Sustainable Communities*. It is a continuing struggle to maintain support but President Obama believes we are moving in the right direction. We are creating a culture that recognizes the value of sustainable communities that strengthen our economy, create good jobs now while providing a foundation for lasting prosperity, use energy more efficiently to secure energy independence, and protect our natural environment and human health.

The Department of Defense is rapidly expanding the use of alternative energies. Culture shifts are taking place in the military. Environmental sustainability and Net Zero are being combined under one mission objective. Since 2011, additional bases have implemented Net Zero programs.

I am pleased that the EPA will be using lessons learned from the Army to expand Net Zero principles to communities. The Federal Government can provide a model of excellence.

I am eager to work with you as a member of the House Appropriations Committee to make sure our laws and regulations allow the flexibility that Net Zero exemplifies.

I look forward to hearing more about sustainable projects and the progress of Net Zero.

Summary of Panel Presentations

Panel 1: *External Perspectives* - Paul Anastas, Yale University; Dick Jackson, UCLA; Marina Moses, National Academies of Science; Nolan Zail, Carmel Partners; Bob Gedert, City of Austin

Paul Anastas

Turning grand concepts of Sustainability into action is what leadership looks like. While a clear vision and a clear conceptual framework of where we are going is important, it is just part of the journey. It is when you turn that vision into action, that it becomes truly important.

The essential goals are in place, but how do we do the right things right? How do two steps forward become truly two steps forward?

How do we maximize the synergies? How do we integrate waste and turn it into energy? What do we do to put these technologies in place?

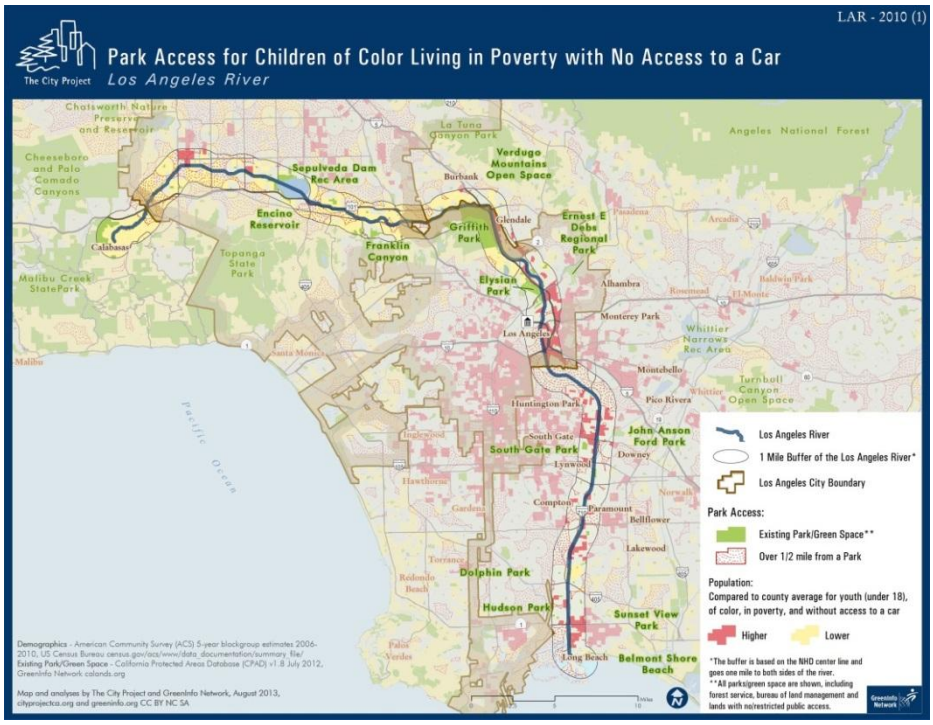
How do we take this to scale? The synergies of government agencies working together can take these to scale.

Richard Jackson – The Los Angeles River Revitalization: Protecting Health and the Environment

The Los Angeles River Revitalization is an example of where stakeholders can band together to create healthy, vibrant communities with greater open space, enhanced green infrastructure, and better recreational facilities.

The mission is to transform the LA River to improve people's lives by carrying out sustainable land use projects, advocacy for river friendly policy, and programs for community benefit.

The LA River, one of the most environmentally degraded in the world, runs 51 miles through some of the most underserved communities in the region. Community revitalization along the LA River that puts children and families first can serve as a best practice example for community redevelopment throughout the country.



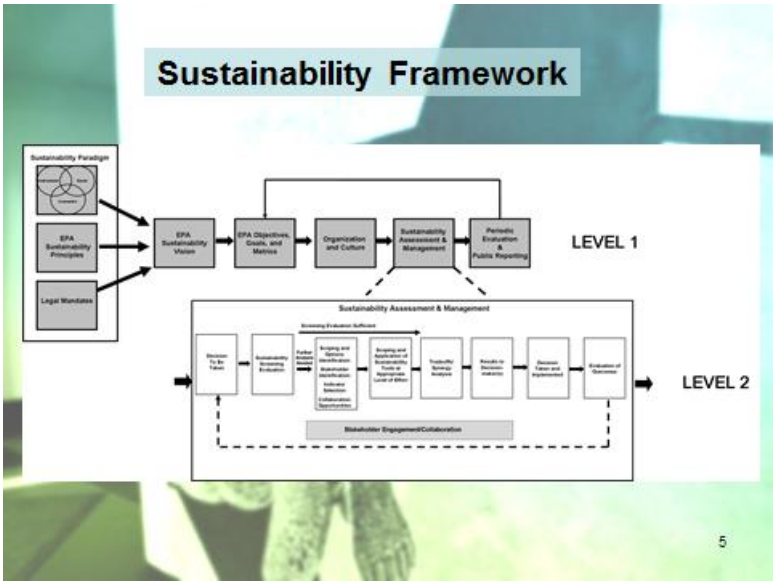
Children of color disproportionately live in the areas along the River with the highest levels of child obesity and the worst access to parks and recreation.

We are working to create a continuous 51-mile greenway corridor that will run along a restored LA River. Think of it as a linear Central Park - a grand public space that will redefine how we move through Los Angeles. We can turn the area from a concrete sluice back into a river that will enable recharge of the groundwater as well as provide a park to an underserved community. The LA River can connect people throughout Los Angeles, restore natural habitat in some of the most park-poor communities in the country, and leave an open space legacy for generations to come.

The message to the advocates is to emphasize the need to create the park for health reasons not just for environmental issues. Your health and the environment are one. Every river should be swimmable and fishable, but the banks should be bikeable and walkable to promote both environmental and human health.

Marina Moses – Science and Technology for Sustainability: Promoting Sustainability through NetZero Strategies

In 2011, the National Research Council issued a report *Sustainability and the U.S. Environmental Protection Agency* which offered a framework for EPA to solve complex environmental challenges through a more integrated, systems approach. It was similar to the 1983 National Research Council report *Risk Assessment in the Federal Government.*



The consensus report answers the following questions:

- What should be the operational framework for sustainability for EPA?
- What scientific and analytical tools are needed to support the framework?
- How can the EPA decision making process rooted in the risk assessment/risk management paradigm be integrated into this new sustainability framework?
- What expertise is needed to support the framework?

Four focus areas have been identified:

1. Energy water food nexus
2. Human health
3. Community resilience
4. Diverse and healthy ecosystems

The NAS is very interested in working with communities. The National Research Council recently published a report *Science and Innovation: Fostering Partnerships and*

Linkages in Sustainability. This report provides a decision framework that can be used by policymakers to examine the consequences, tradeoffs, synergies, and operational benefits of sustainability-oriented programs. Linkages among areas such as energy, water, land, and nonrenewable resources are identified as critical to promoting and encouraging long term sustainability.

A symposium was held on *Fostering Partnerships and Linkages in Sustainability Science and Innovation* to showcase federal investments and institutional structures regarding sustainability, to identify opportunities to help promote practices that would lead communities toward sustainability, and to address communication issues needed to recognize science and innovation as central to the understanding and adoption of sustainable practices.

<u>Bob Gedert – Austin Resource Recovery: Zero Waste Goals and Programs</u>

Austin's Waste Goal is Zero Waste – "No Burn. No Bury." Looking at a 30 year period, Austin, Texas, intends to divert 95% or more of its waste to materials recovery, reuse, recycling, composting and other management strategies.

The program has four keystone initiatives: materials management; expanded recycling opportunities; organics collection and composting; and economic development growth.

Barriers to achieving Zero Waste - "No Burn, No Bury" include:

- Community Planning Needs – reintroducing citizens into the discussion
- Varied Set-Out Rates (85% - 50%) by neighborhood
- Routing Challenges
- Pounds per Household variations
- Customer Education – Language barriers
- Non–traditional Services (Reduce/Reuse)
- Contamination Challenges

Many lessons were learned including:

- Decentralization of education
- A need for a waste characterization study
- Citizen empowerment, communication and monthly meetings
- City Council support and education
- Impacts of truck styles and container sizing
- Continuing transparency and accountability
- Change-orientation operations
- Defined "price points"
- Citizen choice – 'Pay As You Throw' Rates

Federal assistance is needed in establishing National Diversion Goals, a National Measurement System, Zero Waste best practices, Model Cities Grants, and in providing national leadership.

A significant lesson was that customer service is the highest priority for the citizens, while our highest priority is reduction of waste.

Nolan Zail – UC Davis West Village

UC Davis West Village is the largest planned "Net Zero Energy" community in the country. Over the course of a year, the community is designed to generate as much energy as it consumes. It is on track to demonstrate that Zero Energy is practical on a large scale.

The development of UC Davis West Village is a model of public/private partnership with the collaboration between the University of California Davis and a private developer led by Carmel Partners with their joint venture partner Urban Villages of Denver.

They have developed a business plan to partner with private developers that can be replicated. The key is to capitalize on existing technologies as well as to pursue new technologies. This apartment complex proves that Net Zero Energy can be implemented and be profitable for private developers.

What are the incentives for private developers? You need champions or a number of champions who demonstrate personal motivation and are committed to the effort. There needs to be an opportunity to get an equal or better return on investment for investors. This is an opportunity for marketing and branding, capitalizing on the concepts of sustainability and health. Relationships for the public/private partnership with the University and community are valuable. An effective value proposition to achieve optimum value encompasses funding and resources, successful branding, and partnerships, with the aim of improving resilience and security.

There are challenges with regulatory requirements looming as the biggest challenge. For example, because of net metering requirements, separate solar systems and inverters had to be installed in the 600 apartments. How do you recover those costs?

The advantage of a public/private partnership is the ability to leverage resources, as well as knowledge and experiences of all partners. It provides an opportunity to work with academia to access research and information. And it allows the ability to try new technologies – both the good and the bad. In addition to leveraging public/private partnerships, incentives are needed from Federal and State governments both in the form of grants and compliance models.

Building a Net Zero Energy community is not just installing systems but rather living a Net Zero Energy, Water and Waste lifestyle. It is the cultural change of how we manage behavior, the synergy of how we live and how we impact the environment. For this effort to be a success in the future, we need to share lessons learned or we won't move forward

The next challenge is to determine how we move to NET POSITIVE!

Panel 2: *Community Lessons Learned* - Bruce Hendee, City of Fort Collins; David Gard, Oberlin Project; Susan Kaplan, Sustainable Performance Consulting; Jennifer Rawlings, Fort Hood; Bill Ross, Counsel, Brooks, Pierce, McLendon, Humphrey & Leonard, LLP

<u>Bruce Hendee – Fort Collins: Pursuit of a Net Zero Community</u>
Fort Collins, Colorado, has spent the past 40 years developing policies that have greatly benefited the community by increasing its resilience to extreme events, minimizing service disruptions and increasing protection to valuable public and private lands, assets and human health and safety. The City has long been committed to both reducing the impacts on a changing climate through conservation programs and reducing the impacts of a changing climate on us. The City of Fort Collins views climate change adaptation planning as an important strategy to plan for and to address the multiple impacts from a warming climate that might affect business continuity, economic viability, human health and quality of life, ecosystem health, and maintenance of assets, infrastructure, and the delivery of key services to the Fort Collins community.

The last two years have emphasized the vulnerability the Fort Collins community and its regional neighbors can experience due to extreme weather events. Because of events such as the High Park fire, the hottest year on record and the recent flooding, there has been substantial devastation to the region. Aggressive action will reduce greenhouse gas emissions in the future, but it is imperative that action is taken to adapt to changes that are already happening and to prepare for changes ahead.

The Mayor is participating in the White House Task Force subgroup on Built Systems covering such topics as energy, transportation, water and facilities. The climate hub will provide technical support for land managers to respond to drought, heat stress, floods, pests and changes in growing season; regional assessments for hazards and adaptation planning and outreach and education, according to USDA.

In 2011, Fort Collins formed a new area within the city called Sustainability Services. It encompasses the triple bottom line of economy, environment and social sustainability. The intent is to develop more dynamic tools around the balance of the three major areas. Rather than a simple approach of tackling one area, we are looking for synergies and balancing points.

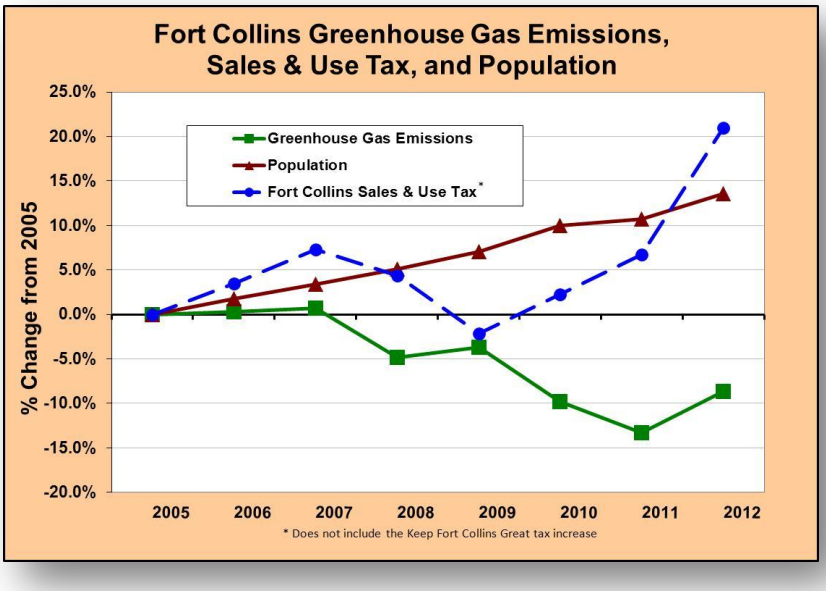
We are in the fledgling stages of developing greater networking around Net Zero. We have started the Net Zero Cities Conference with the intent of developing better networks and learning opportunities around zero energy strategies. Last year we were successful in getting the Cities of Boulder and Loveland to join. Our intent is to develop regional strategies around alternative energy and conservation. This year our regional energy provider Platte River Power Authority agreed to join us. We hope to expand to Longmont and Estes Park. Strategically this helps us to work regionally to accomplish more.

We have created *Fort ZED*, which stands for Fort Zero Energy District. Originally it began with the intent of creating a defined and bounded area with a demand of roughly 80MW within the downtown Fort Collins area and Colorado State University Campus. It has changed now with lessons learned. It is becoming more of a prototype tool, used to develop new systems and testing on a grid-friendly municipal utility.

Other successes have included the Triple Helix Partnership of the City of Fort Collins, Colorado State University, and the Colorado Clean Energy Cluster. Fort Collins is also implementing significant strategies to help reduce energy usage:

- Greater investment in local energy resources that reduce money spent on coal and natural gas by $50 million;
- 13% increase in population AND a 8.7% reduction in carbon emissions;
- Generation of 400-500 jobs;
- Net benefit of $165 million for the community.

These efforts will accelerate achieving the Greenhouse Gas goals by 20 years.



Challenges still face Fort Collins on their pursuit of a Net Zero community – complexity, time, engagement, scale and alignment. Getting the community engaged so they are willing to make a change may be one of the biggest challenges.

David Gard – The Oberlin Project

The Oberlin Project is a formal collaboration between the City of Oberlin, Ohio, Oberlin College, and private and institutional partners to improve the resilience, prosperity, and sustainability of our community. The Oberlin Project's aim is to revitalize the local economy, eliminate carbon emissions, restore local agriculture, food supply and forestry, and create a new, sustainable base for economic and community development.

The City and College have signed on to become one of only 3 Clinton Foundation Climate Positive Development Program cities in the United States, thereby committing to reduce Oberlin's greenhouse gas emissions below zero. The City of Oberlin is on target to reduce its emissions by 50% of 2007 levels by 2015, with 90% of its electricity coming from renewable sources.

A community-based group created by the city council, developed the 2013 Climate Action Plan for the City of Oberlin as a roadmap for transitioning to a climate positive community. Work by the City and the College through the use of the recommended strategies and community outreach will create not only a climate positive community but also a neighborhood where residents live, learn, and lead.

One of the initiatives of the Oberlin Project is the Environmental Dashboard. The Dashboard is designed to make the invisible flows of water and electricity visible and engaging and link these to the conscious thoughts and actions of citizens to build a more vibrant and sustainable Oberlin. Electronic signs in the downtown and schools share information with and bring together the community. The Dashboard project leaders hope to expand the screens and monitoring technology to other local organizations and businesses.

Decisions made in the home and in the workplace determine the ecological health of the bioregion, which includes Oberlin. When this project is fully implemented, the Dashboard links will provide citizens with real-time feedback of the amount of water and electricity being consumed. Citizens will be able to see the water and electricity flows of residences, businesses and the City of Oberlin on the whole. The goal is to present this information in a social and environmental context that engages, educates, motivates and empowers citizens to conserve resources.

<u>Susan Kaplan – Getting towards Zero Waste, 100% Involvement in Growing a Green Community</u>

The Battery Park City Authority (BPCA) created a green community in the heart of New York City. In 2000, a new greener vision was developed for Battery Park City to encourage public/private partnerships to build sustainable buildings. We wanted to build greener, healthier buildings that paid attention to indoor air quality, were more energy-efficient, that recycled water and building materials.

BPCA convened a collaborative team of public-private partners to develop Green Guidelines to establish a process for the creation of environmentally responsible residential buildings that are appreciably ahead of current standards and practices for development.

The guidelines were organized similarly to LEED. We wanted to be able to encourage LEED certification, by making our requirements identical where it made sense, given we were concentrating on residential buildings.

The Green Guidelines were divided into five categories:

1. Energy Efficiency
2. Enhanced Indoor Environment Quality
3. Conserving Materials & Resources
4. Education, Operations & Maintenance
5. Water Conservation & Site Management

Battery Park City Green Projects included the first LEED residential high rise in the U.S., 2200 Green residential units and 18 LEED projects.

What can the future look like?

- Net Zero Buildings
- Design with Nature
- Bioclimatic Skyscrapers
- Building as a Tree

It's all about choices. What if every single act of design and construction made the world a better place?

Jennifer Rawlings – Net Zero Waste Fort Hood 2020

The goal of Net Zero Waste Strategy at Fort Hood is to change the culture to achieve the goals of Net Zero Waste. The key tasks of the project are to:

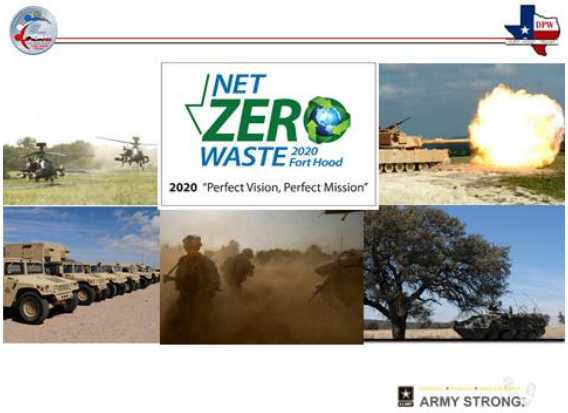
- Reduce amount of solid waste generated
- Re-purpose whenever possible
- Expand Recycling; increase diversion rate
- Use Waste to Energy to eliminate remaining waste
- Identify alternative disposal methods
- Employ a strategic communication campaign
- Utilize Net Zero Waste Workgroups and Annual Workshops

The end result is that Fort Hood Community has embraced Net Zero Waste and is actively supporting the effort.

Partnerships Lessons Learned:

- Not always enough city personnel with the right expertise or spare time
- Too many objectives at once, and original expectations were too high
- Large amount of time spent on education and training staff and residents
- Need dedicated staff to work Net Zero objectives
- Need better accountability with formalized committees
- Need City Council approval and City Manager buy-in
- Requires popular demand from city residents for sustainability
- City voters must demand change, which is done through education

Cities need grants or fellowship programs to provide dedicated sustainability staff. EPA can provide site assistance visits to prioritize strategies, share best practices and feasibility studies to help crunch the numbers. Basic economic and environmental returns on environmental initiatives that are simple to use and easy to access to help sell ideas to city councils, city staff, and residents would also be of great assistance.



Bill Ross – Green Square Complex: North Carolina's State of the Art Sustainable Design Project

The Green Square Complex, a two-block, multi-use sustainable development project in Raleigh, N.C., serves as the home of the N.C. Department of Environment and Natural Resources and a new wing of the Museum of Natural Sciences. The Green Square Complex enables the Department of Environment and Natural Resources and the Museum of Natural Sciences to promote stewardship by example to the general public, while providing experiential learning opportunities focused on the current scientific research and environmental issues affecting our daily lives.

The 250,000 square-foot Green Square Complex encompasses two state buildings and two bridges on two city blocks. The Nature Research Center is an expansion of the Museum of Natural Sciences and the Environment and Natural Resources Building is the new headquarters for the Department of Environment and Natural Resources. Both buildings incorporate many sustainable features and elements and earned the LEED Platinum Certification.

This project includes office space for the 640 DENR employees, the Nature Research Center which includes a restaurant/retail area, a connecting bridge to the existing museum, the Nature Research Center and the DENR Office Building and 426 parking spaces for an underground parking deck.

To achieve LEED Platinum Certification, Green Square uses all LED lighting, occupancy sensors and automatic dimming controls in offices and conference rooms, solar shading devices to diffuse sunlight and reduce temperatures, increased insulation and high efficiency chillers, a unique underfloor air distribution heating, ventilation and air conditioning system. DENR building staff have also used innovative solutions to decrease electricity use. By changing the time of day when the building operates its air handlers, staff managed to reduce the building's energy consumption by 15 percent. These technologies mean that Green Square uses about 30 percent less electricity than a similar building built to minimum standards which saves about $107,000 in energy costs each year.

Rainwater in the building is collected from the roof and diverted to an underground cistern on the site. The rainwater is treated and reused to flush toilets, water plants, and provide cooling tower makeup water. The building's green roof also helps filter rainwater as it travels from the roof to the cistern. This rainwater reuse eliminates storm water, the number one cause of surface water pollution. The building uses low-flow urinals, toilets and showers. This reduces the office building's water usage by about 700,000 gallons a year, and cuts the building's water bill by about $3,000 a year.

Community Lessons Learned included:

- Environmental stewardship
- No cost training and assistance to achieve sustainability
- Impressive Net Zero savings on projects
- Communication with communities
- Participants learn from one another
- Public/private partnership sustainability network

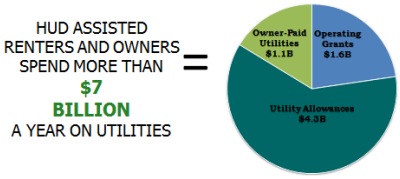
There are three overarching lessons that were learned in building the Green Square Complex and earning the LEED Platinum Rating.

1. Leadership Matters – There needs to be a champion to drive the project forward
2. A good example is the best sermon – Participants learn and are motivated by the success and profit of others.
3. There is power in a partnership and a plan

Panel 3: *Federal and State Initiatives Fostering Sustainability* - Crystal Bergemann, HUD; Scott Mouw, N.C. Division of Environmental Assistance; John Thomas, EPA (Due to flight cancellations for some panelists, Jay Basset and Cheryl Coleman of EPA joined the panel for the discussions.)

<u>Crystal Bergemann – HUD Executive Actions on Energy and Green Building in Affordable Housing: The Federal Renewable Energy Target</u>

HUD Spends more than $7 billion on Utility costs each year. The energy budget is large and growing, as the overall budget is feeling increasingly tight. A modest reduction of just 5% of energy usage could save $350 million a year, or $1.75 billion over 5 years. The renewable energy target for federally subsidized housing integrates housing with energy and climate policy by supporting the Administration's goal of doubling energy generation from renewable sources by 2020.



The joint partnership of HUD, USDA, and Treasury provides opportunities to improve national energy security through increased domestic renewable energy production, expand the renewable energy sector, promote climate resilience, and produce cost effective distributed generation in low-income housing.

Due to a precipitous drop in solar pricing, along with innovative financing such as power purchase agreements, renewable energy generation is now becoming a viable option for the residential sector, including affordable housing. We have the ability through tested, workable technologies and financing mechanisms to reach 100 megawatts of installed renewable capacity on-site at federally subsidized housing by 2020.

Thinking about the future, imagine community renewable energy projects hosted by Public Housing Agencies and other housing organizations. These would be multi-million dollar investments that deliver clean energy to willing energy consumers while offering a stable revenue stream to local communities.

The first Net Zero, Fossil Fuel-Free, LEED Platinum senior housing project in the United States is the Paisano Green Community located at the El Paso, Texas Housing Authority. It is a 73-unit complex that generates energy with solar panels and wind turbines, and has ultra-efficient air-source heat pumps. The project was funded through a nearly $9 million competitive Recovery Act grant through the Public Housing Capital Fund, and is a good example of how far housing authorities are able to go if they stretch their imaginations and take advantage of funding opportunities as they arise.

An interesting characteristic of multi-unit buildings is that participants typically reside under the rooftop that the solar array is housed on, which is not necessarily true for the other deployment models, which can be located off-site. There are approximately 55 systems in the U.S. with capacity of over 50 megawatts. There is growing interest in community approaches and shared solar infrastructure and business models which present significant potential for innovation and deployment.

Lack of upfront capital and financing options, lender risk and administrative burdens all present financial hurdles. But there are also opportunities to:

- Enable power purchase and lease agreements
- Work with CDFIs to create energy loan funds and match demand with financing supply opportunities
- Pursue loan guarantees for renewable energy projects within targeted energy districts
- Engage in the Energy Efficiency Conservation Loan Program

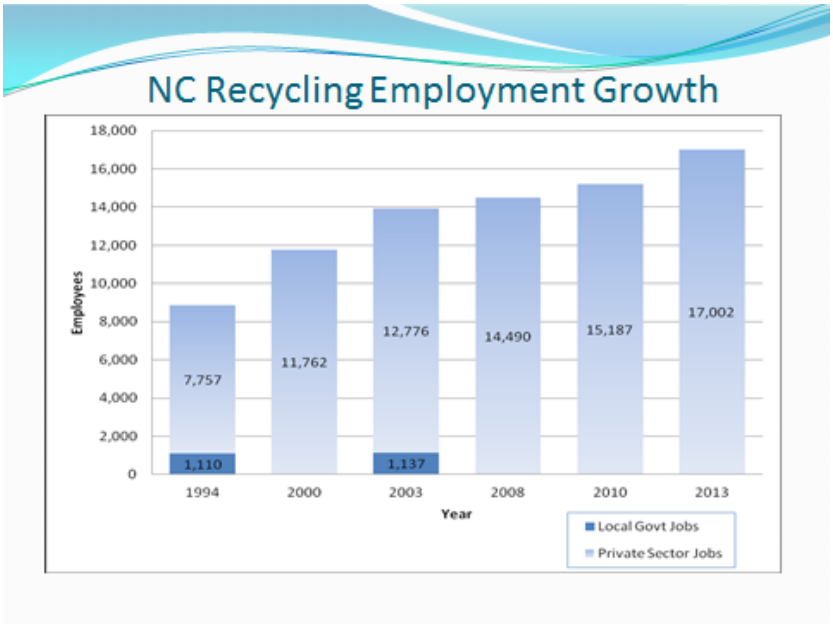
According to DOE's SunShot Initiative, developing shared solar business models can quadruple the impact of related funding and solar deployment efforts.

Scott Mouw - Sustainable Materials Management as a Pathway to NetZero

State assistance programs can be very effective in facilitating community sustainability efforts through direct engagement, familiarity with communities and their peers, and statutory reporting, grant and other mechanisms that drive interaction. North Carolina has a number of assistance programs to encourage sustainable materials management by communities.

Local governments are on the front line of materials management. While local governments are not always savvy about their role in the materials supply chain or equipped to improve efforts, they enjoy the benefits from well-run systems. As a result, states are taking a bigger role in sustainable materials management by setting baseline policies, directing influence over infrastructure development, providing assistance to communities in improving conditions, and deploying best management practices.

Not just the local communities benefit, states also benefit from reduced environmental impacts from disposal, job and business creation, and from the support of manufacturing.



North Carolina receives support from the Federal Government for sustainable materials management. USDA and DOE fund the Waste Reduction Partners program. EPA Headquarters convenes key dialogues with brand companies on recycling issues. EPA Region 4 has been actively engaged with North Carolina by providing direct assistance on key projects, convening of Region 4 States, support of Southeast Recycling Development Council and other regional/national efforts. EPA Region 4 also serves as an advocate for regional and local needs with EPA Headquarters and other stakeholders.

The Federal Government has an important role as a convener of states and communities with other stakeholders as well as to create an atmosphere of support and commitment by decision-makers.

John Thomas - How do we work with communities? Office of Sustainable Communities: Lessons Learned

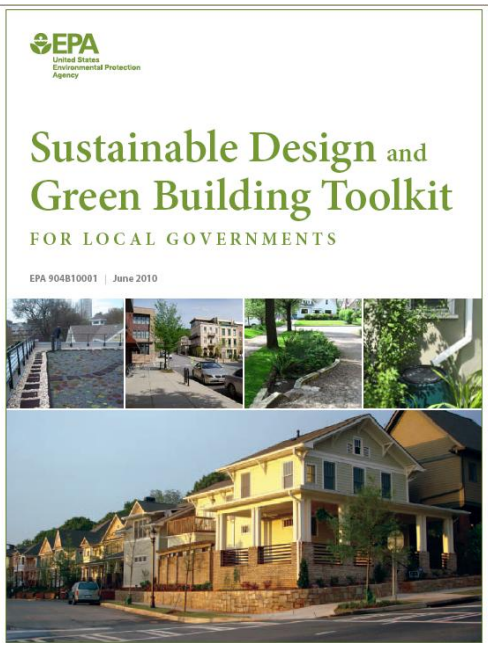
The Office of Sustainable Communities collaborates with other EPA programs; federal agencies; regional, state, and local governments; and a broad array of nongovernmental partners to help communities become stronger, healthier, and more sustainable through smarter growth and green building. This work helps to address the Agency's priorities for water, air and the cleaning up of communities and substantially furthers the Administration's objectives with respect to environmental justice.

Many communities want to foster economic growth, protect environmental resources, enhance public health, and plan for development, but may lack the tools, resources, and information to achieve their goals. In response to this demand, EPA developed the Smart Growth Implementation Assistance Program in 2005 to address difficult challenges and to find transferable solutions with three goals in mind:

- Support communities interested in implementing smart growth policies;
- Create regional examples of smart growth that can catalyze similar projects in the area;
- Identify common barriers and opportunities for smart growth development and create new tools that other communities can use.

To date, EPA has worked with 53 communities.

EPA launched in 2011, *The Sustainable Design and Green Building Toolkit for Local Governments* to assist local governments in identifying and removing barriers to sustainable design and green building within their permitting process. This Toolkit addresses the codes/ordinances that would affect the design, construction, renovation, operation and maintenance of a building and its immediate site. The Toolkit consists of two parts: an Assessment Tool/Resource Guide and an Implementation Guide for developing an Action Plan.



To date, 141 communities are utilizing the Toolkit. Last year, 57 community workshops were held across the country. In 2014, 36 more workshops are anticipated.

It is important to define the type of engagement in the beginning. Is it planning, capital programming, policy evaluation or project design? What is the more effective assistance-charrette vs. workshop, short term vs. sustained support, etc.? What is the level of support the community needs to apply the "tools"? Who are the partners? What are the selection criteria and is there a clear understanding?

The lessons learned from Smart Growth communities:

- There is value in a formal but simple process
    - The ability to be selective
    - More groundwork done by the community partner = greater buy-in
    - The community does not have to hire someone to manage the community grants
- The range of assistance products enables you to "meet communities where they are"
- Never underestimate the value of supporting tools with good processes and training opportunities for other folks out there

<u>Summary Remarks – Sandra Connors, Acting Principal Deputy Associate Administrator, Office of Policy, EPA</u>

Where can we collectively align our efforts and focus on the pivot points that we see occurring to make a visible difference in communities to strive for sustainability?

There are many areas of opportunity.

- Green Infrastructure – HUD, Climate Action Plans call for adapting and adaptive behavior.
- Sustainable Materials Management – Food opportunities are tremendous for making a real difference.
- Standard Setting – These need to be robust indicators to the consumer.
- Energy Efficiency – Opportunities where we would like a deep and concentrated emphasis.

Closing – Jennifer Orme-Zavaleta, Director, National Exposure Research Laboratory, ORD, EPA

The long term objective of this collaborative effort is to help communities become more sustainable and resilient through the development and deployment of Net Zero strategies and technologies. This type of cross organizational collaboration is critical to establishing more resilient and sustainable communities.

Today's conversations have been a great step forward. We were looking to learn from you. What things do you worry about? What keeps you up at night? What other types of tools or assistance would be helpful to you?

We are looking at a paradigm shift moving forward from a risk based approach.

How can we help at the community level to further the goals of protecting human health and the environment?

Tomorrow when we convene the government workshop and the ORD workshop sessions, we will build on what we have heard today – the lessons learned, the cross-cutting issues and the challenges. Thank you all for helping chart our joint path forward to achieve Net Zero footprints in communities across the country.

List of Appendices

1. Agenda
2. Workshop Presentations
3. Speaker bios
4. Participants
5. Net Zero Fact Sheet

Appendix 1: Agenda

Agenda **Workshop: Promoting Sustainability Through Net Zero Strategies**

COMMUNITY WORKSHOP
EPA Research Triangle Park

Objectives:

- Share lessons learned from net zero waste, water and energy efforts in communities, including successes, challenges, and needs.
- Identify common themes and cross-cutting issues.
- Share information about ongoing federal programs and initiatives.

Desired Outcome:

- A resource document/roadmap to assist communities and partners to implement initiatives to reduce waste, water and energy footprint at a local level.

Tuesday, February 25

Topic	Presenters	Time
Welcome and Opening Remarks	**Lek Kadeli** Acting Assistant Administrator, EPA ORD	8:30–8:45
Keynote Address: Sustainability Goals in Strategic Plan	**The Honorable Bob Perciasepe** Deputy Administrator, EPA	8:45–9:05
Army NetZero Waste, Water and Energy Initiative: Link to Communities	**The Honorable Katherine Hammack** Assistant Secretary of the Army for Installations and Environment	9:05–9:25
Questions and Answers	**Bob Perciasepe and Katherine Hammack**	9:25-9:45
Break		9:45–10:00
Cross Agency Collaboration to Advance Sustainability	**The Honorable David Price** 4th District of North Carolina U.S. House of Representatives	10:00–10:15
External Perspectives: A Panel	**Paul Anastas**, Teresa and H. John	10:15–11:45

Discussion Moderator: **Lek Kadeli**, Deputy Assistant Administrator for Management, ORD, EPA	Heinz III Chair, Yale University **Richard Jackson**, Professor and Chair, Environmental Health Sciences, Fielding School of Public Health, UCLA **Marina Moses**, Director, Science and Technology for Sustainability Program, Policy and Global Affairs Division, The National Academies **Nolan Zail**, Partner, Carmel Partners **Bob Gedert**, Director, Austin Resource Recovery Department, City of Austin	
Lunch and Optional Demonstrations	*Storm Water Calculator*, **Tom Speth**, Director, Water Supply & Water Resources Division, EPA, Room C112 *C-FERST*, **Valerie Zartarian** and **Andrew Geller**, EPA, Room C113	11:45–1:15
Community Lessons Learned: A Panel Discussion • Successes • Roadmaps • Challenges Moderator: **Cynthia Sonich-Mullin,** Director, NRMRL, ORD, EPA	**Bruce Hendee**, Chief Sustainability Officer, City of Fort Collins **David Gard**, Executive Director, Oberlin Project **Susan Kaplan**, Principal, Sustainable Performance Consulting **Jennifer Rawlings**, Environmental Program Manager, Fort Hood U.S. Army Installation **Bill Ross**, Of Counsel, Brooks, Pierce, McLendon, Humphrey & Leonard, LLP	1:15–3:30
Break		3:30–3:45
A Panel Discussion: Federal & State - Fostering	**John Thomas**, Acting Deputy Director, Office of Sustainable	3:45–5:30

Sustainability Moderator: **Ron Hoffer**, Senior Advisor, Sustainability and Innovation, Water Policy Staff, Office of Water, EPA	Communities, EPA **Crystal Bergemann**, Energy Policy Specialist, Office of Sustainable Housing and Communities, HUD **Scott Mouw**, Chief, Community and Business Assistance, North Carolina Division of Environmental Assistance and Customer Service	
Closing Remarks	**Jennifer Orme-Zavaleta** Director, National Exposure Research Laboratory, ORD, EPA	5:30–5:45

Appendix 2: Workshop Presentations

Workshop presentations can be found online at the EPA Net Zero Website (http://epa.gov/sustainability/netzero/).

Appendix 3: Speaker Bios

Presenter Biographies

Paul Anastas currently holds the Inaugural Teresa and H. John Heinz III Chair at Yale University with appointments in the School of Forestry and Environmental Studies, the Chemistry Department and the Department of Chemical and Environmental Engineering. His previous experience includes serving as Assistant Administrator for Research and Development, which he describes as "his greatest professional honor" and as the Science Advisor for the U.S. Environmental Protection Agency as well as Assistant Director of the White House Office of Science and Technology Policy leading environmental issues. Professor Anastas currently has published 13 books on various elements of the science and technology of sustainability. He has co-founded several sustainable technology companies and serves as a science advisor to venture capital and private equity firms.

Crystal Bergemann is an energy policy specialist in HUD's Office of Sustainable Housing and Communities where she works to embed sustainable and green building policies and practices into HUD's portfolio. Additionally, she is HUD's program lead on the Federal Renewable Energy Target, a goal of tripling onsite renewable energy capacity in federally assisted housing by 2020. Crystal has a background in energy and water policy, and received a Master's degree in Public Administration from NYU in 2009.

David Gard is the Executive Director of the Oberlin Project, a joint effort of the City of Oberlin and Oberlin College to advance community-wide sustainability. Prior to this role, David spent more than a decade with the Michigan Environmental Council advocating public policies aimed at reducing carbon emissions. He has also worked as a design engineer and served in the U.S. Navy. David holds joint MBA/MS degrees from the University of Michigan's Erb Institute for Global Sustainable Enterprise. He earned a BS in Mechanical Engineering from Northwestern University.

Bob Gedert is the Director of the Austin Resource Recovery Department for the City of Austin. He is responsible for a 400 employee operation that provides direct services to citizens, including solid waste, recycling, and yard trimmings collection, street sweeping, dead animal pickup, household hazardous waste, and the implementation of the Austin Zero Waste Plan. Formerly, Bob operated the recycling service for the City of Fresno Department of Public Utilities, providing services to all single-family, multi-family and business customers within the City of Fresno. He led Fresno from a 29% recycling diversion rate to a 75% recycling diversion rate through the expansion of recycling and composting services to residents, businesses and schools.

He has 38 years of field experience in recycling and solid waste operations, including Material Recovery Facilities (MRF) in Ohio and development of curbside collection programs throughout Indiana. Bob also was the former Chief of Recycling for the State of Indiana, and has written

many state statutes supporting recycling efforts. Bob has a bachelor's degree in Psychology and a Master's in Public Administration. He has taught environmental ethics in several universities as a visiting guest lecturer. He recently co-authored the Austin Resource Recovery Master Plan, outlining the Austin approach toward Zero Waste.

Richard Joseph Jackson is Professor and Chair of Environmental Health Sciences at the Fielding School of Public Health at the University of California, Los Angeles. A pediatrician, he has served in many leadership positions in both environmental health and infectious disease with the California Health Department, including the highest as the State Health Officer. For nine years he was Director of the CDC's National Center for Environmental Health in Atlanta and received the Presidential Distinguished Service award. In October, 2011 he was elected to the Institute of Medicine of the National Academy of Sciences. While in California he helped establish the California Birth Defects Monitoring Program and state and national laws to reduce risks from pesticides, especially to farm workers and to children. While at CDC he established the national asthma epidemiology and control program, oversaw the childhood lead poisoning prevention program, and instituted the federal effort to "biomonitor" chemical levels in the US population. He has received the Breast Cancer Fund's *Hero Award*, as well as *Lifetime Achievement Awards* from the Public Health Law Association, and the New Partners for Smart Growth. In October, 2012 he received the John Heinz Award for Leadership in the Environment.

Dick Jackson lectures and speaks on many issues, particularly those related to built environment and health. He co-authored two books: *Urban Sprawl and Public Health* in 2004 and *Making Healthy Places* in 2011. He is host of a 2012 public television series *Designing Healthy*. He has served on many environmental and health boards, as well as the Board of Directors of the American Institute of Architects. He is an elected honorary member of both the American Institute of Architects and the American Society of Landscape Architects.

The Honorable Katherine Hammack was appointed the Assistant Secretary of the Army for Installations and Environment (ASA IE) by President Obama 28 June 2010. Shortly after taking office, she instituted an organizational name change to acknowledge "Energy" specifically, and created the Office of the Assistant Secretary of the Army for Installations, Energy and Environment (ASA IE&E).

She is the primary advisor to the Secretary of the Army and Chief of Staff of the Army on all Army matters related to Installation policy, oversight, and coordination of energy security and management.

She is responsible for policy and oversight of sustainability and environmental initiatives; resource management, including design, military construction, operations, and maintenance; base realignment and closure (BRAC); privatization of Army family housing, lodging, real estate, and utilities; and the Army's installations safety and occupational health programs.

Prior to her appointment, Ms. Hammack was a leader in Ernst & Young LLP's Climate Change and Sustainability Services practice. In that capacity she assisted clients with obtaining

Leadership in Energy and Environmental Design (LEED) green building certification for their buildings and identification of sustainability strategies.

She was the key LEED advisor to the largest LEED for new construction building in the world (8.3 million sq ft) which received LEED-NC Silver certification. She was also the key LEED advisor on the largest existing green building certification for building operation and maintenance (9.6 million sq ft) which received LEED-EB Gold level certification.

Ms. Hammack has over 30 years of experience in energy and sustainability advisory services. She has experience in the evaluation of energy conservation projects, including ventilation upgrades, air distribution, indoor air quality, lighting efficiency, cogeneration, sustainable design, solar energy and building operation.

Ms. Hammack has a bachelor's degree in mechanical engineering from Oregon State University and an M.B.A. from the University of Hartford.
She is a Certified Energy Manager, LEED Accredited Professional and a Certified Indoor Air Quality Manager.

She has been an active member of ASHRAE, where she has been on the 90.1 Energy Efficiency Standard Committee and on the Standard 189 High Performance Green Buildings Standard Committee. Ms. Hammack is a founding member of the U.S. Green Building Council in Washington, D.C.

Bruce Hendee is the Chief Sustainability Officer (CSO) for the City of Fort Collins. Hendee brings over 30 years of experience in planning and design. He was the founder and president of BHA Design, a landscape architecture and land planning firm in Fort Collins. He led a very successful practice for over 20 years before selling his company and joining the City of Fort Collins as CSO. In his current position, he oversees the Economic, Social, and Environmental Departments of the City and advocates for organization-wide programs and policies related to organizational sustainability initiatives. Hendee also serves a lead role in the organization's efforts around community image and urban design. Hendee currently serves as Vice Chair on the Board of the Colorado Clean Energy Cluster and as Chair of Fort ZED. He is the founder and a coordinating member of the Net Zero Cities Conference, an annual international conference devoted to exploring issues associated with creating zero-energy strategies for cities.

Susan Kaplan founded BuildingWrx in 2011 to help clients find collaborative, sustainable solutions for greening buildings, sites, cities and businesses. Prior to that, Susan served as the founding director of sustainability for Battery Park City Authority (BPCA) in New York City during its groundbreaking creation of some of the greenest urban buildings in the world. Susan worked in all levels of design and construction in furthering the sustainability goals of BPCA – from the early development of green design strategies, through construction documentation, construction, and on to the critical and continuing operations of the properties**.** As a volunteer on many committees for US Green Building Council, Susan takes an active role in the development and constant improvement of all LEED Rating Systems. She is Vice chair, LEED Technical

Committee and a member on the LEED Steering Committee. Susan is a visiting lecturer at Columbia University, NYU, Cooper Union and other Universities. She holds degrees in Environmental Science and Landscape Architecture from the School of Environmental Science and Forestry and from Syracuse University. She is a LEED Accredited Professional (BD+C) and a Registered Landscape Architect in New York State.

Marina Moses serves as Director for the Science and Technology for Sustainability Program (STS) in the Policy and Global Affairs Division of the National Academies. In this capacity, she directs the Roundtable on Science and Technology for Sustainability. Under her leadership, the STS Program issued the consensus report, *Sustainability and the U.S. EPA*, and has recently released a multi-sponsored study, *Sustainability for the Nation*. Prior to joining the Academies, Dr. Moses served on the faculty of the George Washington University School of Public Health and Health Services in the Department of Environmental and Occupational Health. Previously, Dr. Moses held senior scientific positions in the Environmental Management Division of the U.S. Department of Energy and the New York City office of the U.S. Environmental Protection Agency's Superfund Program. Dr. Moses received her Bachelor's (Chemistry) and Master of Science (Environmental Health Sciences) degrees from Case Western Reserve University. She received her Doctorate of Public Health (Environmental Health Sciences) from Columbia University School of Public Health.

Scott Mouw is Chief of Community and Business Assistance in the North Carolina Division of Environmental Assistance and Customer Service. Scott directs the state's recycling program, which includes efforts to improve collection, expand material markets, increase public participation in recycling, and help create and implement materials management policy. Scott has served on the board of the Product Stewardship Institute and is a current board member the Southeast Recycling Development Council. He has also served on the AMERIPEN Technical Advisory Group, APR's Rigid Plastics Committee, the Sustainable Packaging Coalition Labeling project, and the EPA Sustainable Recycling Financing dialogue. Scott holds a BA from the University of Illinois and an MA and MPA from the University of North Carolina – Chapel Hill.

Bob Perciasepe was appointed by President Obama in 2009 as the U.S. Environmental Protection Agency's Deputy Administrator. His career spans nearly four decades as one of the nation's leading environmental and public policy figures. An expert on environmental stewardship, advocacy, public policy, and national resource and organizational management, Perciasepe is widely respected within both the environmental and U.S. business communities.

His extensive experience includes service both inside and outside of government. He served as a top EPA official in the administration of President Bill Clinton, who appointed him, first, to serve as the nation's top water official and later as the senior official responsible for air quality across the U.S. Prior to being named to his current position, he was chief operating officer at the National Audubon Society, one of the world's leading environmental organizations. He has also held top positions within state and municipal government, including as Secretary of the Environment for the State of Maryland and as a senior official for the City of Baltimore.

Perciasepe holds a Bachelor of Science degree in Natural Resources from Cornell University and a master's degree in planning and public administration from the Maxwell School of Syracuse University.

The Honorable David Price represents North Carolina's Fourth District - a rapidly growing, research-and-education-focused district that includes parts of Alamance, Orange, Durham, Wake, Harnett, Chatham and Cumberland counties. He received his undergraduate degree at UNC-Chapel Hill and went on to Yale University to earn a Bachelor of Divinity and Ph.D. in Political Science. Before he began serving in Congress in 1987, Price was a professor of Political Science and Public Policy at Duke University. He is the author of four books on Congress and the American political system.

Price currently serves on the House Appropriations Committee and is the ranking member of the Homeland Security Appropriations Subcommittee. He is also a member of the Appropriations subcommittees covering housing and transportation and military construction and veterans affairs. He is a recognized leader in foreign policy, co-chairing the House Democracy Partnership, which he initiated to help strengthen parliaments in emerging democracies. In North Carolina, David's constituents know him as a strong supporter of education, accessible health care, affordable housing, clean air and water, and improved transportation alternatives.

Jennifer Rawlings graduated from the University of Texas in Austin with a Bachelor's Degree in Geography and the Environment. She has over seven years of experience at Fort Hood US Army Installation working in the areas of sustainable design and development, LEED project execution, pollution prevention and sustainability for the Directorate of Public Works. She continues to implement the development of a strategic Central Texas Sustainable Communities Partnership for Fort Hood and neighboring cities which work towards the improvement of economic vitality and quality of life for the region's citizens to include regional recycling, water and energy conservation, and renewable energy. Most recently she has taken on the responsibility of Environmental Program Manager for Fort Hood's net zero waste and sustainability efforts. She is helping to create a culture that recognizes the value of sustainability.

William "Bill" Ross is the former Secretary of the North Carolina Department of Environment and Natural Resources. He has returned to Brooks, Pierce, McLendon, Humphrey & Leonard, LLP and is resident in the firm's Raleigh office. Bill led the State's primary environmental protection and natural resources conservation agency from 2001-2009. At Brooks Pierce, he focuses on the firm's green growth and sustainability practice. Bill is a visiting scholar at Duke University and a natural resources policy consultant. At Duke, Ross is part of a special partnership between the Nicholas School of the Environment and Duke's cancer program. The partnership explores environmental links to cancer in an effort to improve people's health and the quality of the environment. As a natural resources policy consultant, Bill has worked on innovative ways to conserve, protect, and sustain natural resources while also meeting economic, social, and national defense objectives. Two examples of that work are America's Longleaf, an

initiative to restore longleaf pine across the southeast, and Veridea, the proposed sustainable, mixed-use, transit-oriented, pedestrian-friendly development in Apex.

Nolan Zail served as Senior Vice President of Development at Carmel Partners, Inc. He was responsible for new development projects and the redevelopment, and operations, of properties acquired in Northern California. He led the Carmel Partners team at UC Davis West Village from its initial concept through its current development. Prior to joining Carmel Partners, he served as a Project Manager at Santa Clara Development Co., where he was responsible for managing the development of single-family and multifamily housing projects. Nolan has worked for corporate, non-for-profit and government entities with over 16 years of experience in the design and development of residential and commercial projects including Grand Central Terminal redevelopment in New York. Nolan holds a Bachelor in Architecture from the Royal Melbourne Institute of Technology, Graduate Diploma in Environmental Horticulture from the University of Melbourne and a Masters in Real Estate degree from New York University.

Appendix 4: Participants

First	Last	Organization
Terry	Albrecht	North Carolina Department of Environment and Natural Resources
Paul	Anastas	Yale University
Jay	Bassett	EPA, Region 4
Crystal	Bergemann	Sustainable Housing and Communities, HUD
Alicia	Chakrabarti	East Bay Municipal Utility District
Cheryl	Coleman	EPA
Sandra	Conners	Office of Policy, EPA
Dan	Costa	EPA
Joseph	Fiksel	ORD, EPA
Gary	Foley	EPA
David	Gard	The Oberlin Project
Jay	Garland	ORD, NERL, EPA
Bob	Gedert	Austin Resource Recovery Department, City of Austin
Andrew	Geller	SHC, ORD, EPA
Ellen	Gilinsky	OW, EPA
Fred	Hauchman	ORD, EPA
Susie	Hazen	Federal Consulting Group
Alan	Hecht	ORD, EPA
David	Heins	US Army
Bruce	Hendee	City of Ft. Collins
Ron	Hoffer	EPA
Todd	Hunter	US Army
Richard	Jackson	Fielding School of Public Health, UCLA
Wanda	Johnson	US Army
Lek	Kadeli	ORD, EPA
Ozge	Kaplan	ORD,EPA
Susan	Kaplan	Sustainable Performance Consulting
Paula	Kehoe	San Francisco Public Utilities Commission
Kristine	Kingery	US Army
Marc	Kodack	US Army
Steve	Kolouch	US Army
Matthew	Lee	EPA, Region 3
Carol	Lenox	ORD, EPA
Barry	Liner	Water Environment Federation
David	Lloyd	Office of Brownfields and Land Revitalization, EPA
Alex	Long	US Army
Elaine	Loyack	North Carolina Department of Environment and Natural Resources
Andy	Mangan	U.S. Business Council for Sustainable Development
Anna	Mangum	NC State Industrial Extension Service
Melissa	McCullough	ORD, EPA
Mike	McDonald	EPA
Stan	Meiburg	EPA, Region 4
John	Mire	US Army
Ardra	Morgan	ORD, NERL, EPA
Michael	Morton	EPA
Marina	Moses	The National Academies of Science
Scott	Mouw	North Carolina Department of Environmental Assistance and

Michael	Nye	ORD, EPA
Steve	Nygren	Serenbe
Kenneth	Olden	EPA
Jennifer	Orme-Zavaleta	NERL, ORD, EPA
Lauren	Patterson	Nicholas Institute, Duke University
Donna	Perla	ORD, EPA
Naomi	Poral	Transform Urban LLC
Peter	Preuss	EPA
Andrew	Procter	EPA
Chris	Pyke	U.S. Green Building Council
Jennifer	Rawlings	Ft. Hood U.S. Army Installation
Chris	Rayburn	Water Research Foundation
Linda	Rimer	EPA, Region 4
William	Ross	Brooks, Pierce, McLendon, Humphrey & Leonard, LLP
Thomas	Ruiz	EPA, Region 6
Kathryn	Saterson	NHEERL, EPA
Gregory	Sayles	ORD, EPA
Ben	Scaggs	EPA, Region 4
Scott	Sklar	George Washington University
Michael	Slimak	NPD, SHC, EPA
Matt	Small	EPA
Betsy	Smith	ORD, EPA
Mike	Smith	EPA
Cynthia	Sonich-Mullin	NRMRL, ORD
Thomas	Speth	ORD, EPA
John	Steenbock	NRMRL, EPA
John	Thomas	Office of Sustainable Communities, EPA
Bob	Thompson	NRMRL, EPA
Ramona	Trovato	ORD, EPA
Dena	Vallano	EPA
Alan	Vette	EPA
Barbara	Walton	NHEERL, ORD, EPA
Elaine	Wright	Federal Consulting Group
Nolan	Zail	Transform Urban, LLC
Jose	Zambrana	ORD, EPA
Valerie	Zartarian	NERL, ORD, EPA
Harold	Zenick	NHEERL, EPA

Appendix 5: Net Zero Factsheet

EPA

www.epa.gov/research

science in ACTION

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Sustainable and Resilient Resources Achieving Net Zero Waste, Water, and Energy

EPA and the Army pilot NetZero technologies and innovations on military installations

In 2011, EPA's Office of Research and Development signed a Memorandum of Understanding (MOU) with the Honorable Katherine Hammack, Assistant Secretary of the Army for Installations, Energy and Environment to support the Army's Net zero Initiative. The Army began the net zero initiative in 2011 as a vision to enable the Army to appropriately safeguard available resources, manage costs and natural resources on its installations. The 17 net zero pilot installations participating in the initiative aim to produce only as much energy as used; limit freshwater use and increase water reuse; and reduce the generation of solid waste. Under the MOU, ORD is currently working with one pilot installation, Fort Riley, Kansas, to demonstrate new and innovative technology, methods and approaches that will not only help all installations achieve net zero goals, but also advance the state of the science. The hope is that joint successes can then be used by other Army and non-Army installations and, municipalities across the country.

In 2012, EPA signed a MOU with Dr. Dorothy Robyn, the Deputy Under Secretary of Defense for Installations and Environment to jointly promote and demonstrate innovative technologies on Department of Defense (DoD) bases. This not only complements the partnership with the Army, but expands opportunities to promote and transfer technology successes across the board to military bases and the surrounding communities.

How are EPA and the Army working together?

At Fort Riley, Kansas, EPA scientists and engineers are working with the Army, the Department of Energy's Pacific Northwest National Laboratory (PNNL), U.S. Army Corps of Engineers (USACE), U.S. EPA, U.S. Geological Survey's Kansas State University partnership, and other partners to identify and test a variety of technologies and innovations.

Under this truly cross agency, transdisciplinary, partnership, there are currently three research projects being conducted at Ft. Riley including:

Water reuse: This project will demonstrate and test the effectiveness of reducing drinkable water use through a decentralized treatment of wastewater from sewer lines also known as sewer mining. The advantage of a decentralized treatment system versus a centralized wastewater treatment plant is that a decentralized system decreases the pumping and infrastructure costs, which could decrease energy costs. It also increases water security for mission critical infrastructure located on the installation. At Ft. Riley, decentralized treatment systems will be installed and tested by EPA scientists and engineers. First, EPA will test a commercially available aerobic membrane bioreactor (MBR) for water treatment and store recycled water for local non-drinkable reuse at a scale of about 5,000 gallons per day. Second, EPA will test a more advanced anaerobic membrane bioreactor (AnMBR). In addition to treatment systems, tools that monitor the performance of such systems will be demonstrated and evaluated. The performance data on such systems, including energy efficiency and maintenance costs, will provide decision makers at Ft. Riley and other Army facilities, a basis for selecting alternative approaches for reducing water and energy use.

U.S. Environmental Protection Agency • Office of Research and Development

Containment and Control of Contaminated Wastewater: Ft. Riley uses mostly recycled water and some potable water in a central vehicle wash facility to clean military vehicles. Water from this facility could be treated and reused elsewhere on the installation; however, a military vehicle might become contaminated with a chemical, biological or radiological (CBR) warfare agent in the field. This project will test ways, using harmless surrogates introduced into the wash water as substitutes for CBR agents. The dirty water which flows off of vehicles might contain oil, grease, metals, and mixtures of suspended solids like dirt and mud. This study is important because the presence of more organic/inorganic materials in water can affect the inactivation of these CBR agents. Data resulting from this study will then be available to cities, states, or the Department of Defense facilities that may have to treat large volumes of contaminated water.

Outreach and Water Conservation: This project addresses the social drivers of water demand and the effectiveness of water conservation education and outreach. For example, the amount of water used during showering is determined as much by technology used (i.e. high efficiency showerheads vs. standard showerheads) as it is by the length of time someone spends in the shower. The project will engage, educate, and empower the community living and working at Ft. Riley to conserve water resources at the installation, and measure the effectiveness of these efforts. In working with EPA on this project, Ft. Riley has become an EPA WaterSense partner - the first Army installation and has full access to tools and educational materials to meet the needs of the community. Approximately 60-80 participants on the installation will have their water consumption measured by water meters. The project will establish a residential water use profile for the installation. Based on this profile, EPA researchers will promote water conservation to educate the community about innovative water saving technologies. EPA is also working with Ft. Riley schools as part of the education and outreach component of the project. Data collected by water meters and from Army administered surveys will provide real-time feedback on the effectiveness of the outreach and conservation campaign. The entire Ft. Riley community will be encouraged to save water and identify waste hot-spots around the installation.

Building broader EPA and military partnerships

EPA is currently partnering with DoD in support of the Environmental Security Technology Certification Program (ESTCP) Water Reuse solicitation. Demonstration projects are sought for innovative, energy efficient, low maintenance systems for decentralized treatment and recycling of wastewater

on military installations. Projects will be selected, funded, and managed jointly with the EPA (ORD, Office of Water, National Center for Environmental Research, and National Exposure Research Laboratory) in support of ORD's Safe and Sustainable Water Resources (SSWR) Program. Successful technology demonstrations resulting from this effort will not only help advance the state of the science and SSWR research program, but also provide real world solutions to the U.S. military as well as communities and municipalities across the country. Awards are expected in March 2014.

What's next for EPA's Net Zero?

With the success of these partnerships, EPA is looking to expand their net zero-related activities to communities. The long-term objective of this effort is to help communities become more sustainable and resilient through the development and deployment of net zero strategies and technologies. By pooling federal, state, and local expertise and resources and, setting specific goals such as net zero waste, water, and energy, we anticipate that net zero strategies can be embraced by communities while simultaneously fostering economic growth and promoting citizen health and well-being.

The first step in expanding our net zero efforts to communities will be a workshop in Research Triangle Park, NC on February 25 and 26, 2014, entitled "Promoting Sustainable Communities through Net Zero Strategies." The workshop will convene experienced community leaders and Federal agencies for the purpose of identifying, 1) barriers, solutions, and lessons learned from implementing net zero waste, water, and energy strategies at various scales and 2) ways in which EPA and other Federal agency partners can facilitate and support these sustainability efforts. Stay tuned!