

Sustainability:  
Support Capabilities for  
Air Force Reserve Command

TetraTech

and

Sustainable Facilities & Infrastructure Program

Georgia Tech Research Institute

# The Team

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  - Joe Jahnke
- Georgia Tech Research Institute
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# Overview

- Who is the team?
- What are the upcoming concerns of AFRC with respect to sustainability?
- What services can this team provide that can address these concerns?
- What experience and capabilities does the team have in the area of sustainability?
- What resources can the team bring to support AFRC's efforts in sustainability?

# TetraTech

- More than 7000 employees in over 160 offices worldwide
  - Infrastructure
  - Resource management
  - Communications
- Ranked by ENR as 6th largest environmental engineering and 11th largest design firm
- Existing AFRC contractor

# TetraTech Infrastructure Group

- Water Resources
- Wastewater
- Institution Facilities
- Commercial, Recreational, and Leisure Facilities
- Transportation
- Federal Facilities

# TetraTech Infrastructure Group

Our federal facilities capability ranges from site master planning and sustainable design solutions to design/build for:

- Bachelor enlisted quarters
- Multifamily housing
- Industrial and maintenance facilities
- Water and wastewater systems
- Waterfront structures
- Energy management and efficiency

# Georgia Tech Research Institute

- Training and organizational analysis
- Systems-based sustainability analysis of buildings - Fort McPherson, GA
- Software development:
  - Building-scale sustainability model
  - Installation-scale model
- Existing AFRC contractor

What are the upcoming concerns  
of AFRC with respect to  
sustainability?

# AFRC Concerns

- Sustainable installations:
  - Quality of life
  - Retention of service members
  - Interaction with communities
  - Protection and enhancement of environmental resources
  - Future transitions

What services can the team  
provide that can address these  
concerns?

# Team Services

- Assistance with contractor prequalification and selection for sustainability
- Tools and specifications for sustainable construction, O&M, and end of service life
- Evaluation of the effectiveness of sustainability programs
- Economic modeling of the hard and soft costs of facility and installation privatization
- Staff training on sustainability

# Team Services

- Sustainability benchmarking/metrics to support decision making and resource allocation (and compliance with EO 13148)
- Holistic cost models for programming and design assistance that account for both hard *and* soft costs and benefits of sustainability
- Project documentation/reporting protocols and program evaluation

# Team Services

- Sustainability tools to...
  - Identify and prioritize sustainability improvement opportunities
  - Compare alternatives in terms of sustainability costs and benefits (sustainability “bang for buck”)
  - Develop contextually appropriate specifications for project sustainability
  - Align project teams with the goal of project sustainability
  - Identify and surmount organizational barriers to sustainability

# Team Services

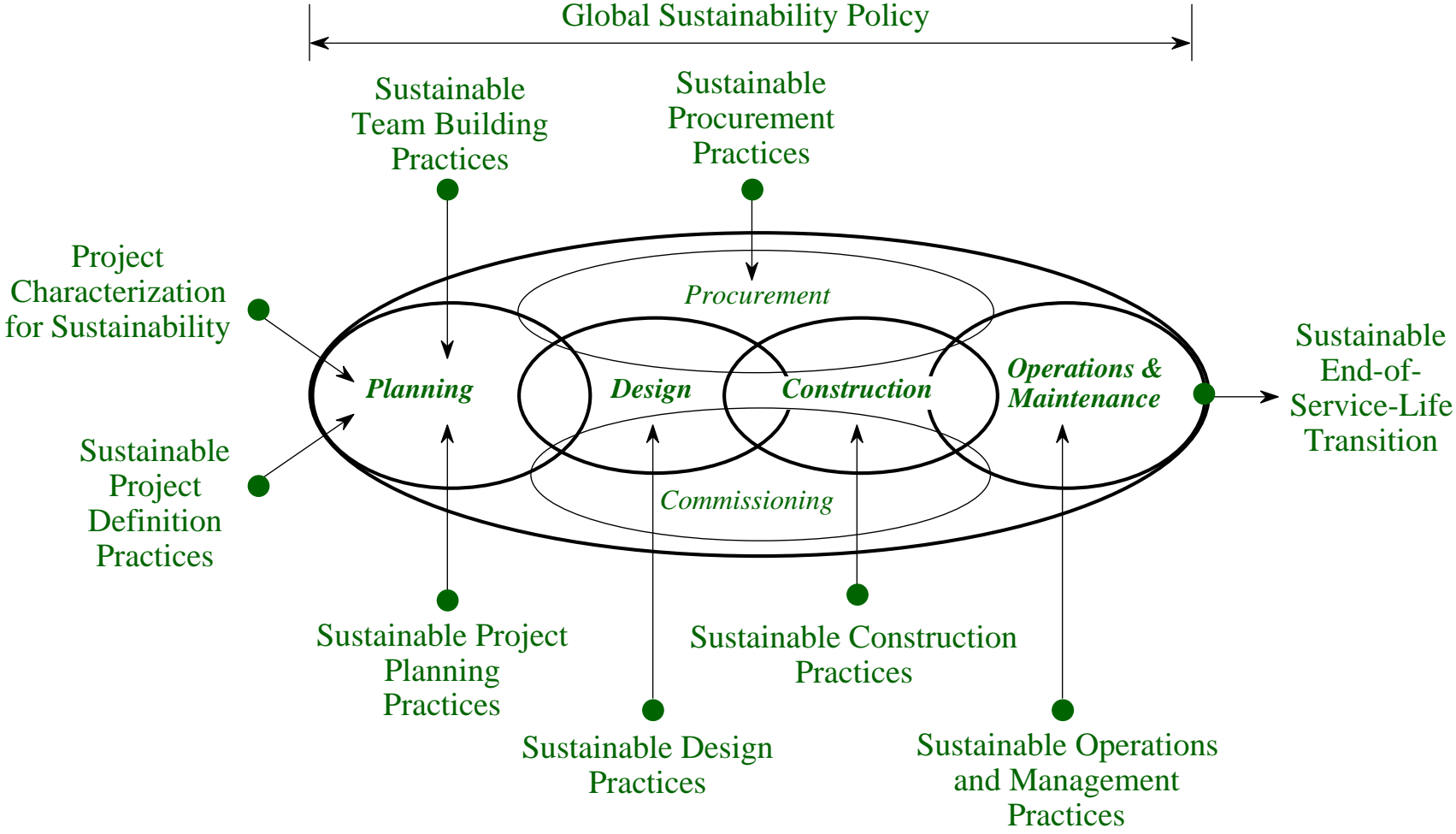
- Consolidation of sustainability resources (indexing to allow easy access to needed information)
- Evaluation of alternative systems and materials
- Metrics of sustainability at the facility and installation scales
- Development of R&D agendas for sustainable facility and infrastructure technologies
- Sustainable facilities & infrastructure training for project teams

What experience and capabilities  
does the team have in the area of  
sustainability?

# Team Experience & Capabilities

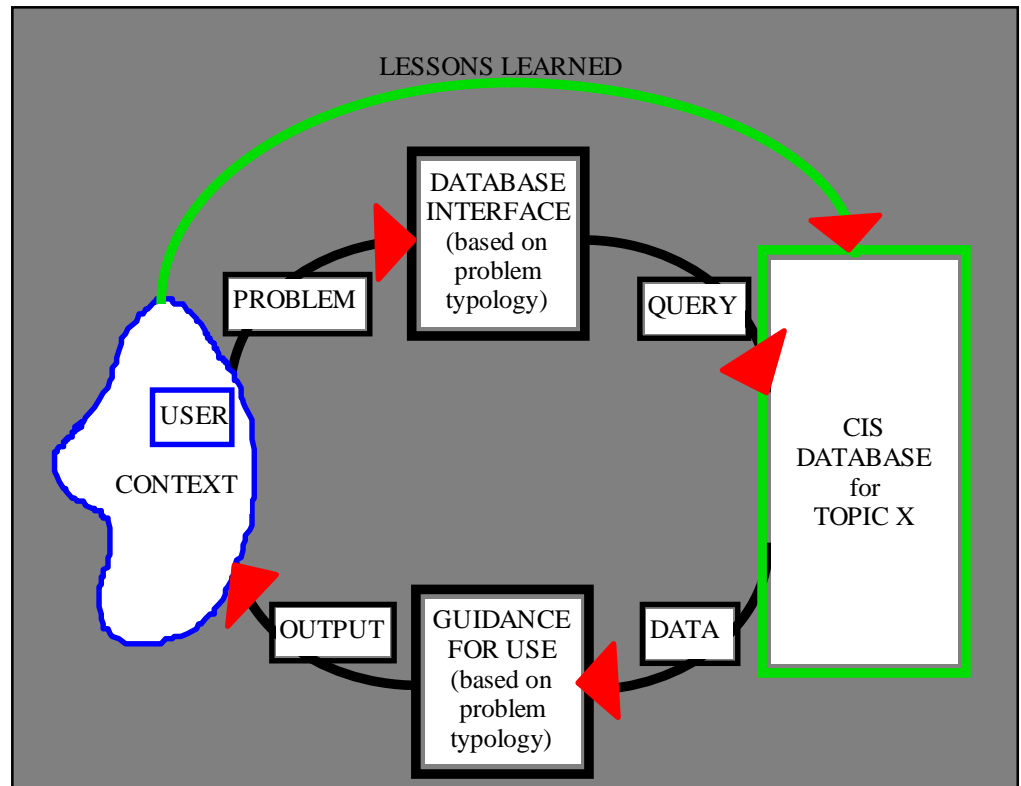
- Decision support & benchmarking
- Materials & systems evaluation
- Cost modeling, information, & control
- Technology optimization
- Knowledge management
- Measurement & prioritization
- Training, alignment, & organizational change
- Program planning & evaluation
- R&D agenda development
- Real project experience

# Strategic Entry Points for Project Sustainability



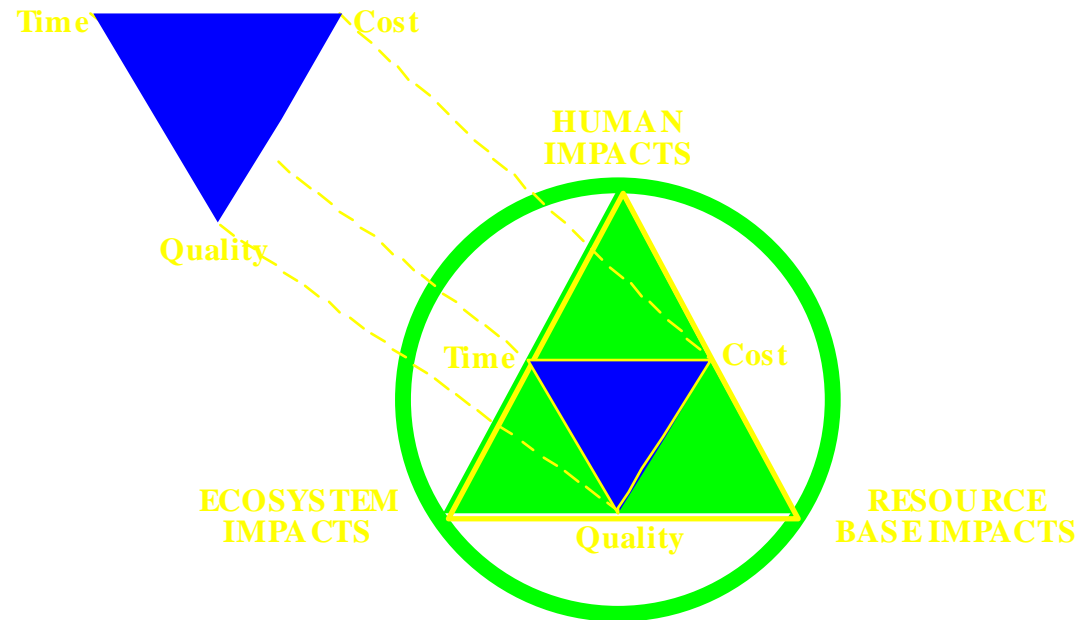
# Decision Support and Benchmarking

- Benchmarking the Decision Making Process:
  - Assess maintenance/rehabilitation decision process
  - Determine drivers
  - Process model validation
  - Needs analysis



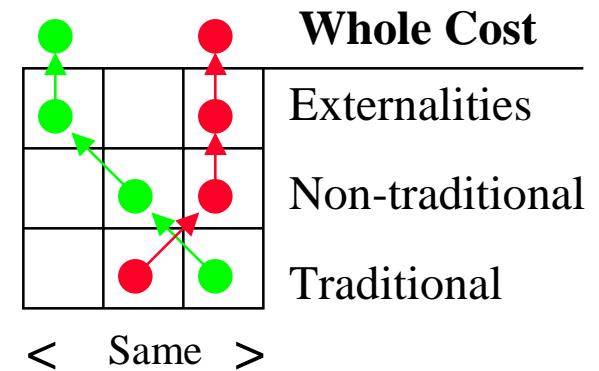
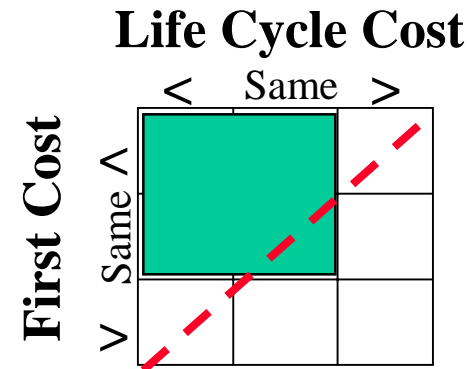
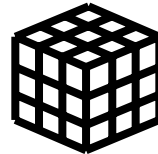
# Materials and Systems Evaluation

- Eco-labeling of Building Materials & Facilities
  - Indicators
  - Testing protocols
  - Documentation
  - Deployment
  - Outreach/Marketing



# Holistic Cost Modeling

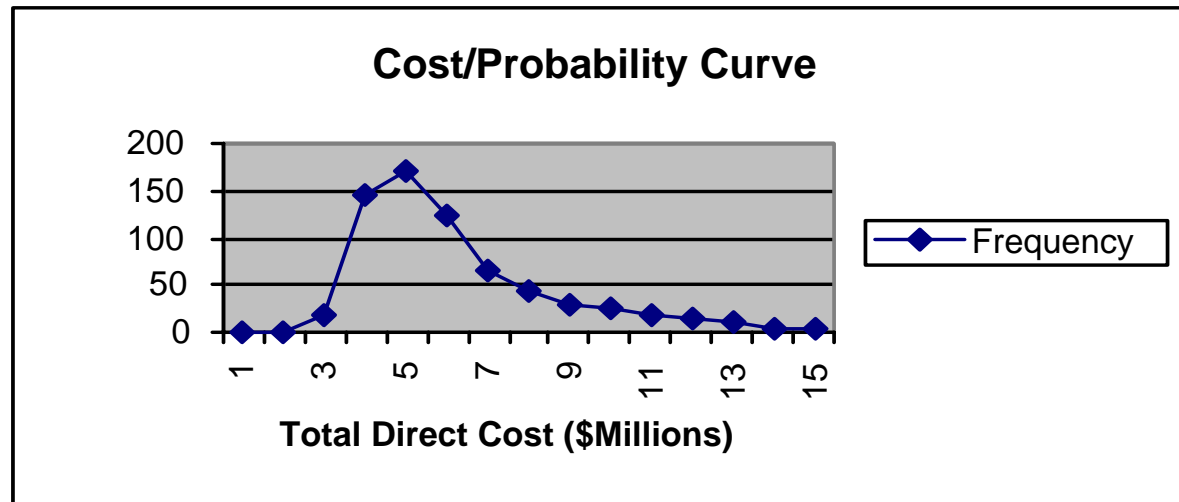
- Hybrid combinations of:
  - Traditional project costs (4Ms)
  - Nontraditional quantitative costs
  - Qualitative costs
- Comparison of alternatives in terms of “true costs”





# Parametric Cost Modeling

- Parametric Artificial Neural Network Cost Estimating Tool (PANN CET):
  - Conceptual Cost Estimating for Dormitories
  - Cost/Probability Functions
  - Range Estimates



# Cost Control

- Parametric Artificial Neural Network Cost Estimating Tool (PANNCET):
  - Identification & Prioritization of Cost Drivers

Number of Stairwells							
Floors Above Grade							
Exterior Doors							
Roof Area							
Number of Elevators							
Footprint							
Floor to Floor Height							
Heating Load							
Exterior Window Area							
Perimeter							
Cooling Load							
Exterior Wall Area							

Influence	Low				High
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# Technology Optimization

- Robotic Ordnance Remediation
  - Identify cost drivers to prioritize R&D
  - Economic analysis to justify automation
  - Navigation
  - Ordnance classification

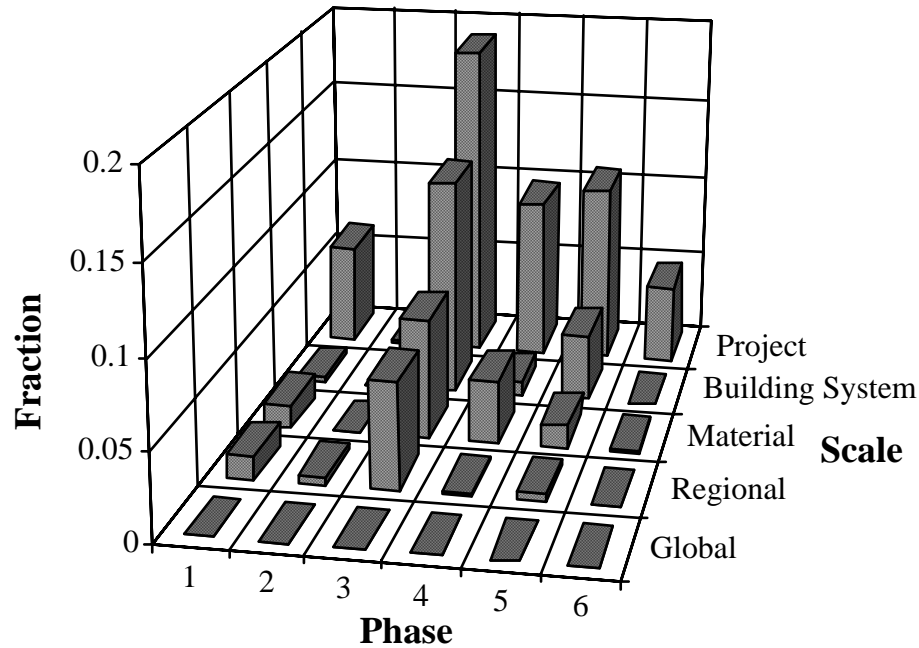
## Input variables:

Environmental Variables	Robot Variables	UXO Variables
Vegetative Cover	Sensor Configuration	Type
Terrain/Topography	Platform Type	Orientation
Weather	Sweep Pattern	Status
Soil/Surface Characteristics	Sweep Speed	Depth

## Output variables:

Cost Indicators	Functional Performance Indicators
Labor Cost	Percent of Known UXO Detected
Equipment Cost	Number of Injuries
Time to Clear	Percent of UXO Cleared

# Sustainability Knowledge Management



(a-2) Government/Non-Profit: Heuristic

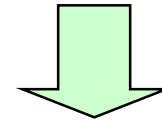
- Sustainability Heuristics Database
  - Trends in sustainability knowledge over time
  - Gap analysis
  - Comprehensive checklist & knowledge base
  - Evaluation tool
  - 5000+ record database

# Environmental Benefits Modeling

- Data Reduction and Decision Support
  - Identifying and managing project success drivers
  - Process for determining sensor placement using cost objectives

CONSOLIDATED SCREENING CHECKLIST FOR AUTOMOTIVE REPAIR FACILITIES DATE:

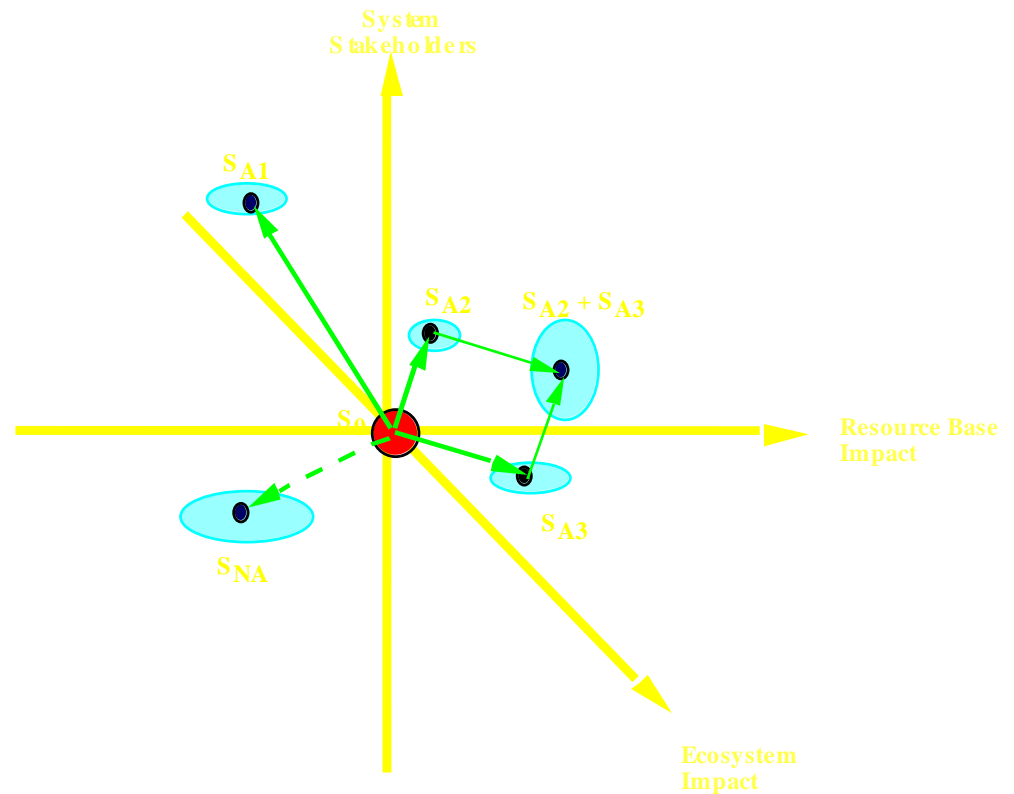
WASTE MANAGEMENT		
Noise Management	Does the facility use floor drains which are not connected to a sewer?	Yes / No
	Does the facility generate or receive, store, use, or dispose of any of the following: PCBs, asbestos, lead-acid batteries, mercury, or other hazardous waste (per EPA's list)?	Yes / No / Yes / No
Oil Spill	Does the facility have an oil spill prevention plan, including spill handling procedures?	Yes / No
	Are there any leaks, drips, or spills of oil or other fluids?	Yes / No
	Is used oil collected and sent off site for recycling, or burned in an on-site incinerator?	Yes / No / Yes / No / Yes / No
Used Oil/Fluids	Does the facility store hazardous waste?	Yes / No
	Does the facility store hazardous waste in an approved container?	Yes / No
Used Air/Filters	Does the facility use air conditioning equipment?	Yes / No
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	Does the facility use air conditioning equipment?	Yes / No



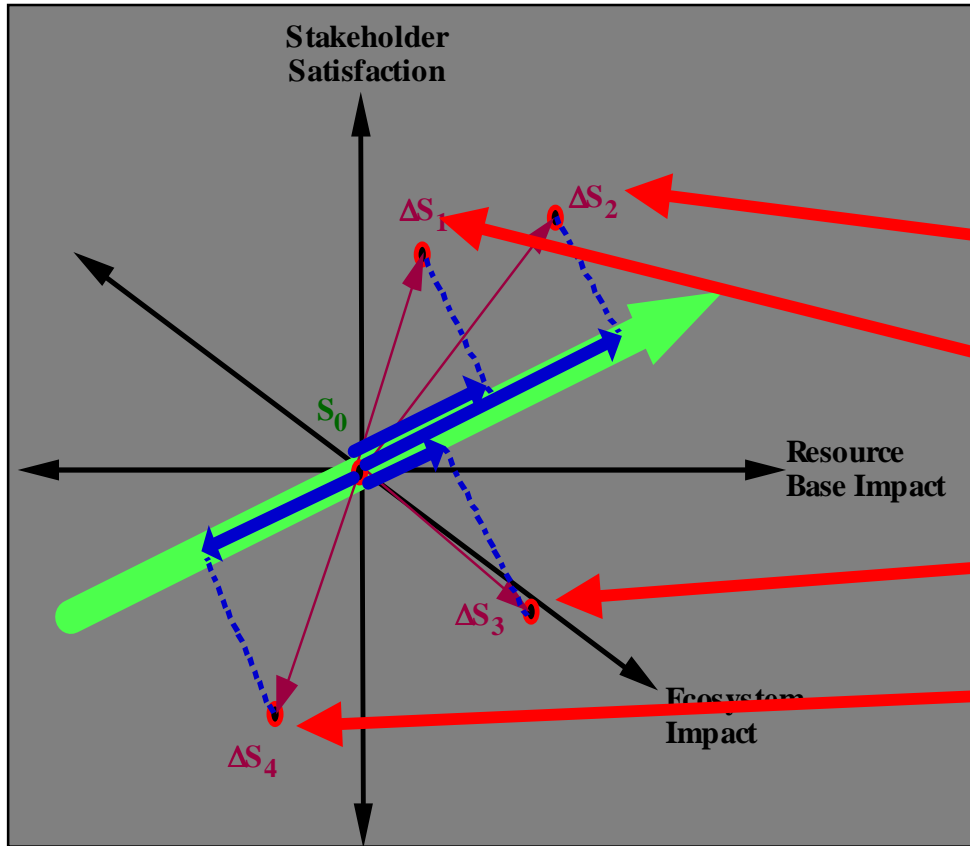
	Waste Mgt.	Use d Oil	Use d Filters	Use d Anti-Freeze	Use d Solvents	Batteries	Rags	Tires	Absorbents	Floor Drains	Stormwater
Waste Mgt	-0.57	0.41	0.157	0.402	-0.18	0.489	0.678	-0.0	0.223	0.11	-0.72
	0.665	0.23	0.024	0.346	-0.2	0.681	0.229	0.424	0.173	0.101	-0.2
Use d Oil	0.49	0.464	-0.21	0.469	0.43	0.84	0.879	-0.08	0.26	0.09	0.266
	-0.21	-0.23	-0.26	0.003	0.46	0.541	0.989	-0.59	0.318	-0.21	0.725
	-0.0	0.827	0.097	0.318	0.604	0.782	0.518	0.072	0.474	0.058	-0.76
	0.238	0.028	0.157	0.287	-0.2	0.494	0.68	0.085	-0.16	-0.08	0.097
	0.317	-0.3	-0.29	0.058	-0.04	0.318	0.815	-0.56	0.648	-0.08	0.717
	0.443	0.372	0.199	0.394	0.421	0.493	0.441	-0.06	0.56	-0.04	-0.29
Use d Filters	0.454	0.29	-0.6	0.319	0.5	0.612	0.601	0.189	0.406	-0.1	0.52
	0.352	0.523	0.064	0.195	-0.66	0.662	0.561	-0.01	0.203	-0.19	0.13
Use d Anti-Freeze	0.372	0.387	-0.16	-0.02	0.722	0.575	0.843	0.026	0.565	0.117	0.515
	0.432	0.438	-0	0.336	0.434	0.753	0.923	-0.34	0.445	0.035	0.159
	0.201	0.524	0.192	0.286	0.018	0.72	0.023	-0.12	0.521	0.077	-0.35
	0.257	0.29	-0.3	0.267	0.26	0.407	-0.41	0.038	0.233	-0.04	-0.09
	0.134	0.513	-0.14	0.1	0.643	0.536	0.033	0.062	0.348	-0	-0.4

# Sustainability Measurement

- Systems-based sustainability assessment model:
  - Identifies opportunities
  - Predicts future impacts
  - Compares alternatives



# Prioritizing Improvement Options



## Priority:

- Option 2
- Option 1
- Option 3
- Option 4

# SFI Training



- Seven course series
  - Customized contract courses
  - Multi-day courses focus on identifying organizational issues and developing a plan of action
  - Includes a final report to support follow-on actions

# Project Team Alignment

- Organizational diagnostics
- Interactive workshops
- Facilitated exercises
- Development of recommendations for project streamlining, stakeholder interactions, organizational change, and sustainability rollout



# Organizational Change Modeling

**Proactive**

**Reactive**

	<b>FLASH</b>	Change of:	<b>CRASH</b>	Change of:
<b>Internal</b>	<ul style="list-style-type: none"><li>• Values</li><li>• Mission</li><li>• Perceptions</li></ul>		<ul style="list-style-type: none"><li>• Functional Requirements</li><li>• Physical Integrity / Function</li></ul>	
	<b>SPLASH</b>	Change of:	<b>CLASH</b>	Change of:
<b>External</b>	<ul style="list-style-type: none"><li>• Market</li><li>• Benchmarks</li><li>• Competition</li></ul>		<ul style="list-style-type: none"><li>• Codes</li><li>• Regulations</li><li>• Standards</li></ul>	

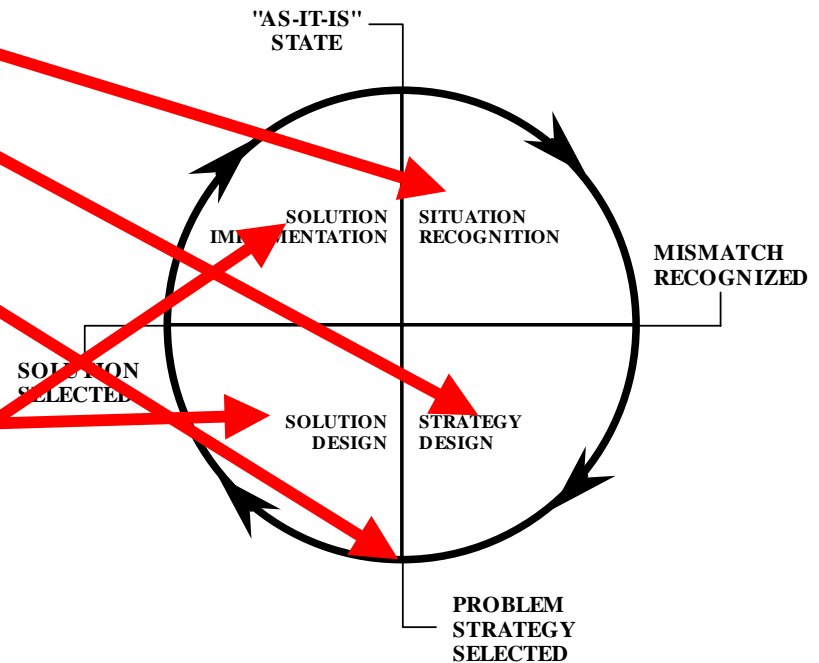
# Program Planning and Evaluation

Problem framing/  
goal setting for  
sustainability

Establishing evaluation  
criteria

Developing measurement  
and documentation  
protocols

Capturing lessons  
learned and providing  
feedback



# R&D Agenda Development

- Establish performance standards
- Benchmark existing performance
- Review Best Available Technologies and Strategies (BATS)
- Identify remaining gaps
- Specify new BATS



# Real project experience

- Patriots Stadium - Sustainable development measures:
  - Crushed concrete
  - Reactivating abandoned well
  - Recharging stormwater
  - Recycle wastewater

What resources can the team  
bring to support AFRC's efforts  
in sustainability?

# Resources

- Sustainability Knowledge Base
  - 5000+ heuristics to support sustainable design
  - 85 definitions of sustainability
  - Annotated bibliography of key resources
  - Database of sustainability initiatives
  - Case study library
  - Image library

# Resources

- Sustainability Resources:
  - 1000+ volume library, including software and videos
  - Materials library - samples and technical documentation by CSI division
  - Collection of over 600 journal articles
  - Internally developed training curricula
  - Internally developed publications, including papers, technical reports, and workbooks

# Resources

- Relevant Partnerships:
  - GT Construction Resource Center
  - GT Colleges of Engineering and Architecture
  - Brooks Energy & Sustainability Laboratory
    - Texas A&M College of Engineering
    - USC Center for Environmental Policy
  - Southface Energy Institute
  - Talisman Partnership
  - Other Federal agencies

Questions?