HOW SUSTAINABLE MATERIALS MANAGEMENT INCREASES ENTERPRISE RESILIENCE

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Supply Chain Realities

Entreprises are increasingly vulnerable:

• Complex global supply networks
• Reliance on outsourcing
• Leaner production
• Environmental pressures
• Economic & political turbulence
• Security threats in a post-9/11 world
Enterprise Resilience

Traditional risk management methods are inadequate to address unforeseen threats in complex industrial systems.

Resilient companies have the capacity to overcome disruptions and thrive in a turbulent, unpredictable environment.
Resilience Time Scales

Real Time
Business Continuity, Efficiency & Agility

Operational resilience
Coping with the risk of disruptions that threaten growth and profitability

Strategic resilience
Anticipating & responding to competitive challenges and market opportunities

Life Cycle
Sustainability & Adaptability

Enhancing the Value Proposition through Metals Recycling: Thinking Globally, Acting Locally

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Ecological "Overshoot"

Ecological footprint (hectares per capita)

Source: Redefining Progress, 2004
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Global Systems View

Industrial Systems

- Product/Service Supply Chains
- Energy Production

Material & Energy Harvesting

Human Impacts

Demand Fulfillment

Ecological Systems

- Renewable Resource Stocks
- Non-renewable Resource Stocks
- Finite Media
- Energy Sources

Direct Utilization

Waste Disposal

Societal Systems

- Energy Use
- Service Use
- Durable Product Use
- Consumable Product Use

Direct Labor

Waste Recovery


30 tons/yr per capita (US)
Global Material Flow Analysis

- Material flow ranges from 11 MT per capita (Japan) to 25 MT (U.S.). “Hidden flows” double the figures.
- Flow per $ (GDP) decreased 40%-60% from 1975 to 1996, but efficiency was offset by GDP growth.
- 50% to 75% of resource inputs are emitted as wastes within a year, mainly air emissions.
- Potentially hazardous flows in the U.S. rose 30%, mainly synthetic organics & fossil fuel byproducts.
- Extraction of fossil energy resources continues to increase. CO$_2$ is 80% by weight of material flows.

Source: WRI, “The Weight of Nations”
Sustainable Materials Management (SMM)

An integrated approach for managing material life cycles with the goal of achieving economically efficient and environmentally effective material use.

Material life cycles include all activities related to material selection, exploration, extraction, transportation, processing, consumption, recycling, and disposal.
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Aluminum Example

Life-Cycle of the Aluminum Can

Recycling uses 5% of energy & material flows vs. primary

Source: Alcan
SMM Strategies

Dematerialization
- Recycling (post-industrial & post-consumer)
- Increased material process efficiency
- Product and packaging re-design
- Reduced transportation needs
- Substitution of services for products

Detoxification
- Toxic & hazardous material restrictions
- Cleaner production technologies
- Waste treatment or containment
Key Findings

• Tension between ecological pressures and increasing societal demand for materials.

• SMM requires a global perspective to avoid shifting material burdens to developing nations.

• Metals offer the greatest opportunity for reducing virgin demand through recycling.

• Better tools are needed for understanding material flows and their ecological impacts.

• SMM policies should encourage voluntary practices based on shareholder value drivers.
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Shareholder Value Drivers

Shareholder Value

- Financial & Operational Resilience
- Sustainable Materials Management
- Social & Environmental Responsibility
- Reduced Ecological Footprint
- Reputation & Market Positioning
- Resource Productivity & Customer Satisfaction
- Business Continuity & Cost Savings

Central Ohio Resource Transformation Center

- **Paper Wastes**
  - Industrial & Municipal Sources
  - Residential Yard Waste
  - Schools

- **Mixed Solid Wastes**
  - Restaurants & Groceries

- **Organic Wastes**
  - Zoo, Racetrack & Fairgrounds

- **Plastic Wastes**
  - Bags

- **Material Recovery**
  - Anaerobic Digester

- **Wast-A-Way Fluff Process**
  - Methane & CO₂

- **Material Markets**
  - Paper
  - Plastics
  - Metals
  - Soil Amendments
  - Dry Ice, Greenhouses

- **Energy Markets**
  - Fuel Pellets
  - Fuel Cell R&D
  - BioDiesel Processing

- **Natural Gas**
  - Building Materials, Furniture

- **Electric Power**
  - Businesses
  - IC Engine, Microturbine or Fuel Cell

- **Plastic Lumber Plant**
  - Rastra Plant

- **FirmGreen/Acrion System**
  - Pure Methanol

- **Residuals**
  - Landfill

- **Audubon Gift Shop**

- **Material Recovery**
  - Paper Recycling

- **Financial**
  - Costs
  - Revenue

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