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# ISO 14001:2015 and Life Cycle Perspective

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# Agenda

- > Intro to Environmental Management Systems
- > Overview of changes in ISO 14001:2015 standard
- > Discussion of key ISO 14001:2015 themes
  - ❖ Aspects and impacts
  - ❖ Risk Evaluation
  - ❖ Life Cycle Perspective
- > Summary

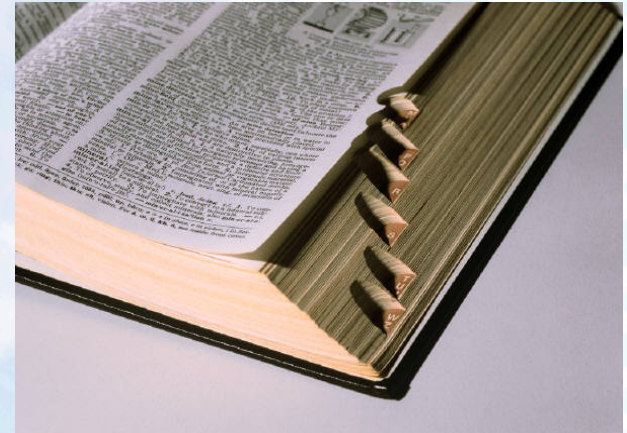
# Intro to Environmental Management Systems



# Environmental Management System

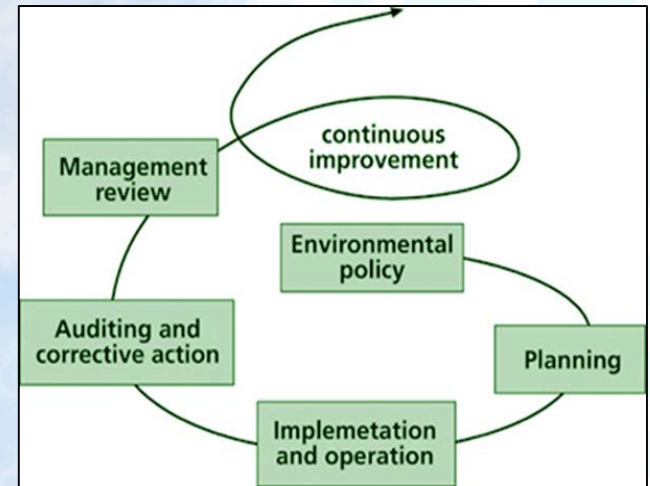
## General Definition & Scope

- > Set of systematic processes and practices for managing risks & opportunities associated with environmental issues
- > Implemented via following a system framework or model
- > Integrates environmental awareness and performance mindset into company culture
- > Exact nature of system must be tailored to organization's needs and operations



# Environmental Management System Purposes

- > An environmental management system helps organizations take a holistic approach to environmental issues by
  - ❖ Identifying;
  - ❖ Managing;
  - ❖ Monitoring; and
  - ❖ Controlling
- > Increase performance and minimize risk
- > Includes the need for continual improvement of an organization's management system and environmental performance





# Organizational Benefits from EMS

*Management systems can have many benefits to your organization large or small*

- > Promote innovation
- > Reduces risks and liabilities
- > Increases likelihood of achieving & maintaining regulatory compliance
- > Alignment to company's KPIs
- > Improved change management execution
- > Company branding
- > Increased employee motivation and engagement
- > Stakeholder interactions, tracking, and management



# Overview of Changes in ISO 14001:2015 Standard

# New vs. Old ISO 14001 Comparison

ISO 14001:2015 Section	Key Elements	Relevant ISO 14001: 2004 Section
Context	<ul style="list-style-type: none"> <li>• Organization and Context</li> <li>• Needs and Expectations of Interested Parties</li> <li>• Determining the Scope of the EMS</li> <li>• EMS Focus</li> </ul>	
Leadership	<ul style="list-style-type: none"> <li>• Leadership &amp; Commitment</li> <li>• Environmental Policy</li> <li>• Organization Roles, Responsibilities &amp; Authorities</li> </ul>	Policy Resources, Roles, Responsibility & Authority
Planning	<ul style="list-style-type: none"> <li>• Actions to Address Risks &amp; Opportunities                Significant Environmental Aspects                Compliance Obligations                Planning Action</li> <li>• Environmental Objectives &amp; Planning Actions</li> </ul>	Environmental Aspects Legal & Other Requirements Objectives, Targets, and Programs
Support	<ul style="list-style-type: none"> <li>• Resources</li> <li>• Competence</li> <li>• Awareness</li> <li>• Communication – Internal &amp; External</li> <li>• Documented Information - Creation &amp; Control</li> </ul>	Resources, Roles, Responsibility & Authority Competence, Training, & Awareness Communication Documentation Control of Documents
Operation	<ul style="list-style-type: none"> <li>• Operational Planning &amp; Control</li> <li>• Emergency Preparedness &amp; Response</li> </ul>	Operational Control Emergency Preparedness & Response
Performance Evaluation	<ul style="list-style-type: none"> <li>• Monitoring, Measurement, Analysis &amp; Evaluation</li> <li>• Evaluation of Compliance</li> <li>• Internal Audit</li> <li>• Management Review</li> </ul>	Monitoring & Measurement Evaluation of Compliance Internal Audit Management Review
Improvement	<ul style="list-style-type: none"> <li>• Nonconformity &amp; Corrective Action</li> <li>• Continual Improvement</li> </ul>	Nonconformity, Corrective Action & Preventive Action



# ISO 14001:2015

**Red = New Requirements**  
**Blue = Changed Requirements**

## 9 Performance evaluation

- 9.1 Monitoring, measurement, analysis and evaluation
  - 9.1.1 General
  - 9.1.2 Evaluation of compliance
- 9.2 Internal audit
- 9.3 Management review

## 10 Improvement

- 10.1 General
- 10.2 Nonconformity and corrective action
- 10.3 Continual improvement

## 4 Context of Organization

- 4.1 Understanding the organization and its context
- 4.2 Understanding the needs & expectations of interested parties
- 4.3 Determining the scope of the EMS
- 4.4 Environmental management system

## Continual Improvement

## 8 Operation

- 8.1 Operational planning and control
- 8.2 Emergency preparedness and response

## 5 Leadership

- 5.1 Leadership and commitment
- 5.2 Environmental policy
- 5.3 Organizational roles, responsibilities and authorities

## 7 Support

- 7.1 Resources
- 7.2 Competence
- 7.3 Awareness
- 7.4 Communication
  - 7.4.1 General
  - 7.4.2 Internal communication
  - 7.4.3 External communication
- 7.5 Documented information
  - 7.5.1 General
  - 7.5.2 Creating and updating
  - 7.5.3 Control of documented information

## 6 Planning

- 6.1 Actions to address risks and opportunities
  - 6.1.1 General
  - 6.1.2 Significant environmental aspects
  - 6.1.3 Compliance obligations
  - 6.1.4 Planning to take action
- 6.2 Planning actions to achieve environmental objectives
  - 6.2.1 Environmental objectives
  - 6.2.2 Planning actions to achieve environmental objectives

# ISO 14001 Revisions (1 of 2)

- > Incorporates ISO's new "high level structure" for all its management system standards (Annex SL)
  - ❖ Context of the organization
  - ❖ Leadership
  - ❖ Planning
  - ❖ Support
  - ❖ Operation
  - ❖ Performance evaluation
  - ❖ Improvement



# ISO 14001 Revisions (2 of 2)

- > Increased prominence of environmental management in strategic planning processes;
- > Greater input from leadership; and
- > Stronger commitment to proactive initiatives that boost environmental performance.
- > Implementation of proactive initiatives to including sustainable resource use and climate change mitigation
- > A focus on life-cycle thinking
- > The addition of a stakeholder-focused communication strategy



# Key ISO 14001 Thematic Changes

Area	More emphasis compared to current version of ISO 14001
Strategic environmental management	<ul style="list-style-type: none"><li>• Ensuring that environmental issues are addressed in strategic planning</li><li>• Integrating the EMS into the site's business model</li></ul>
Leadership	<ul style="list-style-type: none"><li>• Increasing accountability among management team</li></ul>
Protecting the environment	<ul style="list-style-type: none"><li>• Implementing proactive initiatives – P2, sustainable resource use, climate change mitigation, biodiversity</li></ul>
Environmental performance	<ul style="list-style-type: none"><li>• Improving environmental metrics by establishing measurable performance indicators</li><li>• Focusing on outcomes and results</li><li>• Deploying risk based thinking to reduce impacts</li></ul>
Lifecycle thinking	<ul style="list-style-type: none"><li>• Examining life cycle impacts of products and services</li></ul>
Communications	<ul style="list-style-type: none"><li>• Focusing on identifying stakeholder needs &amp; expectations</li><li>• Improving outreach to address stakeholder concerns</li></ul>
Documentation	<ul style="list-style-type: none"><li>• Recognizing the use of electronic systems</li><li>• Flexibility in establishing procedures to ensure effective process control</li></ul>

# Aspects and Impacts

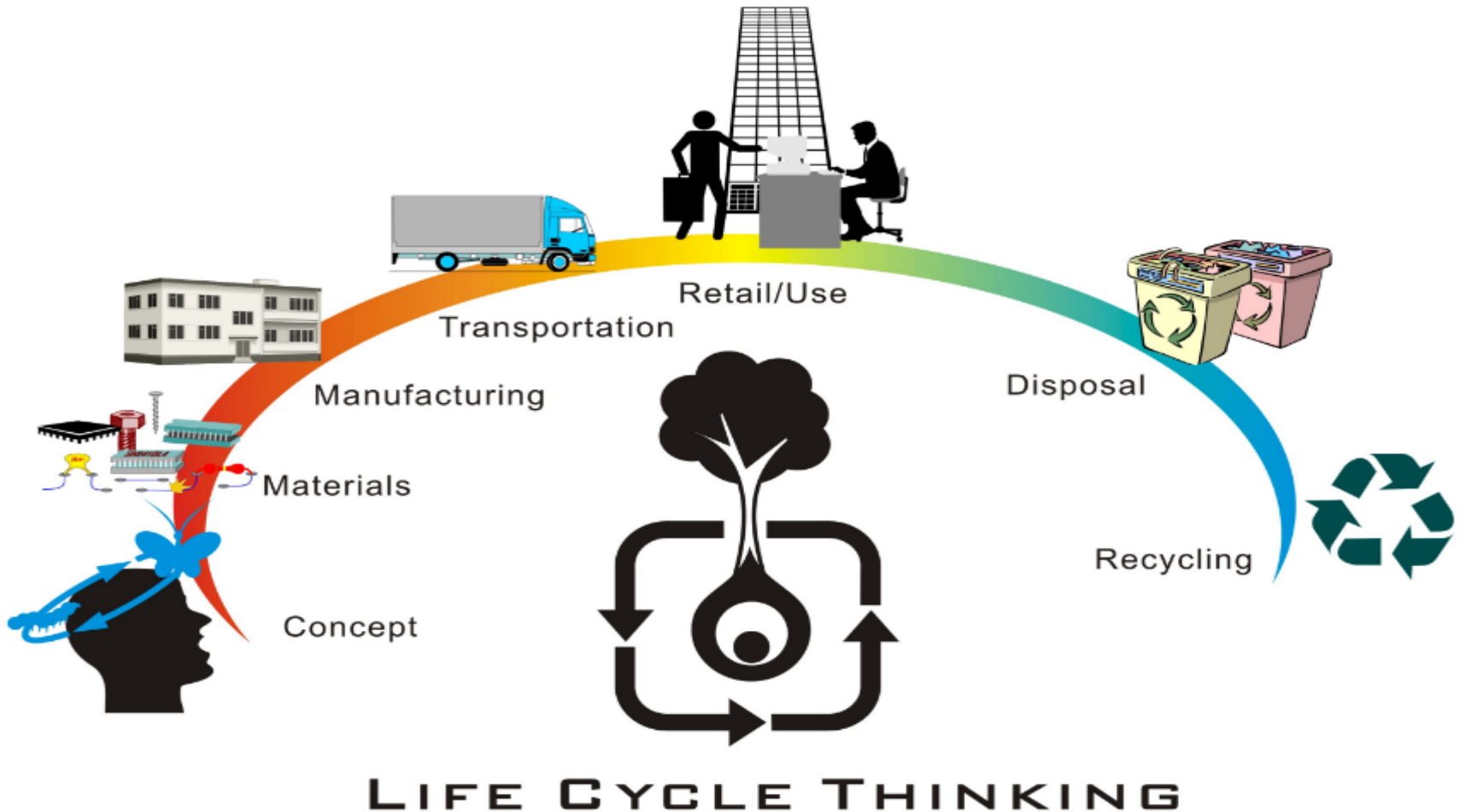
# Aspects and Impacts Purpose

## *ISO 14001:2015*

- > Core element of EMS
- > They define areas to focus
- > Within the defined scope of its management system an organization shall define the aspects of its activities, products and services that it can control...
- > Develop objectives and targets to address significant aspects and impacts



# Developing List of Aspects



# What to Consider

## *ISO 14001:2015*

- > Inputs and outputs
- > Assess controls in place
- > Aspects that have a significant environmental impact
- > Abnormal conditions and reasonable foreseeable emergency situations
- > Can address compliance items but look beyond
- > Things you have control over
- > Update with change
  - ❖ Planned or new developments
  - ❖ New or modified activities, products or services

# Aspects and Impacts Matrix

ENVIRONMENTAL ASPECT SIGNIFICANCE DETERMINATION - SCORING LEGEND			
FACTOR	SCORE <sup>1</sup>	REPRESENTS	COMMENTS
<b>NORMAL OPERATING CONDITIONS</b>			
Likelihood	1	Low	Likelihood of aspect occurring (Yearly)
	2	Medium	Likelihood of aspect occurring (Monthly/Weekly)
	3	High	Likelihood of aspect occurring (Daily)
Severity	1	Low	Mild to harmless - little or no potential for harm to the environment, easily correctable.
	2	Medium	Serious to moderate - harmful to the environment, but not potentially fatal (e.g., kill wildlife), correctable.
	3	High	Severe/catastrophic - very harmful to the environment, or potentially fatal (e.g., kill wildlife); great effort required to correct and recover.
Views of External Interested	1	Low	No inquiries from external interested parties in past year.
	2	Medium	One to three inquiries from external interested parties in past year.
	3	High	Over three inquiries from external interested parties in past year.
Legal / Regulatory	1	Not controlled by legislation / regulations (i.e., no Federal, State, or Local legislation/regulations apply)	
	2	Federal, State, or Local	e.g., SPCC, TRI, Tier II
	3	Federal, State, or Local legislation / regulations apply and a permit or license is required/in place	e.g., Title V, NPDES

**Notes:**

1. Only use the specified scores. Do **not** use numbers outside the range of 1 - 3.



# LCP - ISO 14001:2015

## LCP - Aspects and Impacts Scorecard

Environmental Fields	Weight%	Product Life Cycle						Aspect Score
		Pre-production	Transportation	Production/Process	Distribution (including packaging)	Utilization	Disposal	
		17%	17%	17%	17%	17%	17%	
Waste burden	11%	2	1	2	1	1	2	6
Soil pollution and degradation	11%	1	1	1	1	1	1	4
Water contamination	11%	1	1	1	1	1	1	4
Air contamination	11%	2	2	2	1	1	1	6
Noise	11%	2	1	2	1	1	2	6
Consumption of energy	11%	1	1	3	1	1	1	5
Consumption of natural resources	11%	1	1	3	1	1	1	5
Effects on ecosystems	11%	1	2	2	1	1	1	5
Owner Control	11%	1	1	3	3	3	2	8

1 Add definitions of product life cycle phases

Assessment Score: 47

# Risk Evaluation

# Risks - ISO 14001:2015

ISO standard provides the following guidance:

1. Quantify risks for desired outcome
2. Prevent or reduce desired effects
3. Achieve continual improvement





# Risks - ISO 14001:2015

Consideration of the following potential risks for large and small organizations:

- > Environmental Aspects -> Adverse impacts?
- > Compliance obligations -> Legal obligations  
Damaged Reputation  
Beyond Compliance
- > Expectations of interested parties
- > Literacy or Language Barriers
- > Economic Constraints
- > Potential Emergency Situations - Acts of God (droughts, floods, etc)
- > Nature of processes and hazards handled

# Emerging Risks

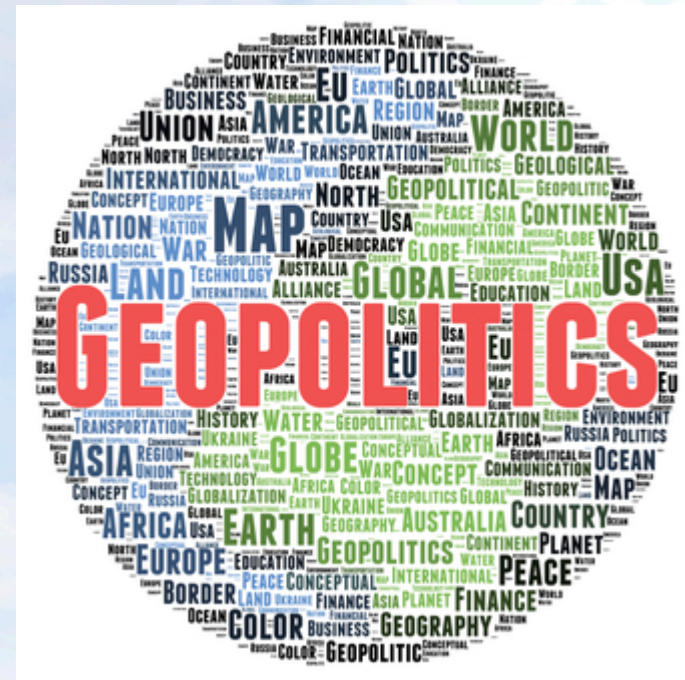
Multi-national organization you want to consider risks on a global scale:

## Major Economic Risks

- > Environmental
- > Geopolitical
- > Societal
- > Technological

## Global Awareness

- > World Economic Forum
- > Global Emerging Risk Survey
- > GRI





# Risk Evaluation

Evaluate risk based on the complexity of your issues.

## *Key Elements of Risk Evaluation:*

- > Assign responsibility and accountability
- > Conduct Research
- > Consult External Subject Management Expert
- > Benchmark
- > Summarize and Report



# Risk Management Tools

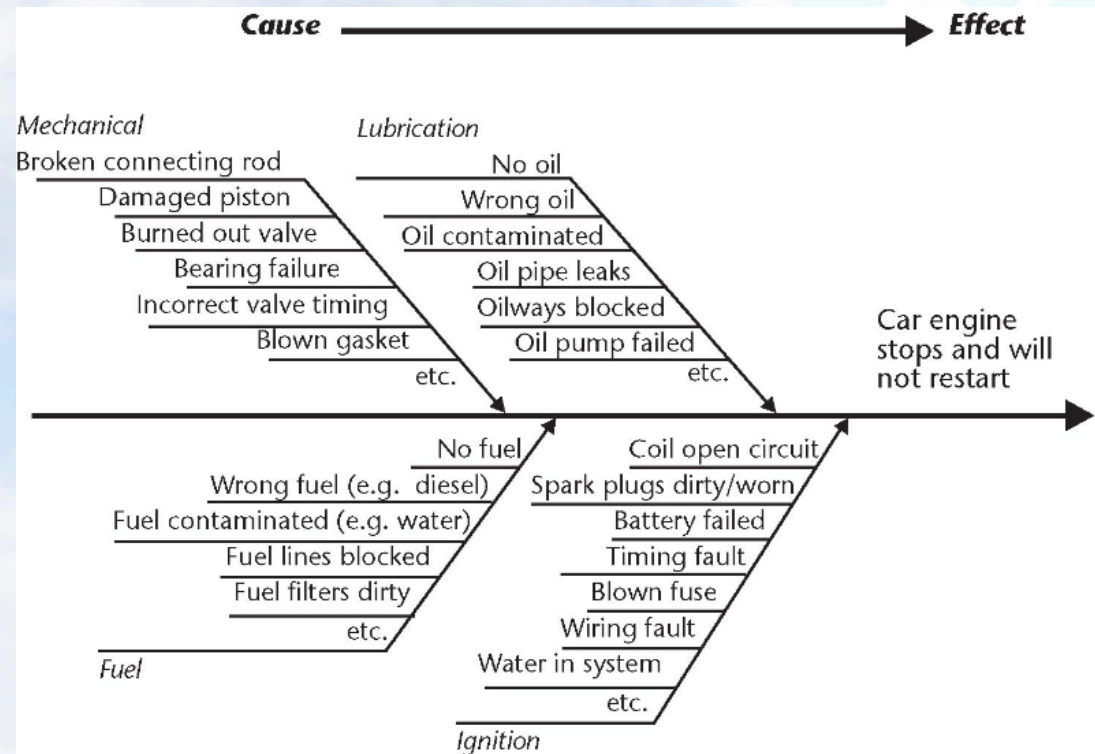
## > Risk matrix

Consequence					Increasing Annual Frequency					
Severity Rating	People	Assets	Environment	Reputation	0	A	B	C	D	E
					Practically non credible failure	Rare Failure	Credible Failure		Probable Failure	Frequent Failure
					Could occur but has not necessarily been observed in industry	Has rarely occurred in industry	Has occurred several times in industry	Has occurred in operating company	May occur several times a year in operating company	Will occur routinely in an individual plant
0	Zero Injury	Zero Damage	Zero Effect	Zero Impact	<p>The risk matrix is a 6x6 grid. The top row (Severity 0) is green. The next two rows (Severity 1 and 2) are yellow. The next two rows (Severity 3 and 4) are red. The bottom row (Severity 5) is red. The text 'Low Risk' is centered in the green area, 'Impact Reduction' is centered in the yellow area, and 'High Risk' is centered in the red area.</p>					
1	Slight Injury	Slight Damage	Slight Effect	Slight Impact						
2	Minor Injuries	Minor Effect	Minor Effect	Minor Impact						
3	Major Injuries	Local Damage	Local Effect	Considerable Impact						
4	Single Fatality	Major Damage	Major Effect	Major National Impact						
5	Multiple Fatalities	Extensive Damage	Extensive Effect	Major International Impact						

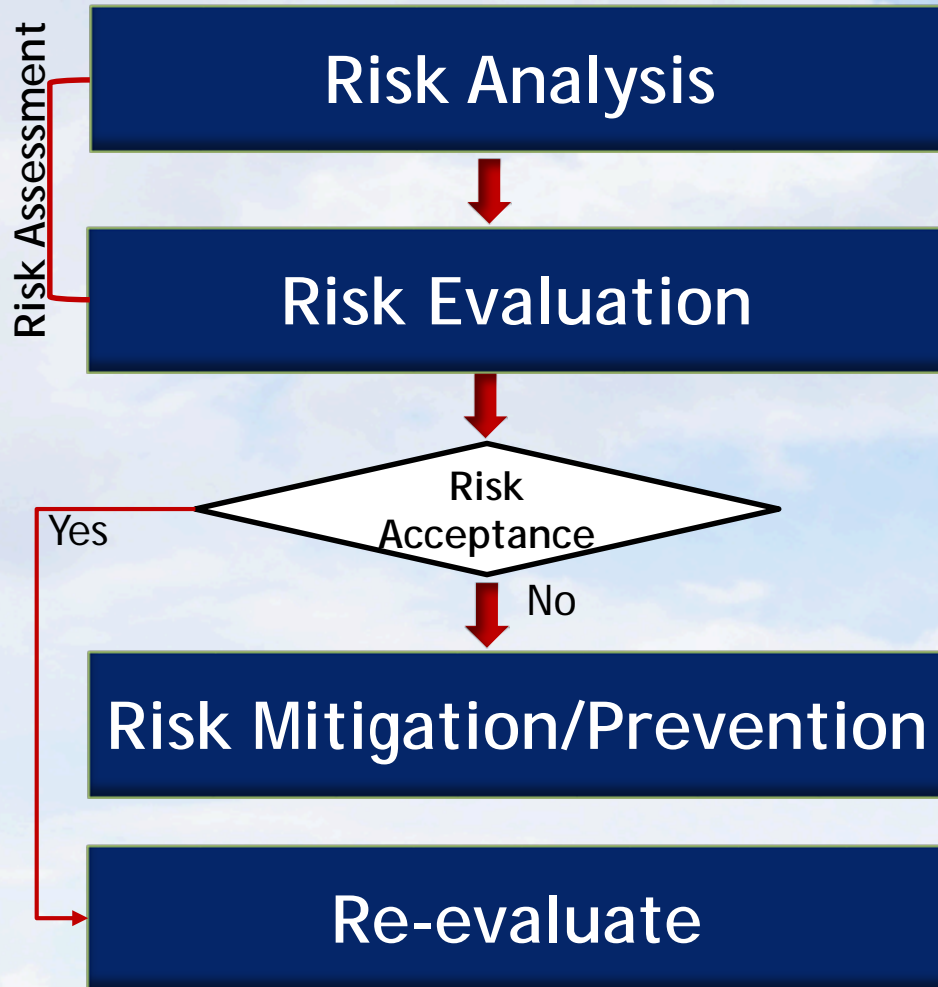
# Implementation of Risk Management

> Other risk management/tools to consider:

- ❖ Fish Bone
- ❖ FMEA
- ❖ Fence Diagram



# Risk Management Implementation

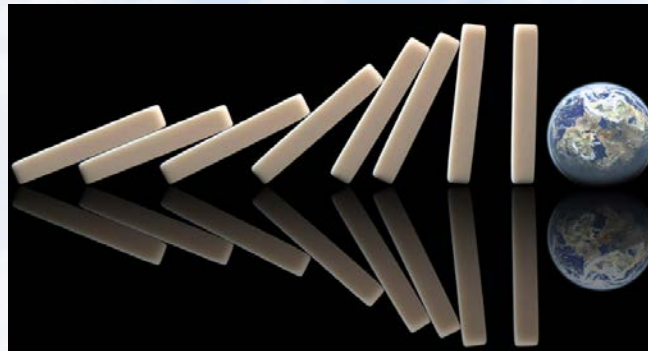


- > Based on Identified Aspects
  - > Identify the system
  - > Identify hazards and possible harms
  - > Compliance Objectives, Interested Parties, Economic Constraints etc.
- > Develop risk assessment based on significant aspects (probability/severity)
- > Compare risk with acceptance criteria
- > Accept or reject risk
- > Estimate costs of migration
- > Management of change (MOC) procedure to assist with prevention
- > Define and take actions for mitigation
- > Evaluate aspects on a periodic basis
- > Develop risk levels of aspects
- > Update objective and targets and take action



# Can MOC Improve Risk Management Implementation?

- > MOC is central to risk assessment and management
  - ❖ Lack of change management is a root cause of many environmental incidents, i.e., change can have a “domino effect” with unwanted implications
  - ❖ Best in class EMS have robust change management components



# Why is Management of Change Important?

- > MOC should be essential part of an EMS
  - ❖ An EMS allows a facility/an organization to operate at an acceptable level of risk (or compliance) and improve aspects of operation based on system performance and feedback
  - ❖ Change management keeps the system at the desired level of risk





# Life Cycle Perspective



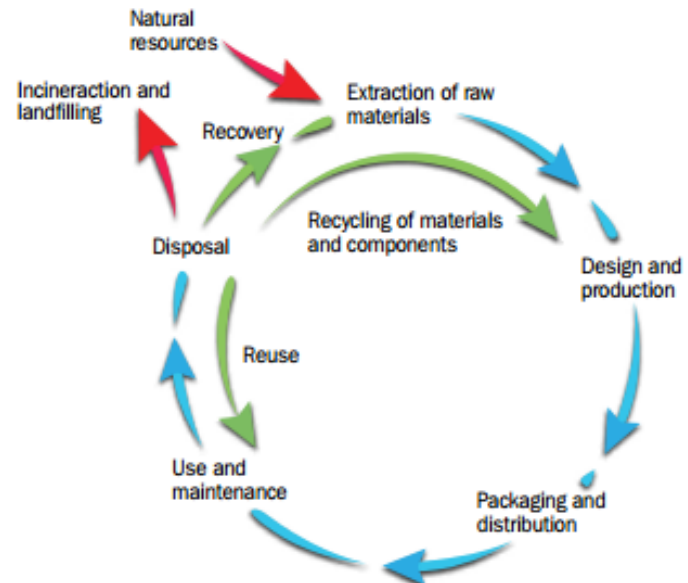
# What is Life Cycle Assessment (LCA)?

## What is an LCA?

Evaluation of impacts throughout a product's entire lifespan including the following steps:

1. Extraction and Processing of raw materials
2. Design and Production
3. Transportation and Distribution
4. Use and Maintenance
5. Recycling and Disposal

**Figure 1: Life Cycle Assessment Iterative Process**



# Why Conduct an LCA?

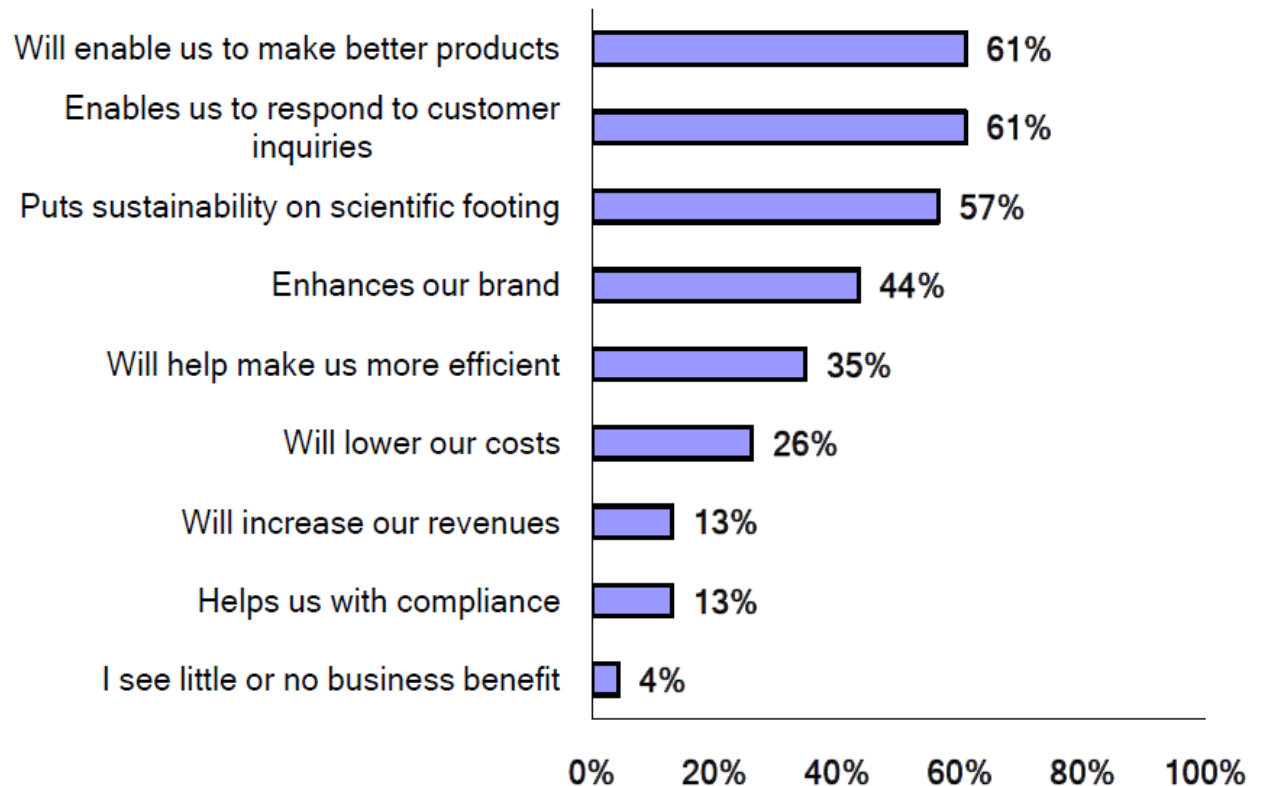
## Applications:

- > **Production process impact and optimization:** Identify the part of a production process to focus optimization efforts.
- > **Supply Chain Engagement:** Large branded companies prompting manufacturers to conduct LCAs and provide carbon/energy data
- > **Waste management:** Used to select a sustainable approach.
- > **Product and packaging development:** Draw on LCA methods in product and packaging design.
- > **Green marketing:** Communicating with customers about environmental performance and progress.
- > **Strategy and risk management:** Improve understanding of their dependence on critical raw materials, the availability of alternative sources and the impacts of those sources.
- > **Sustainability goals:** Support meeting internal or public sustainability goals.
- > **ISO 14001:2015:** Element of the new ISO EMS Standard

# Business Benefits of LCA

## Product and Project Companies Must Incorporate Life Cycle Thinking

Figure 3 Business Benefits of LCA



Question: Which best reflects your thinking on the business benefits of LCA?

Source: Green Research Sustainability Executive Survey (4/11), n=23

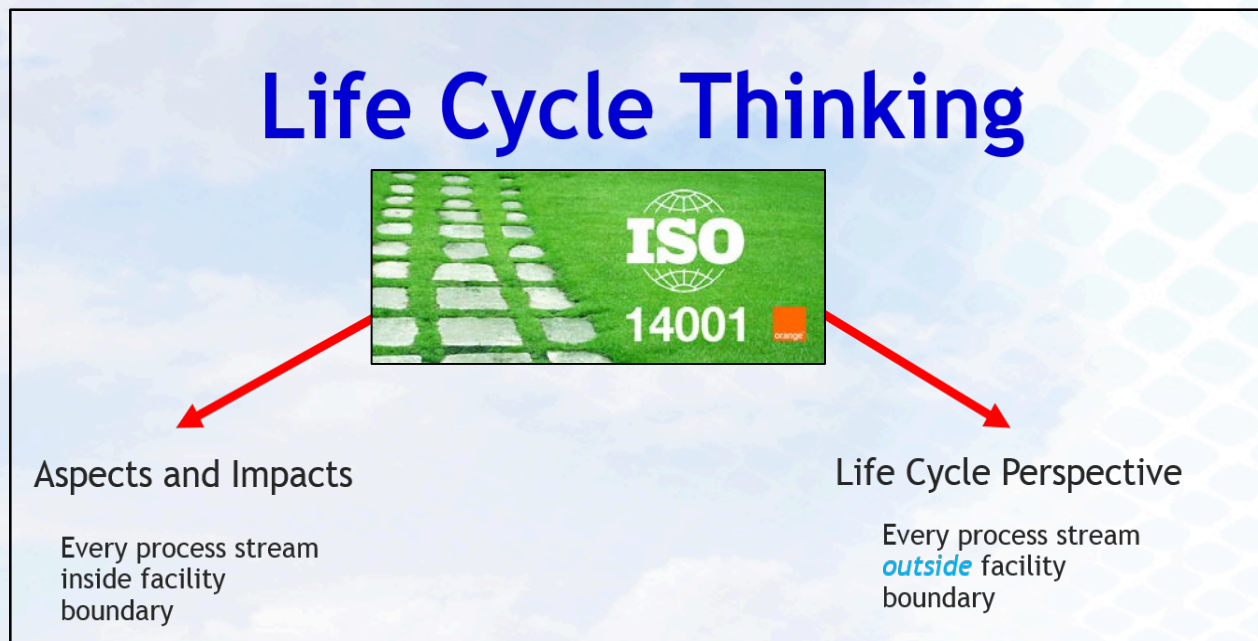


# Who is Doing LCAs?



# ISO standards and LCAs

- > ISO 14001:2015
  - ❖ Introduces Life Cycle Thinking as a requisite of the standard
  - ❖ Future standards may include “Life Cycle Assessments”
- > ISO 14040:2006 and ISO 14044:2006 Standard
  - ❖ Provides a guidance on how to conduct an LCA



# Life Cycle Perspective in ISO 14001: 2015

*ISO 14001:2015 Standard* provides a succinct definition of “Life Cycle Assessment”

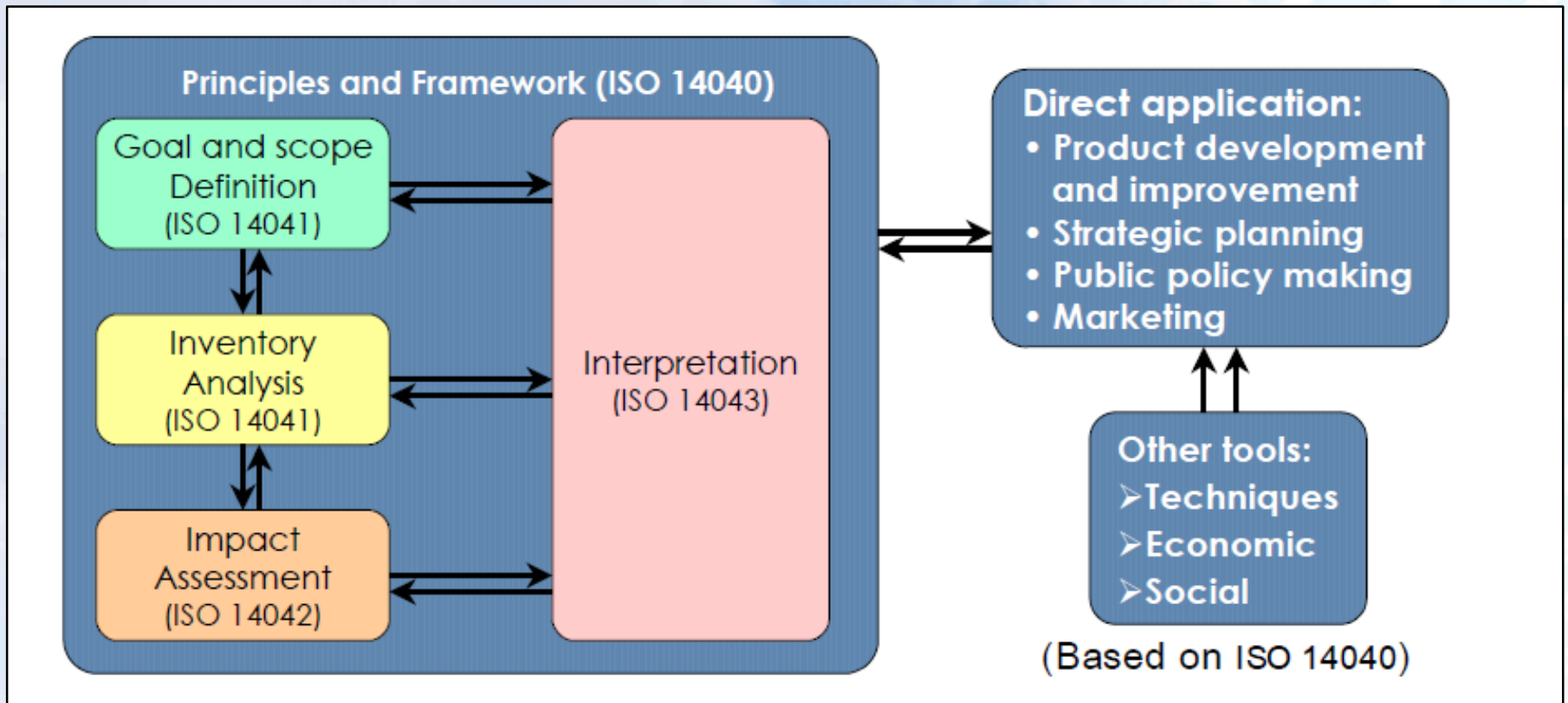
A *perspective* for assessing the environmental aspects and potential impacts associated with a product including

- > Compiling an inventory of relative inputs and outputs of a product system;
- > Evaluating the potential environmental impacts associated with those inputs and outputs; and
- > Interpreting the results of the Inventory Analysis and Impact Assessment phases



# Steps to Developing an LCA

Developing an LCA Involves Four (4) Key Steps:



# Establishing Boundaries

- > Establish Boundaries for the Life Cycle Perspective (LCP)
- > Importance of your Established Boundary:
  - ❖ The credibility of the Environmental Management System (EMS) depends upon the choice of the organizational boundaries.
  - ❖ Do not want to exclude activities, products, services or facilities that have significant environmental aspects.

# Boundary Example

> E.g.

- ❖ The boundary of the system under consideration would begin at procurement of raw materials and end at transportation of final product to the contracted landfill and/or hazardous waste transportation.
- ❖ Company ABC has determined that it will not be able to evaluate any LCP impacts beyond that point due to unavailability of data and no influence over supply chain beyond this point.



# LCP Analysis - Main Components

- > Environmental Aspects Register
  - ❖ Want to determine environmental aspects of activities, products or services that can be controlled and/or influenced.
- > Established Controls
  - ❖ What controls are established, ensuring that environmental requirements are being addressed. in the design and development process for the product or service.
- > Exerted Influence
  - ❖ How much influence is currently being exerted over external service providers?

# LCP Analysis - Aspects Register Example

Life Cycle Perspective Analysis / Aspects Register	
Author	EHS Director
Document ID	
Revision Number	1.0
ISO Standard Ref.	6.1.2 and 8.1

Section 6.1.2 to Evaluate Significance and Controls  
Section 8.1. Determine Controls

Life Cycle Perspective (LCP) Analysis - Template											
ID	Service/ Material Provided	Upstream, Downstream, or Other?*	Aspect	Impact Category	Impact	Control	Significant? (Yes/No)	Operational Influence			Initiatives
								Degree of Influence	If None, Explain	If None, Can Company ABC Exert Any Influence?	
1.1	Bulk Raw Materials	Upstream	Transportation	Receive Bulk Raw Materials	Fuel consumption associated with transportation of raw materials	Company ABC has historically selected facility locations based on proximity of raw materials to minimize fuel consumption from transportation.	No	High			Reduce environmental impact associated with transportation
2.1	Pulp	Upstream	Land	Receive Bulk Raw Materials	Potential destruction of forests through unsustainable forestry	Obtain certification of sustainable forestry from pulp suppliers	Yes	High			Ensure pulp meets European Union Timber Regulation (EUTR) certification and is obtained from suppliers performing sustainable forestry
2.2	Pulp	Downstream	Land	Waste Generation	Generation of waste at the filter press	Company ABC has managed to create a byproduct out of the additional waste generated. This byproduct is managed and used as a landfill liner during landfilling, which occurs downstream of the process.	Yes	High			Company ABC Corporate Key Performance Indicators (KPIs) to reduce waste streams
3.1	Sand	Upstream	Land	Receive Bulk Raw Materials	Impacts to land and water as a result of the supplier not mining in accordance with its mining permit	Notify to sand supplier to maintain compliance.	No	Low			N/A

# LCP Analysis - Aspects Register Example

## > Mapping Aspects Outside of your Facility

### ❖ Upstream:

- ◆ Raw materials acquisitions
- ◆ Transportation, etc.

### ❖ Downstream:

- ◆ End-of-life treatment
- ◆ Final disposal, etc.

## > Reference your Aspects Register

- ❖ Reference established controls and influence associated with environmental aspects outside of your facility.

Life Cycle Perspective Analysis / Aspects Register	
Author	EHS Director
Document ID	
Revision Number	1.0
ISO Standard Ref.	6.1.2 and 8.1

Section 6.1.2 to Evaluate Significance and Controls  
Section 8.1. Operational Planning and Controls

Life Cycle Perspective (LCP) Analysis - Template						
Area	Type	ID	Service/Material	Upstream	Downstream	
MCT	Raw Materials	12	Primer (Coating)	Raw Material Received	Incinerator	
					Landfill (Primer Solids)	
					Sewer	
		12	EP(Coating)	Raw Material Received	Incinerator	
					Sewer	
		12	Paint (Coating)	Raw Material Received	Sewer	
					Landfill (Paint Solids)	
					Emissions	
			38	Polypropylene	Material Received	Recycled
			N/A	Lube	Material Received	N/A
		39	Calcium Carbonate	Material Received	N/A	
		N/A	Part A	N/A	Rejects to Landfill	
		N/A	Part B	N/A	Rejects to Landfill	
	Chemicals	21	Ink	Raw Material Received	Incinerator	
					Fugitive Emissions	
		N/A	Cleaning Solvents	Solvent Received	Incinerator	
					Fugitive Emissions	

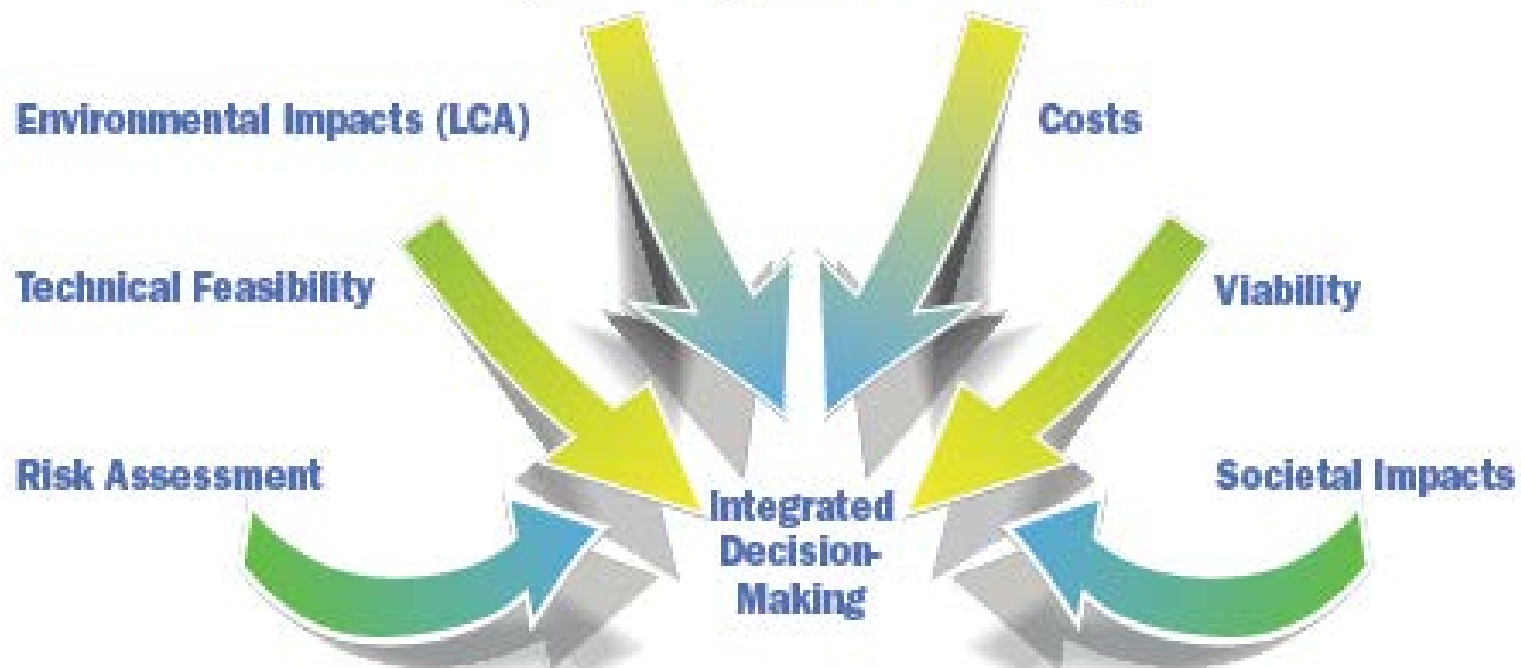


# Summary

- > Understanding Life Cycle Perspective (LCP) very important to getting ISO certified.
- > LCP can also increase operational efficiency.
- > No clear methodology on how to approach LCP.
- > Talk to your ISO auditor on his/her expectations.

# Effective EMS Overview

Figure 6: Integrated Decision-Making



# Questions & Discussion

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- Technical
  - o Develops permit applications for clients in the cement, mining, aerospace, and refining industries across multiple states such as Arizona, Texas, Colorado, California and Utah.
  - o Performs multi-media environmental compliance audits resulting in violation-free agency inspections.
  - o Performs air dispersion modeling (AERMOD) for permitting applications.
  - o Develops Emission Inventories, TRI Inventories, and support clients on other reporting obligations.
  - o Supports implementation of Environmental Management Information Systems (EMIS).
  - o Develops Risk Management Plan (RMP) elements.
  - o Coordinates ownership transfer of environmental permits for clients across multiple states.
  - o Supports permitting and compliance obligations for semiconductor, steel, and power industries.
- Management
  - o Serves as a project manager for over 13+ projects till date.
  - o Manages revenue as a manager/lead consultant on projects worth more than \$500,000 till date.
  - o Co-Instructs the 'Clean Air Act for the Mining Industry' Course.
  - o Trains and supports development of new hires