Industrial Ecology as Praxis:

ENVIRONMENTAL VALUE STREAM MAPPING

Brittany Ducca
Environmental Scientist, Sturm Ruger

INTENTION

01 INTRODUCE INDUSTRIAL ECOLOGY

02 UNDERSTAND EVSM + ITS IMPACT

03 STEP-BY-STEP IMPLEMENTATION STRATEGY

01

INDUSTRIAL ECOLOGY

Defined: the application of ecological concepts to industrial systems, aiming to optimize resource use, minimize waste, and enhance sustainability.

Purpose: promotes resilience and long-term viability in industrial systems.

KEY PRINCIPLES OF INDUSTRIAL ECOLOGY

SYSTEMS THINKING

Viewing industrial processes as interconnected systems within larger ecosystems

SYMBIOSIS

Fostering collaboration and resource optimization, promoting closed-loop systems

WASTE MINIMIZATION

Reducing waste generation and promoting the reuse and recycling of materials

ENVIRONMENTAL VALUE STREAM MAPPING

(EVSM)

02

Systematic methodology used to analyze and optimize environmental performance

ORIGINS OF EVSM

1950's Japan

- Lean Manufacturing - Toyota Production System (TPS)
- TPS goals: eliminating waste, improving efficiency, optimizing processes to enhance performance
- Development of Value Stream Mapping (VSM)

1990's United States

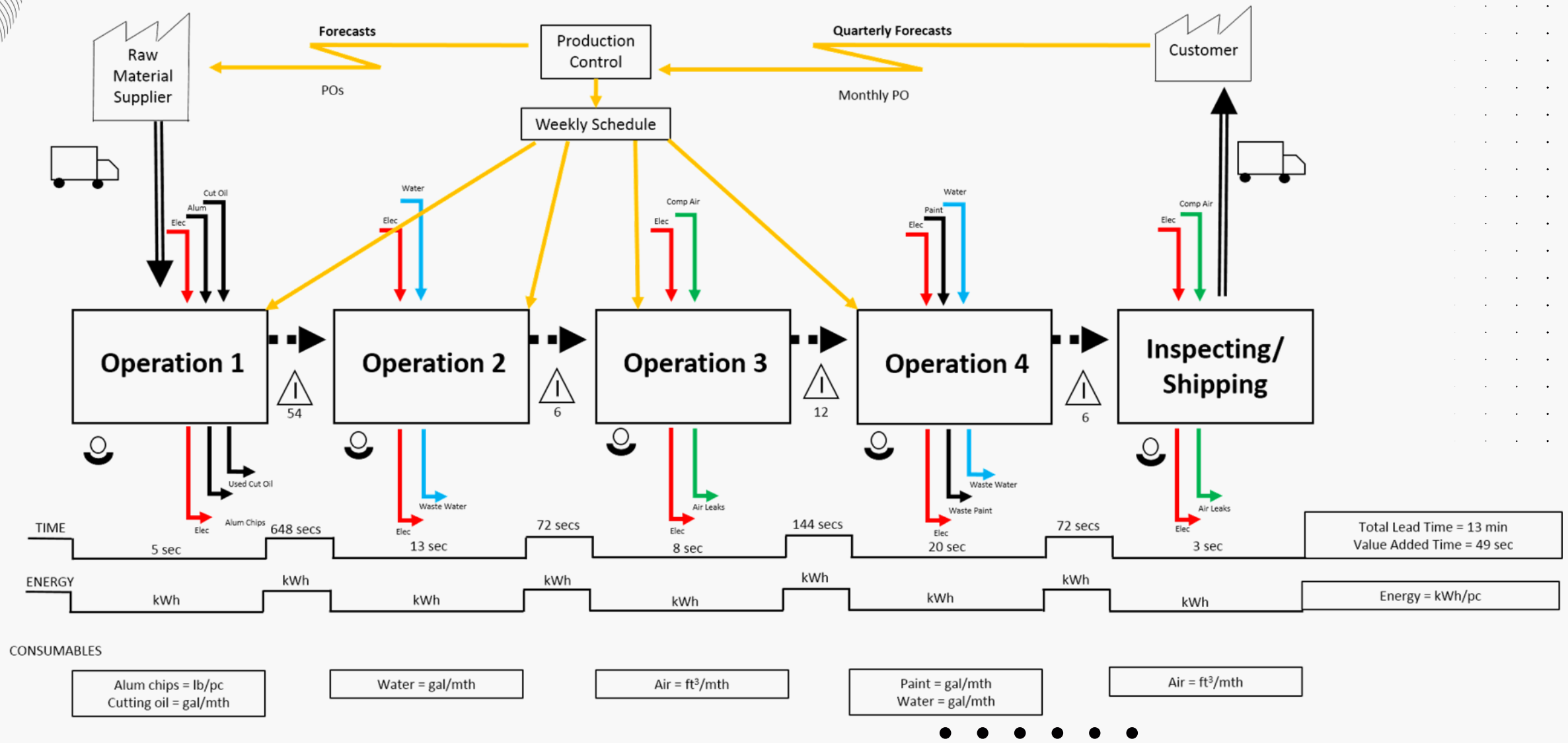
- Environmental considerations began integration into lean manufacturing practices
- Development of EVSM
- Expanded on principles of lean by incorporating resource optimization

Today

- EVSM retains many of the core principles of Lean Manufacturing
- Continues to evolve as a tool for environmental professionals to drive positive change

EPA SAMPLE DIAGRAM

Value Stream Map Incorportaing Inputs and Outsputs



PERSPECTIVE FROM THE EPA

KEY FINDINGS AND INSIGHTS

30%
Cost savings for industrial facilities

20%
Decrease in overall energy consumption

25%
Decrease in hazardous waste generation

40%
Decrease in environmental incidents

70%
Fortune 500 companies integrate EVSM

Sources:
Environmental Protection Agency (EPA). (2008). Lean and Environment Toolkit: Environmental Value Stream Mapping.

03 IMPLEMENTATION STRATEGY

Enrich your environmental program with EVSM

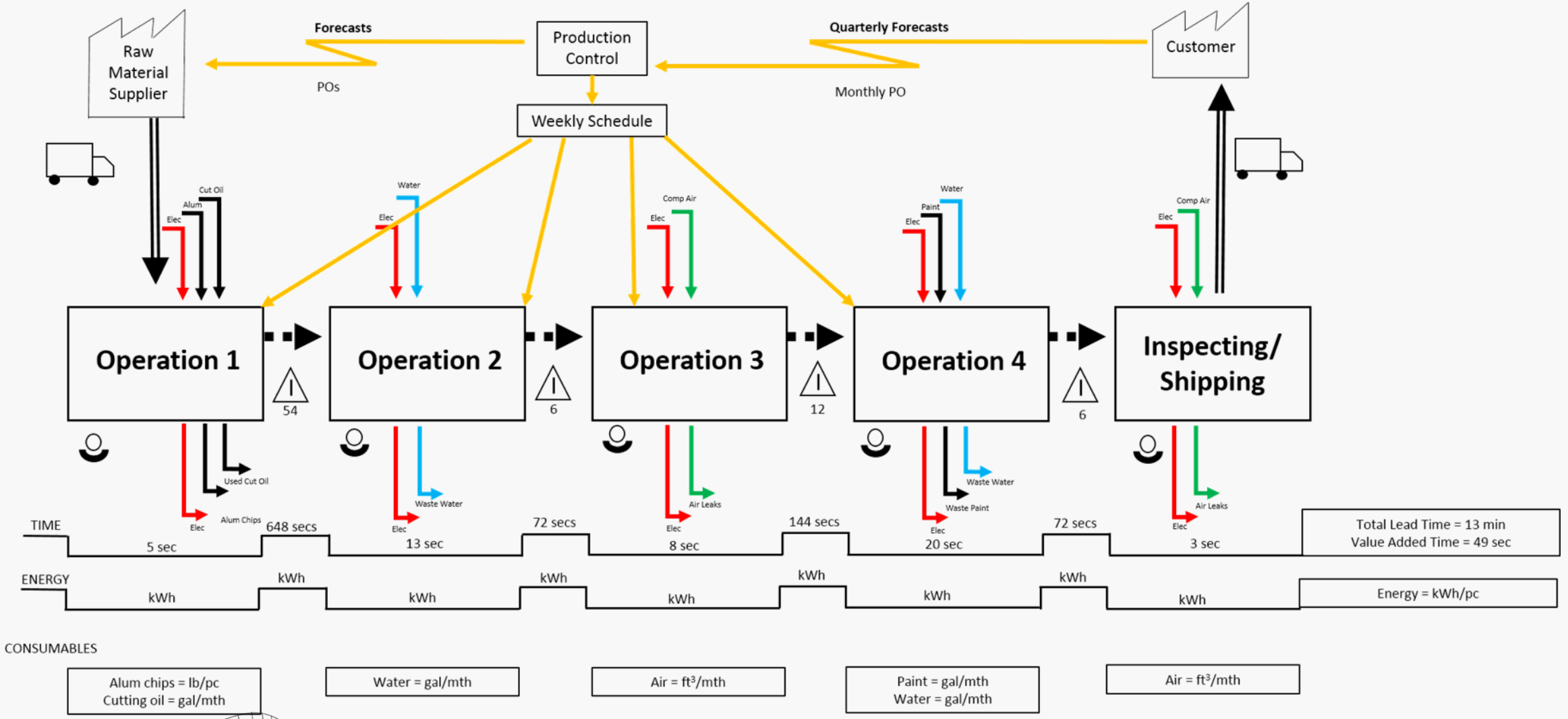
STEP 1: DATA COLLECTION

- Identify specific processes or areas within your facility that you want to analyze and improve
  - Conduct an assessment of operations to identify priority areas
- Consider your data types:
  - Inputs (materials, energy), outputs (waste, emissions), process parameters, and environmental performance metrics
- Ideas for Data Collection:
  - Direct measurements, historical records, stakeholder interviews

STEP 2: PROCESS MAPPING

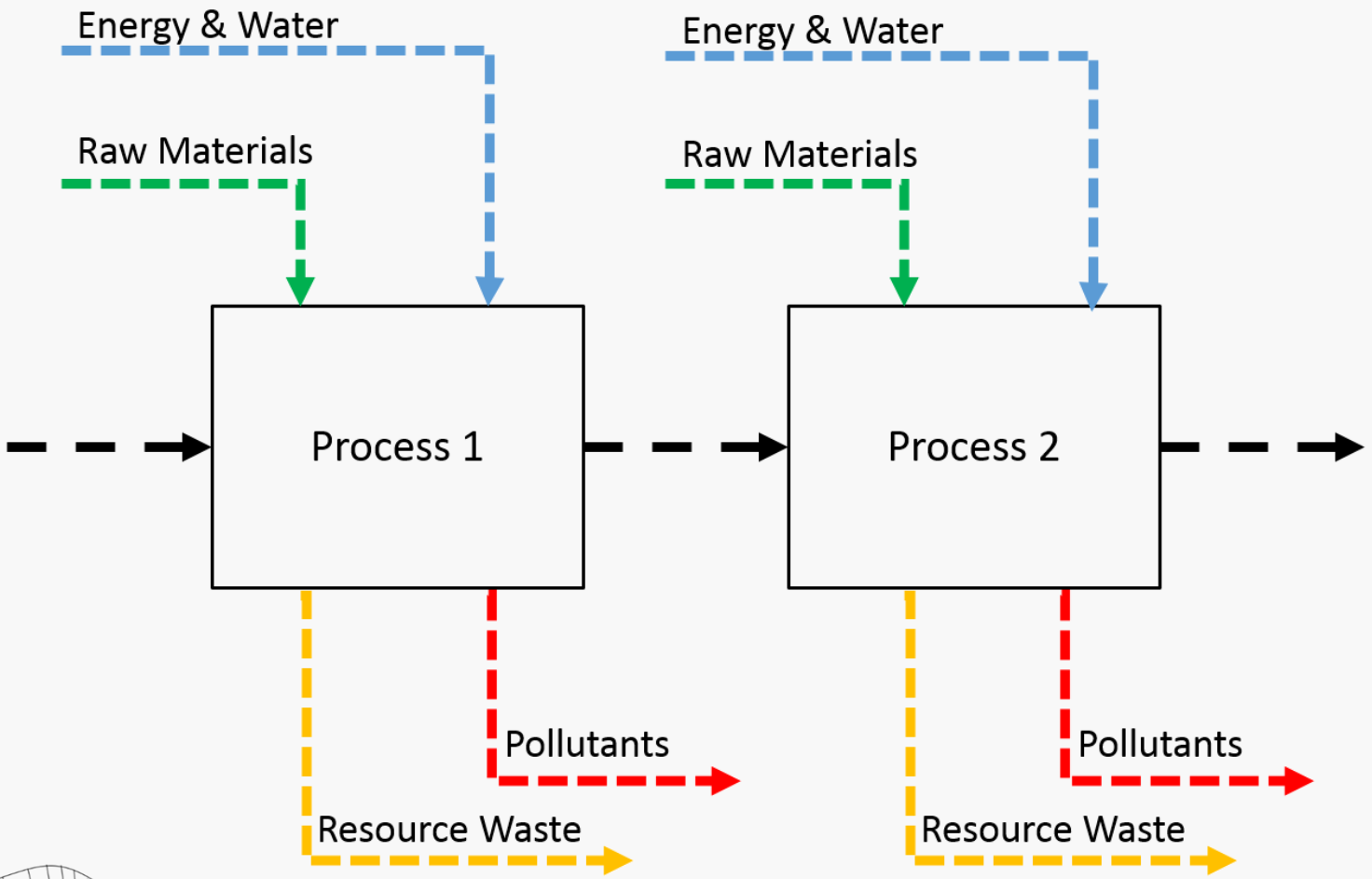
- Capture the Current State:
  - Conduct observational walks to gather firsthand insights into process flow and validate data collected
  - Keep an eye out for opportunities for improvement
- Visualization:
  - Process mapping involves creating visual representations of the flow of materials and energy throughout the production process.
    - Recommend Vizio for map creation
    - Use symbols to identify processes and highlight opportunities
    - Include any local, state, or federal regulation

Value Stream Map Incorporating Environmental Inputs and Outputs (Figure 8)



Source:
Environmental Protection Agency (EPA). (2008). Lean and Environment Toolkit: Environmental Value Stream Mapping

Conceptual Outline of Adding Environmental Inputs and Outputs on Value Stream Maps (Figure 6)



Source:
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STEP 3: ANALYZE AND IDENTIFY OPPORTUNITIES

- Analyze the current EVSM
  - Looking for environmental impacts
  - Identifying areas of inefficiency
- Tools and Techniques
  - Life cycle assessment (LCA)
    - Evaluates environmental impact of a system across its entire life cycle
  - Pollution Prevention (P2) Assessment
    - Identifies opportunities to minimize or eliminate pollution through process modifications, the substitution of materials, and waste reduction strategies.
  - Root Cause Analysis
    - Discovers underlying factors or causes of a problem within a system to prevent recurrence and improve performance
  - Industry Best Practices
    - The most effective and efficient methods, techniques, or approaches adopted within a particular industry to achieve superior results and performance standards

STEP 4: DEVELOP ACTION PLANS & IMPLEMENT CHANGE

- Develop Action Plans
  - Define specific actions, responsibilities, and timelines for implementation
- Strategies for Implementation
  - Make changes in a systemic and iterative manner
  - Plan, Do, Check, Act (PDCA)
  - Provide training, resources, and support to employees involved
  - Foster a culture of continuous improvement and innovation
- Set Targets and Goals
  - Establish key performance indicators and metrics to track progress
  - Conduct regular reviews and evaluations of your EVSM, make adjustments

RESOURCES

EVSM Guides:

- "Environmental Value Stream Mapping Guidebook" by the National Institute of Standards and Technology (NIST)
- "Lean and Environment Toolkit: Environmental Value Stream Mapping" by the Environmental Protection Agency (EPA)

Books:

- “Lean and Green: Profit for your Workplace and the Environment” by Pamela Gordon and Nikhil Arora
- “The Toyota Way: 14 Management Principles from the World’s Greatest Manufacturer” by Jeffrey Liker
- “Industrial Ecology” by T.E. Graedel
- “The Lean Farm: how to minimize waste, increase efficiency, and maximize value and profit with less work” by Ben Hartman

Academic Journals:

- Journal of Cleaner Production
- International Journal of Lean Six Sigma (Volume 8 No.1)

THANK YOU

Do you have any questions?

bducca@ruger.com

Medium.com/bducca

LinkedIn.com/bducca