

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

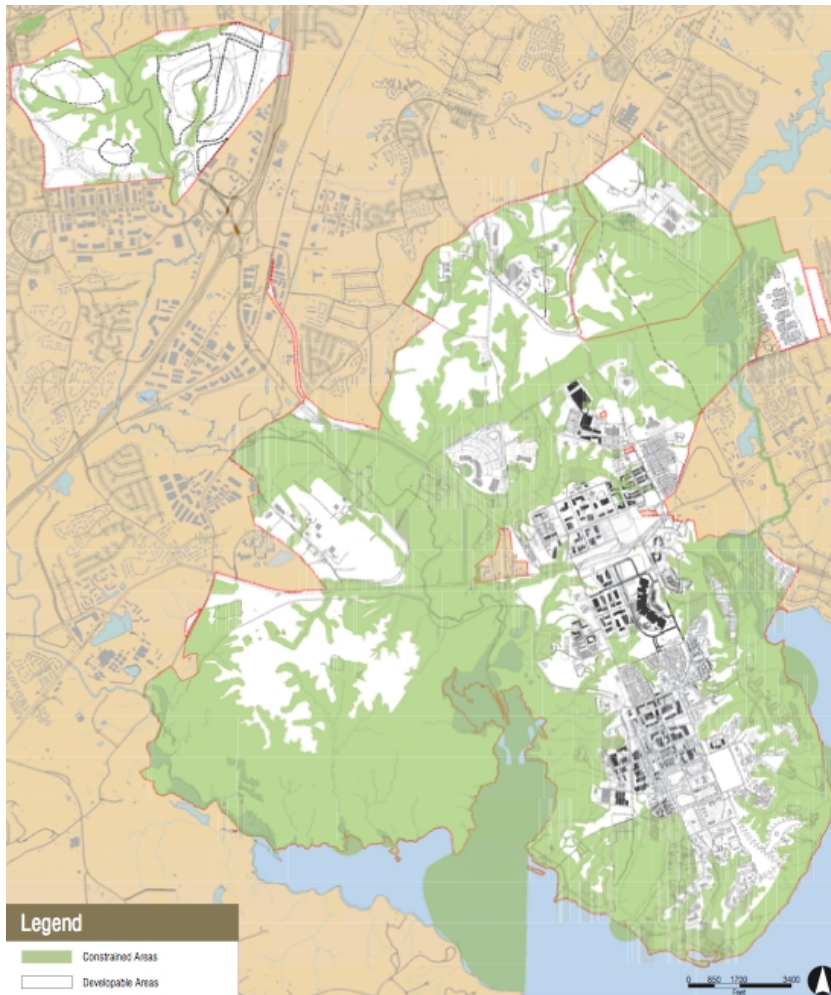
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# Overview

- Project History
- Goals and Approach
- Systems-Based Sustainability Assessment
- Comparison of LEED with Systems-Based Assessment
- Conclusions and Future Work

# Project History

## *Sustainability and the DoD*



- 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

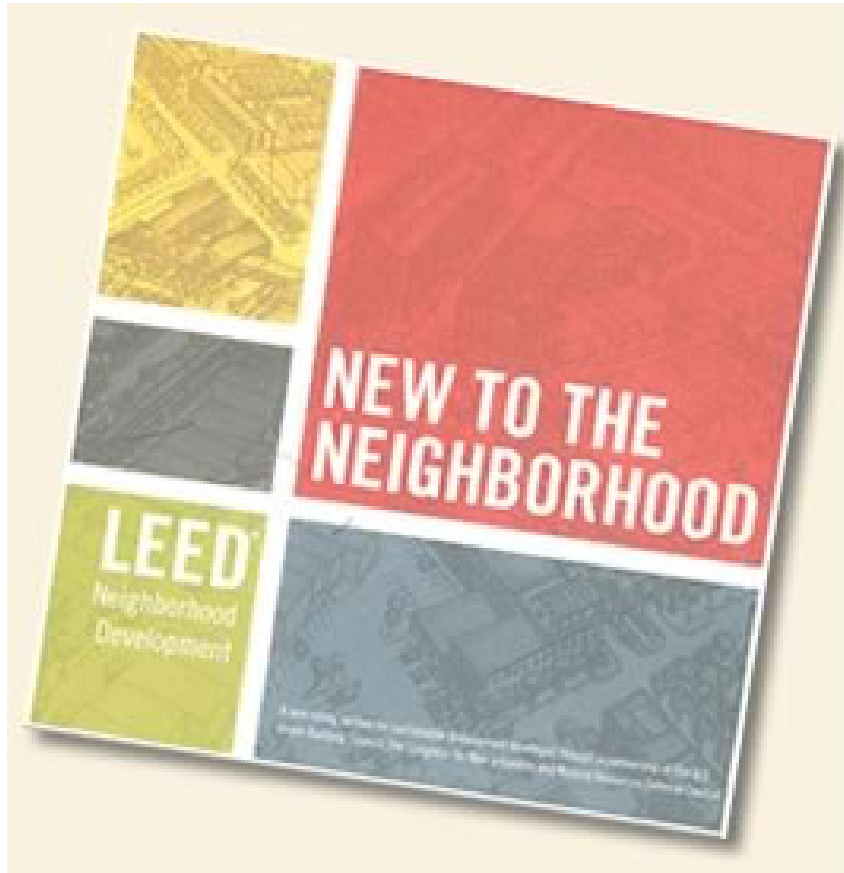
# Project History

## *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)

# Goals and Approach

## *Research Questions*

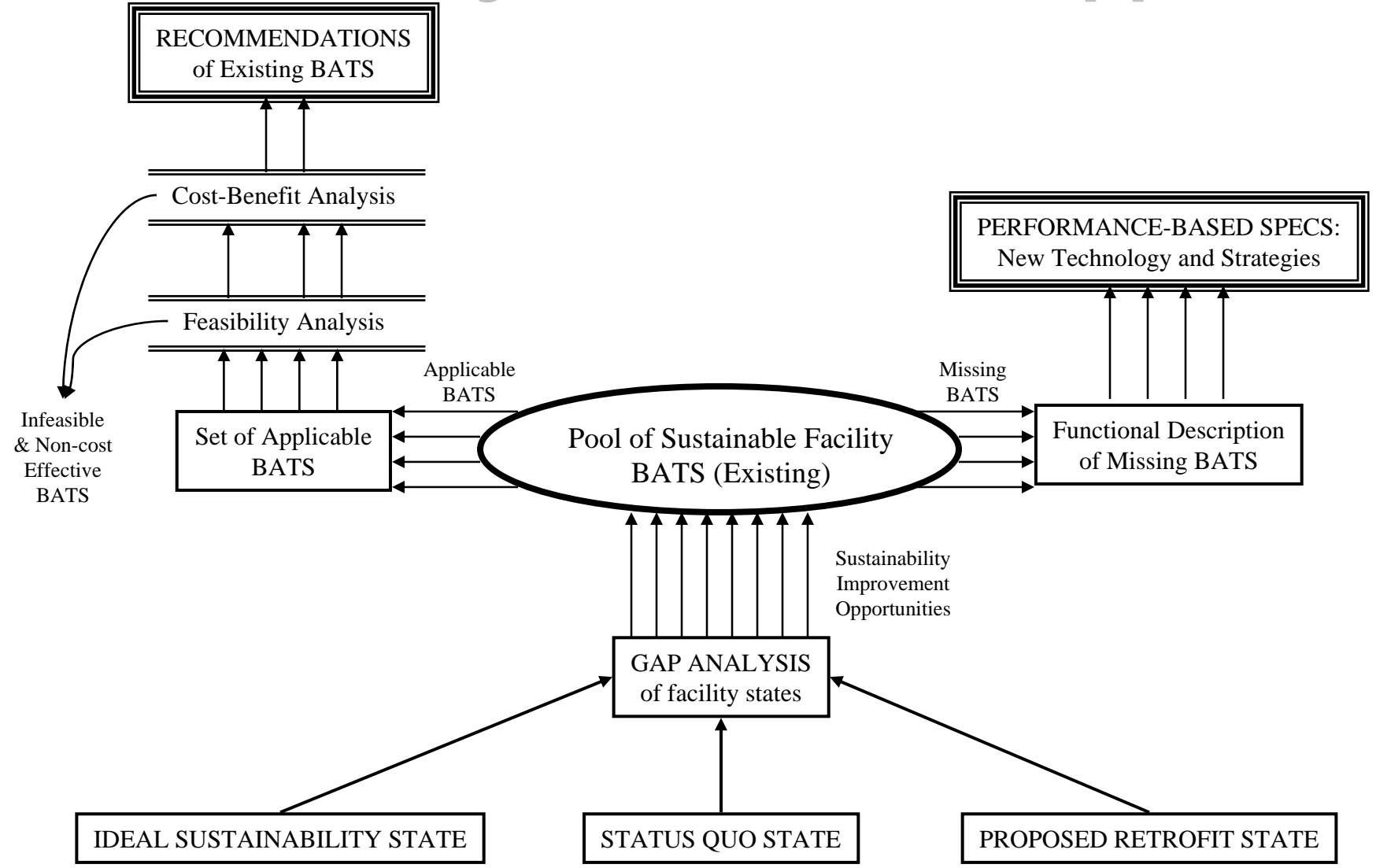
- How sustainable is an installation master-planned using LEED for Neighborhood Development?
- Can LEED-based plans be improved using Best Available Technologies & Strategies (BATS)?
- Which BATS make the most sense in terms of sustainability “bang for the buck”?

# 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

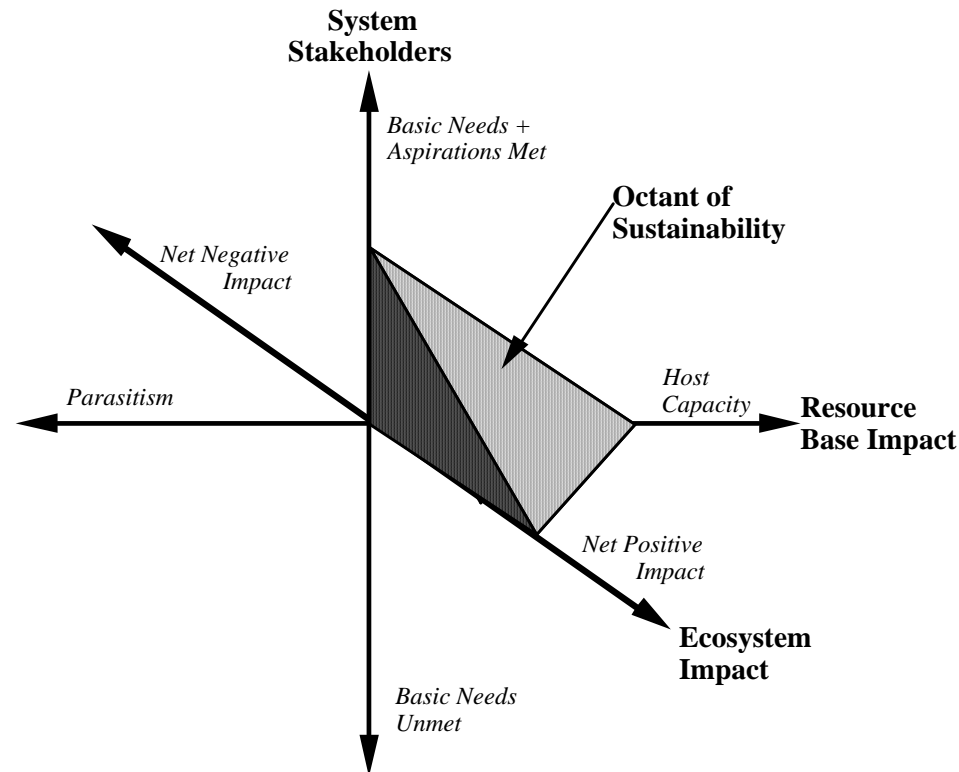
# Systems-Based Approach





**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.**

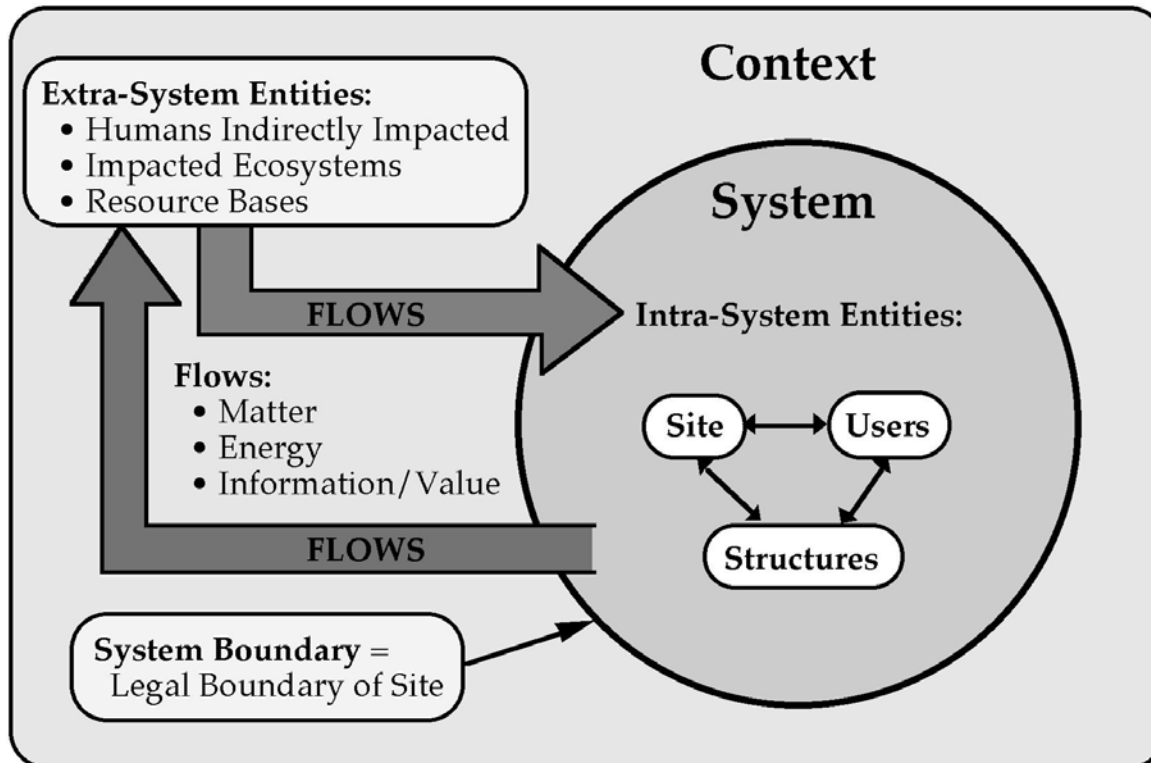
# Defining Ideal Sustainability State



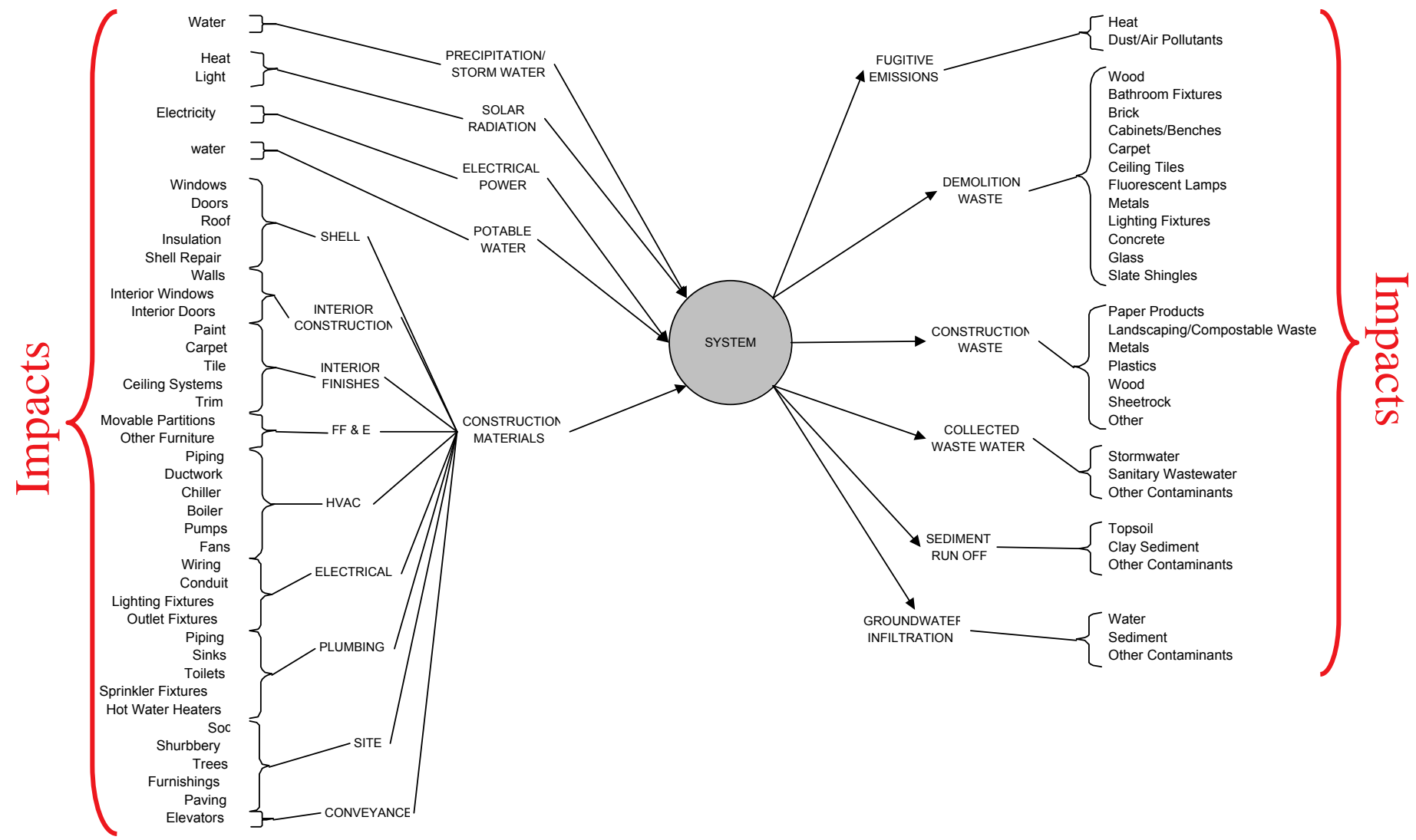
- Stakeholder Satisfaction  $\geq$  Basic needs met
- Resource Base Impact  $\geq$  No or neutral impacts
- Ecosystem Impact  $\geq$  No or neutral impacts

# Systems-Based Sustainability Assessment

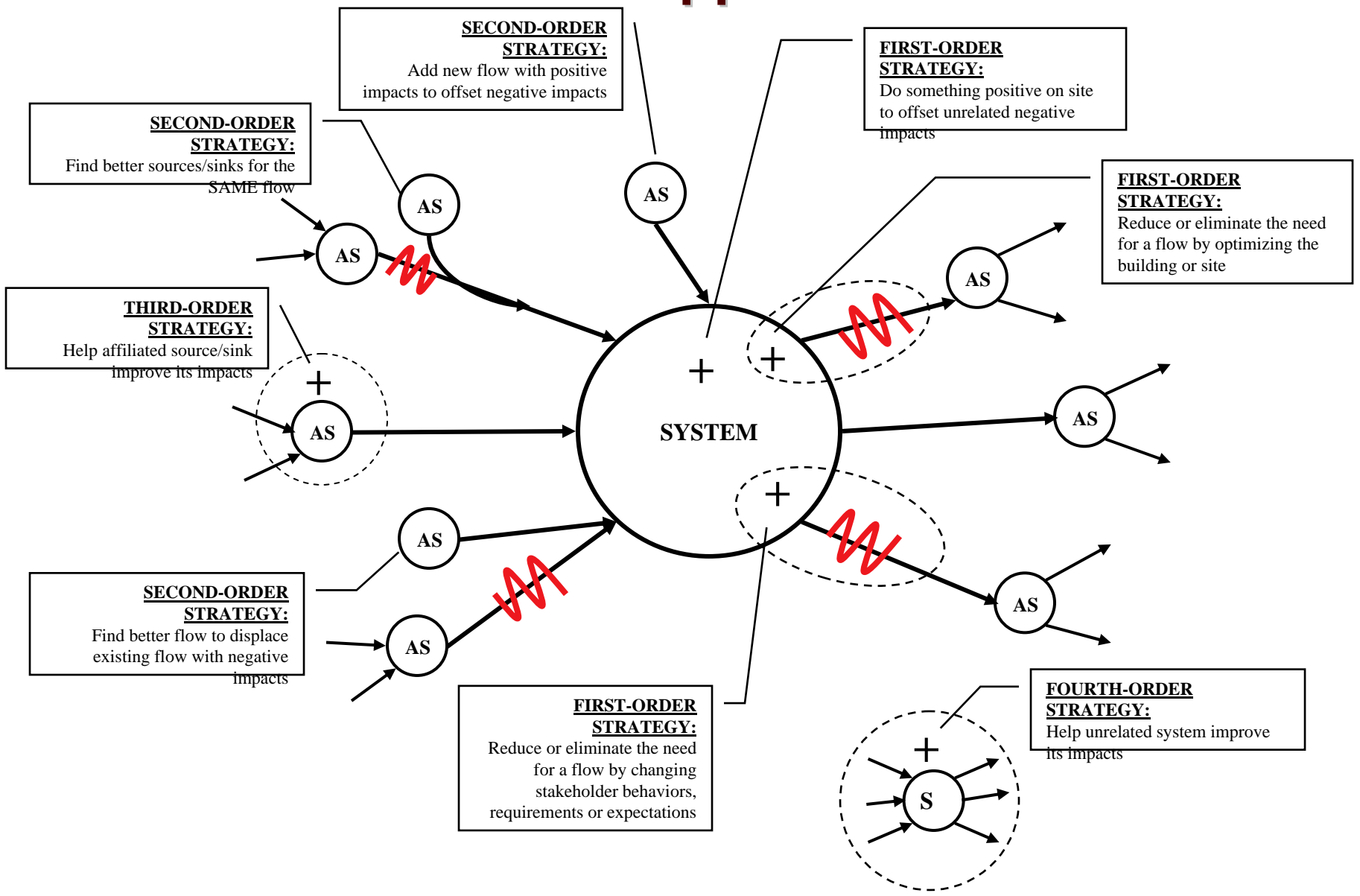
- Define the installation as a system:



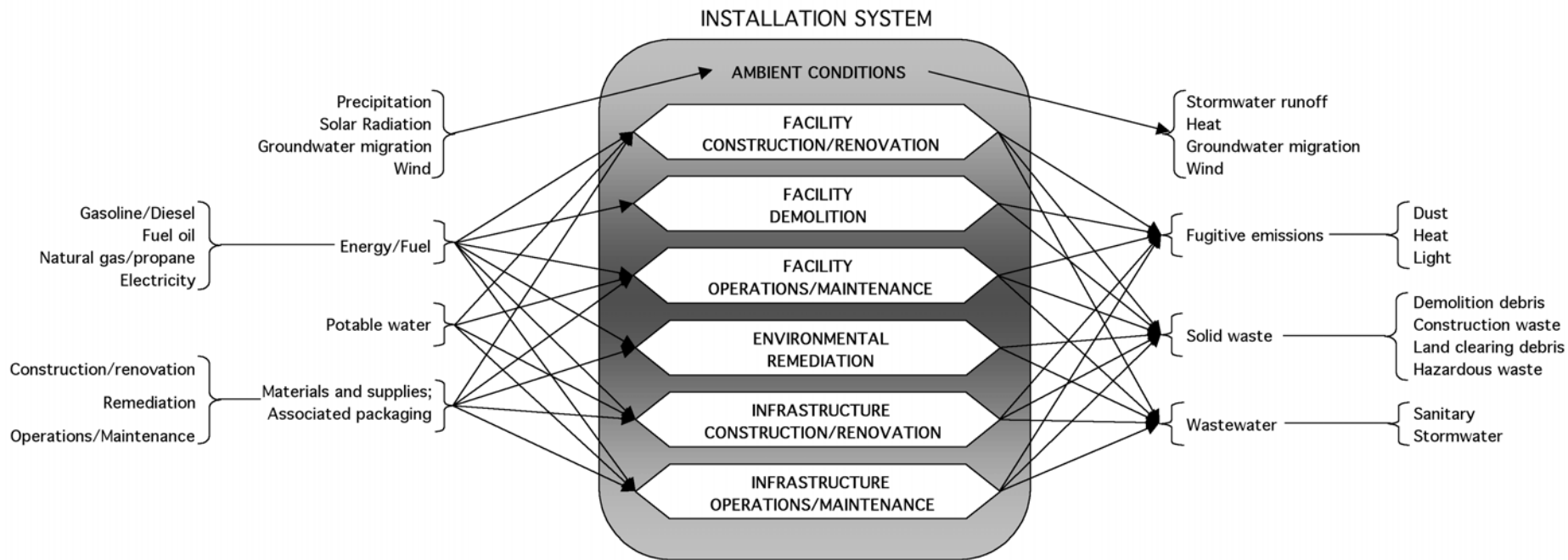
# Facility Systems Model



# Sustainability Improvement Opportunities

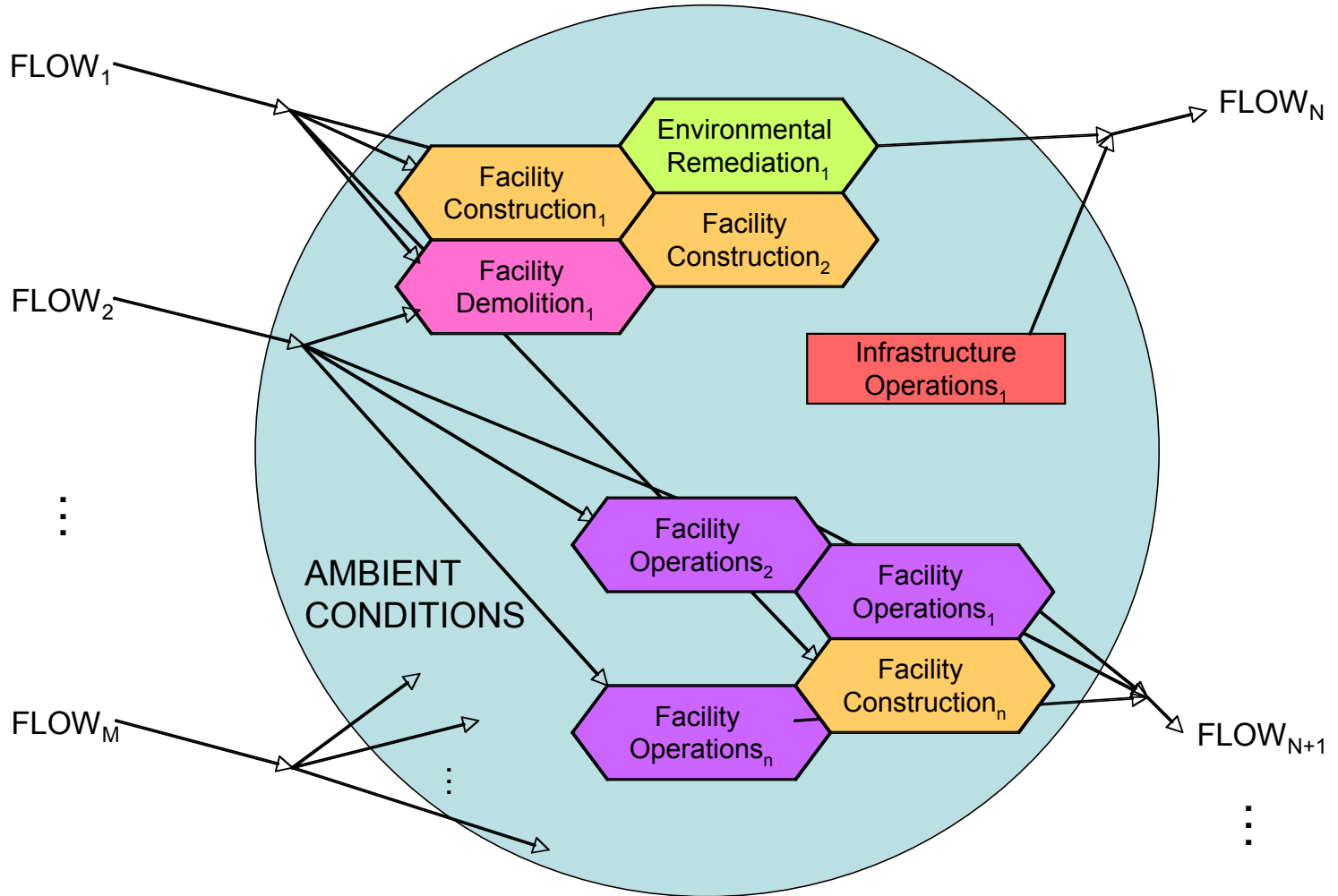


# Scaled-up Flow Model



## Generic Project Typology

# Amalgamated Flows



What about synergistic effects? Traffic, air quality, etc.?

# BATS Review & Evaluation

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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