Sustainability at the Installation Scale: A Comparison of LEED-ND and Systems-based Sustainability Assessment

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Overview

• Project History
• Goals and Approach
• Systems-Based Sustainability Assessment
• Comparison of LEED with Systems-Based Assessment
• Conclusions and Future Work
Federal agency needs:

- Comply with new legislation
- Expedite master planning
- Deal with Base Realignment & Closure
- Maximize future flexibility
- Look beyond transformation: “Army after next”
- Find new synergies
Project History
Sustainability and the US Army

- Army’s SPiRiT rating system attempted to adapt LEED-NC to military projects
- Current policy requires LEED Silver certifiability for MILCON projects
- Variety of installation-specific efforts, including sustainability master planning
LEED for Neighborhood Development (LEED-ND)

- Credit Categories include:
  - Smart Location & Linkages
  - Neighborhood Pattern & Design
  - Green Construction & Technology
  - Innovation & Design Process

- Pilot projects range from 0.17 - 12,800 acres (0.07 - 5180 ha)

http://www.usgbc.org
Goals and Approach

Research Questions

• How sustainable is an installation master-planned using LEED for Neighborhood Development?
• Can LEED-based plans be improved using Best Available Technologies & Strategies (BATS)?
• Which BATS make the most sense in terms of sustainability “bang for the buck”? 
Goals and Approach

Project Objectives

• To determine if any improvements can be made to recommendations developed in prior studies
• To identify existing BATS that could be implemented to improve on LEED-ND
• To delineate areas where R&D is needed to develop technologies and strategies for installation sustainability
• To compare the outcomes of LEED-based solutions with systems-based solution development
Systems-Based Approach

- GAP ANALYSIS of facility states
  - IDEAL SUSTAINABILITY STATE
  - STATUS QUO STATE
  - PROPOSED RETROFIT STATE

- Pool of Sustainable Facility BATS (Existing)
  - Set of Applicable BATS
  - Functional Description of Missing BATS

- PERFORMANCE-BASED SPECS: New Technology and Strategies

- Cost-Benefit Analysis
- Feasibility Analysis

- RECOMMENDATIONS of Existing BATS
  - Applicable BATS
  - Infeasible & Non-cost Effective BATS

- Set of Applicable BATS
- Missing BATS
- Sustainability Improvement Opportunities
In the context of this study, a “sustainable installation” is one in which current and future states of the facility cause no net negative impacts to resource bases or ecosystems, while satisfying the needs of its stakeholders.
Defining Ideal Sustainability State

- Stakeholder Satisfaction $\geq$ Basic needs met
- Resource Base Impact $\geq$ No or neutral impacts
- Ecosystem Impact $\geq$ No or neutral impacts
Define the installation as a system:
SECOND-ORDER STRATEGY: Add new flow with positive impacts to offset negative impacts

SECOND-ORDER STRATEGY: Find better sources/sinks for the SAME flow

SECOND-ORDER STRATEGY: Find better flow to displace existing flow with negative impacts

THIRD-ORDER STRATEGY: Help affiliated source/sink improve its impacts

FIRST-ORDER STRATEGY: Reduce or eliminate the need for a flow by changing stakeholder behaviors, requirements or expectations

FIRST-ORDER STRATEGY: Do something positive on site to offset unrelated negative impacts

FIRST-ORDER STRATEGY: Reduce or eliminate the need for a flow by optimizing the building or site

FOURTH-ORDER STRATEGY: Help unrelated system improve its impacts

Sustainability Improvement Opportunities
Scaled-up Flow Model

Generic Project Typology
What about synergistic effects? Traffic, air quality, etc.?
125 discrete improvement recommendations were identified, including:

- **Installation Inputs**
  
  “Include grid-integrated distributed renewable energy generation capabilities on post.”

- **Installation Outputs**
  
  “Import dredged materials from local waterways and use for fill.”

- **Intra-system Impacts**
  
  “Use Enhanced Use Leasing (EUL) to encourage active use of underutilized facilities on post.”

- **Emergent System Impacts**
  
  “Establish delivery consolidation process to minimize delivery vehicle trips.”
Conclusions

• LEED provides a well-understood method for identifying sustainable best practices, but it does not address all the possible impacts of an installation that could affect its sustainability.

• It presently is limited in the scope of project types, impacts, and life cycle phases it considers.

• The systems-based method addresses these issues by being generalizable to multiple project types and phases and by providing a systematic means for identifying all impacts.
Conclusions

- There are negative impacts associated with installations/neighborhoods that are presently unavoidable.
- With current technologies, offsets are the only way to cost-effectively neutralize some kinds of negative impacts.
- There is significant room for improvement in current practice using existing BATS - stakeholders need to look beyond minimum LEED requirements!
LEED vs. Systems-Based Assessment

• LEED and the systems-based assessment method are complementary:
  – LEED is an easy to understand way of finding and capturing low hanging fruit, although it still has some blind spots
  – Systems-based sustainability assessment helps to identify and fill in the gaps
  – Used together, the tools can result in a more sustainable installation than LEED alone
Future Work

- Finer resolution of model objects to capture specific project types and context factors
- Additional, more detailed set of objects based on known military project prototype designs for common facility types
- Additional BATS information captured in a searchable repository
- Agent-based models to capture emergent properties of subsystems
- Eventual scaling of approach to a portfolio level (without geographic continuity)
Questions?

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