Towards a Zero-Waste Society

Next Generation Integrated Biorefineries

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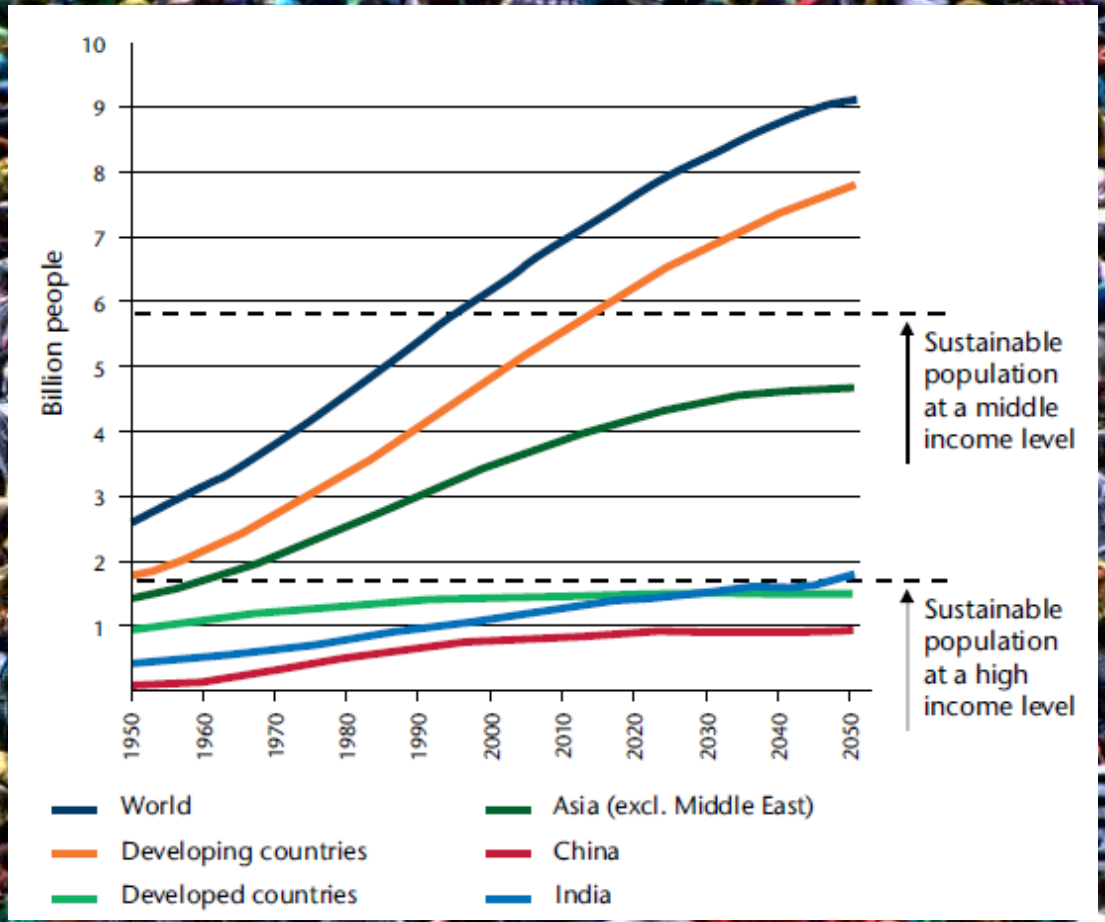
Our World Is Facing Serious Challenges…

Growing world population



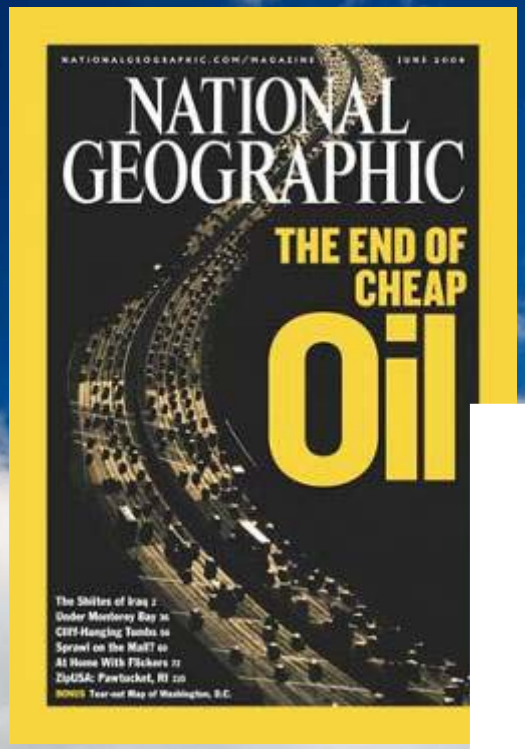
From 6.8 Billion to 9 billion in 2050

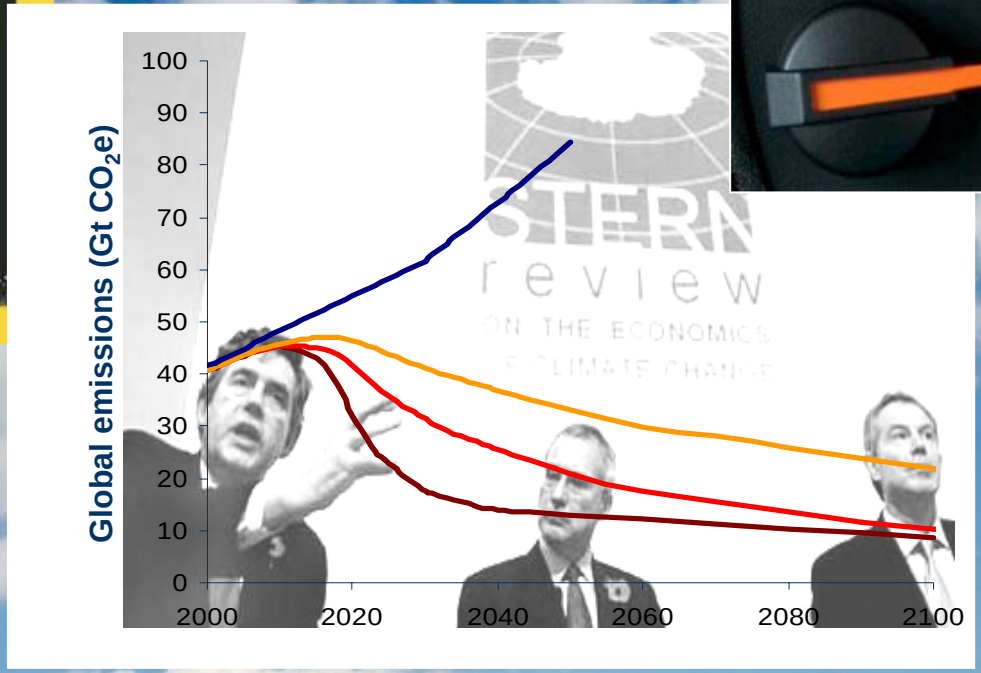
Source: World Resources Institute 2008

Resource constraints

Scarcity of food, land, materials

Carbon constraints






The quest for sustainable development will be the main trend in the coming decades

The Chemical Industry Is Taking Its Responsibility and Is Well Positioned to Address Some of The Real Issues

DSM Mission Statement

- **Our purpose is to create brighter lives for people today and generations to come.**
- **We connect our unique competences**

  in Life Sciences and Materials Sciences to create solutions that nourish, protect and improve performance.

Sustainability

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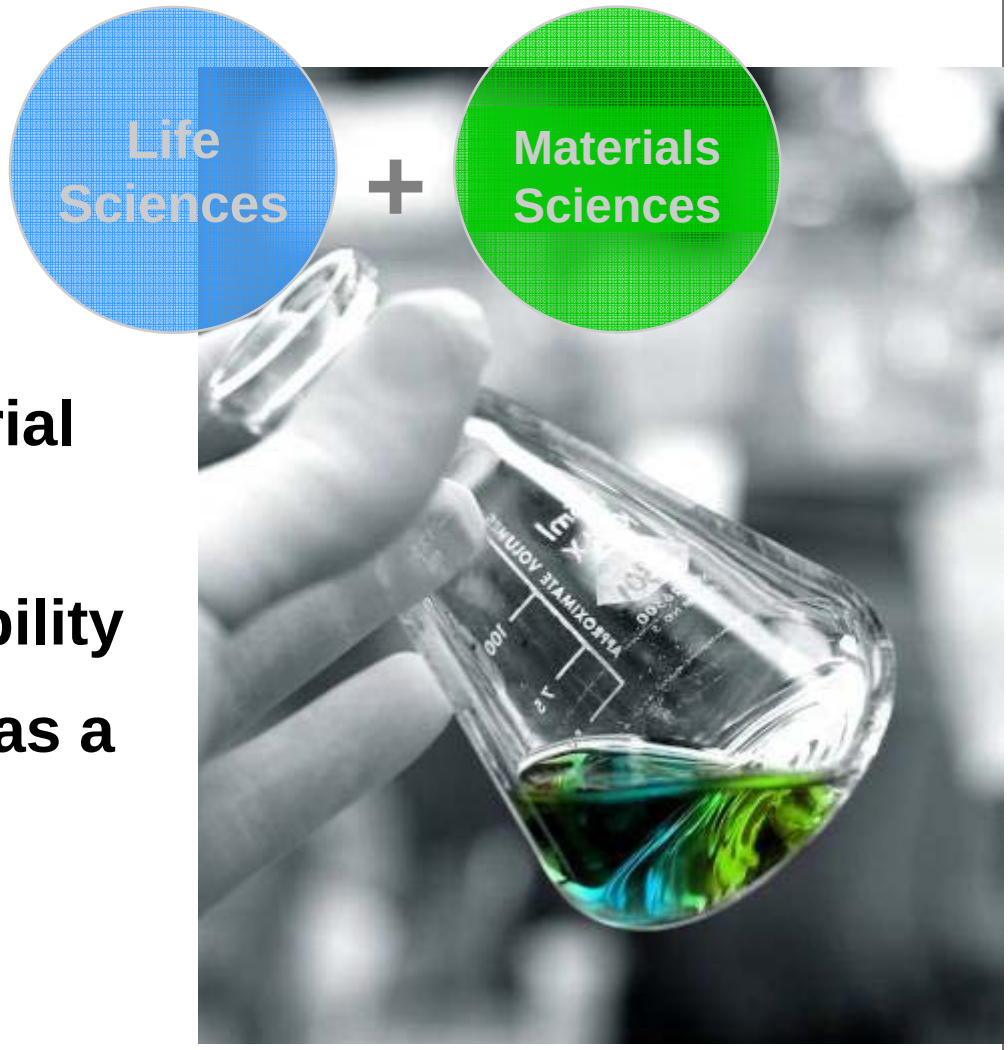

- **Life Sciences and Material Sciences competences**
- **Leadership in Sustainability**
- **Life Cycle Assessment as a guiding principle**

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DSM Recognized for Sustainability

- Global Dow Jones Sustainability
  - In 2009 DSM was again named industry leader of the chemicals sector
- Member of World Business Council for Sustainable Development
- Member of China Business Council for Sustainable Development
- Responsible Care® Program
  - DSM member since 991
  - The company has undertaken continuously work on improving its performance in the field of safety, health and environment

Dow Jones Sustainability Indexes
Member 2009/10

World Business Council for Sustainable Development

Responsible Care®
OUR COMMITMENT TO SUSTAINABILITY

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Dow Jones Sustainability Indexes
Leader 2009 / 2010

Social: People
- Sustainability embedded in our company
- More diverse workforce
- Responsible partner in society

Environmental: Planet
- Improve eco-footprint throughout the value chain
- Leader in white biotechnology

Economic: Profit
- Sustainable value creation for our shareholders and customers
- CFROI > 8.5%

Simultaneously creating value along three dimensions

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DSM: Ability to change
100 years of successful transformations

Innovation is our Sport™
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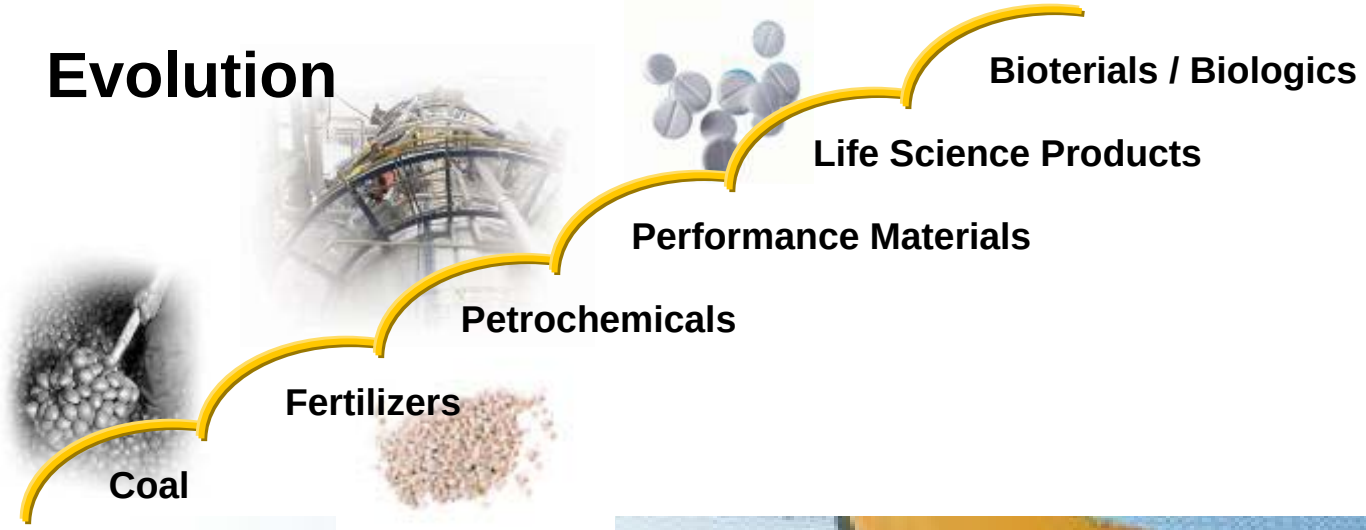
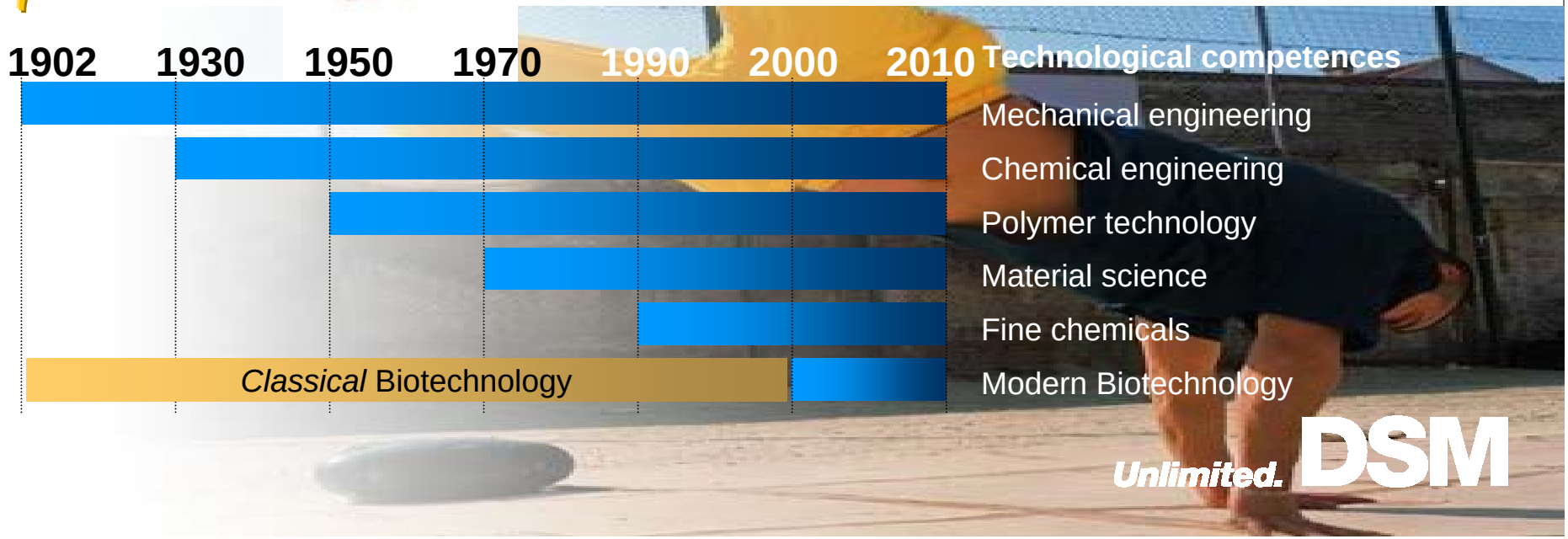
Evolution





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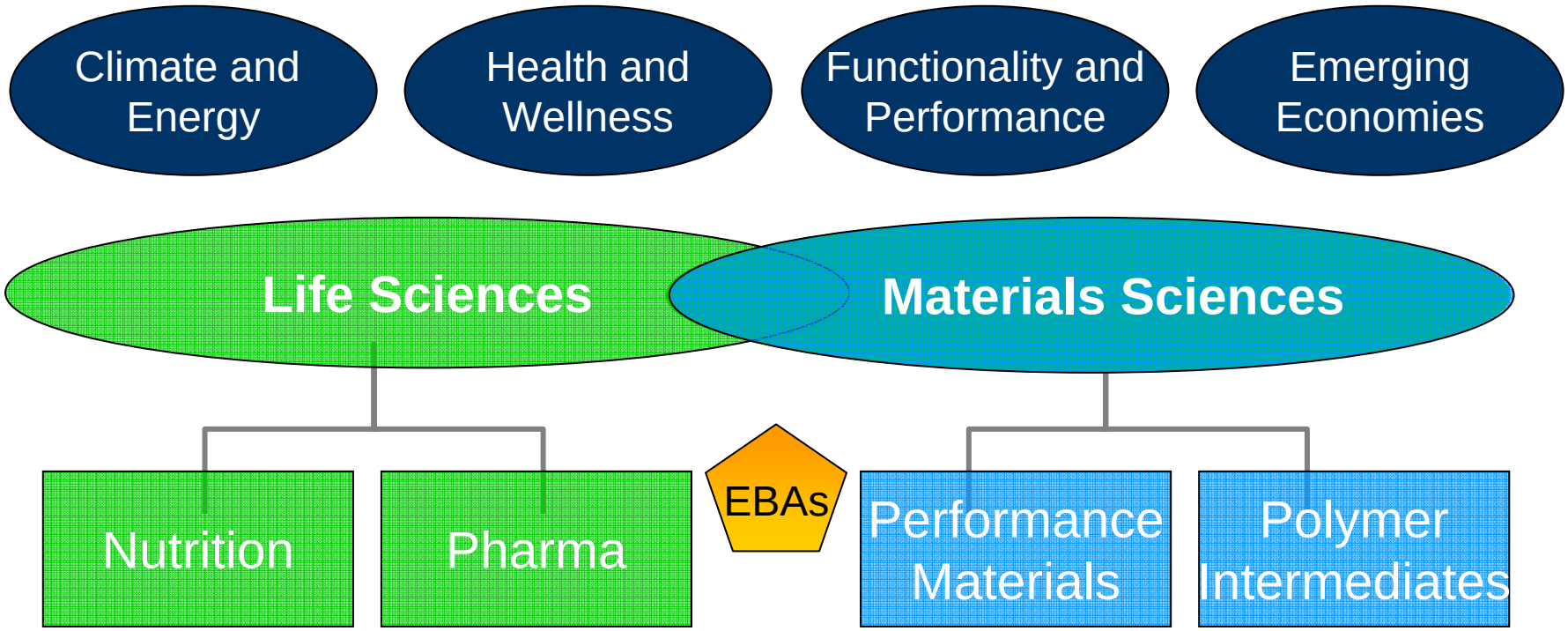
Global trends drive DSM's innovation strategy



Contributing to a more sustainable world

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Technology integration
Chemistry, Biotechnology *and* Energy

DSM: Leader in Sustainable Manufacturing

Dow Jones Sustainability Indexes
Member 2008/09

Biotechnology Competence

Fermentation
&
Enzymology

Catalysis Competence

Chemo-Catalysis
&
Bio-Catalysis

Process Technology
Integrated Process - Low Energy *and* Energy Integration

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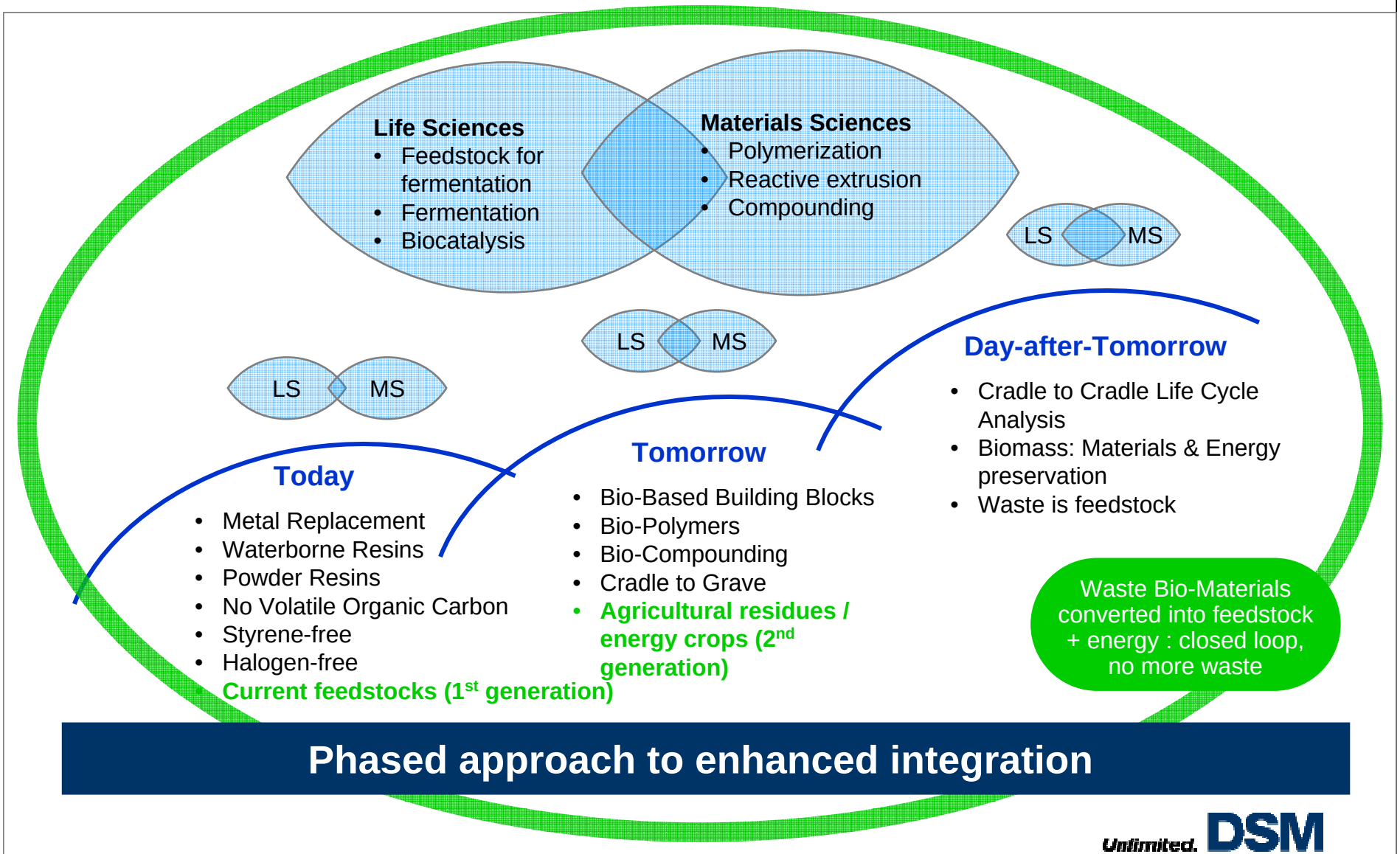
Bio-Performance Materials: a Journey



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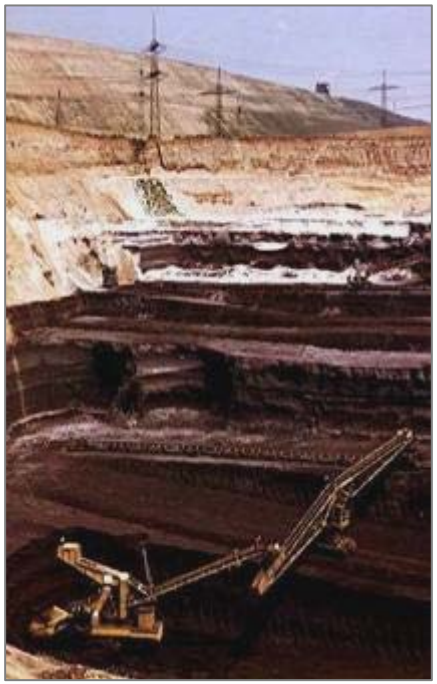
Raw Materials for Energy and Chemicals Manufacturing



Coal

Gas

Oil

Biomass

Finite

Renewable

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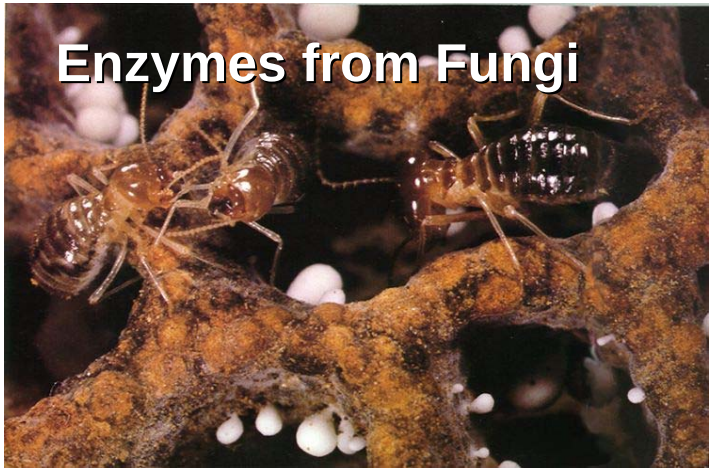
Lignocellulose Feedstocks for next generation Biorefineries
- *Avoid* Food Competition
- Preserve Biodiversity
- Use *Waste-Products* of Agriculture and Forestry

Inspired by Nature – Termites Efficiently Use Waste Biomass as Feedstock

DSM is developing enzymes and fermentation organisms that can utilize sugars derived from waste biomass



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A New Value Chain is Emerging

Feedstock Provision	Feedstock Processing	Primary Conversion	Secondary Conversion	BioCompounds & Formulation	Converters
• Farming • Storage • Distribution	• Grain seed milling • Biomass pretreatment - enzymatic conversion	• Fermentation • Chemical conversion • Enzymatic conversion	• Polymerization • Chemical Synthesis	• Compounding • Formulation • Reactive Extrusion	• Moulding • Film extrusion


Food & Feed


Bio Medical

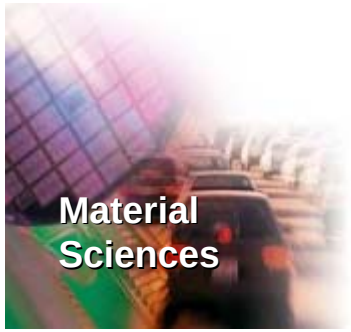

Coatings


Automotive


Pharma


Personal Care


Electrical



DSM has multiple capabilities that extend across several stages in the value-chain that extend into multiple product and market combinations.

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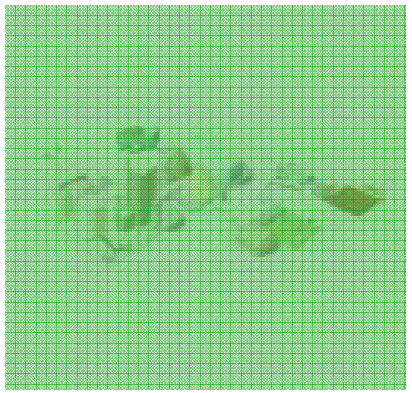
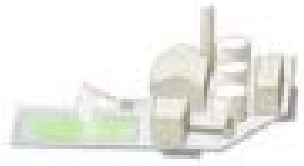
Revolution from 'Oil to Bio'
Innovations Required



- *Oil*-refinery:
  - Crude oil (finite) as feedstock
  - Technology established
  - Very efficient use of (limited) feedstock

- *Bio*-refinery (1st generation):
  - Starch / Sugar (renewable) as feedstock
  - Technology established
  - Efficient use of (unlimited) feedstock
  - Food competition for some feedstocks



- *Bio*-refinery (2nd generation):
  - Biomass (renewable) as input
  - Sustainability
  - Logistics? Small scale *or* vicinity of harbor
  - Technology integration (energy, chemistry *and* biotechnology) still in development
  - Integration if Carbon Capture technologies
  - Valorization of co-products
  - Early stage, high risk. Partnerships required

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Integration of Technology Platforms

The development of biorefineries to become as efficient as nafta-based refineries requires the integrated use of *technologies* (chemistry, biotechnology, energy), *cross sector collaborations* and *long term commitment* from all stakeholders.

What's holding us back?

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