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BEYOND SMART SUSTAINABLE MANUFACTURING - BSSM

ONLINE TRAINING

KRISHNAJI PAWAR - CEO & FOUNDER



02. WHAT IS SMART SUSTAINABLE MANUFACTURING?

SECTION - SMART SUSTAINABLE MANUFACTURING

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Overview

- The production of sustainable goods is an essential component of sustainability .
- We take a different approach to environmental engineering than most other companies.
- This group's main emphasis is on avoiding problems from occurring in the first place, as opposed to the more common approach of responding to issues when they arise, such as cleaning up or minimizing the effect of trash.
- In order to achieve this goal, the We places a strong emphasis on all three aspects of sustainability: the environment, society, and the economy.
- Manufacturing that is both smart and sustainable, an economy based on the circular use of resources, planning for environmentally friendly manufacturing, the social sustainability of manufacturing, and the implications of manufacturing on sustainability are all topics of study..

> We advise customers on company sustainability, decision-making, and innovation. Our innovative thinking and counsel empowers leaders to improve organizations, value chains, markets, and systems.



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Current areas of research include

01. Smart/Sustainable Manufacturing:

Pursual of sustainable manufacturing through design and scheduling

Incorporation of principles of sustainability into the field of Smart Manufacturing

02. Circular Materials Economy:

Development of a Circular Economy within Industrial Symbiosis

Development of optimal supply chain solutions for recycling of rare earth elements

03. Green Manufacturing Planning:

Pursual of a profitable and environmentally friendly disassembly sequence

Development of sustainable manufacturing by remanufacturing end-of-use products

04. Social Sustainability of Manufacturing:

Development of sustainable manufacturing by low carbon, green, artificial intelligent, smart, quality control, additive, and subtractive manufacturing

05. Sustainability Impacts::

Assessment of sustainable performance for a system by quantifying the potential environmental, economic, and social impacts

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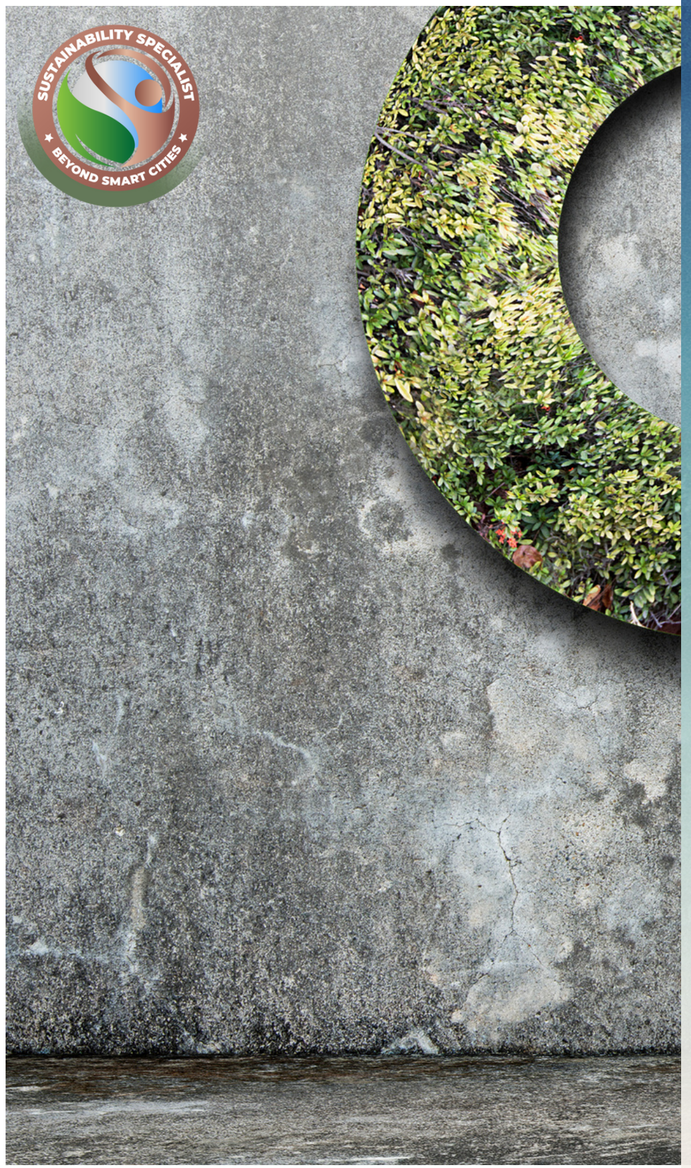
Smart/Sustainable Manufacturing

- Sustainable production reduces environmental effect so future generations may benefit.
- This ambition requires waste and energy reduction research.
- Design and production stages must be examined.
- Design considerations impact the lifetime.
- Product environmental effect may be reduced through intelligent decision-making.
- Product environmental effect also depends on production.
- New energy-efficient machine tool design, operation, process planning, and scheduling are crucial.
- Sustainable manufacturing uses smart manufacturing.
- Manufacturing and data-driven decision-making are combined.
- Sensors gather production, shop floor, and corporate data to decrease waste and boost productivity.
- AI can analyze this data to improve production and distribution.
- Sharing this data reduces corporate and supply chain waste.

> Smart, flexible, efficient and sustainable manufacturing industry provides relevant and attractive employment opportunities, now and for the future



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CIRCULAR MATERIALS ECONOMY

Materials Circular Economy provides a platform for research related to the science, engineering and technologies of sustainable materials, 6Rs (reuse, recycle, redesign, remanufacture, reduce, recover), lifecycle engineering and life cycle assessment of materials with or without the use of artificial intelligence and data science.



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Circular Materials Economy

- The 1800s industrial revolution and mass manufacturing changed human history.
- Innovations have made product manufacturing faster and cheaper due to rising customer demand.
- Large-scale manufacturing has improved the lives of many, but it has also irreparably damaged the environment and depleted natural resources.
- Changing our consumption habits might help.
- That is, switch from a "take, make, and dispose" approach to a circular economy that lowers waste and dependency on natural resources by reusing products.
- Due to its regenerative qualities—recovery, reuse, remanufacturing, and recycling—a circular economy may address the three pillars of sustainability—environmental, economic, and social.
- Thus, the circular economy model mimics long-lasting, resilient, efficient, and risk-balancing natural systems.

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> design principles that maximise resources and eliminate waste. Circular design integrates sustainable material flows into products and services to design out unnecessary waste.
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> ”



Green Manufacturing Planning

- Green Manufacturing is a manufacturing that minimizes waste and pollution achieved through sustainable design.
- It integrates the economic benefits with environmental impact and covers the whole life cycle of products from design, production, assembly, transportation, recycling, and disposal.
- The recovery and reuse for end-of-life products are the key steps to achieve green manufacturing.
- To efficiently recycle the remaining value of obsolete products, we study a reverse process of assembly i.e. disassembly.
- The disassembly planning problem needs to decide the disassembly sequencing and the end-of-life ways for products.
- Our goal is to find a profitable and environmentally friendly disassembly sequence while making the recycling decisions for every part of products.

> Essentially, it is the “greening” of manufacturing, in which workers use fewer natural resources, reduce pollution and waste, recycle and reuse materials, and moderate emissions in their processes



Social Sustainability of Manufacturing

- Social sustainability is about identifying and managing business impacts, both positive and negative, on people.
- The quality of a company's relationships and engagement with its stakeholders is critical.
- Directly or indirectly, companies affect what happens to employees, workers in the value chain, customers and local communities, and it is important to manage impacts proactively.
- Businesses' social license to operate depends greatly on their social sustainability efforts.
- In addition, a lack of social development, including poverty, inequality and weak rule of law, can hamper business operations and growth.
- At the same time, actions to achieve social sustainability may unlock new markets, help retain and attract business partners, or be the source for innovation for new product or service lines.

Internal morale and employee engagement may rise, while productivity, risk management and company-community conflict improve.

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Sustainability Impacts

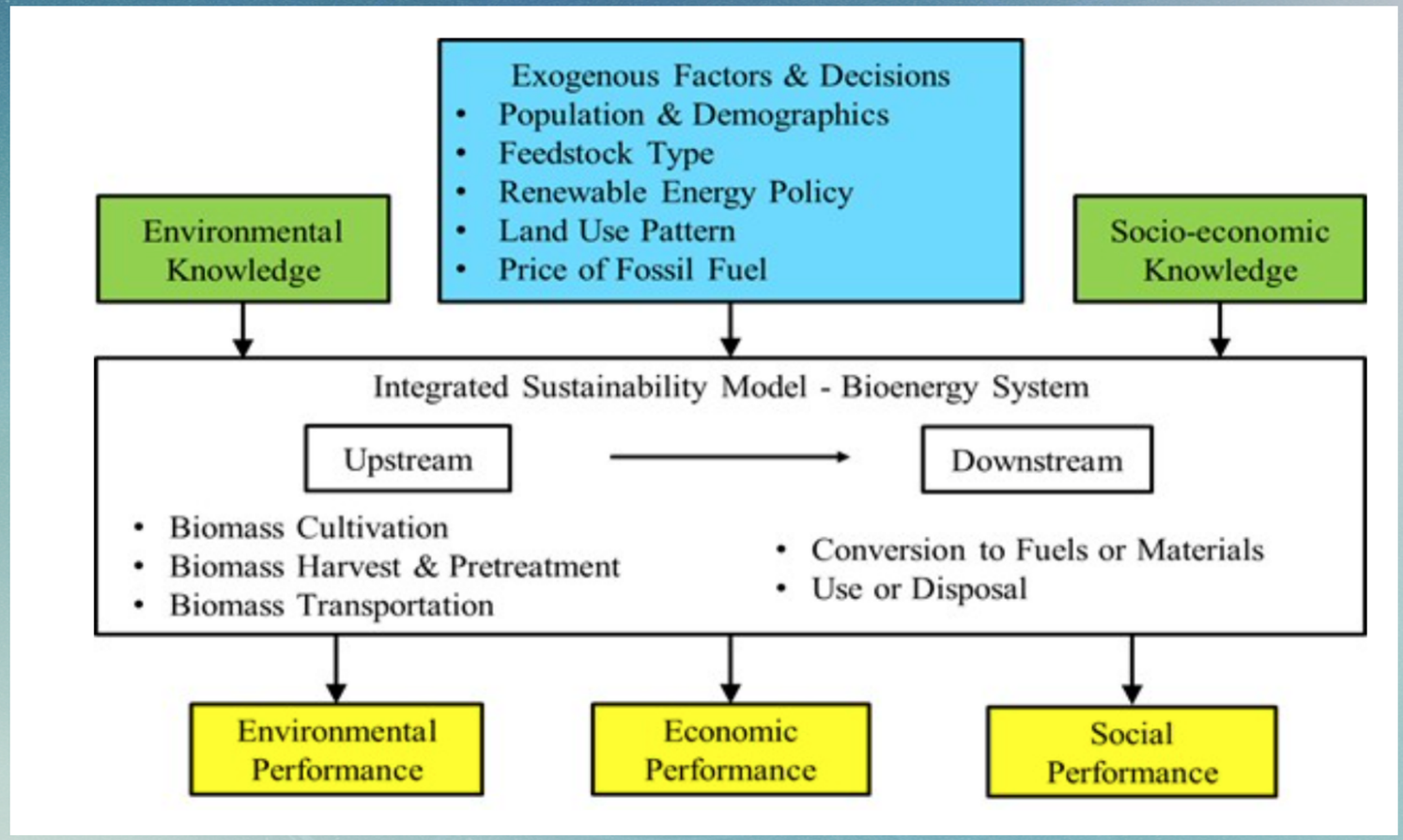
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Exogenous Factors & Decisions
• Population & Demographics
• Feedstock Type
• Renewable Energy Policy
• Land Use Pattern
• Price of Fossil Fuel
Environmental Knowledge
Socio-economic Knowledge
Integrated Sustainability Model - Bioenergy System
Upstream
Downstream
• Biomass Cultivation
• Biomass Harvest & Pretreatment
• Biomass Transportation
• Conversion to Fuels or Materials
• Use or Disposal
Environmental Performance
Economic Performance
Social Performance



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