

Fiscal Year 2009



Center for the Advancement of Sustainability Innovations

<https://casi.erd.c.usace.army.mil>

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Work Plan

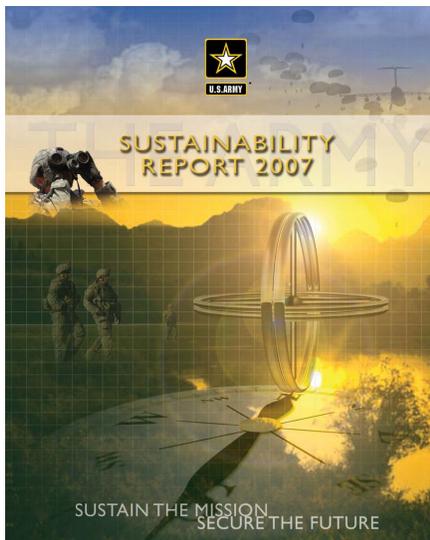
Contents

Introduction	3
CASI Contacts	6
Anticipating Emerging Issues	7
Sustainability Approaches, Education, and Knowledge Management	8
Sustainable Regional Planning	9
Sustainable Energy Solutions	11
Sustainable Facilities and Infrastructure	14
Sustainable Water Resources	19
Military Ecosystem Challenges	21
Sustainable Forward Military Operations	22
Climate Change Impacts	23
List of Acronyms	25

Introduction

Background: The Center for the Advancement of Sustainability Innovations (CASI) was established by the Engineer Research and Development Center (ERDC) as a new capability in 2006 to be hosted at the Construction Engineering Research Laboratory (CERL) in Champaign, IL. CASI was established with the goal of focusing the value of ERDC expertise, technologies and partnerships toward helping the U.S. Army Corps of Engineers (USACE), the Army, and the Department of Defense (DoD) achieve more sustainable facilities and operations.

CASI aims to contribute toward the objective articulated in the Association of the U.S. Army Torchbearer Issue (Feb 07), *Sustaining the Mission, Preserving the Environment, Securing the Future*: that Army sustainability is a true combat and national security multiplier. Sustainability innovations from CASI and its partners are measured against the triple bottom line, as stated in the Army Strategy for the Environment: (1) benefit to organizational missions, (2) benefit to the communities that help support and are impacted by preparations for, and the conduct of, military missions, and (3) benefit to the environment.



CASI Organization: To help organize ERDC and its partner capabilities toward these goals, CASI has created “technology focus areas” for domains in which it can provide capabilities and expertise relevant to USACE, Army and DoD sustainability requirements. These technology focus areas include:

- Anticipating Future Issues and Opportunities
- Sustainability Approaches, Measures and Knowledge Management
- Sustainable Regional Planning
- Sustainable Energy Solutions
- Sustainable Facilities and Infrastructure
- Sustainable Water Resources
- Ecosystem services and natural capital
- Sustainable Forward Military Operations
- Climate Change Impacts and Adaptations

This document summarizes plans for fiscal year 2009 (FY09) in each of these technology focus

areas. Many projects and events involve multiple technology focus areas. Some of these cases are noted in this plan.

Each focus area identifies:

- Lead(s) for this area
- Brief description of the technology focus area
- List of relevant planned upcoming events
- Projects (these vary in status – some already funded and underway, others included in a sponsor’s FY09 work plan, and more that are possibilities without secure funding
- Services: ongoing activities, such as web sites or rapid response capabilities
- Publications: outcomes from previous projects in this technology focus area and important planned publications may be listed.

2008 Highlights

In 2008, CASI was engaged in many new initiatives. Some of these activities are highlighted below by technology focus area:

Anticipating Future Sustainability Issues

- CASI (Fittipaldi, Goran) participated in Army Environmental Policy Institute (AEPI) Foresight meeting to review/identify emerging issue topics (Jun 08).
- CASI (Baker, Goran, Fournier, Hartranft, Myers) participated in planning and presenting a “futures” forum for Installation Management Command (IMCOM) leadership focused on sustainable and secure energy and North American electrical grid (Jul 08).

Sustainability Approaches, Education and Knowledge Management

- CASI (Hanson) provided input into the

Army's first sustainability report using the Global Reporting System.

- CASI team, in partnership with AEPI and Office of Directorate of Environmental Programs (ODEP), Assistant Chief of Staff for Installation Management (ACSIM), visited the Toyota plant in Cincinnati, OH (Aug 08)

- CASI special report on sustainability measures and benchmarks was published: *Reporting and Advancing Sustainability Initiatives* (Hanson, Krooks, Rewerts, Foltz, Gerdes).

Sustainable Regional Planning

- CASI team developed the Strategic Sustainability Assessment Geoportal (completed summer 08).

- CASI team held stakeholder forum in Fort Bragg-Fayetteville, NC, region with Sustainable Sandhills partnership (May 08).

- Working with Desert Research Institute (DRI, Mouat), CASI team (Westervelt, Tierstrip) conducted an initial "futures" analysis for Nellis Air Force Base. NV. DRI conducted several stakeholder engagement sessions.

- CASI (Westervelt) participated in Mojave summit in preparation for regional futures planning initiative (Sep 08).

- Sustainable Installations Regional Resource Assessment (SIRRA) is being ported to operate in the Corpsmap environmental system (Jenicek, Slagel, continuing from Sep 08).

Sustainable Energy Solutions

- Supported USACE and Assistant Secretary of the Army for Installations and Environment (ASA-I&E) in developing the Army Energy Strategy (Hartnft).

- Article published in *EM: The Magazine for Environmental Managers*: "Energy MicroGrids and Their Potential Use in the Military" (Ducey, Goran, Oct 07).

- Participated in a Building Energy Efficiency Workshop at the American Society for Heating, Refrigeration, and Air-Conditioning Engineers

(ASHRAE) Winter Conference in Chicago, IL, Jan 08.

- Initiated new Small Business Innovation Research (SBIR) effort on microgrid design (Ducey, Apr 08).

- Proposal for Fort Sill, OK, micro-grid demonstration was briefed to Environmental Security Technology Certification Program (ESTCP) (Ducey, Abdullah, Sep 08).

- Completed two Installation Technology Transfer Program (ITTP) projects: two Deployable-Renewable Energy Power Stations (D-REPS) at the National Training Center, Fort Irwin, CA; and two Building Integrated Photovoltaic (BIPV) solar roofs at Fort Huachuca, AZ.

- Installed a 500-kWp solar carport at Fort Dix, NJ.

Sustainable Facilities and Infrastructure

- CASI helped plan/execute an ESTCP project for Leadership in Environmental and Energy Design (LEED) Platinum emergency response building at Fort Bragg and used building information modeling (BIM) for energy analysis during planning charettes (continuing through 09).

- CASI held well attended workshop on sustainable design in Denver at the Joint Services Environmental Management (JSEM) conference (May 08).

Sustainable Forward Military Operations

- CASI conducted two workshops on "requirements" and published a special report on the results, with roadmaps for each system (water, energy, waste, systems integration, etc., Aug 08).

- Published ERDC-CERL Report SR-08-13, *Sustainable, Full Spectrum Contingency Operations Gap Assessment*, by Curtin, et al. (Aug 08).

- CASI supported the newly established Training and Doctrine Command (TRADOC) Integrated Capabilities Development Team (ICDT) for base-camps (continuing in 09).



In Jun 08, CASI was identified as part of the new Corps of Engineers Sustainable Design and Development Directory of Excellence (DX) along with USACE's Savannah District.

- CASI partnered with George Mason University, AEPI, USACE, Army War College and U.S. Military Academy, West Point, NY, to help shape an understanding of emerging “environmental security” concepts and approaches for the U.S. Army (Sep 08).

Sustainable Water Resources

- CASI white paper (Goran, Myers, Jenicek) on water resources for U.S. military bases helped shape a new project, sponsored by ASA(I&E) through AEPI, providing a national-level forecast of water supply impacting Army/DoD bases over the next few decades, with a detailed “water budget” analysis for two bases.

- CASI organized, in collaboration with the Army Research Office (ARO) and Strategic Environmental Research and Development Program (SERDP), a workshop hosted by the University of Illinois WaterCAMPWS (National Science Foundation center) on water technologies – looking at water access, water conservation and water reuse technologies (Scholze, Gerdes, Goran).

Emerging Military Ecosystem Challenges

- Published Special Report ERDC/CERL SR-08-4: *Provision of Ecosystem Services through Market-Based Approaches* (Keysar, Goran, Mar 08).

- Planned and participated in Ecosystem Services for Military Lands workshop at Eglin Air Force Base, FL, with The Nature Conservancy and SERDP (Hayden, Ashby, Goran, Apr 08).

- Participated in Ecosystem Services Workshop led by Department of Interior (DOI) Naples, FL (Aug 08).

- Published paper: “U.S. Military Installation Land Management History” (Balbach, et al.), participated and gave presentations (Hayden, Doe, Enscore and Goran) at Militarized Landscapes Conference, Bristol, UK (Sep 08).

Climate Change Impacts

- CASI collaborated with the National Aeronautical and Space Administration (NASA) and U.S. Geological Society (USGS) to establish an inter-agency forum on climate change impacts, with connections to the U.S. Climate Change Science Program Office and the Government Accountability Office (GAO). Forum sessions held (or scheduled) in Jan, Mar, Apr, Jun, Aug, Oct and Dec 08.

- Participated in Climate Change in the Southeast: Natural Resources Leaders’ Group (May 08).

It should be noted that, throughout 2008, ERDC and its partners participated in many forums and projects related to USACE, Army and DoD sustainability beyond those identified in this document. The previous list of accomplishments focuses only on efforts that were enhanced by, initiated through, or supported directly by CASI.

New Partnerships

University of Illinois–Office for Sustainability.

Recently, the University of Illinois Urbana-Champaign (UIUC) campus selected Dr. Richard Warner as the first Director of their new Office of Sustainability. CASI already had close collaboration with several organizations at UIUC, and this new office provides a framework to coordinate and enhance existing collaborations and to provide CASI improved access to expertise in numerous technology areas. A new agreement is being drafted to formalize this enhanced collaboration.

Actions for Change. The USACE Actions for Change (AFC) were developed after analyzing performance of the Southeast Louisiana Hurricane Protection System as well as other analyses internal and external to USACE. The AFC comprise a set of concepts that USACE will focus on to transform its priorities, processes, and planning to better serve the nation and Armed Forces across all its mission areas with two major goals: to improve public safety and improve USACE’s water resources infrastructure. The four overarching themes are: (1) comprehensive systems approach; (2) risk-informed decision-making; (3) communication of risk to the public; and (4) professional and technical expertise. CASI is partnering with several AFC initiatives, primarily focused on enabling a more comprehensive systems approach to water resource management that supports sustainability, adaptive management, and anticipatory engineering, and provides a framework for comparison and analysis of information relevant to watershed-scale investment decisions. This partnership involves the application of relevant technologies and expertise across civil and military programs, with a focus on advancing sustainable solutions in both program areas.

South Pacific Division (SPD) Sustainable Engineering Center. USACE recently approved the creation of a new center that will be supported by SPD's Districts (Albuquerque, Los Angeles, Sacramento and San Francisco). This center will provide capabilities for renewable energy solutions, sustainable design for civil and military facilities and infrastructure, and sustainable ecosystem restoration. CASI will be a key partner supporting this new center.

Cooperative Research and Development Agreements. Agreements focusing on sustainable capabilities for regional analysis have been completed with Marstel-Day and Booz Allen Hamilton. CASI is also working toward an agreement with Concurrent Technologies Corporation (CTC) for both sustainable regional capabilities and sustainable energy solutions.

2009 Planning

As in previous years, CASI's FY09 efforts will be aligned with the interests of, and opportunities

provided by, stakeholders, with a continuing special interest in supporting the Army Strategy for Sustainability. Along these lines, CASI will be part of the team framing how the Army reports on sustainability progress, and also an important part of the interactions between the Army and sustainability tool providers such as the Global Reporting Initiative and the U.S. Green Building Council's (USGBC) LEED suite of standards.

This document is a point-in-time summary of projects planned for FY09 and does not cover all new initiatives that will arise during the year. Also, some of these proposed projects will likely be unfunded or the concepts may change with stakeholder input. CASI welcomes your interests, comments and questions. Please contact the CASI team (Bill Goran, Michelle Hanson, Annette Stumpf) if you have a general question about CASI or this report. If you want to discuss a specific event or project, please contact the leader for that focus area. Contact information is provided below.

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Anticipating Emerging Issues

Lead: William D. Goran

Focus Area Description: The purpose of this focus area is to engage stakeholders through forums, white papers, publications and other means about emerging issues, to interpret how emerging issues might impact them, and to identify alternative courses of actions to consider.

Events

IMCOM Futures Forum. As part of quarterly business meetings, IMCOM has established a futures forum to consider emerging issues and how they will impact the Army and its installations. This forum is supported by IMCOM's planners, and specifically by the Chief, Center for Future Installation Strategy and Concepts Division. CASI provides support to the planning division for these forums, to include finding experts in specific topic areas and capabilities to forecast and backcast various scenarios. This support is coordinated through Karen Baker, IMCOM.

Projects

IMCOM Future Technology Forecasting. This is a proposed project for periodic forecasting of emerging challenges for IMCOM, along with emerging technologies and how these challenges and technologies might impact the operations and assets of Army bases and ranges.

Publications and Services

Foresight Process. As part of the Army Strategy for Sustainability, ASA(I&E), through AEPI, has established a "foresight" process specifically focused on identifying, exploring and helping the Army prepare for emerging sustainability challenges. Issues such as "how might nanotechnology impact Soldier and Civilian health and safety" and "how will climate change impact U.S. and global security" have been covered in previous years through the Foresight process. The process includes a bulletin publication series titled "Foresight - Searching for Sustainability" located at: <http://www.aepi.army.mil/foresight.html>. William Goran, CASI Director, serves on the Foresight consultative team and CASI has helped AEPI identify new themes and related experts, and also to draft initial white papers as input to the Foresight bulletins. This support is coordinated through John Fittipaldi, Senior Fellow at AEPI.



How will renewable energy infrastructure affect the ecosystem?

CASI White Paper Series. CASI white papers are one of the Center's key contributions. Previous white papers have helped shape subsequent projects, research solicitations, and investment strategies by the military services.

Renewable Energy Sources: a New Generation of Challenges for the Military and the Nation. In FY09, a new white paper will be drafted relating to the challenge of renewable energy resources. DoD has a goal of obtaining 25% or more of its energy from renewable energy sources by the year 2025. Reaching this goal will reduce energy costs, include energy security and help reduce the military greenhouse gas footprint — but it will also engage the military in a series of new challenges.

Renewable sources of energy can require extensive built infrastructure over large areas of land- and seascapes, disturbing military operations, sensitive and protected habitats, and sacred areas and artifacts. New energy support structures will also require a complex set of land property rights, electrical distribution rights, and financing options. Costly mistakes can be made if DoD pursues courses of action without fully understanding the consequences and alternatives. This white paper will be intended to help highlight potential issues and courses of actions to help address and mitigate potential problems.

Sustainability Approaches, Education and Knowledge Management

Lead: Michelle Hanson

Focus Area Description: This focus area relates to improvements in sustainability metrics and reporting, advancements in sustainability education and learning resources, and management and sharing of sustainability approaches and knowledge.

Event

Installation Sustainability In-Progress Review (IPR). Scheduled for Mar 09 at Fort Bragg, NC.

Funded Projects

Assist with Development of the Army Strategic Plan for Sustainability. The objective of this work is to provide critical support for next-step activities that advance the Army strategic plan for sustainability. This includes specific support to Army organizations requiring assistance with innovative sustainability concepts and information about relevant benchmarks. It will also include tools for collaboration and information sharing, and triple-bottom-line accounting. The CASI team will work with AEPI and the secretariat points of contact to develop a "transforming initiatives" options list that will be evaluated from perspectives of cost-benefit, feasibility, timeframe, stakeholder engagement, and other factors. Proponent: AEPI.

Next phase of Army Sustainability Reporting.

In FY08, CASI researchers worked with AEPI to evaluate use of the Global Reporting Initiative (GRI) tool to report on the status and progress of Army sustainability efforts. The next phase of this work will involve incorporating lessons learned from the first reporting cycle into an improved report for subsequent years. Proponent: AEPI.

Proposed Projects (in a program)

Evaluation/Demonstration of Costing Methodology and Cost-Benefit Tool for Opportunity

Analysis of Stryker Units. Principal Investigator: Chris Rewerts (ERDC-CERL); research team includes members from the Energy and Security Group (ESG), AEPI, and G-4. The objective of this project is to conduct an economic analysis for the logistics of supplying fuel and water in military operations in garrison, training activities, and theatre. This analysis will identify opportunities for employing technology innovations that will reduce total ownership costs and enhance effectiveness, thus becoming a "force multiplier" for military operations. The proposed work would involve conducting an analysis with the engagement of a military unit and the Army G-4. Proponent: AEPI. This project is in the FY09 AEPI work plan.

Proposed Projects (not in a program)

Develop Crosswalk Between USACE Campaign Plan and the Army Strategic Plan for Sustainability. This project will provide USACE an analysis of its new campaign plan that focuses on linkages between the plan and the Army Strategic Plan for Sustainability. It will identify immediate and long-term actions that will both advance sustainability within USACE and support the larger Army goals. Educational opportunities will be included. Proponent: HQ USACE.

Roadmap for Implementation of Sustainability Concepts from Executive Order (EO) 13431 into Civil Works Assets.

The Federal Real Property Council recently added a sustainability element to its reporting requirements for real property assets. This requirement includes incorporation of energy and water reduction goals as described in EO 13431. The HQ USACE Asset Management team requires assistance to develop a road map to incorporate these requirements into its structural and land assets and for subsequent reporting submittals to the Office of Management and Budget (OMB). Proponent: HQ USACE.



Assessment of Sustainability Metrics Methods for Army Land Use Decision Processes. Principal Investigator: Chris Rewerts (ERDC-CERL). Assessment and evaluation methods for land use decision-making, such as those prescribed by the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA), do not currently consider potential dimensions of impacts or mitigation efforts. This limits the effectiveness of decisions, at times imposing unneeded curtailment of Army mission or efforts to offset their impacts. This project would identify and evaluate currently available methods for determining metrics of sustainability that can be applied in land use decision-making processes. It will include methods for assessing ecosystem services. These metrics will broaden the base against which an assessment is made and allow for a more long-term, comprehensive picture of decision impacts. Proponent: TBD.

Publications

Reporting and Advancing Army Sustainability. This technical report describing the efforts and results of a first-year project on sustainability reporting will be published in FY09.

Services

Army Sustainability Committee (ASC). ERDC-CERL POCs are members of the Army Sustainability Committee and participate in ASC meetings and telephone conferences.

Installation Sustainability Program. ERDC-CERL POCs participate in the Installation Sustainability Program through attendance at action plan development workshops and goal-setting sessions.

Sustainable Regional Planning

Lead: James Westervelt

Focus Area Description: This focus area relates to the advancement of arrangements, approaches, resources, tools, and procedures to provide capabilities for coordinated and collaborative regional planning.

Events

- Southwest Sustainability Workshop, Barstow, CA (Sep 08).
- Zambezi Basinwide Stakeholders Forum, Lilongwe, Malawi (Nov 08). Sponsored by the South African Development Corporation, along with the Global Water Partnership South African, the World Conservation, The Nature Conservancy, the World Wide Fund for Nature, the South African Research and Documentation Centre, and the Institute for Water and Sanitation Development. POCs: James Westervelt (CERL) and Lisa Morales (HQ USACE).

Projects

Alternative Futures for Southwestern Base. Principal Investigator: David Mouat (DRI); research team includes Judith Lancaster (DRI) and Scott Basset (University of Nevada at Reno). Proponent: Office of the Secretary of Defense (OSD).

Analysis of Southwestern Regional Planning Approaches. Principal Investigator: James Westervelt (ERDC-CERL); research team includes Natalie Myers (ERDC-CERL) and Elisabeth Keysar (CTC). Proponent: OSD. The goal is to compare and contrast various regional planning approaches, frameworks, and tools.

Strategic Sustainability Assessment (SSA). Principal Investigator: Elisabeth Jenicek (ERDC-CERL); research team includes members from Land Use Evaluation Model (LEAM) group and UIUC LEAM Lab. *Fort Bragg:* The short-term goal is to promote the use of the Geoportal by the Sustainable Sandhills and other groups in the region. The team proposes a trilevel approach that incrementally increases ownership of the SSA Geoportal by local planners and the community. Ultimately this will include the ability to use the platform for regional planning on a day-to-day basis and to develop new growth scenarios. *Location TBD:* This project is a multi-year effort to conduct a regional sustainability assessment at an Army installation in the Southwestern U.S. The phases include: regional characterization and stakeholder engagement; developing a regional plan of action to include identifying issues and analysis tools; developing regional models and continued engagement; refining models and assembling visualization tools; and support to the region to include training and additional scenarios and modeling. Proponent: AEPI.

SIRRA Migration to CorpsMap. Principal Investigator: Elisabeth Jenicek (ERDC-CERL). The purpose of this project is to move SIRRA relational database and geographic information system (GIS) indicator maps to the CorpsMap environment. SIRRA includes a relational database and national GIS maps for 54 sustainability indicators in 10 issue areas. Proponents: HQ USACE/Actions for Change (White).

SBIR Phase II. Principal Investigator: James Westervelt (ERDC-CERL); research team includes LEAMgroup and UIUC LEAM Lab. This work seeks to extend the market utility of the LEAMgroup alternative futures capabilities to include the forecasting of road/highway needs and sharing of results to the public via Geoportal technology. Proponent: SBIR program.

Incremental Change Analysis. Principal Investigator: James Westervelt (ERDC-CERL); research team includes Kathleen White (ERDC-CRREL), Manroop Chawla (ERDC-CERL), Larry Canter (contractor), and Joel Schlagel (Institute for Water Resources [IWR]). This project is within the AFC Theme 1 program. Goals of the project are to (1) review and document the laws, approaches, regulations, frameworks, and guidelines for conducting incremental change analyses for civil works projects and (2) develop tools to support incremental change analyses.

Proposed Projects

Mojave Desert Sustainable Military Mission Analysis. Principal Investigator: James Westervelt (ERDC-CERL). Anticipated collaborators include DRI, the National Defense Center for Environmental Excellence (NDCEE), University of Redlands, and AEPI. Proponent: Jan Larkin (OSD Legacy Program) and Leslie Gillespie-Marthaler, Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health [DASA-ESOH]).

Florida, Alabama, and Georgia (FLAG) Corridor. The FLAG Corridor, which includes Eglin Air Force Base, FL, Fort Rucker, AL, and Fort Benning, GA, is an area of significant interest for the U.S. military. The Southeast Regional Partnership for Planning and Sustainability (SERPPAS) has sponsored workshops to address planning and mission sustainability issues along this corridor. CTC (Key-sar, Eady) is supporting OSD in an analysis of this region using ecosystem services as one approach to understanding the natural resource values being derived by residents and by the military in this region. CASI is collaborating with CTC on this initiative.

Publication

Strategic Sustainability Assessment (SSA) Technical Report. *Strategic Sustainability Assessment: Pilot Study Final Results*, ERDC/CERL TR-08-DRAFT, due for publication first quarter FY09. This report documents the application of the SSA methodology in the Fall Line Region.

Services

SSA Geoportal. The SSA Geoportal contains results of the Regional Sustainability Assessment conducted in the Fall Line Region, with a focus on the Fort Bragg sub-region. Geoportal content includes GIS maps showing projected urban growth in the region over a 30-year timeframe based on a set of alternate future scenarios. Additional content depicts the impact of urban growth on a set of sustainability issues, including environmental stress, military testing and training, energy, air quality, water, and housing. Access to the Geoportal is currently limited to research team members.

EKO Sustainable Regional Planning Website. The Sustainability, Encroachment, and Room to Maneuver (SERM) website is a resource for regional planning. The site is intended for installation planners concerned with current and future incompatible land use issues. The site contains links to ERDC-CERL research projects in this area, including Historic Growth Analysis, Urban Growth Modeling, Quantifying Mission Impacts, and Incompatible Land Use Solutions. <https://eko.usace.army.mil/fa/serm/>

SIRRA Web-Based Analysis Tool. The SIRRA web-based analysis tool provides a simplified national assessment of sustainability across 10 issues: air quality, airspace, energy, urban development, threatened and endangered species, location, water, economy, quality of life, and infrastructure. The SIRRA methodology rates the regions surrounding 308 military installations in terms of vulnerability due to 54 individual sustainability indicators. The SIRRA tool uses existing science and measurement-based national data sources. The data was then mapped into GIS coverage for individual indicators coded as red, amber, or green. This methodology is incorporated into a web-based analysis tool: <https://ff.cecer.army.mil/ff/sirra.do>. The database is currently being updated and relocated to a more flexible web environment.

Sustainable Energy Solutions

Lead: Tom Hartranft

Focus Area Description: From a military capability systems support perspective, power and energy are ubiquitous in sustainability. They are a consideration in many facets of military operations. The purpose of this CASI Technology Focus Area is to identify the sustainability needs associated with integration of power and energy into military missions. ERDC-CERL offers a full suite of power and energy related services and resources in support of the Army Energy Strategy and energy strategies of other DoD elements. An energy research and development overview is available as a two-page brochure at: <http://www.cecer.army.mil/td/tips/docs/Energy%20Branch%20Systems%20trifold.pdf>

Events

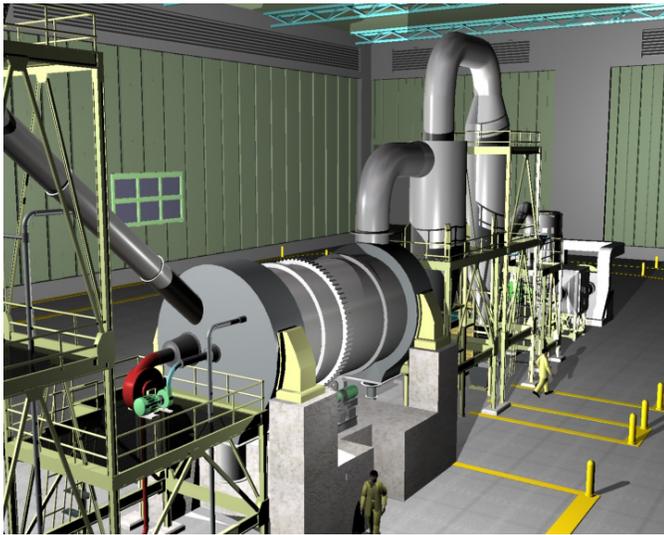
USACE Energy Policy Act Workshops. CERL's Energy Branch is conducting training courses to help USACE District design and construction engineers implement energy conservation requirements for new construction per Energy Policy Acts of 2005 and 2007. An Engineering and Construction Bulletin describes this series of training workshops completed to date at four sites: http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2007_12.pdf Experts from the Department of Energy (DOE) Federal Energy Management Program (FEMP), Department of Energy's Pacific Northwest National Laboratory (PNNL), and National Institute of Standards and Technology taught portions of this course. Energy Branch experts are leading the sessions, providing expertise in new technologies and ASHRAE 90.1 application to buildings, and also performing real building pressurization tests to demonstrate commissioning requirements for building envelopes.

IMCOM Annual Army Workshops on Energy-Efficient Technologies for Buildings. Installation energy managers participated in a Jan 08 technologies showcase working session held in conjunction with ASHRAE technology forum. A one-day energy managers' session focused on IMCOM energy manager activities and installation successes. This was followed by a two-day workshop with contractors, DOE labs, and installation energy managers with focus on emerging energy technologies. ERDC planned and facilitated three other annual IMCOM workshops during 2005 and 2007 for Army installation energy managers. <http://www.annex46.org/workshops%5Fseminars/>

Waste to Energy Workshop. Planned and hosted a technical workshop to inform government officials of the potential for military installations to use waste-to-energy technology and to potentially launch working groups to advance the growth of this field. This event explored the need and opportunity, waste characterization, technologies, case studies, and other issues. It is anticipated that this event will serve as the launch pad for working groups to address specific topics. IMCOM and AC-SIM participated. The May 20-21, 08 workshop was co-chaired by ERDC-CERL and ARO. http://www.cecer.army.mil/techreports/ERDC-CERL_TR-08-11/ERDC-CERL_TR-08-11.pdf

IMCOM Energy Summit - Renewables. Partnered with PNNL to facilitate a one-day technical overview of emerging renewables for the Dec 07 IMCOM Energy Summit. Technical insights were provided to IMCOM senior leadership from DOE, academic, and industry renewables technology experts. Also partnered with PNNL for a Jul 08 follow-up IMCOM Energy Summit focused on tailoring renewables business approaches for specific Army installation implementations.

Building Automation Systems for Sustainable Facilities. ERDC team planned and performed an Aug 08 LonWorks Building Automation Systems workshop at Chicago. Focus was on implementation of base-wide control systems at Army installations. Over the past year, CERL, Savannah District, and Huntsville Engineering and Support Center (HESC) have developed guidelines to help installations create an implementation plan and are now working with several installations to develop and execute installation-specific plans. The workshop reviewed LonWorks technology and discussed key specifications and requirements for LonWorks Direct Digital Control (DDC) systems and a base-wide Utility Monitoring Control System (UMCS); stepped through the development of an implementation plan; discussed the challenges associated with implementation of a base-wide system; demonstrated the Fort Hood LonWorks UMCS and how to use a LonWorks network configuration tool; and provided the opportunity to share experiences, ask questions, and learn from others. Electronic presentation files are available at: <https://eko.usace.army.mil/fa/bas/>; scroll down to the bottom.



Biomass to energy via rotary kiln gasifier.

Projects

Energy Conservation in Buildings and Community Systems (ECBCS) Annex 46. This is an International Energy Agency (IEA) sponsored initiative with ERDC acting as the Operating Agent for the international effort. The scope is to influence the decision-making process that determines the use of energy-saving measures in building retrofits of government buildings: e.g., offices, hospitals, large one-story production facilities, maintenance shops, and specialty warehouses. ERDC is leveraging the expertise of the international energy community in support of the Army Energy Strategy for installations. <http://www.annex46.org/>

Energy-Efficient Communities. Pursuing collaboration with a new IEA initiative for energy-efficient communities. The main objective of this effort is to use an integrated and multidisciplinary approach as a basis for providing tools, guidelines, recommendations, best-practice examples, and background material for designers and decision-makers in all fields concerned. This integrated approach will enable communities to set up sustainable and secure urban energy structures and identify the specific actions necessary to reach ambitious greenhouse gas reduction goals. These objectives are aligned with IMCOM, ACSIM, and ASA(I&E) visions of the future. In the beginning stages of discussions with IMCOM and ACSIM to sponsor ERDC-CERL participation. Outreach to this new IEA initiative will leverage modest Army funding for travel and labor with the participating countries' funding. <http://www.ecbcs.org/annexes/annex51.htm>

MILCON Transformation Model Request for Proposal (RFP). ERDC is developing and delivering energy performance benchmarks for USACE to meet the intent of the 2005 Energy Policy Act and the new 2007 Energy Independence Policy Act (EIPA) reductions in energy consumption. Working with HQ USACE/Engineering and Construction along with USACE Centers of Standardization, DOE labs, ASHRAE, IMCOM, and ACSIM to establish facility benchmarks along with prescriptive technology implementation suites that will meet the policy act energy reductions for a variety of climatic conditions in U.S. and overseas. To date, delivered specifics for Barracks and Tactical Equipment Maintenance Facilities, which were ACSIM's priority facility types. The next highest priority facility types are now in the works.

Energy Section for Installation Design Standards. This is patterned after MILCON Transformation technical support for new construction, except that it focuses on modifications to existing facilities. ACSIM funded this new effort in Jan 08 to provide generic energy guidelines for installations to use for major facility retrofits. A consensus approach was agreed to by IMCOM and installation energy managers attending the Jan 16-18, 08 Energy Workshops. Delivered new installation energy design standards to ACSIM May 08. These design standard inputs are now being transformed into an Energy Unified Facility Criteria for institutionalized guidance to USACE Districts and installation staffs.

Energy Engineering Analysis Program (EEAP). Technically leading the ongoing EEAP installation energy analyses in the continental U.S. (eight installations in FY08) and in Europe (six installations in FY08). This encompasses full technical onsite energy audits and subsequent return-on-investment (ROI) analyses tailored for each installation's current utility costs, mission needs, and an assessment of alternative financing mechanisms. HESC is IMCOM's project manager and business lead for EEAP. PNNL provides technical support on an "as needed" basis per direction of HESC.

FY07/08 Power Security Assessment Methodology. Providing technical oversight for an FY07 Congressional Add to (1) develop an energy security self-audit model for Army installations and define/prioritize critical energy demands and (2) identify installation critical power and energy needs. ERDC is now seeking funds to automate these self-audit and technology screening processes in some form of electronic "TurboTax" like software.



Remote site power generation using photovoltaics at Fort Irwin, CA.

FY08 Power Delivery Demonstrations. Proposed and received ACSIM FY08 funding for two renewable power delivery demonstrations. One is a Deployable-Renewable Energy Power Station to power a remote, off-grid wi-fi tower at the National Training Center, Fort Irwin, CA. The other is a membrane roofing material retrofit with an integrated thin-film photovoltaic (PV) power system at Fort Huachuca, AZ.

Publications

USACE Model RFP. ERDC is providing energy conservation analyses for Military Construction (MILCON) Transformation Model RFP documentation to the USACE facility Centers of Standardization.

Power and Energy for Deployed Bases. Researched and published a paper on deployed military base power and energy, "Sustainable Energy for Deployed Military Bases." It was published in the 2008 American Society of Mechanical Engineers (ASME) proceedings of the 2nd International Conference on Energy Sustainability. http://www.cecer.army.mil/techreports/Hartranft_ES2008-54136/ES2008-54136.pdf

Building Automation Systems for Sustainable Facilities. For years, government installations have faced the complexities of multi-vendor building automation systems (BAS). There is a great need to identify and assess design and specification requirements for open BAS. ERDC has been developing technical guidance for installation master planning and BAS implementations. Two recent publications include: (1) http://www.cecer.army.mil/techreports/ERDC-CERL_TR-07-3/ERDC-CERL_TR-07-3.pdf and (2) http://www.wbdg.org/cb/ARMYCOE/COEECB/ecb_2005_17.pdf

Services

ERDC-CERL receives hundreds of telephone calls and emails each year seeking technical and business consultation on installation power and energy issues and projects. Most of these are answered quickly at no cost to the inquiring office. For those inquiries that are especially complex or that spawn follow-on extended technical support, the lab develops specific work plans, negotiates terms and costs, and executes and reports on the work for the benefit of all. In addition, a number of efforts are centrally funded by IMCOM to benefit all Army installations. The projects and events previously documented in this section are all examples of customer-funded services and products.

Sustainable Facilities and Infrastructure

Leads: Richard Schneider and Annette Stumpf

Focus Area Description: The purpose of this focus area is to help USACE, the Army and DoD work toward achieving sustainable planning, design and development goals. The focus area team leaders are part of the SDD DX that the Corps has established to provide support in developing criteria, research and development, design and construction support services, and training and advisory assistance. In this technology area, CASI also provides support and collaboration with USGBC and other organizations involved in SDD.

Events

DUSD(I&E) Green Building Team Visit to China. Annette Stumpf and/or Richard Schneider will go to China as a member of ODUSD(I&E) Green Building Team to exchange views with Chinese military counterparts in Chongqing, China, on planning, design, and construction of the new Peoples Liberation Army (PLA) Logistics Engineering Academy using Green Building and Environmental Impact Assessment (EIA) standards. Other topics of discussion include use of U.S. techniques, technology, and equipment to jointly build new academy buildings demonstrating Green Building design and construction standards, and U.S. and Chinese military and civil regulations governing Green Building and EIA. The DUSD(I&E) Green Building Team is providing green building expertise and support to OSD(I&E) under a U.S. security cooperation program with the Peoples Republic of China and the PLA. The China program is conducted under an agreement signed by the Secretary of Defense and his Chinese counterpart to exchange environmental information. After several years of building confidence, the program has moved to an information sharing stage. In Oct 06, a group from OSD(I&E) visited China and returned with proposals for cooperation, the most promising being to work on building a new "green" campus for the PLA Logistics Engineering Academy. Subsequent visits by a U.S. Green Building Delegation in Mar 07 to China, and a Chinese delegation to the U.S. in Aug 08 initiated and continued information sharing regarding design and construction of the PLA green academy.

Sino Tour of Military and Civilian Green Building Projects. As a part of the continuing dialog between China and the U.S., a Chinese delegation will

visit the United States in part to obtain guidance on development of bid packages for sustainable master planning and green building design. They will also tour military and civilian green building projects to learn first-hand how projects in the U.S. are achieving high standards for sustainability.

CASI Briefing at South Pacific Division's (SPD) Regional Business Meeting (Oct 30-31, 08) in Monterey, CA. William Goran briefed attendees on CASI mission and activities. SPD has invited CASI to participate in a proposed Sustainable Engineering Center.

Webinar on Army Implementation of LEED-2009. Under leadership of the Sustainability Directorate of Expertise (DX), consisting of ERDC-CERL and Savannah District, a virtual meeting with USACE Districts will be planned to communicate information needed to successfully transition from LEED-NC 2.2 to LEED-2009. The webinar date will be selected after LEED-2009 is issued by USGBC and Army policy guiding use of LEED-2009 has been approved.

"Sustainable Building Design and Projects for the U.S. Army," presentation by Annette Stumpf at Illinois Sustainable Technology Center's Sustainability Seminar series, Nov 3, 08, UIUC campus.

LEED for DoD Projects Workshop. Participated in this event sponsored by Society of American Military Engineers, Nov 6, Alexandria, VA.

12th Annual USACE Small Business Conference. ERDC will participate in "sustainability" track; Dec 8-10, 08, Memphis.

Projects

Design, Monitoring, and Validation of a High-Performance Sustainable Building (year 3 of 4). Sponsor: ESTCP Topic Area 4: Sustainable Infrastructure, Facilities Management. Project lead: Manette Messenger (Southeast Region, IMCOM). Team includes operational and research personnel: Mike Frnka (Southeast Region, IMCOM), Rob Harris, Ray Barbeau, John Rose, Paul Wirt, Glen Prillaman and many others (Fort Bragg, NC), Candice Moore Groves and Anne Rogers (Southface Energy Institute), PNNL, and Christy Etter (CH2MHILL).

Emergency services facility at Fort Bragg will be a high-performance sustainable building. Best practices will be captured as part of an ESTCP project.



The purpose of this four-year research project is to demonstrate “whole building” design processes using off-the-shelf building materials and components to achieve higher building performance at no additional first cost. The team is working on a community emergency services building being built at Fort Bragg as a design/bid/build project. Team members are involved during the design, construction, commissioning, and operations of the building and will compare performance of the new building (high-performance design) with a conventional fire station at Fort Bragg. The project is currently expected to receive a LEED-NC 2.2 Platinum rating. Lessons learned will be shared with all services and with the Centers of Standardization for Army facility types.

Gap Analysis Study - Southeast Region Resilient Home, Year 2: Enabling Community Resiliency.

The Resilient Home Program is part of the Southeastern Region Research Initiative (SERRI), a Department of Homeland Security (DHS) Program, and is managed by the Savannah River National Laboratory (SRNL).

- Resilient Home Program management: Tim Smail (SRNL). Technical assessment lead: Laura Tovo (SRNL). Program leadership and applied engineering expertise.
- Lead for gap analysis: Dave Tilotta (North Carolina State University [NCSU]). Sustainable building materials, outreach, and expertise in response and rebuilding.
- Property remediation lead: Michael Heitkamp (SRNL).
- Construction: Thomas Napier (Lead), Jim Wilcoski, Richard Schneider, Annette Stumpf, Steve Cosper, Heidi He, Stephanie Yousef, and Giselle Rodriguez (ERDC-CERL). Construction

techniques and unique earthquake test stand.

- Flooding effects: Bob Wendt (Oak Ridge National Laboratory [ORNL]). Assessment of biological and chemical contaminants; and Heshmat Aglan (Tuskegee University). Flood damage assessment and unique testing capabilities.
- Wind effects: Clemson University. Structural assessment and unique wind tunnel and wind resistance testing.
- ORNL assessment tool: Alicia Compere (ORNL).
- Program Advisor and Advisory Board lead: John Plodinec (SRNL Program Team).

The goal of the Resilient Home Program is to enable community recovery following a natural disaster by dramatically speeding the return of residents to their homes after an event. By facilitating the return of homeowners, the community infrastructure can begin to start rebuilding and the economy will be stimulated. This program provides effective tools, techniques, resources and information, through applied research and development, to those who experience or respond to natural disasters. To accomplish this goal, the program treats disaster recovery as a process with four phases: assessment, response, rebuilding, and prevention.

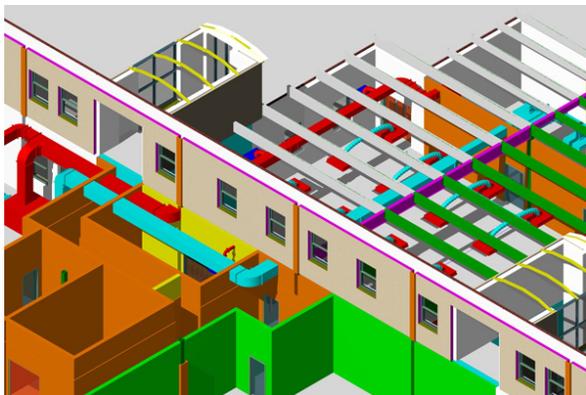
Developing Best Practices for Early Design Energy Analysis using BIM Project (Phase 2 of Early Design Energy Analysis Using BIM).

Sponsor: ACSIM ITTP. Technology Standards Group Requirement Addressed: Primary — Intelligent Engineering Drawing Data; Secondary — Life-Cycle Facility Information Modeling/Exchange. Project Lead: Annette Stumpf (ERDC-CERL). Lessons learned using Green Building Studio (GBS) in FY08

on a variety of projects will be documented. The team plans to complete the test of three BIM software packages which can be used to export gbXML to GBS to conduct energy analyses. AutoCAD Revit and ArchiCAD have been tested successfully; the Bentley TriForma gbXML export is still being completed by the vendor. A procedure will be described to help users understand what information needs to be represented in the early BIM model, how to set up the energy modeling defaults in GBS, and what sustainable design considerations should be addressed. A process will be outlined explaining how the Centers of Standardization or project teams could use a basic BIM model to easily determine energy consequences of various decisions for the unique project site and climate. Finally, the proposed process will be tested using GBS and BIM for a USACE District project and a final project summary report will be provided.

Army Implementation Guidance for LEED

2009. Sponsor: Vincent Kam (ACSIM). Leads: Richard Schneider and Annette Stumpf (ERDC-CERL). Technical objective: Funds are provided for assess-



Ductwork modeling in BIM.

ment of EO 13423, EISA07 and USGBC LEED 2009, recommendations for requisite changes in Army guidance, and USGBC LEED-NC 2.2 Silver validation of 10 Army project sites for the FY09 MILCON Program.

Proposed Projects

Low-Impact Development (LID) Demonstration Projects in the Chesapeake Bay Watershed. Sponsor: Philip Columbus (ACSIM-ITTP) and William Sproul (ACSIM, Army Environmental Programs). Leads: Annette Stumpf and Kelly Dilks (ERDC-CERL). Technical objective: Plan and perform effective LID demonstration projects in the Chesapeake Bay Watershed and verify project type, design, construction, cost-effectiveness, and functionality. Demonstrate that LID projects can be

used effectively instead of traditional stormwater management practices in critical habitat so that large-scale base realignment and closure (BRAC) construction projects will have no direct impact on water quality discharged to the bay's tributaries or shoreline.

Policy and Feasibility Implications of the Army Using LEED-ND (Neighborhood Development).

Sponsor: John Fittipaldi (AEPI). Leads: Annette Stumpf and Richard Schneider (ERDC-CERL). Technical objective: Evaluate the suitability of applying LEED-ND (Neighborhood Development) to Army master planning to enhance installation sustainability. AEPI assists the Army secretariat by developing policies and strategies to anticipate and address environmental issues that may affect the Army. AEPI, IMCOM, ACSIM, and USACE Army master planning stakeholders will be asked to participate in the proposed research effort. There is a need to tie all these players and efforts together to develop a strategic vision for sustainable Army installation master planning. Once the vision is attained, the path to achieve it will be developed.

Rapid Response Capability for LID. The Army must begin using LID practices according to new requirements outlined in EISA07. Many opportunities to integrate LID practices into military operations are being lost, or substandard designs are being implemented, because adequate technical assistance is neither easily available nor widely known. A proposed center of expertise could assemble experts who would be able to help project teams on a reimbursable basis.

Buildings as Net-Zero Energy Resource Islands. Sponsor: ESTCP Topic Area - Sustainable Infrastructure/Energy Efficiency and Renewable Energy for DoD Installations. Lead: Kathleen Paulson (Naval Facilities Engineering Command - NAVFAC). Submitted as an ESTCP FY09 Project. This project will demonstrate high-efficiency building operation and maintenance strategies for an existing office building with the following goals:

- Facilitate net zero resource consumption
- Produce sufficient energy from onsite renewable energy sources to be a net zero energy producer and at least carbon neutral for all building energy inputs
- Recover and reuse rainwater to offset building water consumption
- Reduce resource use (paper and office expendables) by 50% from the existing baseline
- Develop aggressive strategies for solid waste recycling to eliminate or recover at least 80% of the baseline waste stream.

The product of this effort will be a roadmap for achieving “net zero resource consumption.”

Facilities Criteria Development. USGBC continues with the evolution of LEED green building rating systems into an open “book shelf” of criteria to evaluate sustainability of a wide range of facility types in varying environmental and climatic zones. Given the plethora of Army facility types, and the difficulty for many to achieve LEED Silver given their differences from the base LEED models, it is important that sustainability criteria unique to Army facilities be developed. As the USGBC moves forward, members envision an open ended process of criteria development and approval as the bookshelf expands. The Army needs to be engaged in this process to address critical facility types unique to the Army.

AFC Sustainable Solutions Project Delivery Team (PDT). The USACE AFC effort includes initiatives to rapidly transform planning, design, construction, and operation and maintenance principles as well as decision-making processes. Alternative actions have been grouped into four themes. Richard Schneider (ERDC-CERL) is a member of the AFC Theme I, Comprehensive Systems Approach, Sustainability Project Delivery Team. The Sustainability PDT’s objective is to create and cultivate a new corporate behavior and processes focused on sustainability of projects by incorporating ecosystem principles and asset management to actualize the USACE Environmental Operating Principles (EOP). Their approach is to make the environment an integral component of system performance and to integrate asset management and the EOP into the life-cycle of USACE infrastructure.

Services

Army Sustainability Committee. ERDC-CERL participates in periodic Army Sustainability Committee meetings and telephone conferences to represent the sustainable facilities and infrastructure point of view and to help coordinate ongoing activities with the SDD community.

SDD Directory of Expertise. HQ USACE created the Sustainable Design and Development (SDD) Directory of Expertise (DX) at the Savannah District. The SDD DX is supported by CASI for technology issues and for collaboration with USGBC and other organizations engaged in research and development. The SDD DX will maintain technical expertise in the rapidly changing and evolving area of SDD including criteria and requirements, LEED rating tools, and emerging technologies to achieve

SDD goals. It will support HQ USACE in the development of criteria, research and development, and technology transfer. It will provide planning, design and construction support services, training, and advisory assistance to others on a reimbursable basis. Upon request, the DX can provide the following functions for SDD and related matters:

- Interpreting Army, Air Force, USACE, DoD, and other federal policies, regulations and requirements
- Training on philosophy, concepts, and history of SDD
- Training and consultation on implementation of LEED
- Reviewing contract documents, Installation Design Guides (IDGs) and other documentation to ensure SDD is included
- Interpreting LEED credit requirements
- Participating in planning and design charrettes
- Helping with government validation process
- Developing technical guidance and guide specifications upon request by HQ USACE.

The SDD DX currently consists of the following individuals: Judith Milton (Savannah District), Richard Schneider and Annette Stumpf (ERDC-CERL). HQ USACE proponent for SDD is Joanne Qualey.

Sustainable Design and Development Websites.

- Corps of Engineers Technical Excellence Network (TEN) SDD Center
<https://ten.usace.army.mil/TechExNet.aspx>
- Engineering Knowledge Online (EKO) Sustainable Design and Development Website:



CASI personnel participate in planning and design charrette at Fort Bragg, NC.

- <https://eko.usace.army.mil/fa/sdd/>
- Center for Advancement of Sustainability Innovations: <https://casi.erdc.usace.army.mil/>
 - EKO Water Conservation Website: <https://eko.usace.army.mil/fa/water/>
 - EKO Regional Planning/SERM Website: <https://eko.usace.army.mil/fa/serm/>
 - EKO Army Environmental History Website: <https://eko.usace.army.mil/fa/envhistory/>
 - ERDC-CERL SDD website: <http://www.cecer.army.mil/sustdesign/>
 - Imagine a Sustainable Champaign County: <http://inquiry.uiuc.edu/cil/out.php?cilid=285>
 - Proactive Options with Neighbors for Defense-installation Sustainability (PONDS) Website: <http://ff.cecer.army.mil/ponds/home.htm>
 - Sustainable Designer's Aid Website: <https://ff.cecer.army.mil/sda/>
 - Many private virtual teams are also hosted on EKO.

Maintain Communication Lists and Distribute SDD Policy Changes, Items of Interest with SDD Contacts. Points of contact include District/Division SDD/LEED accredited professionals and District/Division/installation personnel interested in SDD.

Construction Industry Institute (CII) Sustainability Community of Practice (COP). Richard Schneider is a member of CII's Sustainability COP. This COP consists of members who share a vision of employing activities that meet the needs of the present without compromising the ability of future generations to meet their own needs. The goal is to increase awareness and consideration of sustainability by publicizing information through a web-based portal, sharing information, and generating guidelines to help members achieve sustainable development practices. COP efforts are currently focused on sustainability as it applies to industrial construction, the close parallel being USACE civil works activities. USACE is a member of CII. M.K. Miles III, Deputy Chief, Engineering and Construction, HQ USACE, serves on the CII Board of Advisors and Ilker Adiguzel, Director, ERDC-CERL, is the alternate. More information on CII may be found at: <http://www.construction-institute.org/>

Army POC for USGBC. Richard Schneider (ERDC-CERL) serves as the Army membership contact for USGBC and is responsible for all membership issues.

USAF Project A-5. POC: Richard Schneider (ERDC-CERL). The U. S. Air Force (USAF) has initiated an evaluation of its existing project delivery processes, in part to develop new processes to best (1) integrate SDD considerations into the project delivery process from planning through programming, design and construction; (2) develop methodologies to report and track SDD efforts in the project delivery process; (3) implement project commissioning into facility projects; (4) align USAF SDD efforts with established industry best practices; and (5) implement requirements of EPAct 2005, EISA07, EO 13423, higher level policy directives\ goals, etc.

Interagency Sustainability Working Group (ISWG). POC: Richard Schneider (ERDC-CERL). The Army's active participation in ISWG is critical to its effective implementation of sustainable practices. The Office of the Federal Environmental Executive (OFEE) chartered ISWG, chaired by DOE FEMP, which convenes to coordinate the implementation of statutory requirements as they relate to sustainable practices across all federal agencies. Decisions made by ISWG, the EO 13423-mandated Office of Federal High-Performance Green Buildings (GSA), and OFEE will guide DoD in implementing its Sustainability Implementation Plan.

DoD Sustainability Executive Committee (SEC) and Army Component Sustainability Councils (CSC). POC: Richard Schneider (ERDC-CERL). Draft DoD "Sustainable Installations Policy" identifies a hierarchical organization responsible for oversight of sustainable policy implementation: the SEC within DOD(I&E), senior officials overseeing development of policy, corporate business processes, support of continuous improvement, reporting and an effective oversight structure; the CSC to oversee development of component sustainability policies, budgeting for sustainability considerations, and development of and reporting on progress of the component sustainability implementation plans; and installation/base Sustainability Working Groups to develop and execute installation sustainability policies. Active participation in the CSC is critical to the Army's effective implementation of sustainable practices.

Sustainable Water Resources

Leads: Kathleen White and Elisabeth Jenicek

Focus Area Description: This focus area addresses access to, and the sustainable use of, water resources. Activities include understanding water resources status, quantities and qualities; conservation approaches and technologies; water reuse technologies and approaches; and other capabilities to improve and enhance the availability and quality of water as a sustainable resource.

Events

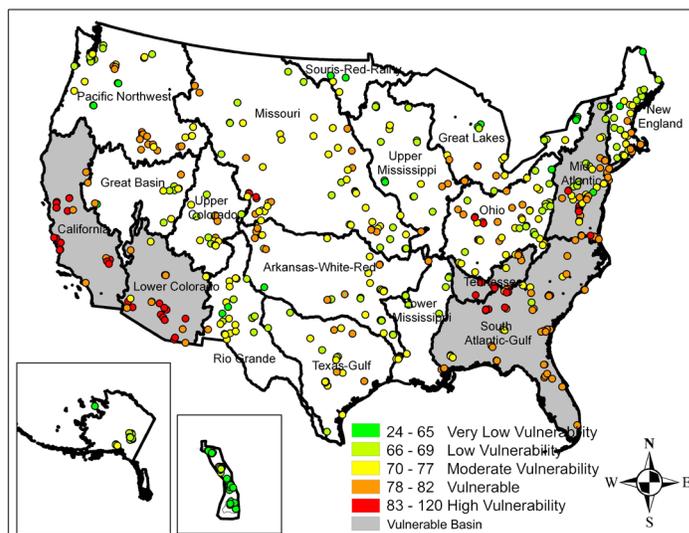
Climate Change and Water Management/Hydrology PDT Meeting. Presented results of initial analysis for the National Watershed Screening for Sensitivity to Water Control project (Natalie Myers, ERDC-CERL) at CRREL on Oct 21-23, 08. POC for this event was Kathleen White (ERDC-Cold Regions Research and Engineering Lab - CRREL).

Military Applications for Emerging Water Use Technologies. Workshop scheduled for Nov 12-14, 08 at UIUC. Hosted by the WaterCAMPWS, and sponsored by ERDC-CERL, ARO and SERDP, this workshop will address water technology options and requirements for both fixed facilities (military installations) and forward military operations. POC for this event is Richard Scholze (ERDC-CERL).

2009 AWWA Water Resources Symposium. **Symposium, Jan 25-27, 09.** Will feature presentations on "Water Availability in USACE Planning" (Elisabeth Jenicek, ERDC-CERL) and "Application of Adaptive Management to Water Resources Management and Planning" (James Westervelt, ERDC-CERL).

Funded Projects

National Watershed Screening for Sensitivity to Water Control. Principal Investigator: Elisabeth Jenicek (ERDC-CERL); research team includes members from ERDC-CERL and UIUC. The purpose of this project is to apply a set of indicators from the SIRRA web-based tool, along with several USACE-specific indicators, to a watershed level national assessment. This project will inform policy regarding the "rules set" for USACE dams. Proponent: Kathleen White (on assignment to HQ USACE).



Map shows 309 Army installations color-coded to reflect relative vulnerability of their watersheds. Ratings are based on a set of 24 indicators that relate to fresh water supply and demand.

Watershed Investment Decision Tool. Principal Investigator: Kathleen White (ERDC-CERL). This tool will be a discrete module in the CorpMap viewer (<https://corpsmap.usace.army.mil/>). It will contain national GIS maps of data relevant to watershed-level planning. This will include existing data layers in the SIRRA web-based analysis tool, new infrastructure layers, and data related to the civil works budgeting process. Data resolution will include USACE Division, District, and watershed. Research team includes members from ERDC-CERL and CRREL, IWR, and LEAMgroup. Proponent: Kathleen White (on assignment to HQ USACE, AFC).

Installation Water Audit Guidance Public Works Technical Bulletin. Principal Investigator: Elisabeth Jenicek (ERDC-CERL). This project will describe findings (to include installation guidance) of ongoing research in preparing installation water demand estimates. Proponent: Malcolm McLeod (HQ USACE).

Regional Water Assessment Guidance Public Works Technical Bulletin. Principal Investigator: Natalie Myers (ERDC-CERL). This project will describe findings of ongoing research in preparing regional water availability sustainment assessments using online national-level GIS data sets. Proponent: Malcolm McLeod (HQ USACE).

Proposed Projects (in a program)

Phase II – Army Installation Water Sustainability Study. Principal Investigator: Elisabeth Jenicek (ERDC-CERL); research team includes members from ERDC-CERL and UIUC. Apply water assessment methodology developed in Army Installations Water Sustainability Study to 10 additional continental United States (CONUS) installations. The method includes developing a regional water budget for each installation-region that considers water supply and demand in the effective region, e.g., river basin or watershed. This evaluation projects 30 years into the future to determine potential regional water demand and recommends policy options. Proponent: David Sheets (AEPI).

Water Reuse Strategies for Army Installations. Principal Investigator: Richard Scholze (ERDC-CERL); research team includes members from the WaterCAMPWS. This project will investigate state-of-the-shelf water reuse technologies and evaluate Army installations for applicability of these technologies to reduce Army demand for purchased potable water. The product will be a set of recommendations for application of water reuse technologies based on a variety of criteria to include regional and mission-specific factors. This study will also recommend changes to Army policy to increase implementation of water reuse strategies. Proponent: David Sheets (AEPI).

Evaluate Vulnerability of OCONUS Army Installations to Issues of Water Supply and Demand. Principal Investigator: Elisabeth Jenicek (ERDC-CERL); research team includes members from ERDC-CERL and UIUC. This study will document the status of water supply/demand in OCONUS installation regions — identify the key local organizations and policies that govern water supply and allocation — and assess the availability of local water supply and demand data. This information is intended to help prioritize OCONUS locations for detailed water studies and to inform development of a method to prepare regional water budgets in key OCONUS locations. Proponent: David Sheets (AEPI).

Publications

Army Installations Water Sustainability Study Technical Report. *Installation Water Sustainability Assessment: Pilot Study Results*, ERDC/CERL TR-09-DRAFT, due for publication in fourth quarter of

FY09. This report documents findings of the subject study to include results of national screening and installation-level assessments at Forts Bragg, NC, and Bliss, TX.

National Watershed Screening for Sensitivity to Water Control Report. *Installation Water Sustainability Assessment: Pilot Study Results*, ERDC/CERL TR-09-DRAFT, due for publication third quarter FY09. This report documents findings of subject study to include results of national screening.

Watershed Investment Decision Tool. The Watershed Investment Decision Tool will be a discrete module located on the CorpsMap website (<https://corpsmap.usace.army.mil/>).

Public Works Technical Bulletins (PWTBs). The Installation Water Audit Guidance PWTB, due for publication fourth quarter 09, will contain instructions for installations to conduct water audits to support Installation Water Management Plans. The Regional Water Assessment Guidance PWTB, also due for publication fourth quarter 09, will contain instructions for installations to prepare regional water availability sustainment assessments.



A proposed CASI project would document the status of water supply and demand at OCONUS installations.

Military Ecosystem Challenges

Lead: Tim Hayden

Focus Area Description: The purpose of this focus area is to identify, investigate and develop capabilities for emerging challenges in military-related ecosystems. Military “related” ecosystems include those that are directly or indirectly used and impacted by the military, those that are protected by the military to buffer mission activities, and those that provide valuable ecosystem services to the military and to the communities that co-exist with the U.S. military in areas across the nation and around the world.

Events

Ecosystem Services Workshop. Naples, FL, Dec 8-11. A Conference on Ecosystem Services (ACES 2008) will bring together government, non-government, academia, tribal, and private sector leaders to advance the use of ecosystem services and related science in conservation, restoration, resource management and development decisions. Website: sss.conference.ifas.ufl.edu/ACES

SERDP Statement of Need Development (FY10). CASI will develop military requirements for quantifying ecosystem services. Market-based and functional-based quantification methods for ecosystem services are rapidly evolving. DoD must develop methods and technologies to quantify ecosystem services that functionally support military mission requirements. Failure to integrate mission support values for ecosystem services may result in adopting externally driven quantification and valuation approaches that are inadequate to describe the contribution of these services in supporting military operations, training, and testing requirements.

See also *Southeastern Ecosystems Sequestration Guidelines in the Climate Change focus area section.*

Publications and Services

CASI White Paper Series. The Military Ecosystem Challenges team will participate in the research and publication of a new white paper called *Renewable Energy Sources: A New Generation of Challenges for the Military and the Nation*. This effort is described in more detail under the Emerging Future Issues technology focus area.

Endangered Species Law and Management of Species Adversely Affected by Climate Change. The Association of Fish and Wildlife Agencies (AFWA) has formed a subcommittee to analyze, deliberate and recommend any necessary changes to the Endangered Species law and/or implementing policy to accommodate management of species adversely affected by climate change (*see also the work plan for Climate Change Impacts*). This subcommittee will develop a position paper for adoption by the AFWA. Potential modification to the ESA related to climate issues in response to this position paper or other national policy initiatives will have significant implications for compliance and management of federally listed species on DoD lands. At the direction of Scott Belfit (ACSIM), Tim Hayden is contributing to the AFWA subcommittee as a technical representative for the Army.



Switching military installations to maximum use of renewable energy may have consequences not only on the ecosystem, but also for considerations such as hydrogen production and storage.

Sustainable Forward Military Operations

Lead: Deborah R. Curtin

Focus Area Description: This focus area seeks to identify the Army's required capabilities for full spectrum contingency operations. To meet the objectives of this focus area, a multi-disciplined approach is necessary to develop doctrine, organizations, training, materiel, leadership and education, personnel and facility solutions that ensure sustainability and efficiency while eliminating redundancy. This aspect of CASI directly supports the Base Camp Integrated Capabilities Development Team (ICDT) led by the Maneuver Support Center (MANSCEN) tasking to prepare a Concept Capability Plan (CCP) and Capabilities-Based Assessment (CBA) for years 2015-2024.

Events

Sustainable Contingency Operations (CON-OPS) Stakeholders Working Group. The purpose of this interagency work group is to provide an informal forum for sharing information. For more information please contact Deborah Curtin at deborah.r.curtin@usace.army.mil or 217-398-5567. The work group met twice in FY08 and, depending on availability of funding, will meet at least once in FY09.

Base Camp ICDT Workshop. The Base Camp ICDT held a workshop at Fort Leonard Wood, MO, during Oct 7-10, 08. The purpose was to conduct an IPR of the ICDT; final adjudication of comments to the Base Camps CCP, Version 0.3; and implement revisions for CCP Version 0.5 Staff Officer Review.

North Atlantic Treaty Organization (NATO) Workshop on Environmental Security Concerns Prior to and During Peace Support and/or Crisis Management Operations. On Nov 25-26, 08, the Swedish Defence Research Agency will host a workshop in Umeå, Sweden, open for participation to NATO and partner nations. The workshop will concentrate on scenario building to address all phases of the conflict cycle of prediction, prevention, conflict management and post-conflict recovery. The geographical setting for the scenarios will be Sub-Saharan Africa, bearing the Whole-of-Government/Comprehensive Approach in mind. William Goran, CASI Director, has been invited to present a paper: "Emerging U.S. Concepts and Engagements Toward Long-Term Regional Environmental Security."

Logistics Capability Assessment Tool (LOG CAT) Methods, Modeling, and Analysis Work Group (mMAWG). William Goran, CASI Director, and Kurt Kinnevan, MANSCEN, are members of mMAWG. The submitted decision issue, reduction in fuel and water supply requirements for forward land bases, was based on the CASI Special Report, *Promoting Sustainable Full Spectrum Operations Through Improved Science and Technology* and the Base Camp ICDT CCP and CBA.

Proposed Projects

Promoting Sustainable Full Spectrum Operations through Improved Science and Technology. Principal Investigator: Deborah Curtin (ERDC-CERL) and Kurt Kinnevan (MANSCEN). AEPI



Reducing logistics burdens would support sustainable operations.

has partially funded this effort as a follow-on to the FY07 Sustainable, Full Spectrum Contingency Operations Gap Assessment.

Reducing Impacts of Military Projects. Principal Investigator: Chris Rewerts (ERDC CERL). This effort has been proposed to use a "full cost accounting" decision-support tool developed as part of the Sustain the Mission Project (SMP). A study team composed of AEPI, CASI, the Energy and Security Group (ESG), the Army G-4, and a Stryker unit will apply the SMP Tool to operational scenarios focused on minimizing impacts and total ownership costs, including the potential adoption of off-the-shelf technologies in unit operations.

Publication

Sustainable, Full Spectrum Contingency Operations Gap Assessment (Aug 08). This special report addresses the increasing importance of sustainability in full spectrum operations as a force multiplier through increased operational efficiencies, reduced logistical burdens, reduced costs, and use of science and technology (S&T) initiatives as needed. The report was vetted through multiple stakeholders at all levels of DoD. A copy of the report can be obtained through CASI.

Services

Review of ICDT Draft, Version 0.3: Base Camps for the Future Modular Force (2015 – 2024) Concept Capability Plan (Aug 15, 08). At the request of Kurt Kinnevan (MANSCEN), CASI is reviewing the subject CCPs.

Committee Participation. At the request Kurt Kinnevan, Deborah Curtin is serving as a Core Work Group member for the Base Camp ICDT. William Goran, Michael Case (CASI) and Kurt Kinnevan participate in the LOG CAT mMAWG.

Climate Change Impacts

Lead: **William D. Goran**

Focus Area Description: This focus area relates to the impacts of climate change on public resources and how managers adapt to them. This aspect of CASI is broadly “inter-agency” focused, as these impacts and adaptations are relevant to all public resource managers, not just U.S. military activities and missions. However, the 2008 Defense Authorization bill included language that requires DoD to identify the impacts of climate change on military facilities, ecosystems, and missions.

Events

Climate Change Impacts Inter-Agency Working Group Forum. This forum, which started in Nov 07, is ongoing. Sam Higuchi (NASA) and William Goran (USACE) chair the forum, which focuses on climate change impacts and adaptations. Meetings are held every four to eight weeks. In Jun 08, a working group website was established on FedCenter at <http://www.fedcenter.gov/> with the following notice on the public page:

Climate Change Interagency Working Group. The purpose of this interagency working group is to provide an informal forum for sharing data, approaches, scenarios and expertise relative to forecasting and responding to climate change impacts. For more information, or if you are interested in contributing to the efforts of the climate change team, please contact the team coordinator, Stephanie Yousef. Access is obtained via request for a login to Stephanie Yousef, at stephanie.yousef@us.army.mil or 217-352-6511. Non-federal employees must be sponsored by a federal employee to obtain a login.

The working group met in Jan, Mar, Apr, Jun, Aug and Oct 08 in half-day sessions hosted at NASA HQ in Washington, DC. Upcoming meetings are planned for Dec 5, 08 and Jan 27, 09. Presentations are focused on agencies’ sharing approaches and guidance related to climate change impacts and adaptations. The Aug presentations highlighted two GAO studies related to climate change and the draft document: *A Federal Leader’s Guide to Climate Change* by Rachael Jonassen of the Logistics Management Institute (LMI).

Workshop on Climate Change Impacts on Defense Assets in Alaska. Under the leadership of ERDC-CRREL, a workshop is being planned for Jul 14-16, 09 in Anchorage, AK, focused on understanding and responding to the impacts of climate change in DoD natural and physical infrastructure in Alaska. ARO and SERDP/ESTCP are partners. Information about this workshop can be obtained from Jon Zufelt, ERDC-CRREL, at jon.e.zufelt@us.army.mil or 907-384-0511.

Planned Projects

Use of Multi-Scale Models, Data and Scenario Projections to Reduce Risk of Climate Change Effects and Human Disturbances on the Distribution of Nesting Snowy Plovers and Wintering Piping Plovers on Florida Military Installations. Principal Investigator: Igor Linkov (ERDC-Environmental Lab - EL). This effort was proposed against the SERDP 2009 Statement of Need entitled: Managing and Restoring Southeast Coastal Ecosystems Under the Threat of Climate Change. The project was approved (Oct 08) by the SERDP Scientific Advisory Board.

Risk Quantification for Sustaining Coastal Military Installation Assets and Mission Capabilities. Principal Investigator: Edmond Russo (ERDC-Coastal and Hydraulics Lab - CHL). This effort was proposed against the ERDC statement of need entitled: Assessment of the Impact of Sea Level Rise on Military Infrastructure. The project still needs to be approved (Mar 09) by the SERDP Scientific Advisory Board.

Proposed Project

Terrestrial Carbon Sequestration Potential of Publicly Managed Lands in the Southeast. Principal Investigator: Harold Balbach (ERDC-CERL) with a team from U.S. Forest Service, U.S. EPA, and U.S. Fish and Wildlife Service. This effort, which has been proposed in the Legacy Resource Management Program, was put together in response to a forum of the Southeast Natural Resources Leader's Group at a meeting in May 08, in Charleston, SC, on Climate Change.

Publications

Federal Leader's Guide to Climate Change. This is currently a draft manuscript written by Rachael Jonasson of LMI. It interprets the scientific information on climate change and proposes the "way

forward" for various federal managers who need to consider climate change in their agency planning and budgeting processes. CASI, through the Inter-Agency Working Group, is reviewing and will disseminate this document.

Services

Review of Climate Change Science Program Office Publications. At the request of Robert Boyd, Directorate of Research and Engineering, OSD, CASI is reviewing various publications from the Climate Change Science Program Office, especially those relating to climate change impacts and adaptation.

Committee Participation. At the request of Peter Schultz, Director of the Climate Change Science Program Office, William Goran, CASI Director, is serving on the advisory committee for Adaptation and Responses to the Climate Change Science Program Office.

Committee Participation. Harold Balbach is serving on a committee of the American Society of Agronomy that is crafting society recommendations for members and affiliated organizations regarding climate change adaptations.



Climate change is expected to have a major impact on many public resources .

Acronyms

ACES	A Conference on Ecosystem Services	IEA	International Energy Agency
ACSIM	Assistant Chief of Staff for Installation Management	IMCOM	Installation Management Command
AEPI	Army Environmental Policy Institute	IPR	In-Progress Review
AFC	Actions for Change	ITTP	Installation Technology Transfer Program
AFWA	Association of Fish and Wildlife Agencies	IWR	Institute for Water Resources
ARO	Army Research Office	JSEM	Joint Services Environmental Management
ASA(I&E)	Assistant Secretary of the Army for Installations and Environment	LEAM	Land Use Evaluation Model
ASC	Army Sustainability Committee	LEED	Leadership in Environmental and Energy Design
ASHRAE	American Society for Heating, Refrigeration, and Air Conditioning Engineers	LID	Low Impact Development
ASME	American Society of Mechanical Engineers	LMI	Logistics Management Institute
BAS	Building automation system	LOG CAT	Logistics Capability Assessment Tool
BIM	Building Information Modeling	MANSCEN	Maneuver Support Center
BIPV	Building Integrated Photovoltaic	MILCON	Military Construction, Army
BRAC	Base Realignment and Closure	mMAWG	Methods, Modeling, and Analysis Work Group
CASI	Center for Advancement of Sustainability Innovations	NASA	National Aeronautical and Space Administration
CBA	Capability-based assessment	NATO	North Atlantic Treaty Organization
CCP	Concept Capability Plan	NAVFAC	Naval Facilities Engineering Command
CERL	Construction Engineering Research Lab	NCSU	North Carolina State University
CHL	Coastal and Hydraulics Lab	ND	Neighborhood Development
CII	Construction Industry Institute	NDCEE	National Defense Center for Environmental Excellence
CONOPS	Contingency Operations	NEPA	National Environmental Policy Act
COP	Community of Practice	ODEP	Office of Directorate of Environmental Programs
CRREL	Cold Regions Research and Engineering Lab	OFEE	Office of Federal Environmental Executive
CSC	Component Sustainability Council	OMB	Office of Management and Budget
CTC	Concurrent Technologies Corporation	ORNL	Oak Ridge National Lab
CU	Clemson University	OSD(I&E)	Office of the Secretary of Defense for Installations and Environment
DHS	Department of Homeland Security	PDT	Project Delivery Team
DoD	Department of Defense	PLA	People's Liberation Army
DOE	Department of Energy	POC	Point of contact
D-REPS	Deployable- Renewable Energy Power Stations.	PNNL	Pacific Northwest National Lab
DRI	Desert Research Institute	PONDS	Proactive Options with Neighbors for Defense-installation Sustainability
DX	Directory of Expertise	PWTB	Public Works Technical Bulletin
EEAP	Energy Engineering Analysis Program	ROI	Return on Investment
EISA	Energy Independence Policy Act	S & T	Science and Technology
EKO	Engineering Knowledge Online	SBIR	Small Business Innovation Research
EL	Environmental Lab	SDD	Sustainable Design and Development
EOP	Environmental Operating Principles	SEC	Sustainability Executive Committee
ERDC	Engineer Research and Development Center	SERDP	Strategic Environmental Research and Development Program
ESA	Endangered Species Act	SERM	Sustainability, Encroachment, and Room to Maneuver
ESG	Energy and Security Group	SIRRA	Sustainable Installations Regional Resource Assessment
ESTCP	Environmental Security Technology Certification Program	SPD	South Pacific Division
FEMP	Federal Energy Management Program	SRNL	Savannah River National Lab
FLAG	Florida, Alabama, and Georgia Corridor	TEN	Technical Excellence Network
GAO	Government Accountability Office	TRADOC	Training and Doctrine Command
GBS	Green Building Studio	UIUC	University of Illinois (Urbana-Champaign)
GIS	Geographic Information System	USACE	U.S. Army Core of Engineers
GRI	Global Reporting Initiative	USGBC	U.S. Green Building Council
GSA	General Services Administration	USGS	U.S. Geological Society
HESC	Huntsville Engineering and Support Center		
ICDT	Integrated Capabilities Development Team		
IDG	Installation Design Guide		