



US Army Installation Sustainability Overview

November 2006

16 November 2006



Introductions

- **Name**
- **Organization**
- **What is the greatest challenge facing humankind?**



Overview

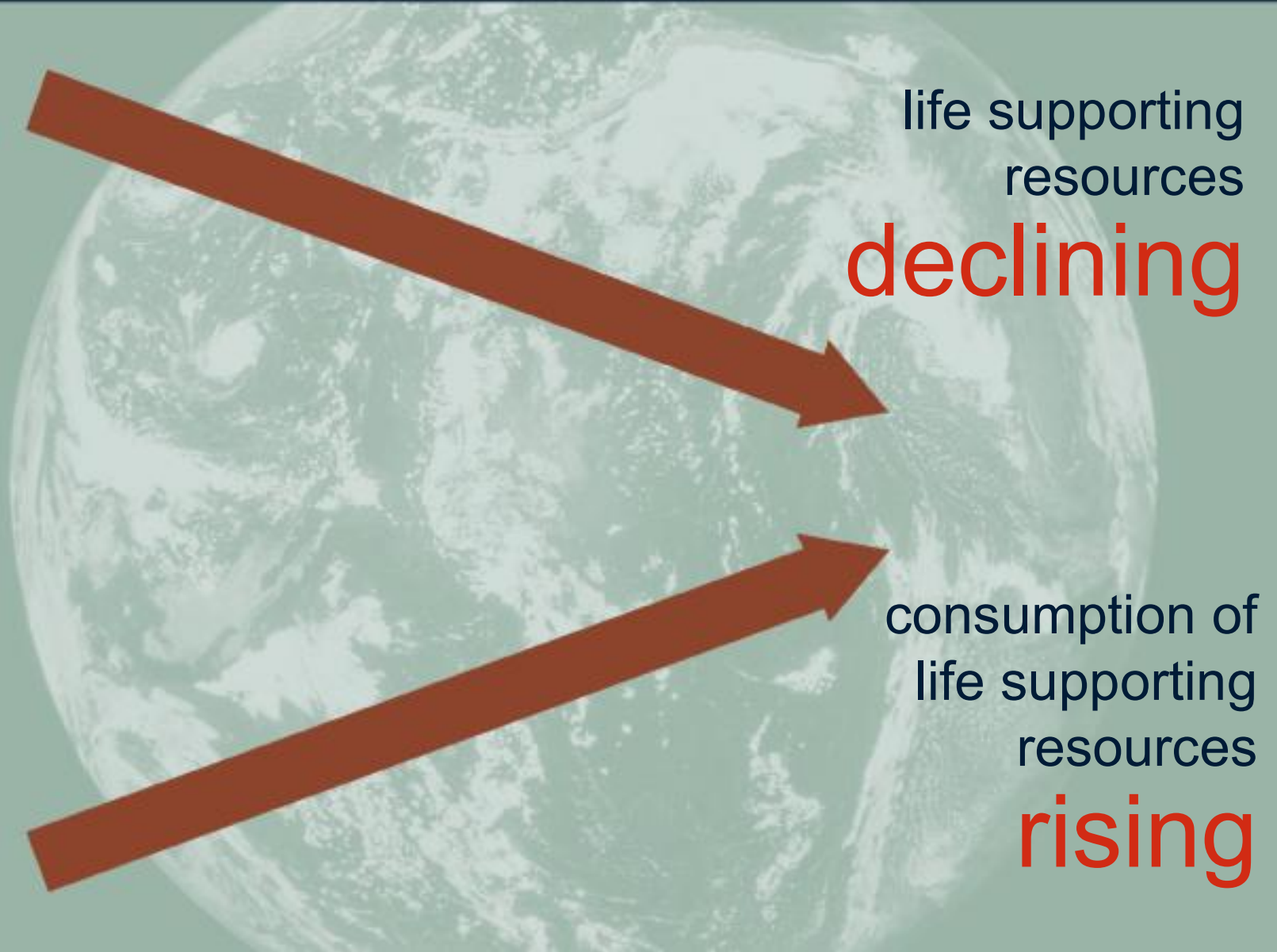
- **What is sustainability – why should we care?**
- **The Army Strategy for the Environment**
- **The Army installation sustainability strategic planning process**
- **Application to the Army National Guard**



What is Sustainability – Why Should We Care?

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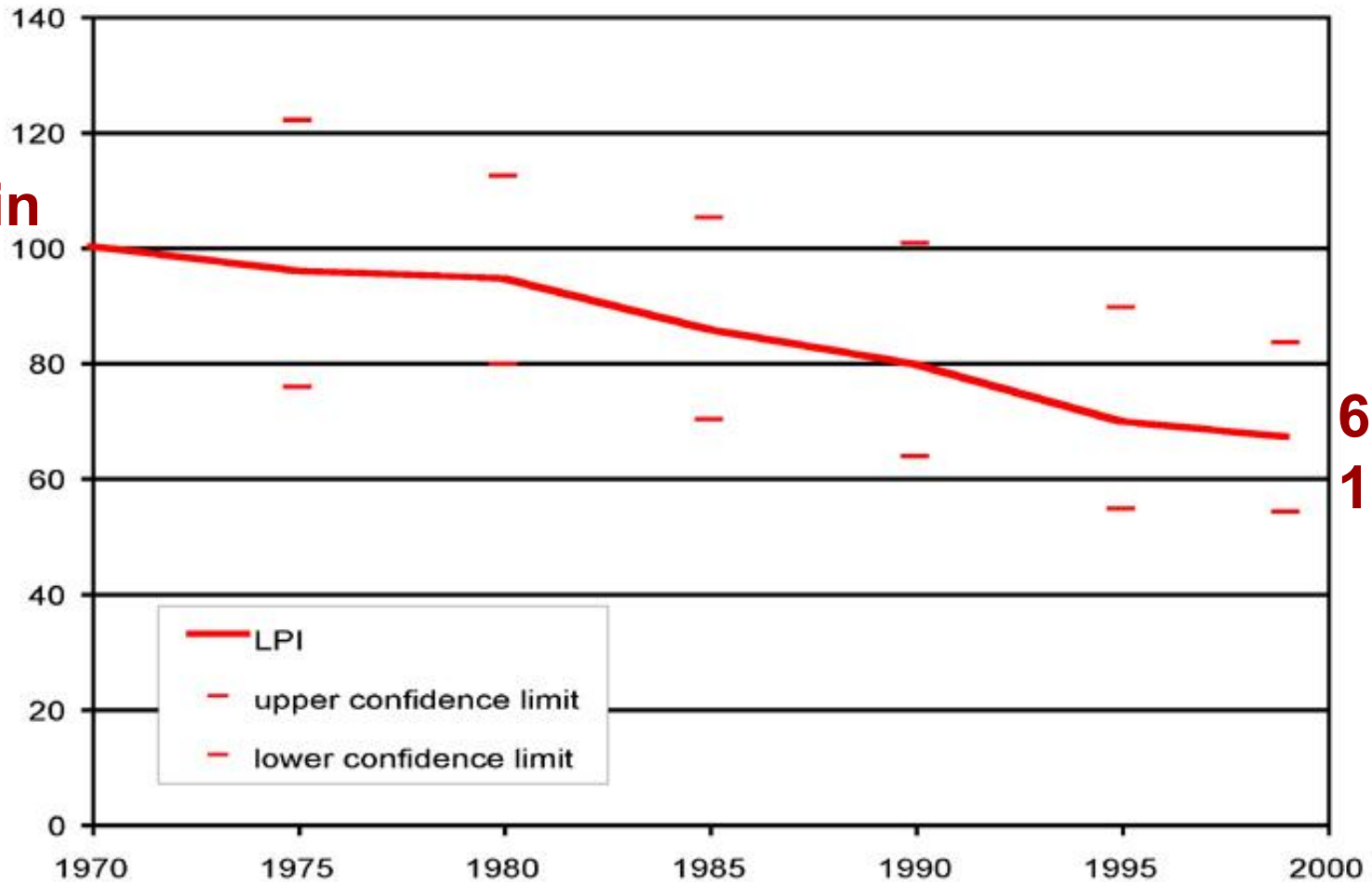
Part 1: The Challenge



Living Planet Index

Figure 1: Living Planet Index, 1970-1999

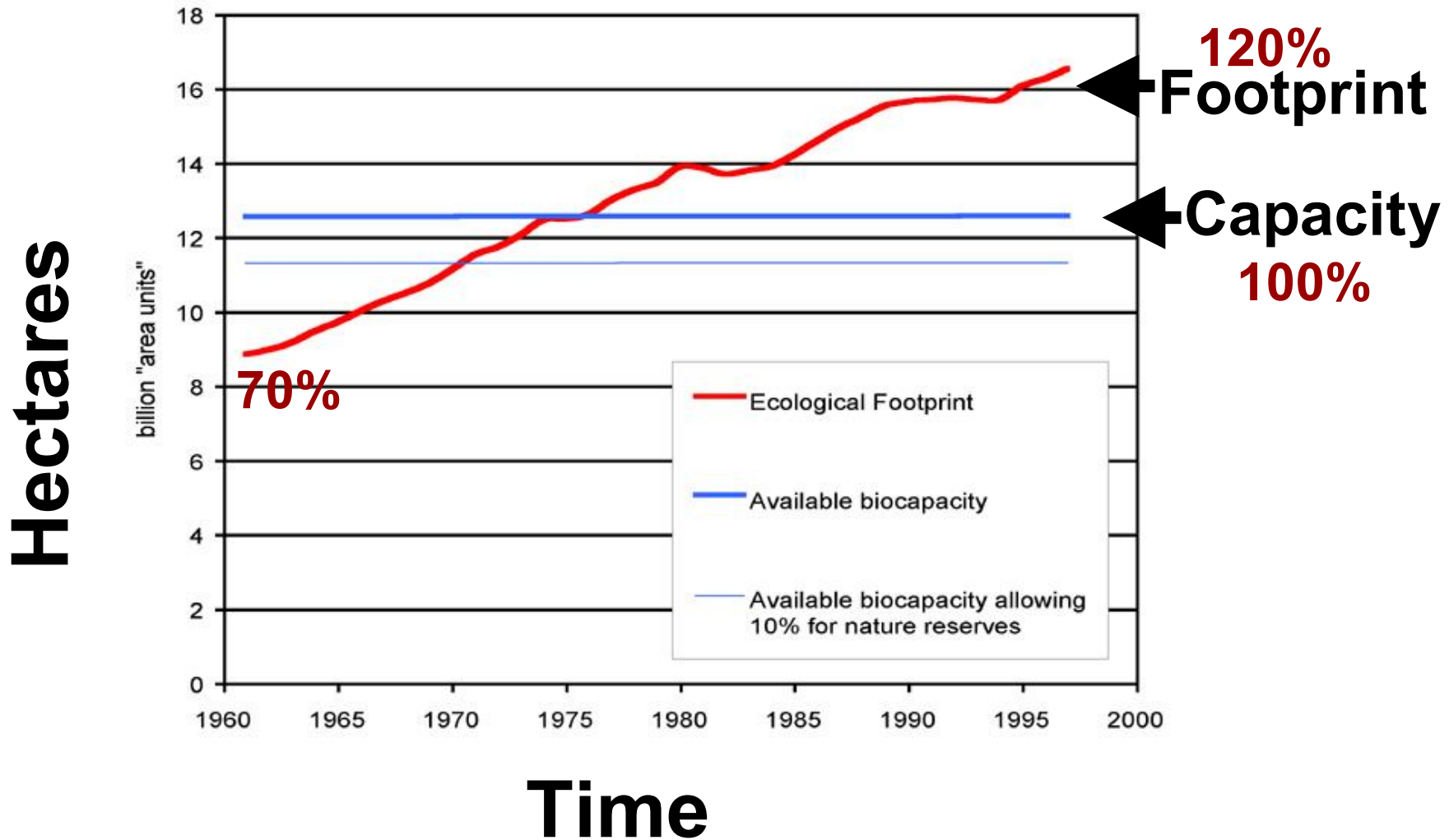
**100% in
1970**



**65% in
1999**

World Ecological Footprint

Figure 2: World Ecological Footprint, 1961-1997





Basic economics

- **Costs increase when supply falls and demand rises**





Rising Demand

- **Demand for resources is rising for three reasons:**
 - ✓ **Population is rising**
 - ✓ **Quality of life is rising worldwide**
 - ✓ **Wasteful and inefficient technology**



Falling Supply

- **Supply of life-supporting resources is declining in both quantity and quality**
- **Ecosystems are losing their capability to regenerate**
- **It's complicated and open to debate – but most scientists world-wide agree**

Inefficient Technology

Linear Industrial Processes

Waste is created faster than it can be reconstituted to quality resources.

Take-make-waste



- 80% of products are discarded after single use.
- 99% of original materials made in the US become waste within 6 weeks of sale.
- One million pounds of waste/person/year

Step 1 - bauxite is mined in Australia

Step 2 - bauxite is trucked to plant for chemical processing 1 ton ore yields up to 1/2 of Aluminum Oxide

Step 3 - shipped to Norway for processing

Step 4 - oxide sits at smelter site for up to 2 months

Step 5 - 2-hour smelting reduces 1/2 of oxide into 1/4 ton of metal

Step 6 - metal ingot cured and shipped to Germany to be rolled

Step 7 - ingot is heated to 900°F and rolled into coil

Step 8 - coil is stored and cold rolled into sheet

Step 9 - sheet metal is shipped to England punched and formed into cans

Step 10 - can is washed, dried, primed and painted

Step 11 - can is lacquered and coated inside

Step 12 - cans are palletized, stored, and shipped

Step 14 - bottler cleans and fills with product

Step 15 - cans are packed in promotional boxes palletized and shipped to retailer

Step 16 - Can is purchased, contents consumed within a few minutes and is thrown away

Life Cycle of a Coke Can



A closed system

***We're at zero balance
on earths – we only have
one, no spares.***

***MG Larry Lust
HQDA***



It all comes down to money...

- “Resource” is a topic that embodies both economic and physical attributes
- We are NOT going to run out of the physical resource - *Did a shortage of stones end the stone age?*
- We ARE going to run out of willingness to pay (in \$, frustration, and consequences) for some resources and in some locations
- So, at \$10 billion dollars or 1 million cases of cancer or 1 million refugees per pound or per barrel or per bushel, we have an infinite supply . . .
What are you willing to pay?



Economists' view

Well being

Human Survival

Goods & Services

Raw Materials

Natural Resources



Ecosystem services

- **\$36 trillion is the estimated worldwide value of ecosystem services such as flood control, water cleansing, air purifying, nutrient recycling etc (1997 dollars)**
- **\$39 trillion was the Gross World Product in 1997 – the sum of all economic activity**
- **Already beyond the theoretical**
 - ✓ **New York City water system – pays annual fees to upstream landowners for the value of ecosystem services provided by undeveloped land**



Effects on the Army

- **Current and future missions**
- **Military training**



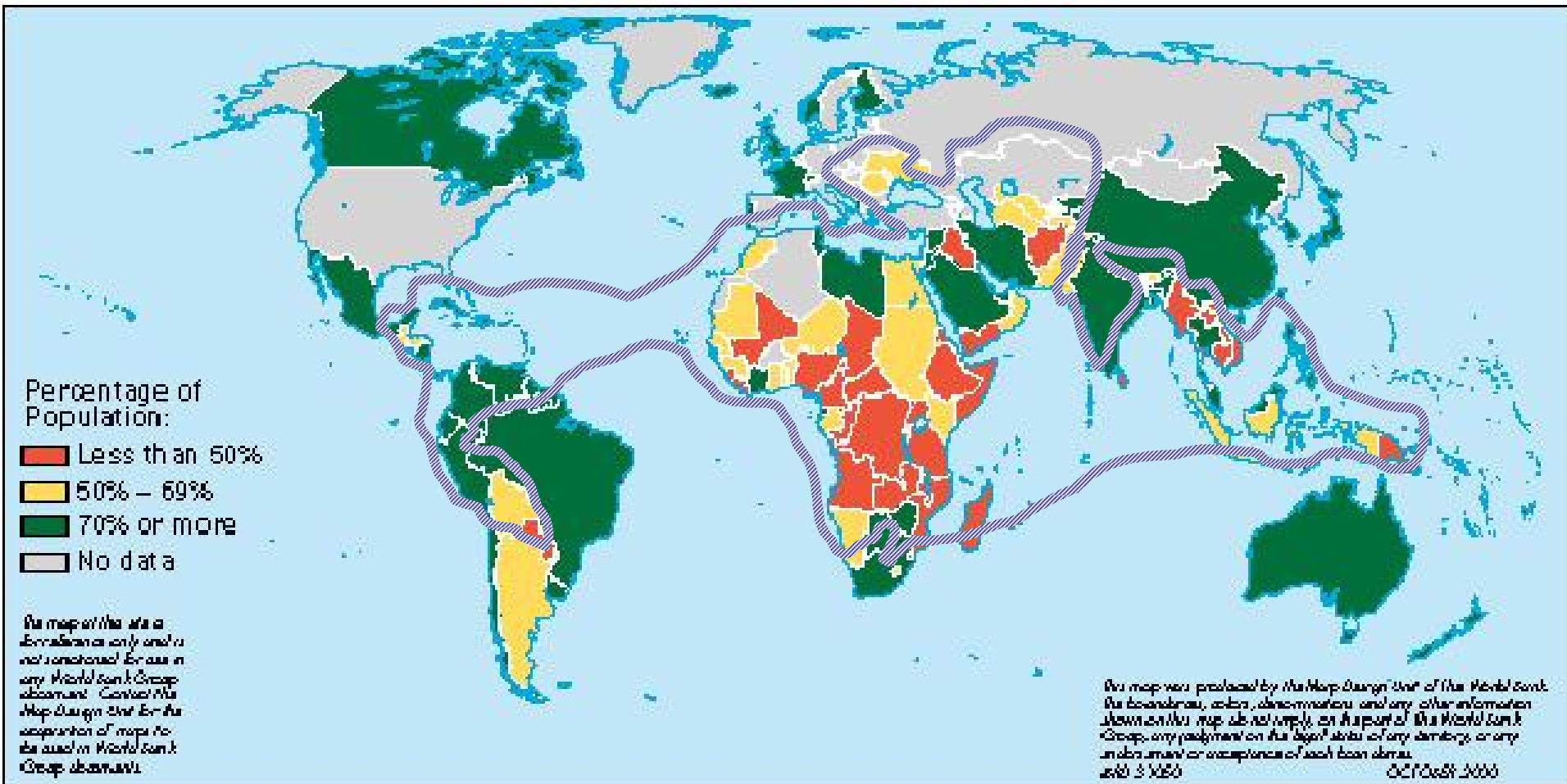
Limited supply also causes...

- ***competition for resources***
- ***instability and conflict***

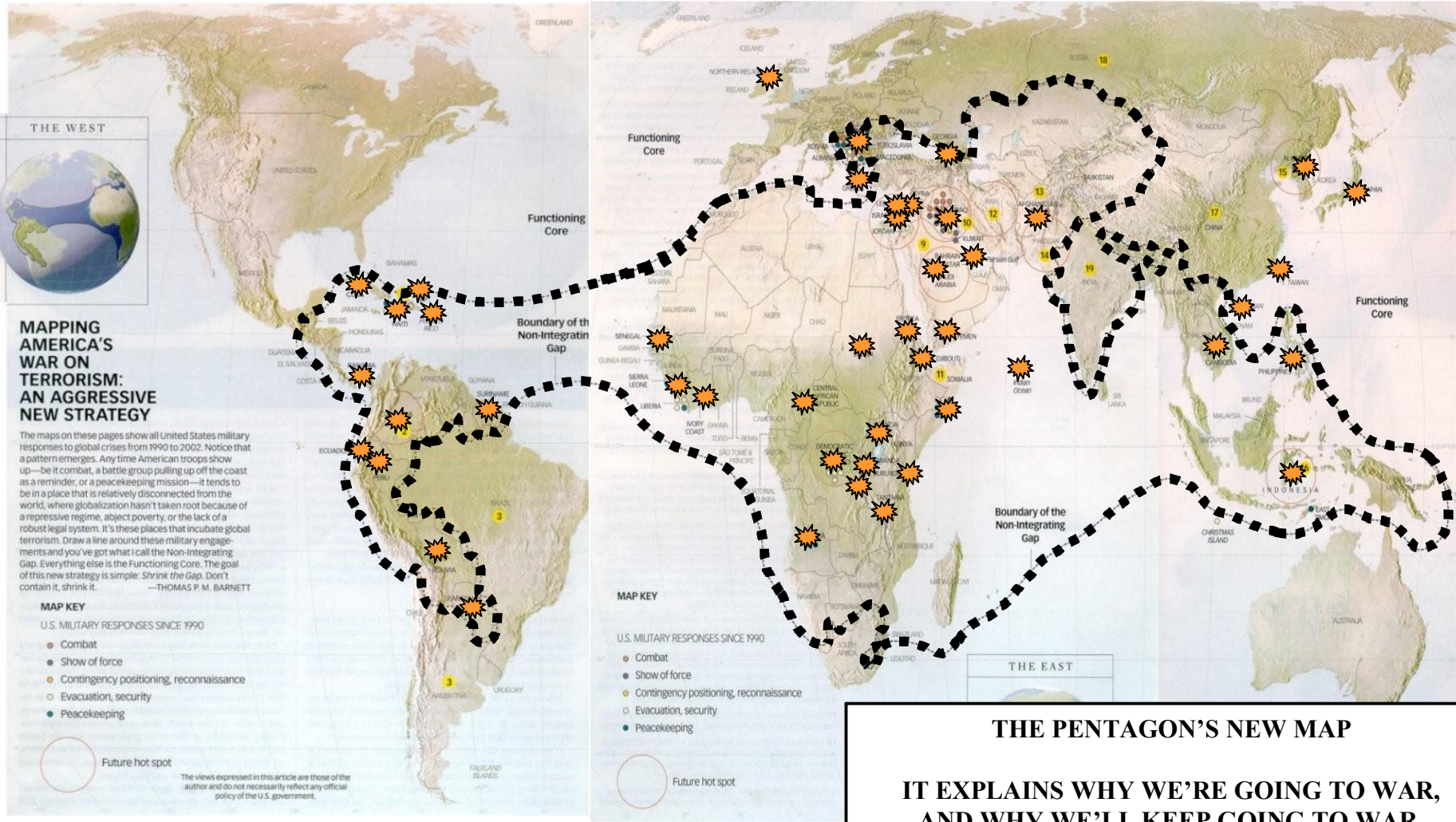




Access to Safe Water, 1990-96



Resource scarcity contributes to instability



MAPPING AMERICA'S WAR ON TERRORISM: AN AGGRESSIVE NEW STRATEGY

The maps on these pages show all United States military responses to global crises from 1990 to 2002. Notice that a pattern emerges. Any time American troops show up—be it combat, a battle group pulling up off the coast as a reminder, or a peacekeeping mission—it tends to be in a place that is relatively disconnected from the world, where globalization hasn't taken root because of a repressive regime, abject poverty, or the lack of a robust legal system. It's these places that incubate global terrorism. Draw a line around these military engagements and you've got what I call the Non-Integrating Gap. Everything else is the Functioning Core. The goal of this new strategy is simple: *Shrink the Gap. Don't contain it, shrink it.* —THOMAS P. M. BARNETT

THE PENTAGON'S NEW MAP

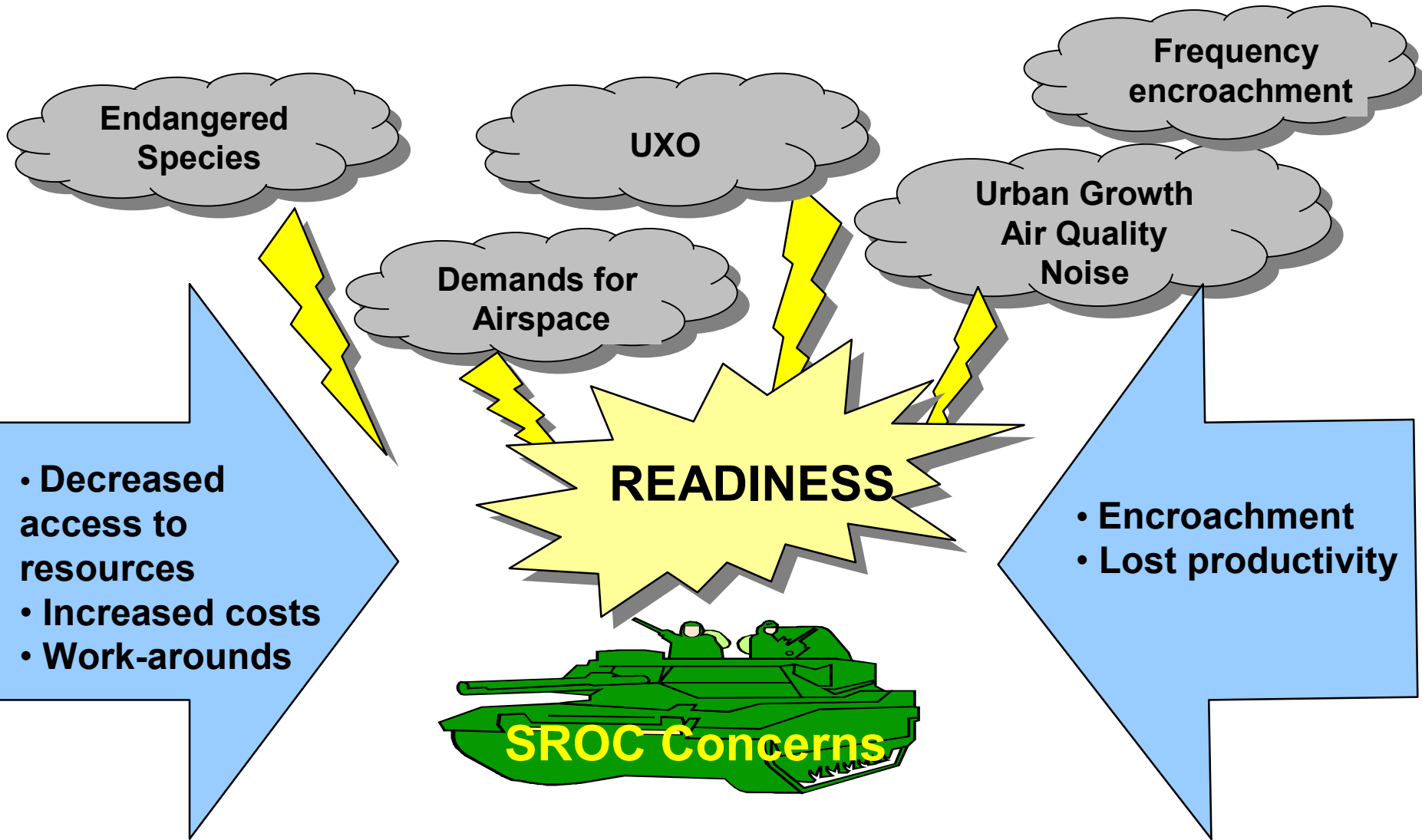
IT EXPLAINS WHY WE'RE GOING TO WAR, AND WHY WE'LL KEEP GOING TO WAR.

BY
THOMAS P.M. BARNETT, U.S. NAVAL WAR COLLEGE
 [MAPS BY WILLIAM MCNULTY]

Printed in Esquire, March 2003

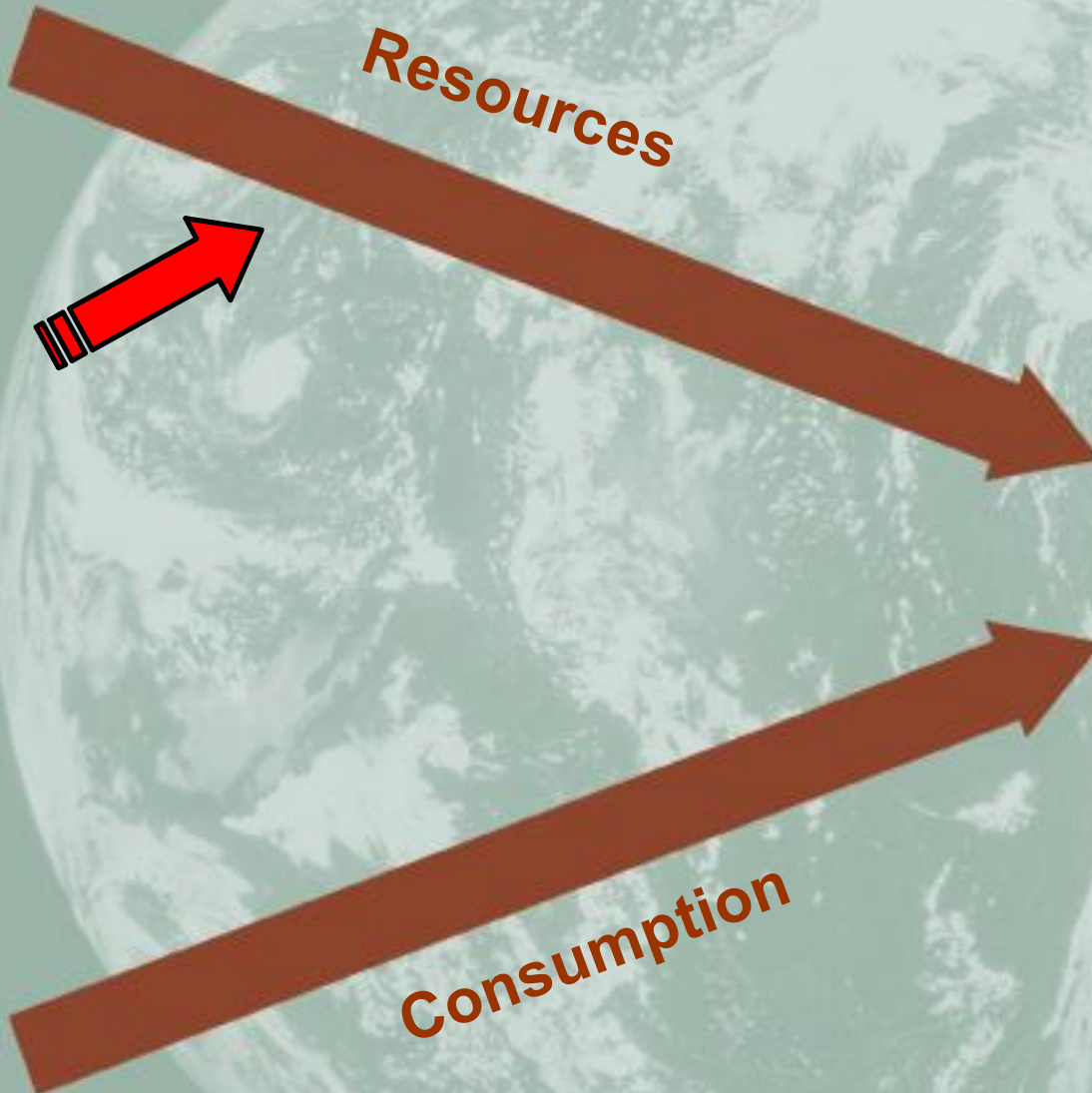
- ☀ **US military deployments 1990 - 2003**
- ■ ■ **The "gap" countries – plagued by poverty**

Challenges to the Military Mission



Source: SECDEF Senior Readiness Oversight Council Report to Congress 2001

Installation Challenges



- Mission constraints
- Public concerns
- Resource scarcity
- Rising costs
- Degradation of air, land, water
- Reduced well-being
- Competition for resources



ENCROACHMENT



Worst case – lost capability

- **Massachusetts Military Reservation**
- **Vieques**
- **Makua Training Range**
- **Fort Bragg - RCW**



Diminished capability

Fort Bragg, faces the following issues that may impact its mission:

- A 125,000 acre **training land shortfall** – and a community growing up to the fence line
- **Air quality** failing to meet federal standards -> potential constraints on smoke/obscurant use, construction, and transportation
- Annual **water demand** of over 3 billion gallons – and the upstream demand for water growing exponentially
- **Skyrocketing resource costs:** \$30M/year for energy alone



Incompatible development near Fort Bragg's Ste. Mere Eglise drop zone



Leadership Concern

- **Congressional testimony**
 - ✓ **impact of environment on readiness**
- **Legislative Relief**
 - ✓ **Readiness and Range Preservation Initiative**
- **State Encroachment Legislation**
 - ✓ **Florida and Georgia**



For the Soldier



Today and Tomorrow

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Army Strategy for the Environment

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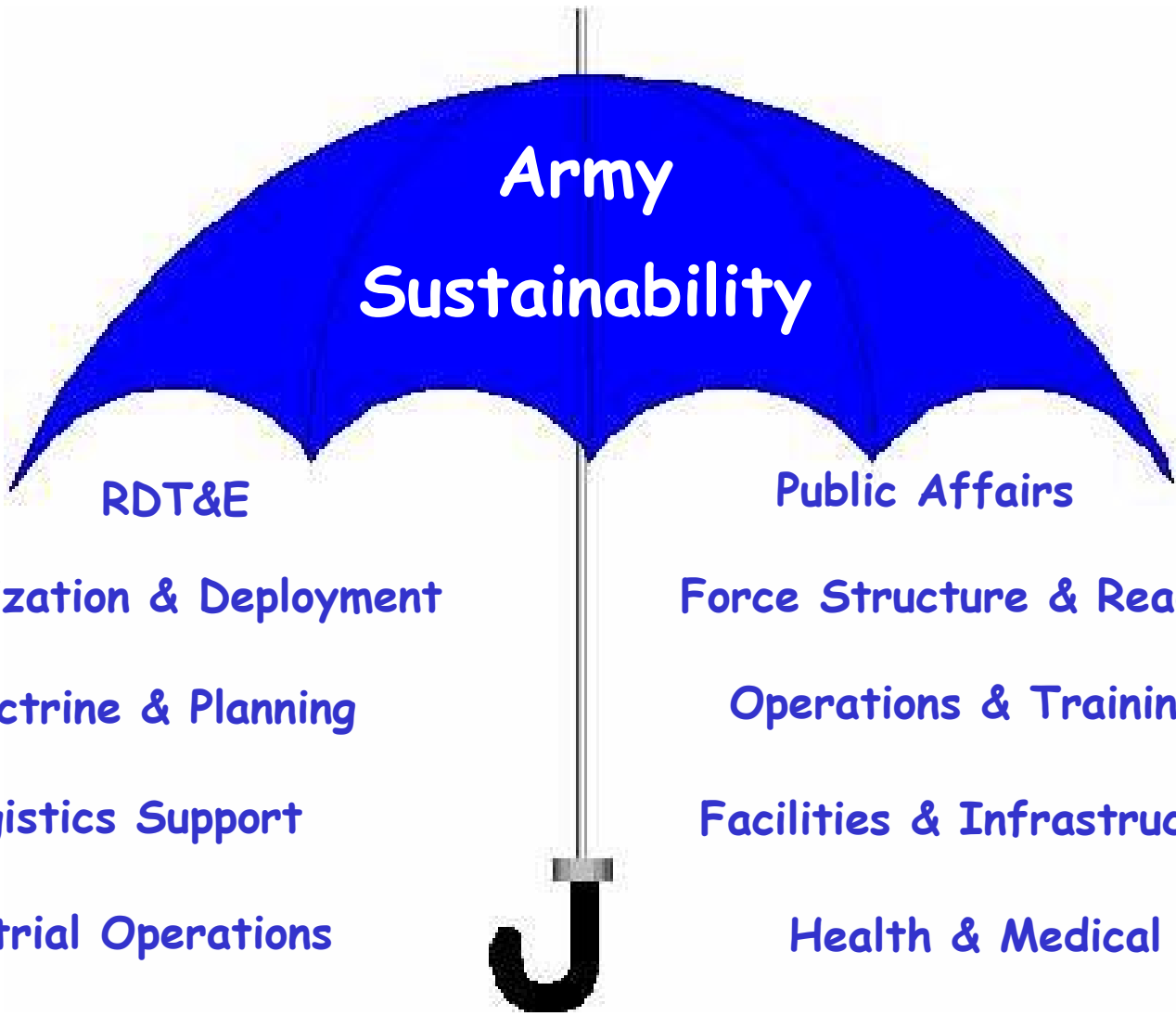


“Recognizing the Need”

Army Sustainability

COL Jeffrey G. Phillips
Chief, Sustainability Division
OACSIM/ODEP

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Army Sustainability

RDT&E

Public Affairs

Mobilization & Deployment

Force Structure & Readiness

Doctrine & Planning

Operations & Training

Logistics Support

Facilities & Infrastructure

Industrial Operations

Health & Medical

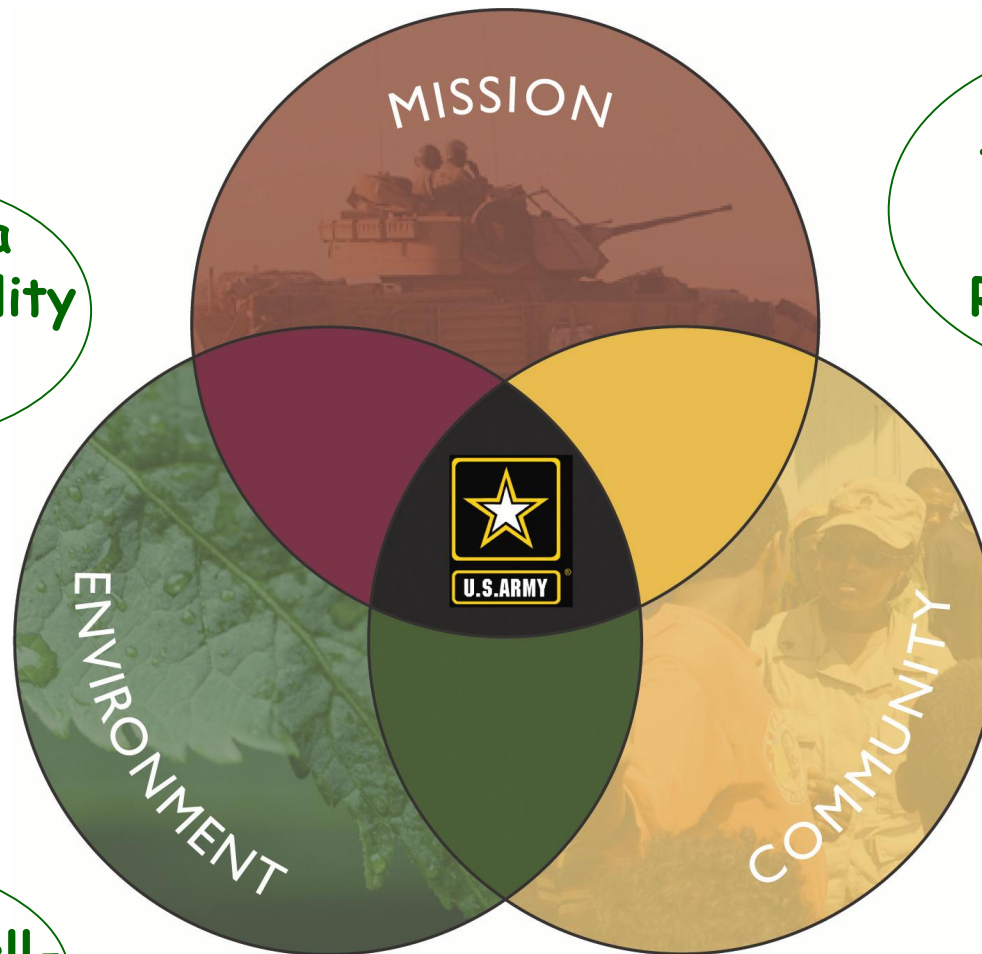
Systems Acquisition

Base Operations

Transportation



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Foster a Sustainability Ethic

Meet Test, Training and Mission Requirements

Strengthen Army Operations

Minimize Impacts and Total Ownership Costs

Enhance Well-Being

Drive Innovation

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“Triple Bottom Line”



Lewis

NORTHWEST

NORTHEAST

PAARNG

AP Hill

Eustis

Carson

Knox

Campbell

Bragg

Jackson

SOUTHWEST

SOUTHEAST

Hood

Polk

Rucker

Benning

Stewart / HAAF

IMA-PARO

Anniston AD

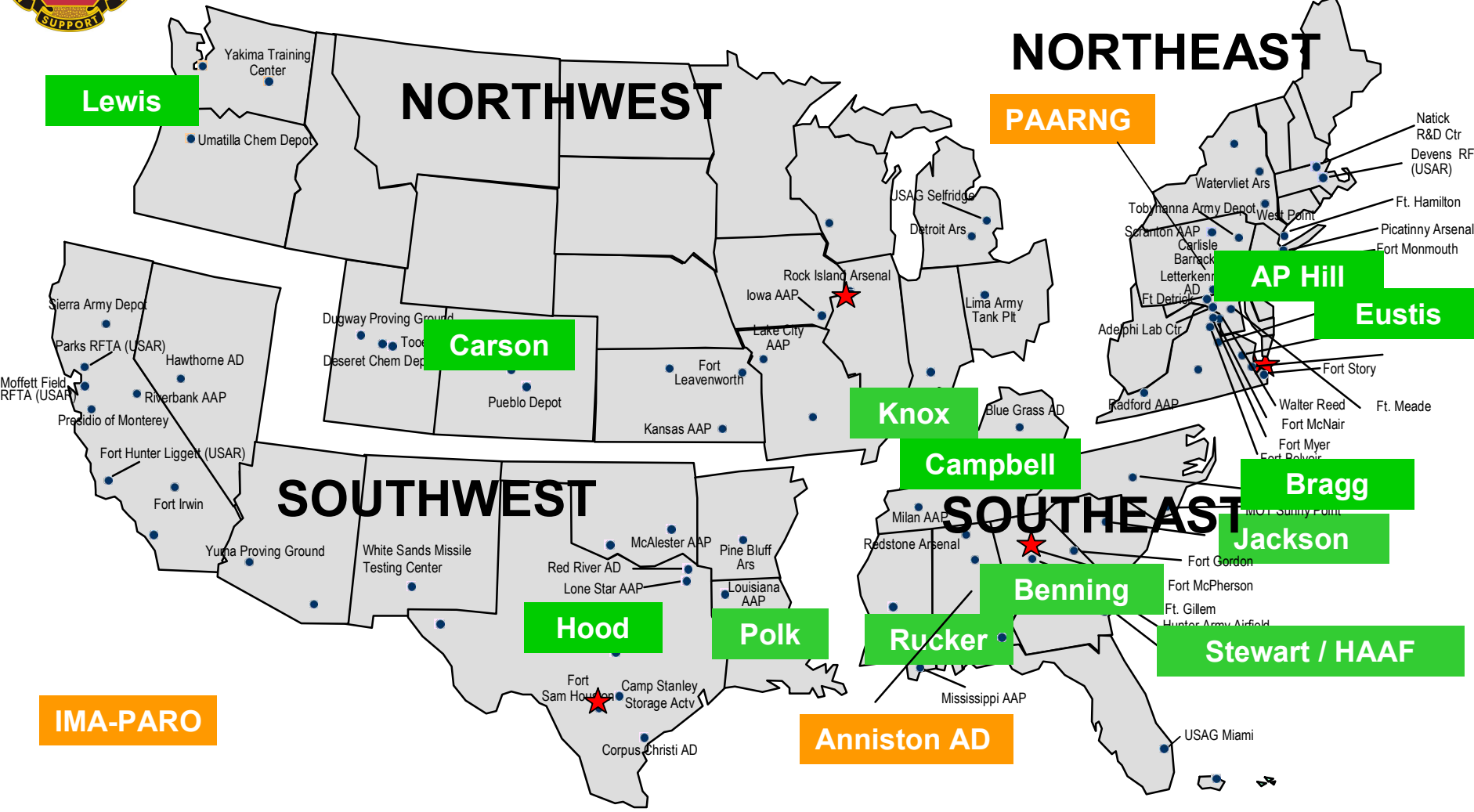
IMA-EURO

13 installations doing sustainability planning

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FY07 Installation Sustainability Efforts

As of Sep 06



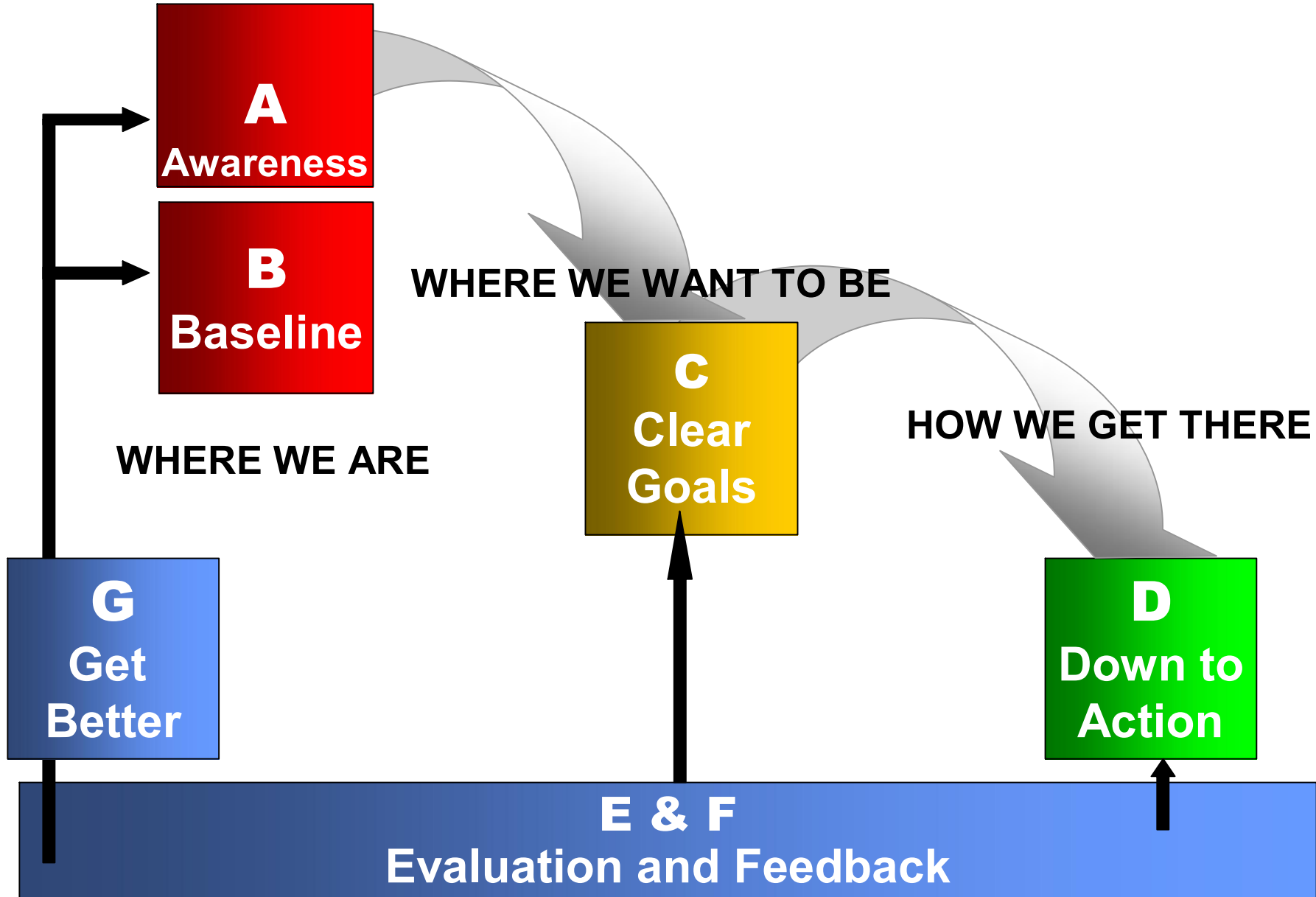


Army Installation Sustainability Strategic Planning Process and Results

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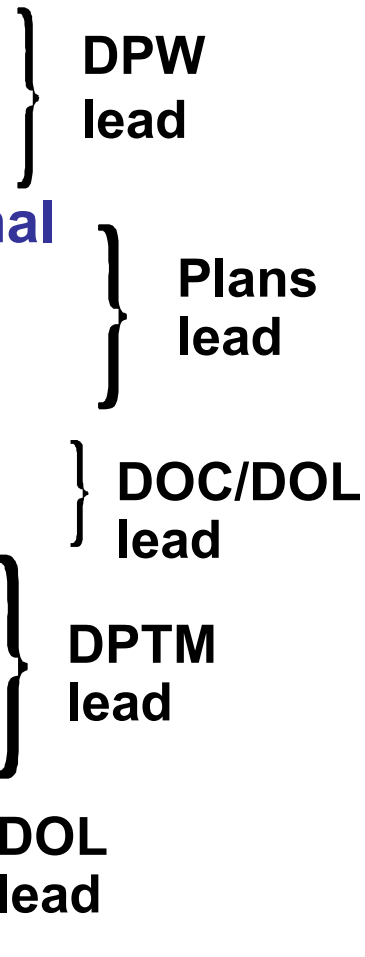
Strategic planning for sustainability – IMA ABCDEF Model





Installation Sustainability Goals - Include all core business processes

- **Facilities – meet platinum SPiRiT standards**
 - **Energy – renewable, secure energy**
 - **Water – reduce use, improve quality**
- **Strategic and Functional Planning – joint regional planning, planned development/growth, compatible land use, regional education**
- **Procurement – completely cyclable non-toxic materials, no waste, local sources**
- **Military Training/Land Management – optimize use of existing training lands, create easements/buffers around fencelines**
- **Transportation – convenient (reduced congestion), reliable, clean (emission-free), renewable fuels**

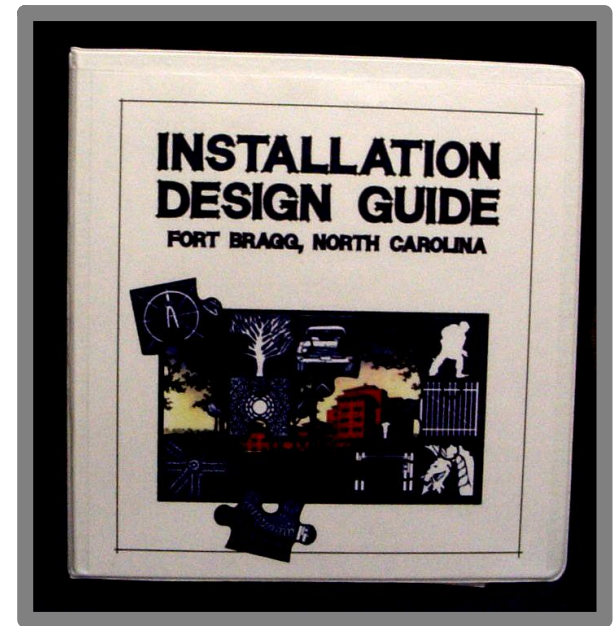




Facility Goals – build to SPiRiT

Standards

- Bragg - integrated SPiRiT Standards throughout the Installation Design Guide
- Bragg, Hood – Built pervious pavement demonstration project for better storm water management
- Hood – inserting sustainable design criteria into construction practices
- Carson – built “silver” training facility
- Bragg – built “gold” facility for Golden Knights at no additional cost



Fort Carson “silver” building



Energy goals – renewable, secure energy

- **Bragg - solar/wind powered lighting at remote access control points**
- **Bragg - Working energy efficient family housing designs with RCI partner**
- **Lewis – photovoltaic pilot project**
- **Lewis – National Renewable Energy Lab study on renewable energy resources (biomass)**





Water goals – reduce use, improve quality

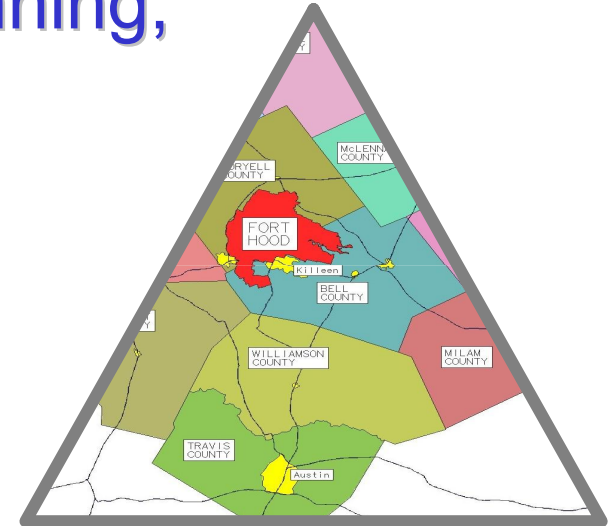
- **Bragg – 30% reduction in potable water use 2002; feasibility study for reclaiming treated wastewater for irrigation**
- **Carson – 10% reduction in water use 2002**
- **Lewis – Planning for wastewater reuse for irrigation starting 2007**
- **Hood – water conservation and water resource planning**



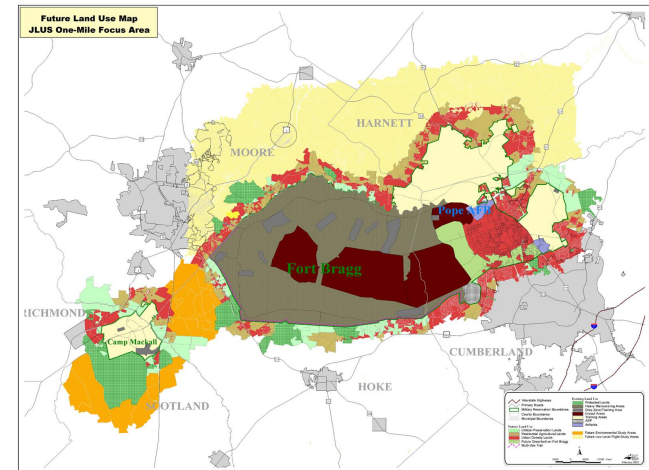


Regional goals – joint planning, outreach

- Hood, Bragg, and Lewis – leading regional sustainability initiatives
- Bragg - Development of a 6-county and Fort Bragg GIS to support regional land-use planning
- Carson – working with community planners to build a recycling center vs homes outside the fence line



Ft. Hood – central Texas – one Community



Fort Bragg/Pope Air Force Base Proposed Future Land Use Map



Procurement goals – cyclable materials, no waste

- Hood – evaluating construction materials (agriboard, porous pavement)
- Campbell – evaluating complete reuse of household garbage and building deconstruction
- Bragg – 59% landfill diversion and grinding all concrete rubble for road pack
- Lewis – evaluating recyclable carpet tiles, CO2 dry cleaning, plastic wood; going for 40% landfill diversion
- Carson – increased recycling 25% and decreased HW by 31%



Processed household garbage –
soil amendments, plastic lumber



Fort Bragg Sustainability Accomplishments –2001-2005

- Built “Freedom Village” in a couple months out of excess materials
- Reduced potable water usage by 30%
- Converted all concrete demolition rubble into road aggregate for training land restoration
- Increased solid waste diversion rate to 59%.
- Established a neighborhood recycling program
- Built a 36,000+ sq foot "gold" facility for the Golden Knights Parachute Team,
- Revised Installation Design Guide to incorporate SPiRiT, the Army's green building standards.
- Completed a Joint Land Use Study
- Created a seven-county GIS database used by all counties to make integrated land-use decisions.
- installed solar and wind-powered exterior lights which are completely off the grid
- Converted all 150 non-tactical vehicles to alternative fuels
- Using biodiesel in all Range Control diesel vehicles.
- implemented an on-post shuttle bus service that connects with the city bus system
- Incorporated both pedestrian and bicycle paths into all construction projects.
- Identifying local sources of procurement for commonly used items
- Established Sustainable Sandhills regional partnership with 6 surrounding counties



The list goes on and on - **INCREDIBLE** progress in 3 short years, all without huge investments of \$\$s, by people pulling together across staff elements towards common goals.



Zero Energy Housing Demonstration

Description: Energy costs continue to rise. The military, through its housing privatization partnerships will build the housing for military families that will last for the next 50 years. The need is to validate and institutionalize those technologies that can reduce future costs and impacts of operating and maintaining facilities. Demonstrate/validate the “zero energy housing” concept for the Army/RCI by building 6 houses with the Fort Campbell RCI partner Actus Lend/Lease that will demonstrate efficient, super efficient, and zero energy (or near zero energy) designs and technologies.

Interested Installations: Ft Campbell and ACTUS Lend/Lease are willing to do the demonstration project. Lessons learned on viable technologies can be applied to all RCI efforts, and will at a minimum be integrated into all ACTUS Lend/Lease projects (40,000 planned military units).

Objectives and Deliverables:

- ✓ Build 6 houses that provide examples of very energy efficient (2 Units), super energy efficient (2 Units) and zero energy (2 Units). ACTUS has already decided to construct units. We need funding to do detailed performance monitoring.
- ✓ Monitor economic, environmental, and functional performance.
- ✓ Develop business case study, document first costs vs life cycle costs, and provide to all RCI partners.

Estimated Cost: Cost \$360K to include support in design and monitoring.

Duration: 24 months.

Partners: Corps of Engineers, DOE, EPA,

System Links: Once the business case can be made at one installation with one RCI partner, this effort could impact thousands of military staff living quarters.



Range Slash Biomass to Energy

Description: Slash from timber harvesting reduces the utility of training areas, increases the chance of fires and may remain in place for up to 10 years. The cost to remove is about twice the cost of destroying during prescribed burns. However, if the small diameter wood could be collected and converted to energy (especially during peak energy demand times) the cost of removal might be off-set by energy savings. Further, in some instances, energy generation during critical peak times can result in rebates from the power supplier. Several mobile systems are available that could take wood waste and convert them to power. For this case, Fort Campbell seeks to demonstrate a portable gasification and power generation system made by Biomax Systems that will convert small diameter woody biomass to power.

Interested Installations: Forts Campbell, Stewart, Jackson. DASA I&E/ESOH is interested in terms of deployable systems and is already working with Southern Command on a demonstration.

Objectives and Deliverables:

1. Identify candidate technologies
2. Develop a demonstration plan
3. Develop funding proposal (ESPC, ESTCP, etc.)
4. Conduct demonstration
5. Develop case study

Estimated Cost: \$435,000

Duration: 18 months to get started

Partners: USFS, EPA, ESPC contractor, Homeland Security

System Links: Directly supports range management and training missions. Can support efforts to develop deployable energy production systems that can rely on fuels on location (interest from DARPA, DASA I&E, ESOH, and ESTCP), relevant to disaster debris management and emergency power production. This project links to the C&D mining project. A technology demonstration may be appropriate for multiple uses.



Product/By-Product Synergy

Description: The Project has, at its core, the idea of product and by-product synergy. This is the practice of matching under-valued waste or by-product streams with potential users. This helps create new revenues or savings for the entities involved (hence the waste to profit moniker) while simultaneously addressing social and environmental impacts. Unlike waste exchanges, product/byproduct synergy recognizes that the acceptance of one entity's material as a feedstock for another takes more than simply announcing its availability. Rather, it is a *relationship-building and networking process* between individuals and companies. The Project will establish a network of city, military installation, small manufacturing, agricultural, and industrial users who are turning their waste streams into revenue streams. It will therefore serve the dual functions of reducing the region's collective impact on the environment while strengthening the viability of its critical, job generating sectors.

Interested Installation: Fort Bragg

Objectives and Deliverables:

- ✓ **Planning:** An information collection and facilitation process, bringing information and people together from a diverse set of Sandhills communities to reveal and discuss feedstock needs and by-products. In particular, this phase will identify the top 50 candidates for by-product synergy in the region. This phase also has the additional benefit of providing information and identifying likely advocates for sustainability and green business.
- ✓ **Detailed Market Definition:** A thorough analysis of waste streams of up to 25 companies, with a minimum of ten companies participating. Similar analyses of the wastes produced by military installations as well as the materials that represent the largest purchases of the installation.
- ✓ **Implementation/Network Creation:** The creation of by-product synergy flows between at least ten partners. The military installations would seek partnerships with local firms capable of producing needed goods and capable of using their "wastes". The working session(s) would be designed to learn about what loops could exist based upon the materials and products routinely used and waste currently discarded.
- ✓ **Technical Evaluation:** Once we identify potential loops, the team will work to explore potentials to:
 - Use waste as feedstock for other processes;
 - Identify new products that might be developed using "waste" materials;
 - Explore ideas for new sustainable products that companies may be interested in developing to provide a more sustainable option to interested military markets; and
 - Link military installations to firms that might be able to support them in developing sustainable services and products in their local/regional communities.

Estimated Cost: None at the moment.

Duration: 12 months to get up and running. Then on-going operated by regional efforts.

Partners: Fort Bragg, Sustainable Sandhills, NC Business Council for Sustainable Development, NC DENR, Camp LeJeune, several companies.

System Links: This concept has potential links to all solid waste issues our installations have. This process can help form the mechanism for creating "cradle-to-cradle" or zero waste material use patterns at an installation.

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Water System Sealant Demonstration

Description: Leaking waste water treatment systems create environmental impacts, regulator concerns, and impact the efficiency of the treatment system (inflow). The traditional option has been replacement of pipes. Cook Composites and Polymers has developed an in-place composite system that coats the interior of the pipe with a composite made from poultry feather fiber. The estimate cost of this option is ½ that of replacement.

Interested Installation: Fort Bragg

Project Steps:

1. Develop proposal for ESTCP consideration.
2. Submit in February 07.
3. Conduct demonstration and validation.
4. Develop business case study.

Estimated Cost: \$500-750K over 3 years.

Partners: Local poultry manufacturers, Sustainable Sandhills

Basis: System has been used extensively by communities seeking cost effective way to repair leaking sewer systems without



Waste to Energy/C&D Landfill Mining

Description: C&D landfills and demolition debris use land that might be put to other purposes. As current C&D landfills are consumed, installations will be faced with increasing costs to dispose of waste off-site. C&D landfills may represent value from materials and fuel for power production. Under this project, the host installation would establish process to glean value from C&D waste by extracting materials with value – copper, concrete, etc. If this process is cost beneficial, the installation would evaluate the technical and economic feasibility of reclaiming C&D materials that have been previously landfilled. The goal would be recovery of materials and land reclamation.

Interested Installation: Forts Bragg and Campbell

Objectives and Deliverables:

1. Establish process for future C&D waste
2. Collect data on amounts recovered, economics, and landfill space preserved
3. Evaluate feasibility for landfill mining
4. Develop excavation plan
5. Conduct pilot test
6. Develop case study

Estimated Cost: Initial contract for service is under consideration at Fort Bragg to be paid for from QRP funds. Data evaluation and pilot would require up to \$375,000.

Duration: 18-24 months

Partners: Service firms, EPA, State Regulator

System Links: Mining may have link to material recovery, purchase of recycled



Sustainable Installations

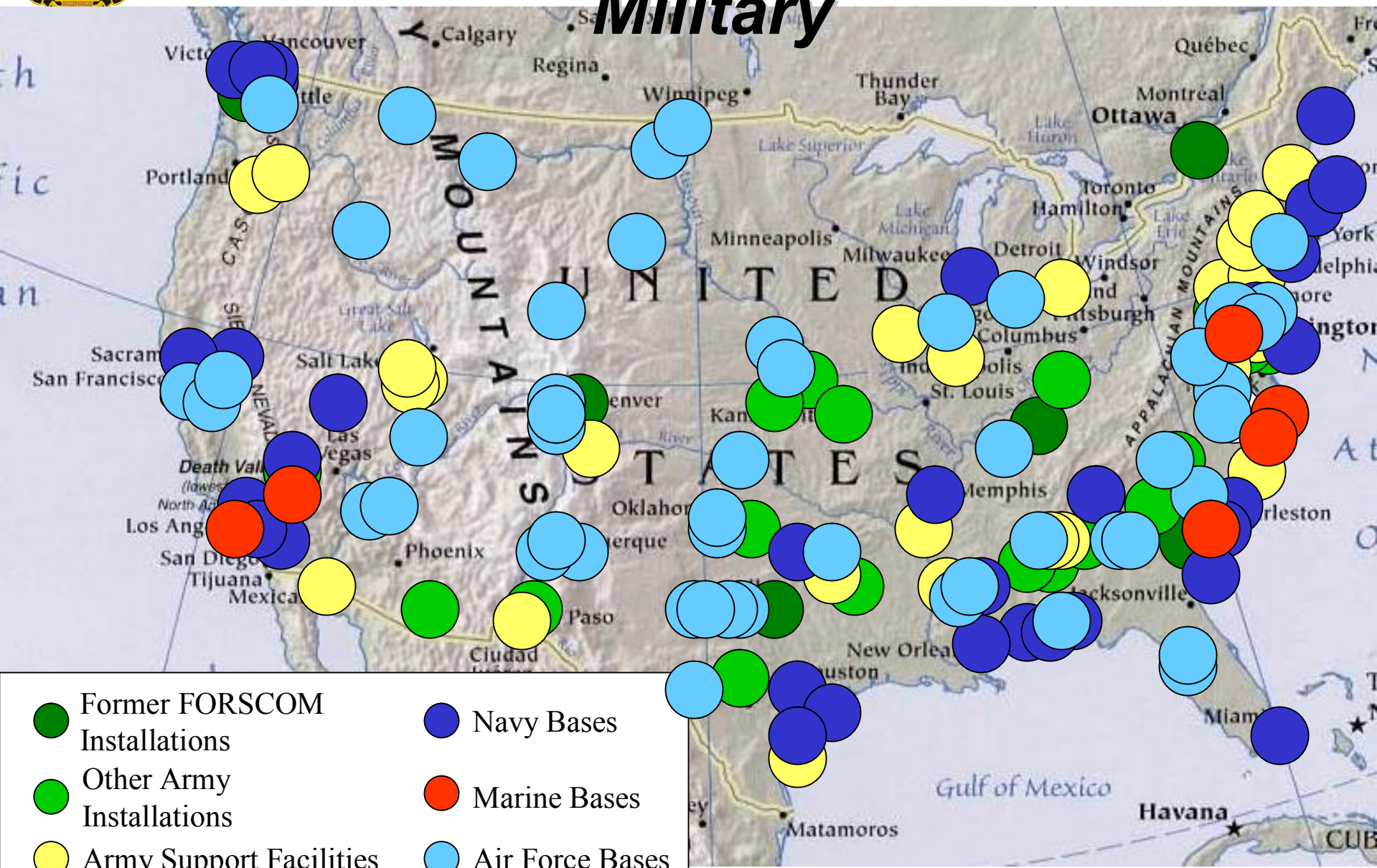


An integrated approach
that includes all
stakeholders – military,
civilian, communities,
regulatory agencies....
to ensure
READINESS.



Sphere of Influence – Active

Military





SUSTAIN THE MISSION.



SECURE THE FUTURE.





Questions?

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Closing Thought

“When times are new, we must think anew. We must disenthral ourselves.”

A. Lincoln

