

Sustainable Manufacturing



**Greening Our Future By
Educating Tomorrow's Workforce**

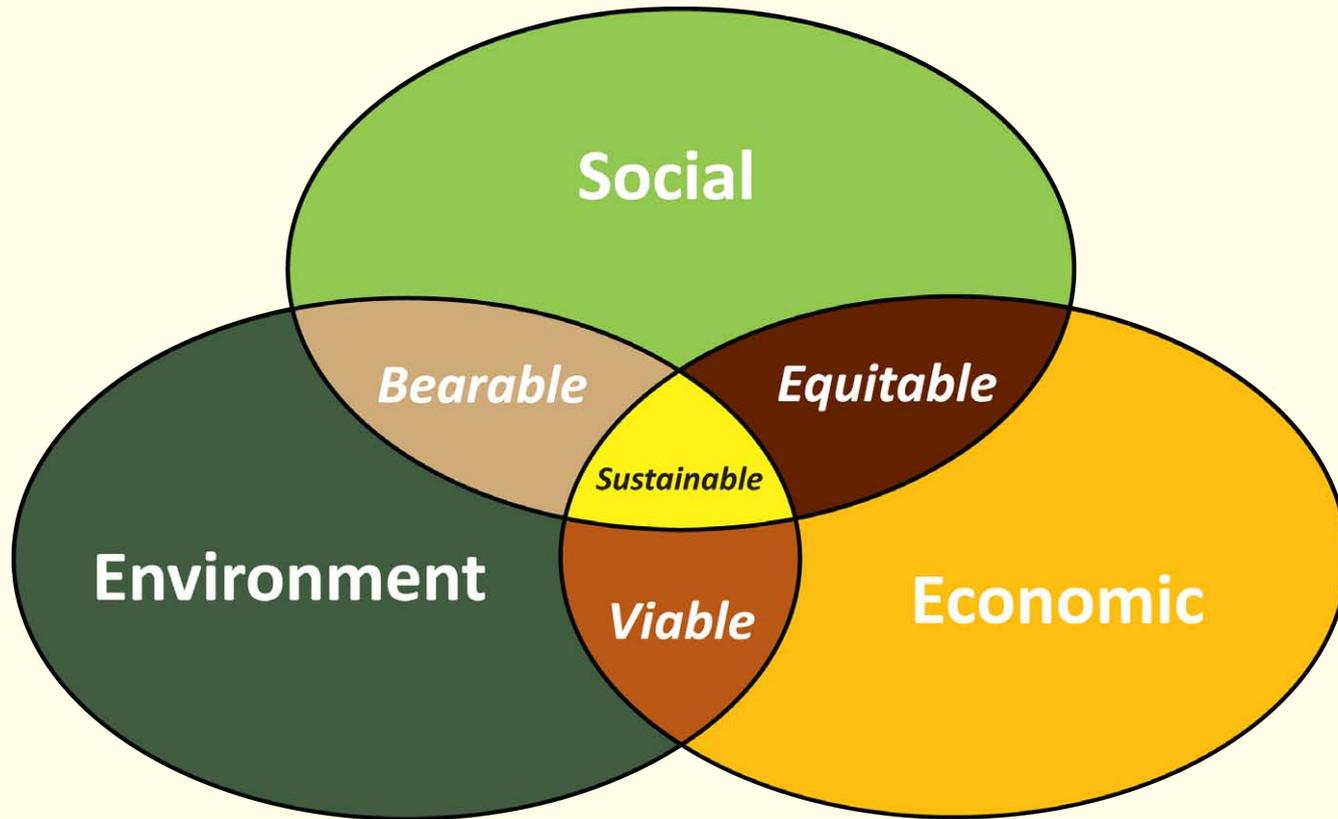
Sustainable Manufacturing

What is sustainable manufacturing?

- decision makers focus on a ***triple bottom line*** that address the three pillars of sustainability.
 - social responsibility (***people***)
 - economic considerations (***product***)
 - environmental impacts (***planet***)



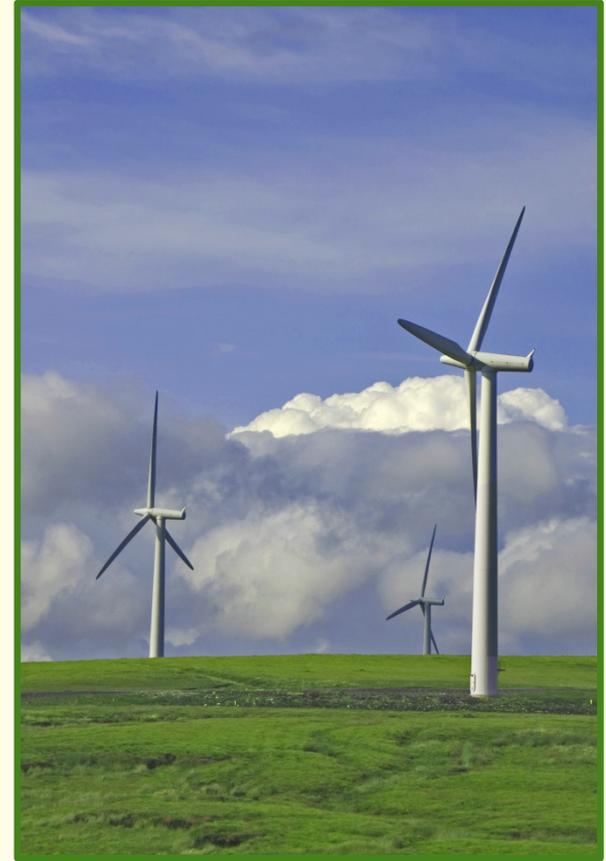
Three Pillars of Sustainability Model



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“Sustainability is not only central to business strategy, but will increasingly become a **critical driver of business growth**. How well and how quickly businesses respond to this agenda **will determine which companies succeed** and which will fail.”

—Patrick Cescau, CEO of Unilever



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Sustainable Manufacturing is the new normal.

95% of the world's largest companies now report on environmental performance and sustainability metrics.

70% of companies state that sustainability is permanently on their management agenda.

70% of companies state that sustainability is necessary to compete in today's marketplace.

70% of companies state that their sustainability efforts increased in 2011.

50% of companies state that sustainability will lead to increased profitability and reduced costs.



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As sustainable manufacturing takes hold across the country, the demand will grow for employees who:

- Can identify waste.
- Implement lean techniques.
- Recognize opportunities to improve efficiency.
- Understand life cycle impacts.
- Conserve resources.
- Prevent pollution.



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Q. Why do employers see value in a green workforce?

A. It's simple. The less money manufacturers spend on wasting energy, water, raw materials, and time, the more money they have to spend on hiring new employees, adopting new innovations and expanding to new markets.



What Are Green Jobs?

Manufacturers engaged in sustainability are looking to create *Green Jobs*.

- Jobs that provide products that use renewable energy resources, reduce pollution, conserve energy and natural resources, and reconstitute waste.
- Jobs in which companies establish a culture where process improvements lead to more environmentally friendly products and use fewer natural resources.



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But who will fill these new green jobs?

- EPA is looking to *educators* at community colleges, high schools and vocational-technical schools to *help meet these demands* by incorporating sustainability concepts into the classroom.



Green Jobs Strategy

Strategies for developing a green workforce include:

- Evaluating the current workforce knowledge gap and identify training programs to meet industry needs.
- Working with established universities, community colleges, and vocational/technical high schools to integrate clean energy workforce training into existing curricula and programs.
- Tailoring programs for low-income workers and environmental justice communities.



Green Jobs Strategy

EPA Region 4 Office of Environmental Justice

- Working to enhance green economy activities in environmental justice communities.
- Fostering green jobs that target unemployed/underemployed workers.
- Promoting Alabama E3: Energy, Economy, and Environment.
- Implementing Sustainable Manufacturing Curriculum.



Environmental Justice

Q. What causes environmental injustice?

A. A combined lack of environmental awareness, political influence, and economic power makes impoverished and minority communities vulnerable to become a frequent target for environmentally hazardous activities.

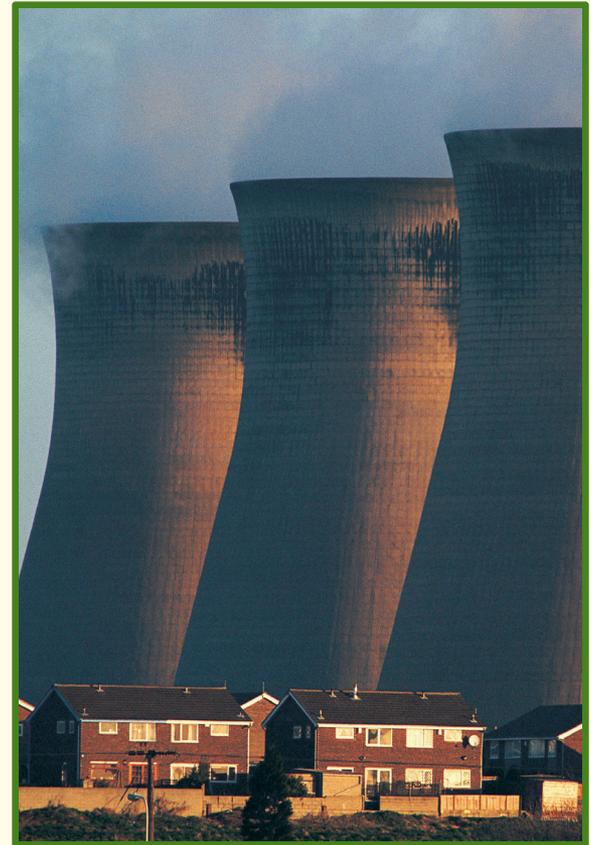
Environmental injustice persists because of our society's *“as long as it’s not in my back yard”* mentality.



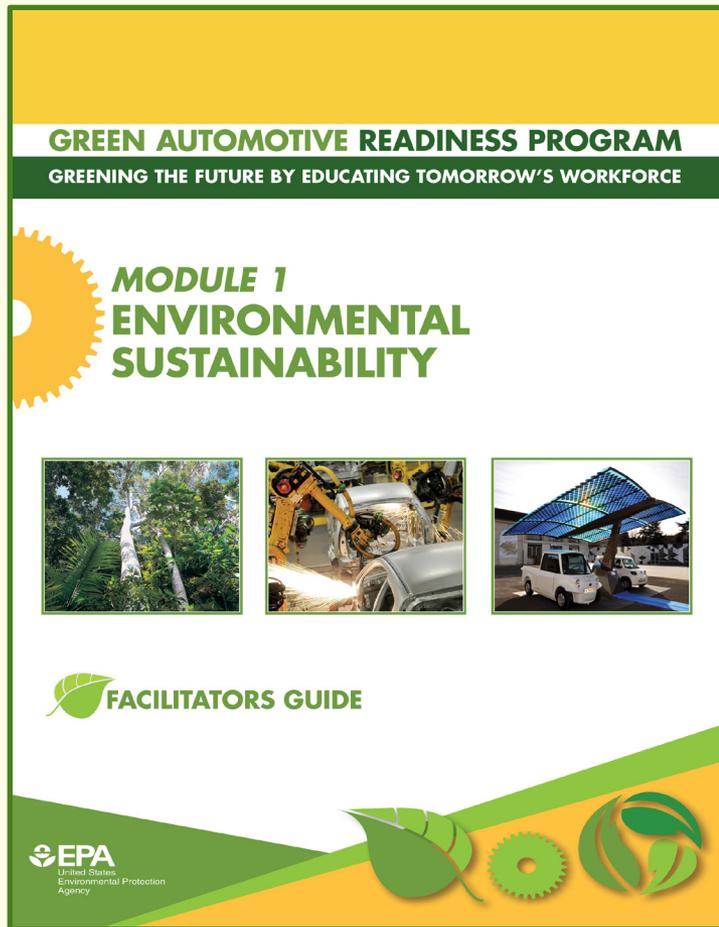
Environmental Justice

“Far too often, and for far too long, low-income, minority and tribal communities have lived in the shadows of some of the worst pollution, holding back progress in the places where they raise their families and grow their businesses.”

—*Lisa F. Garcia, senior advisor to the EPA Administrator for Environmental Justice*



Sustainable Manufacturing Curriculum



*Greening Our
Future By
Educating
Tomorrow's
Workforce!*

Sustainable Manufacturing Curriculum:

Greening the Future By Educating Tomorrow's Workforce

- Developed by EPA Region 4
- Contributions from Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM).
- Intended for educators at high schools, career and vocational institutes, community colleges and trade schools.
- Supports existing green job training programs in the automotive supply industries.



Sustainable Manufacturing Curriculum

Facilitator's Guides

- Learning Objectives
- Glossary Terms
- Step-by-step Instructions
- Icons
- Resource Materials
- Quizzes
- Activities
- Handouts

GREENING THE FUTURE BY EDUCATING TOMORROW'S WORKFORCE

Nested Sustainability Model



Topic
Sustainable Manufacturing
20 minutes
(Elapsed Time: 55 minutes)

Learning Objective
Name the three pillars of sustainability and analyze the interdependence of a sustainability model.

Notes for the Facilitator

-  Some experts feel that the "nested sustainability model" is a better visual representation of the interdependency of the pillars of sustainability. This model views the economy as a part of society and our society being a part of our environment as a whole. This model is intended to convey that all economic decisions have an effect on our society and environment, but that the environment encompasses all.
-  This website lists out other ways to visualize the interactions between the environment, the economy and society in sustainable development models. <http://computingforsustainability.wordpress.com/2009/03/15/visualising-sustainability/>
-  Using visuals available from the website above, print out various models of sustainability. Pass them out and have students get into groups and explain why the visual does or doesn't work to convey the concept of sustainability.

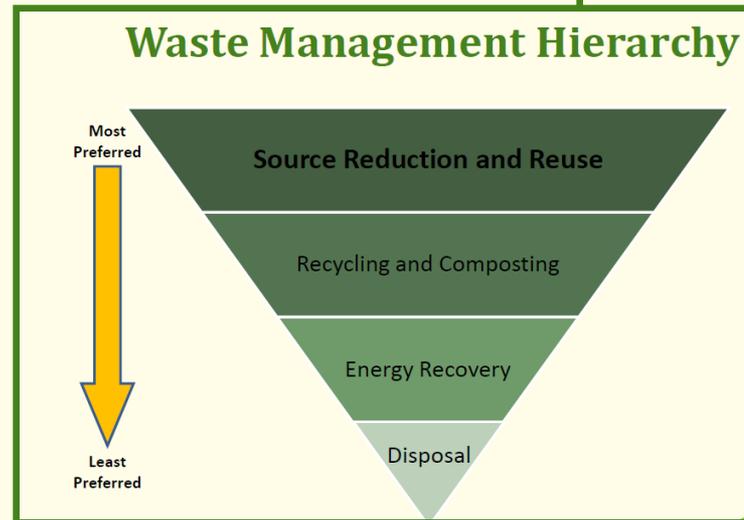
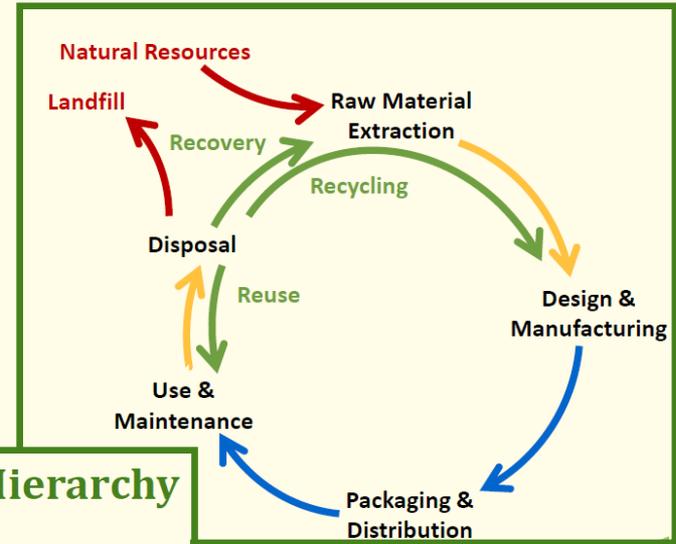
By having the students analyze the visuals, they will start to mentally construct (make mental models) of the interdependence such as the "three-legged" model. The goal is to shift their paradigm thinking of a one-to-one relationship to a complex/interdependent relationship. Keep the "onscreen text" PowerPoint up so students can ask these questions when looking at visuals of the model.



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Presentation Slides

- Graphic Aids
- Photos
- Videos
- Discussion Questions



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Module 1: Environmental Sustainability

Topics:

- Environmental Justice
- Sustainability as the Next Environmental Revolution
- Sustainable Manufacturing
- Environmental Awareness and Social Responsibility
- Greening the Supply Chain
- Life Cycle Analysis
- Full Cost Accounting



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Module 1: Environmental Sustainability

Learning Objectives:

- Identify the ways the environment has a direct personal impact.
- Define environmental justice.
- Define sustainability as it relates to manufacturing.
- Name the three pillars of sustainability and analyze the interdependence of a sustainability model.
- Correlate greening the supply chain to corporate success.
- Define a product's life cycle.
- Recognize what contributes to the full cost of manufactured goods.



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Module 2: Lean Manufacturing and Pollution Prevention

Topics:

- P2 Through Environmental Regulations
- Lean and Clean Manufacturing
- Value Stream Mapping
- Waste Management Hierarchy
- Moving beyond the traditional 3 R's



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Module 2: Lean Manufacturing and Pollution Prevention

Learning Objectives:

- Define “pollution prevention” and explain how it impacts you.
- Identify environmental regulations that apply to manufacturing.
- Define waste.
- Connect lean manufacturing strategies with environmental wastes.
- Use value stream mapping techniques to identify inputs and outputs for a manufacturing process.
- List the waste management hierarchy from top to bottom.
- Propose approaches for better waste management at home and at work.



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Module 3: Energy and Carbon

Topics:

- Carbon Intensity of Energy Sources
- Why Carbon Matters to Manufacturers
- How Manufacturers Pay for Energy
- Energy Efficiency Strategies



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Module 3: Energy and Carbon

Learning Objectives:

- Define energy.
- Rank the carbon intensity of various energy sources.
- Describe the role of carbon dioxide and other air emissions in the greenhouse effect.
- Calculate carbon footprint and propose ways to reduce it.
- Read and disseminate information from an energy bill.
- Recognize energy intensive manufacturing processes and equipment.



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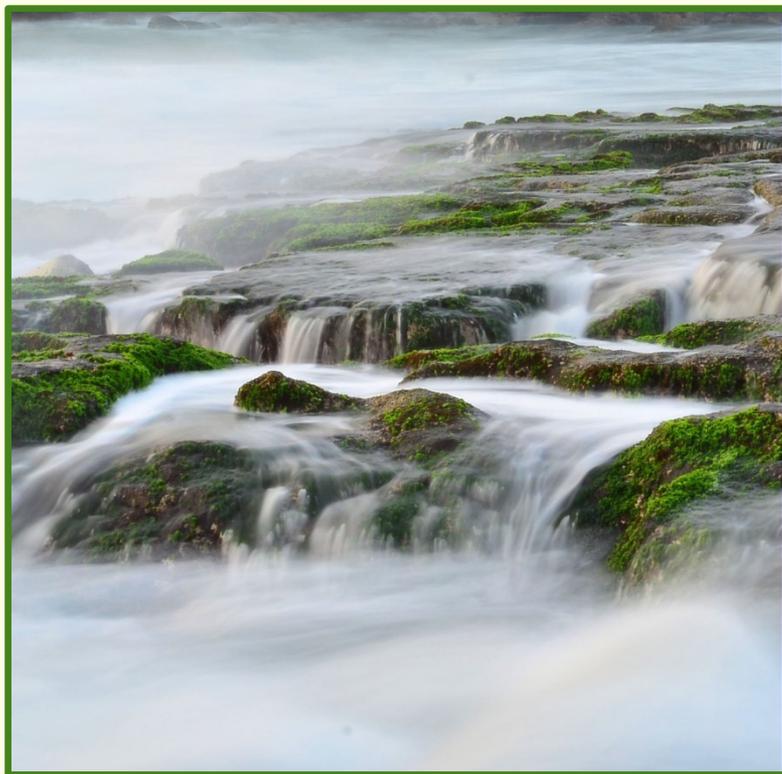
Each module is customizable with activities and discussion questions for each topic. Educators can and should pick and choose which topics, discussion questions, and activities best fit their classroom needs.

Suggested Elapsed Time

- *Module 1: 2 hours, 55 minutes*
- *Module 2: 2 hours, 40 minutes*
- *Module 3: 2 hours, 40 minutes*



Sustainable Manufacturing



“We might not have made it without committing to sustainability. It is a **revised definition of success** and this new paradigm has a name: Doing well by doing good. It is a **better way to bigger profits.**”

—*Ray Anderson, Founder and Former Chairman of Interface, Inc.*



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