Integrating Sustainability into DoD Acquisition Programs

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The Vision

DoD developers, program managers, and prime contractors analyze alternatives for meeting mission requirements and make informed decisions that result in:

- Sustainable systems regarding energy, water, chemicals/materials, & land use
- Lower Total Ownership Cost

How? Use Life Cycle Impact Assessment
Life Cycle Impact Assessment
ISO 14040

Early Decisions Have Long Term Cost & Health/Environmental Implications

System Boundary

**Inputs**
- Chemicals & Materials
- Energy
- Water
- Land Use

**Outputs**
- Air Emissions & Greenhouse Gases
- Toxic Wastes
- Solid Wastes
- Wastewater

**Impacts**

**Raw Materials Acquisition**

**Development & Manufacturing**

**Operation & Maintenance**

**Recycle or Disposal**
Life Cycle Cost & Environmental Impacts

Locked-In Early

Acquisition, Technology and Logistics

Percent (%) of Cost

Development
Design
Use /Maintenance

Time

% Cost Locked-In
Cumulative Costs

Most Risks Occur Here

Disposal or Reuse
DoD Sustainability Sectors

- Installations Management
- Military Operations & Training
- Acquisition
Sustainability in DoD Acquisition
From Development through Disposal

PERFORMANCE

LIFE-CYCLE COSTS

HUMAN HEALTH & ENVIRONMENT

High Performance

Low Impacts

Low Costs
We can test & measure this

We need some criteria to weigh alternatives

We can calculate this – Need to do better
What We’ve Learned About LCA in DoD

• Pockets of good practice & results exist
• Some practices stymied
• Sustainability insufficiently considered across DoD
  – Examples: water use, noise, toxic chemical use
• Need better Total Ownership Cost estimates
  – Not all life cycle costs (LCCs) estimated and analyzed
  – Poor transparency for LCC
  – Large O&M costs often passed to operators
• Consistent DoD methodology for analyzing sustainability & related costs does not exist
Challenges

- Where do we get the data to estimate outputs, impacts & life cycle costs?
- What phases in the acquisition process can we reasonably assess sustainability?
- What are the life cycle assessment boundaries?
- Do we assess for whole systems, sub-systems, components?
- There are many players & the acquisition system is complex & changing
- ESOH issues are not high priority
  - Priorities are cost, performance, schedule
What are the Boundaries?

Cradle-to-Grave

- raw material acquisition
- material processing
- manufacturing
- use
- waste management
What are the Boundaries?

Gate-to-Grave

- raw material acquisition
- material processing
- manufacturing
- use
- waste management
What Level to Assess?

• Do we assess for whole systems, components, sub-components?
Current Thinking – Part 1

Focus on 3 key acquisition stages:

- Analysis of Alternatives (AoA)...use an “LCA light” method
- Development...a bit more detailed
- Design...as detailed as data availability will allow
Current Thinking – Part 2

• Focus on 4 key life cycle stages:
  • Research & development
  • Production & deployment
  • Operation & support (O&S)
  • Recycling/demilitarization/disposal

Stages are consistent with OSD O&S Cost Estimating Guide
Current Thinking – Part 3

• Focus on a few key “inputs” and “impacts”

Energy
Chemicals & Materials
Water Use
Land Use

System Boundary

Research & Development
Production & Deployment
Operation & Support
Disposal

Human Health Impact
Cancer & non-cancer toxicity; Noise

Environmental Impact
Air & water emissions; Waste (SW + HW); Land transformation

Mission Impacts
Energy, water, land, & material availability; Noise
Life Cycle Costs
Current Thinking – Part 4

- Score alternatives in AoA phase via a series of questions
- Compare via spider-web diagram
The Way Ahead

• Convene a DoD steering group…done
• Benchmarking study on methods & tools for analyzing sustainability…done
• Collect quantitative case studies…underway
• Adopt method(s) to DoD acquisition process…underway
• Ensure “impact” related costs are included in life cycle cost estimates (per OSD-CAPE guidance)
• Pilot/test the process…learn…refine
• Develop a Military Standard -- “Life Cycle Assessment for Sustainability in Acquisition” …outline done
Formula for Success

LCA Framework + BCA + EO 13514 = MIL-STD for LCA in Acquisition

ISO Standard 14040
LCA General Framework

Business Case Analysis
Required by Law\(^1\)
Sustainability a Required Element

Executive Order on Sustainability
“Advance sustainable acquisition”

Military Standard
Sets a consistent assessment method
LCA is tailored for DoD

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DEPARTMENT OF DEFENSE

LIFE CYCLE ASSESSMENT PROCESS FOR SUSTAINABILITY IN DOD ACQUISITIONS

Not for distribution outside the DoD Sustainability in Acquisition Working Group.
Questions & Discussion
Two Major Components of LCA

• Life Cycle Inventory (LCI)
  – Accounting for inputs and outputs of system

• Life Cycle Impact Assessment (LCIA)
  – Translates LCI into HH&E impacts
  – Used for comparing systems/components
DoD Acquisition Process

- Materiel Development Decision precedes entry into any phase of the acquisition process
- PDR = Preliminary Design Review   CDR = Critical Design Review
- FRP = Full Rate Production
Spider-web Diagram
Possible Methods to Weigh/Score Outputs

• Stakeholder weighting
  • Example: Is energy or waters use more important (sensitive) for a specific system

• Use of spider-web diagrams

• Use of Data Envelope Analysis (DEA)
  • Also called frontier analysis
  • Used in operations research & investing (portfolio theory)
  • Runs a series of optimization calculations…finds most efficient alternatives as compared to all others
DoD Systems Sustainability
Example of a Cross-Cutting Risk & Cost Factor
• We did a worldwide benchmarking study
• Developed 5 types of physical, chemical, toxicity data needed to assess risk
• Scope of data needed would depend on life cycle use & exposures for a specific system
• Data is tied to phases in acquisition process