

Introduction to Bioeconomy



<https://www.youtube.com/watch?v=2xvXkOMRTs4>

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What is Bioeconomy?



The bioeconomy comprises those **parts of the economy** that use **renewable biological resources (biomass)** from land and sea – such as crops, forests, fish, animals and microorganisms, as well as biological residues and waste –**to produce** food, animal feed, materials, chemicals, fuels, and energy in a sustainable way

a new theoretical and analytical **concept**

a dynamically developing **sector of the modern economy.**

„GREENING“ of Economic Thinking

I. Environmental and Ecological Economics (1980,1990)

Sustainable **Development**

II. Green Economy-(2008) (renewable resources-
wind,water,solar,geothermal energy)

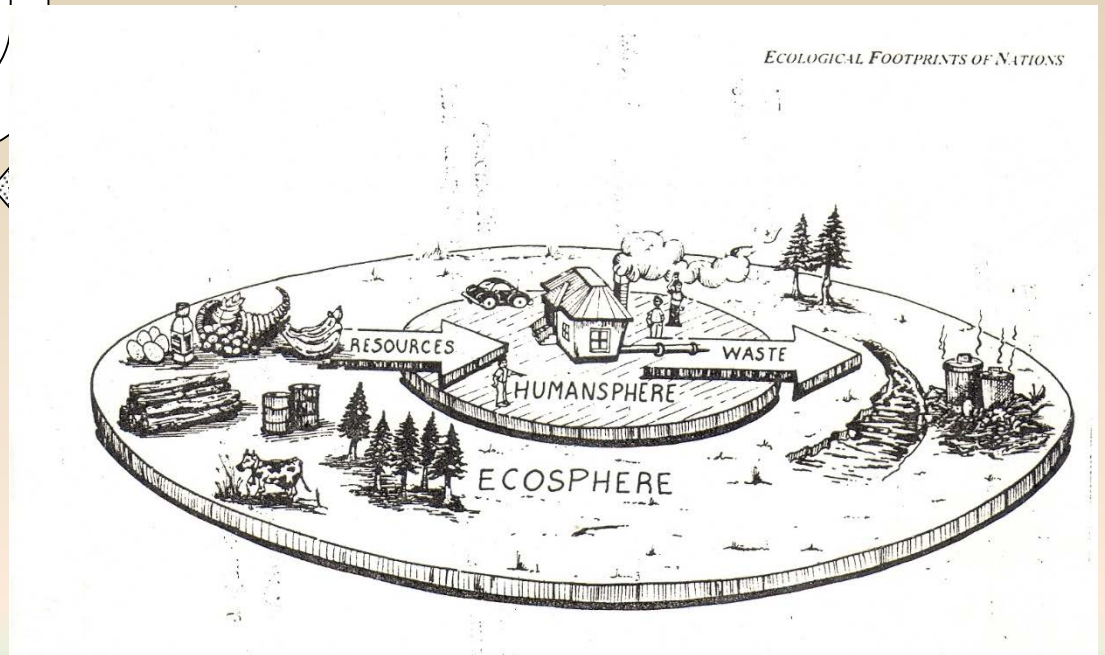
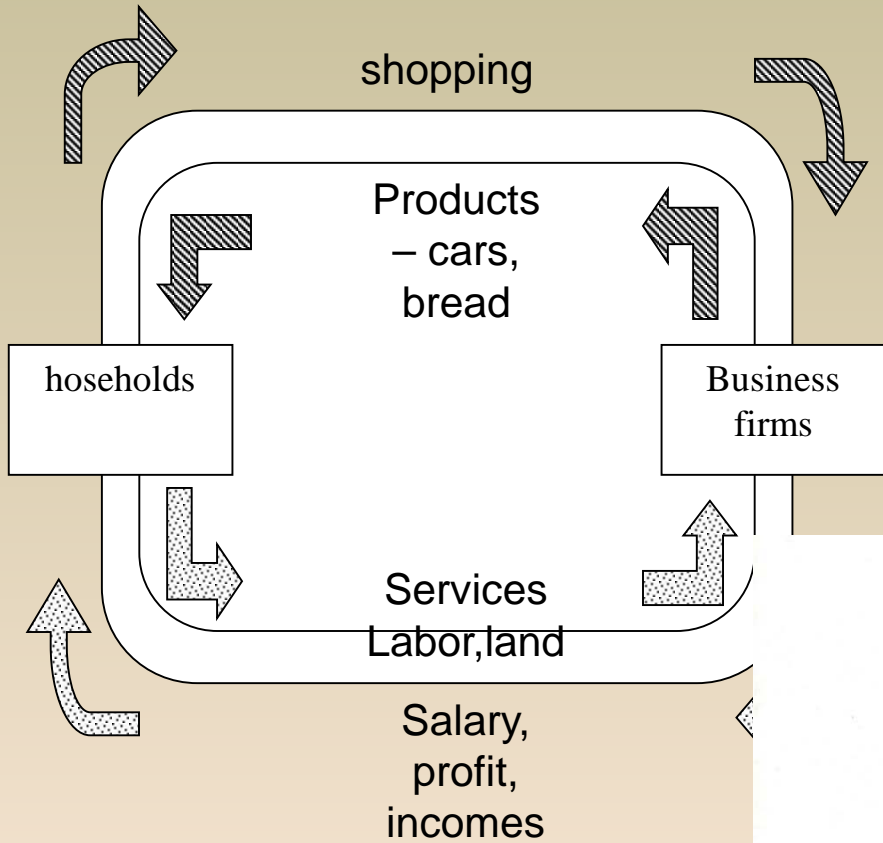
Green **growth**

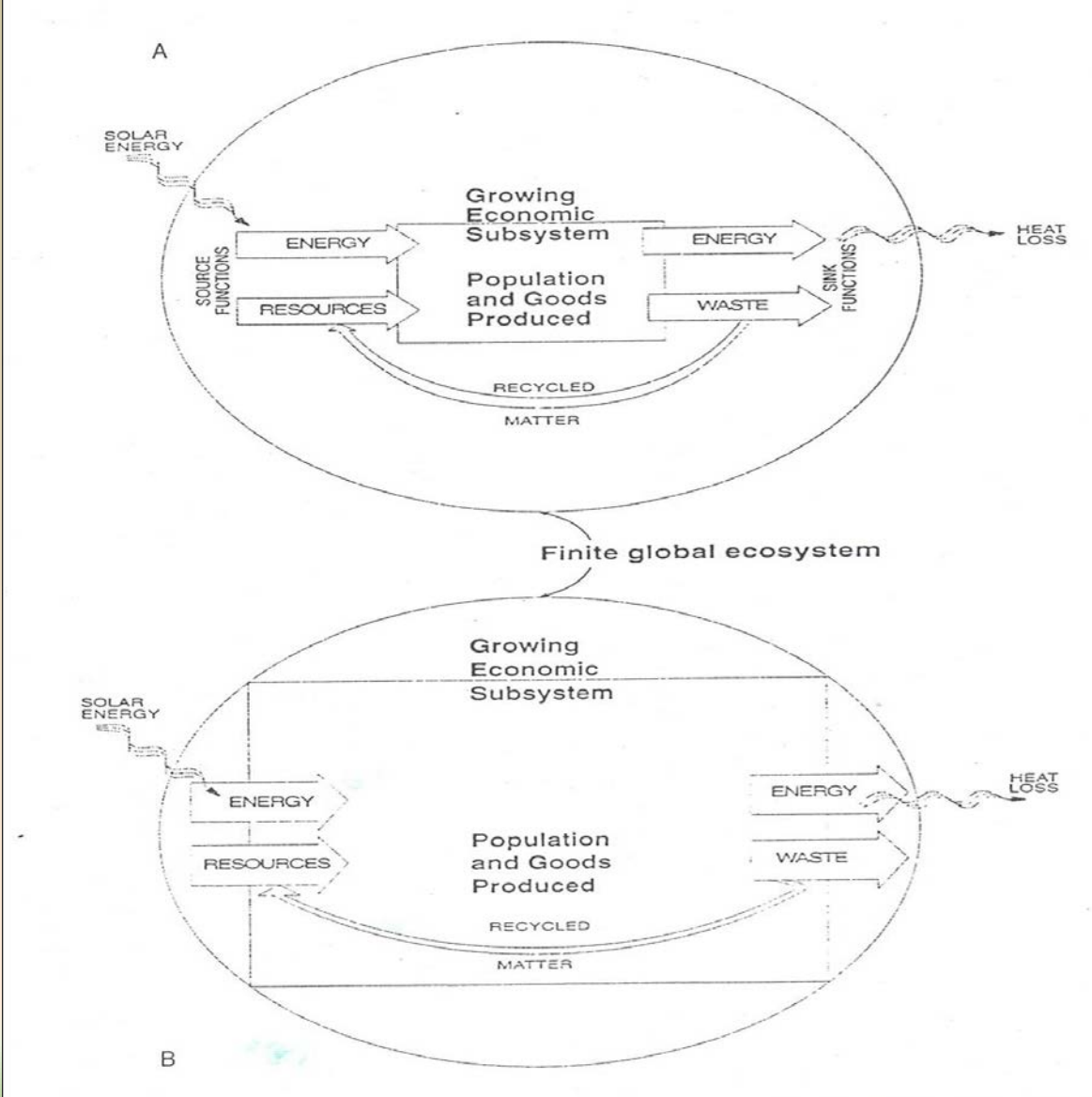
III. Bioeconomy (2012)- part of Green Economy using (bio resources
crops, forests, algae, agricultural and food wastes)

Sustainable **growth**

Decoupling of economic growth from environmental
degradation

BIO economy





Bioeconomy means 'biologisation' of the economy

Fossil resources are replaced by bio-based substitutes, not only for **energy**, but also for **material, clothing, plastic, and chemical applications**.

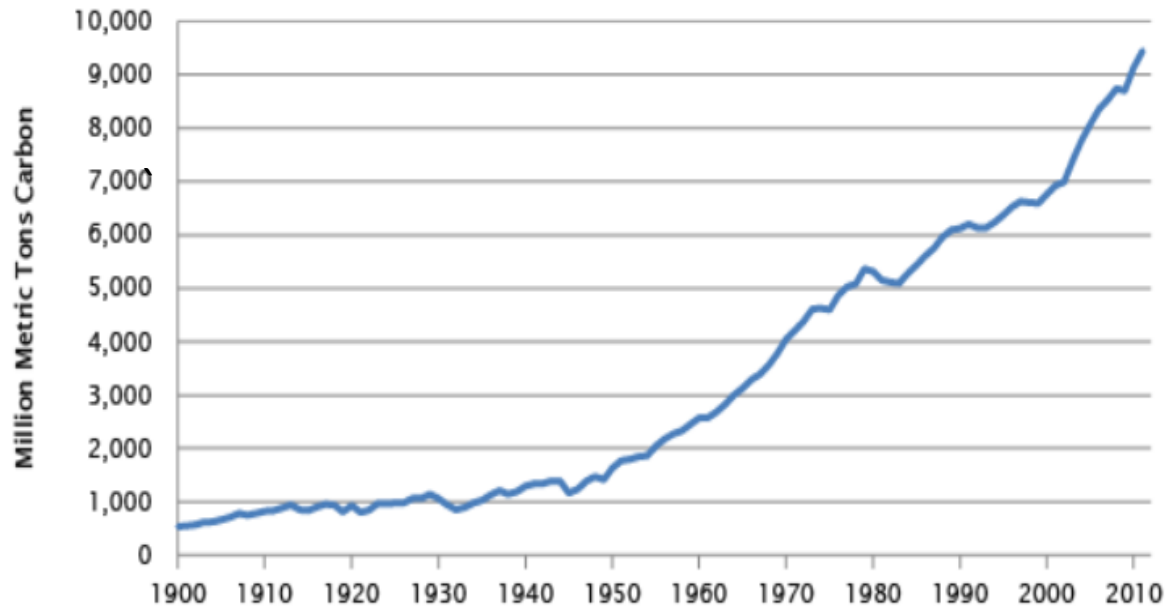
Why ?

Main drivers

- Climate changes
- Security and resource scarcity
- Economic growth - creating jobs
- Feeding growing population

Climate changes are still one of the main challenges of present world



















Global Carbon Emissions from Fossil-fuels 1900-2011



Source: Boden, T.A., Marland, G., and Andres R.J. (2015). *Global, Regional, and National Fossil-Fuel CO₂ Emissions*. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, doi 10.3334/CDIAC/00001_V2015.

The Roads to Decoupling: 21 Countries Are Reducing Carbon Emissions While Growing GDP

Since 2000, More Than 20 Countries Have Reduced Annual GHG Emissions While Growing Their Economies

COUNTRY	CHANGE IN CO ₂ (2000–2014)	CHANGE IN GDP (2000–2014)
Austria	-3% 	 21%
Belgium	-12% 	 21%
Bulgaria	-5% 	 62%
Czech Republic	-14% 	 40%
Denmark	-30% 	 8%
Finland	-18% 	 18%
France	-19% 	 16%
Germany	-12% 	 16%
	 %	 29%

Biomass is the fourth largest energy source after coal, oil, and natural gas.

1.2. GLOBAL RENEWABLE ENERGY SYSTEM

The primary energy supply of renewables is dominated by bioenergy (Figure 12)

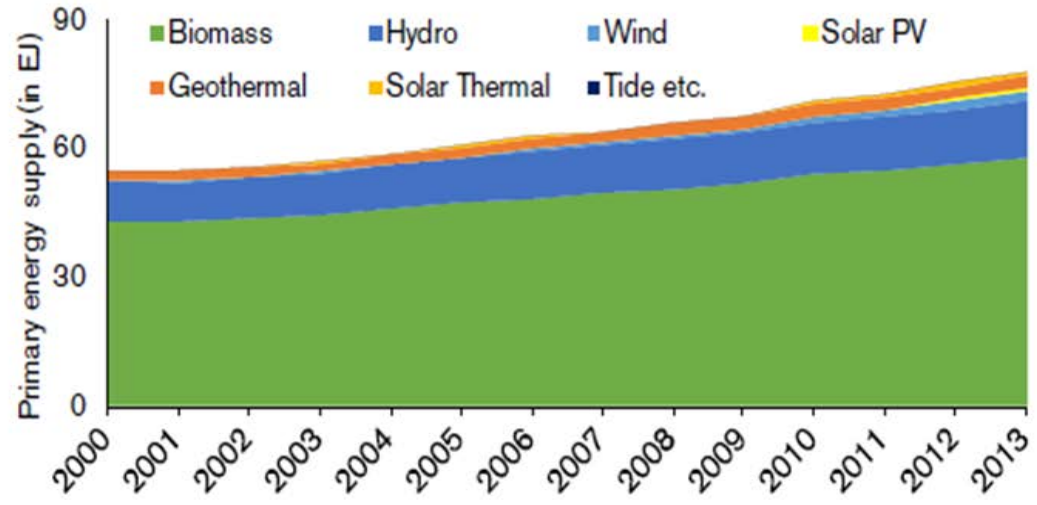


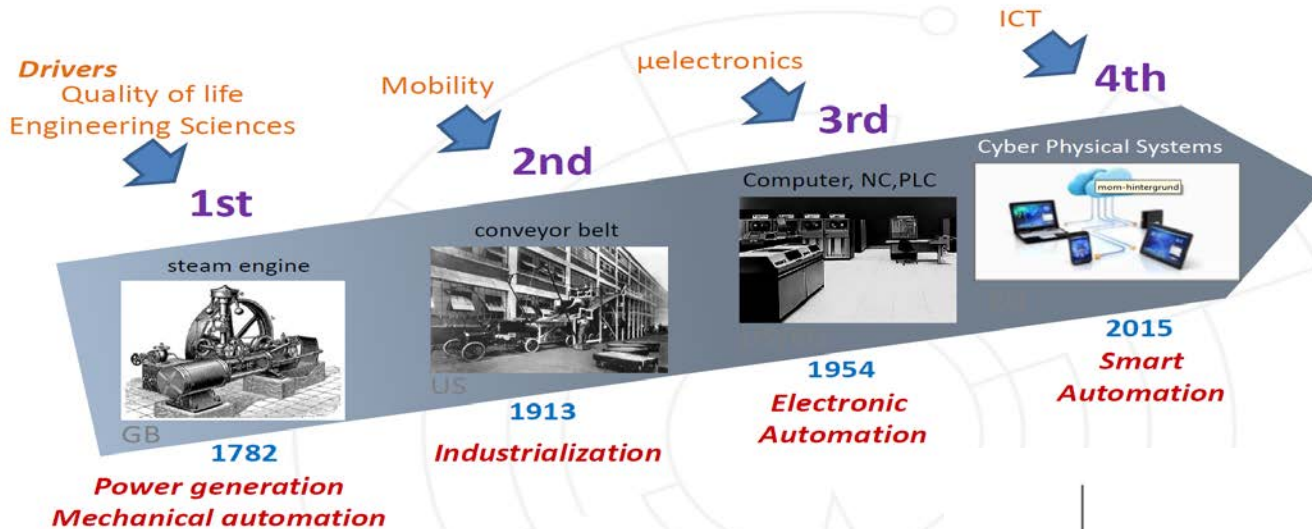
Figure 12. Primary energy supply of renewables globally

What is biomass?

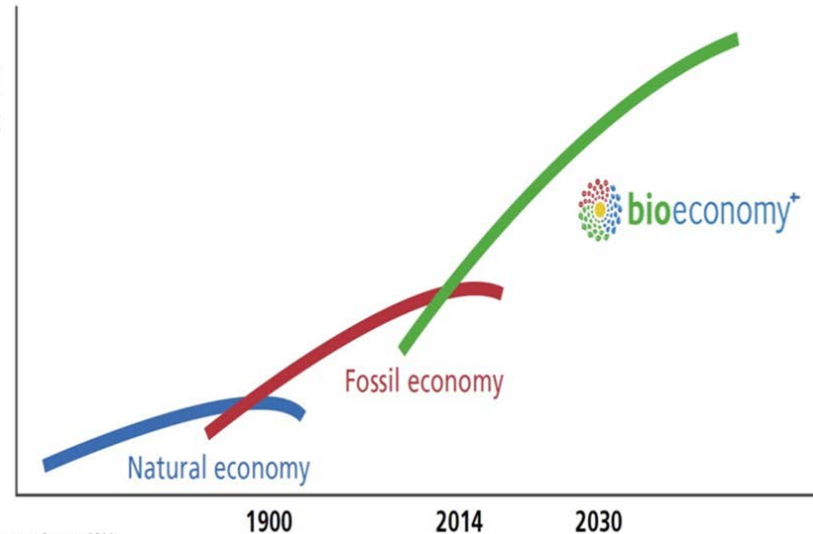
<https://www.youtube.com/watch?v=-CvjDw9f9ZI>

Bioeconomy Based on new biology cuts across sectors can be compared with industrial revolution 4.0

The 4th Industrial Revolution - „Industry 4.0“



GDP and well-being



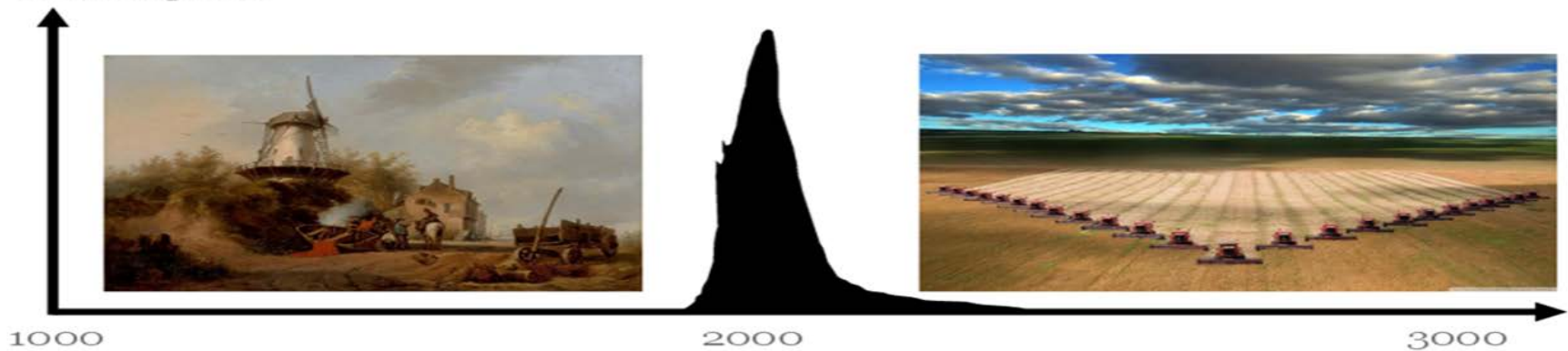
Bioeconomy is also a very ancient and traditional

For thousands of years we have used biomass in different ways and for different purposes: we eat it, build with it, burn it or wear it. **Thus the bioeconomy is as old as mankind. It is our natural habitat; it's the ancient ground upon which we have built our world**



From bioeconomy to bioeconomy

Oil
consumption



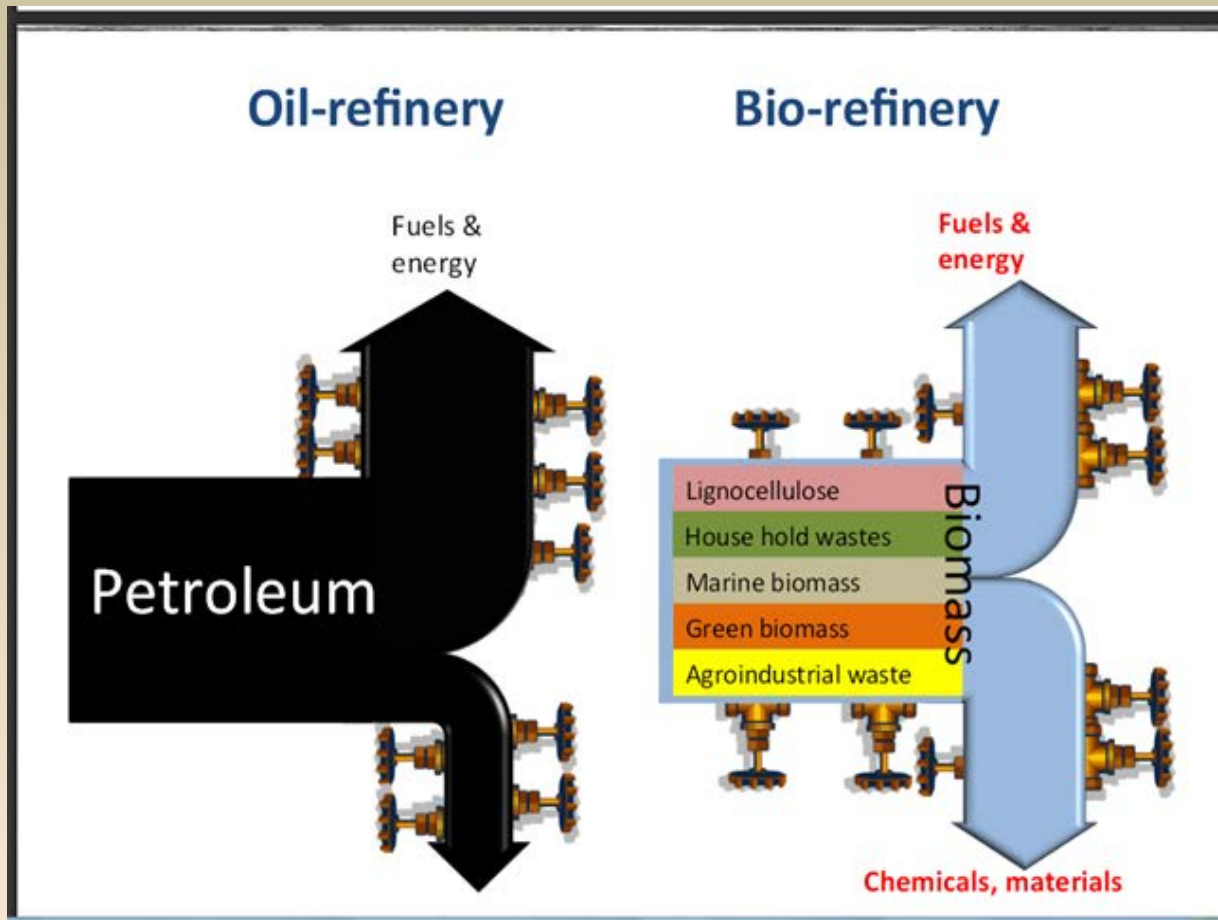
Living off the land

*A brief
moment
in history*

Living off the land

Bioeconomy is the challenge is to make better use of biomass with new technologies





Biobased Economy / Circular Economy

Fossil route:
1.000.000 year



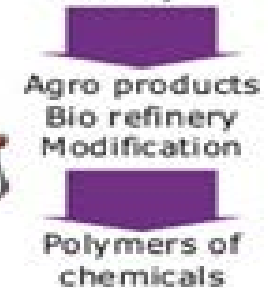
BROKEN CIRCLE



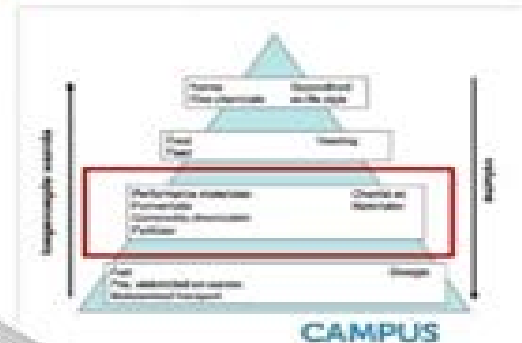
CLOSED CIRCLE



Bio route:
1 to 2 year



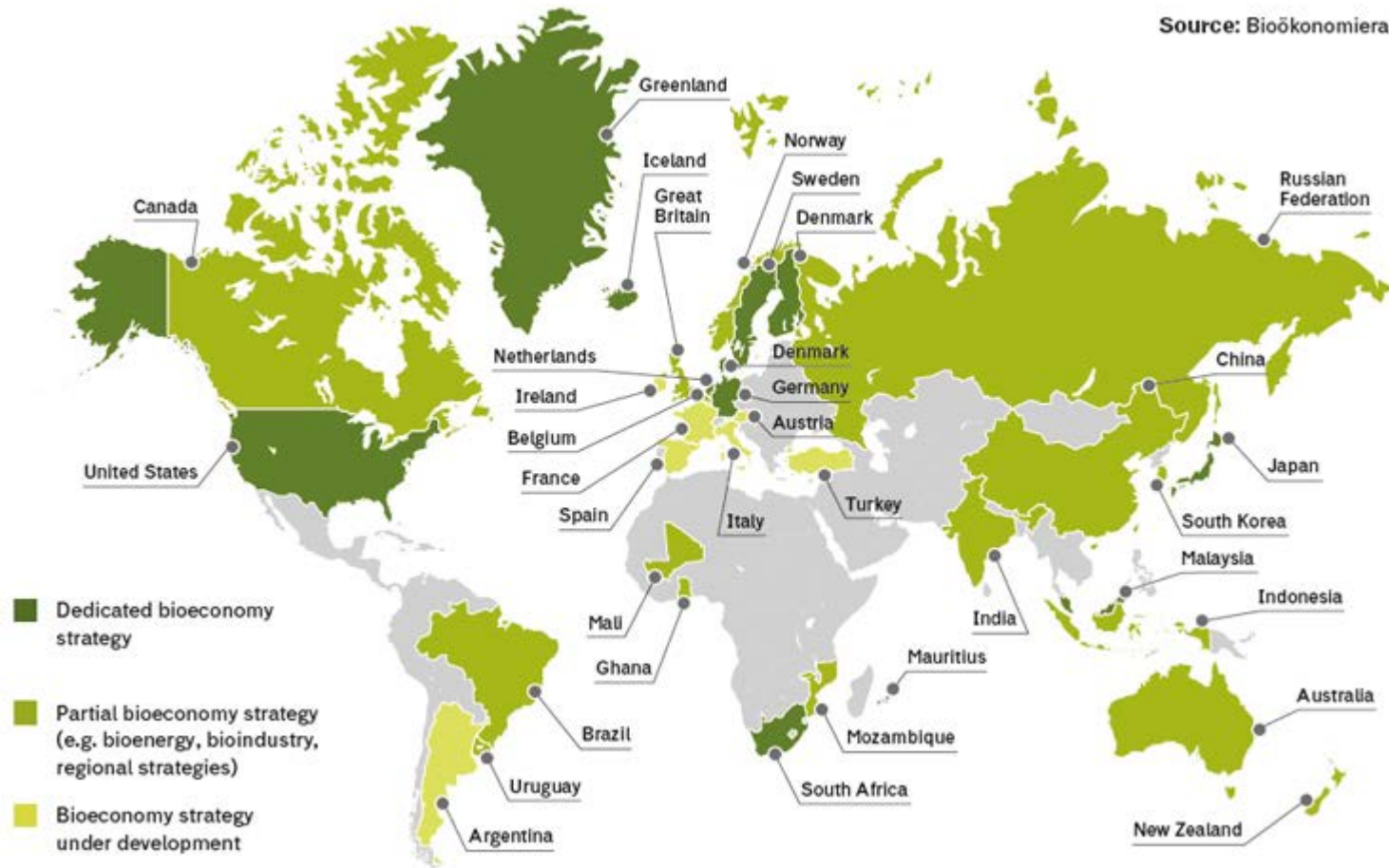
Accelerating Biobased Business



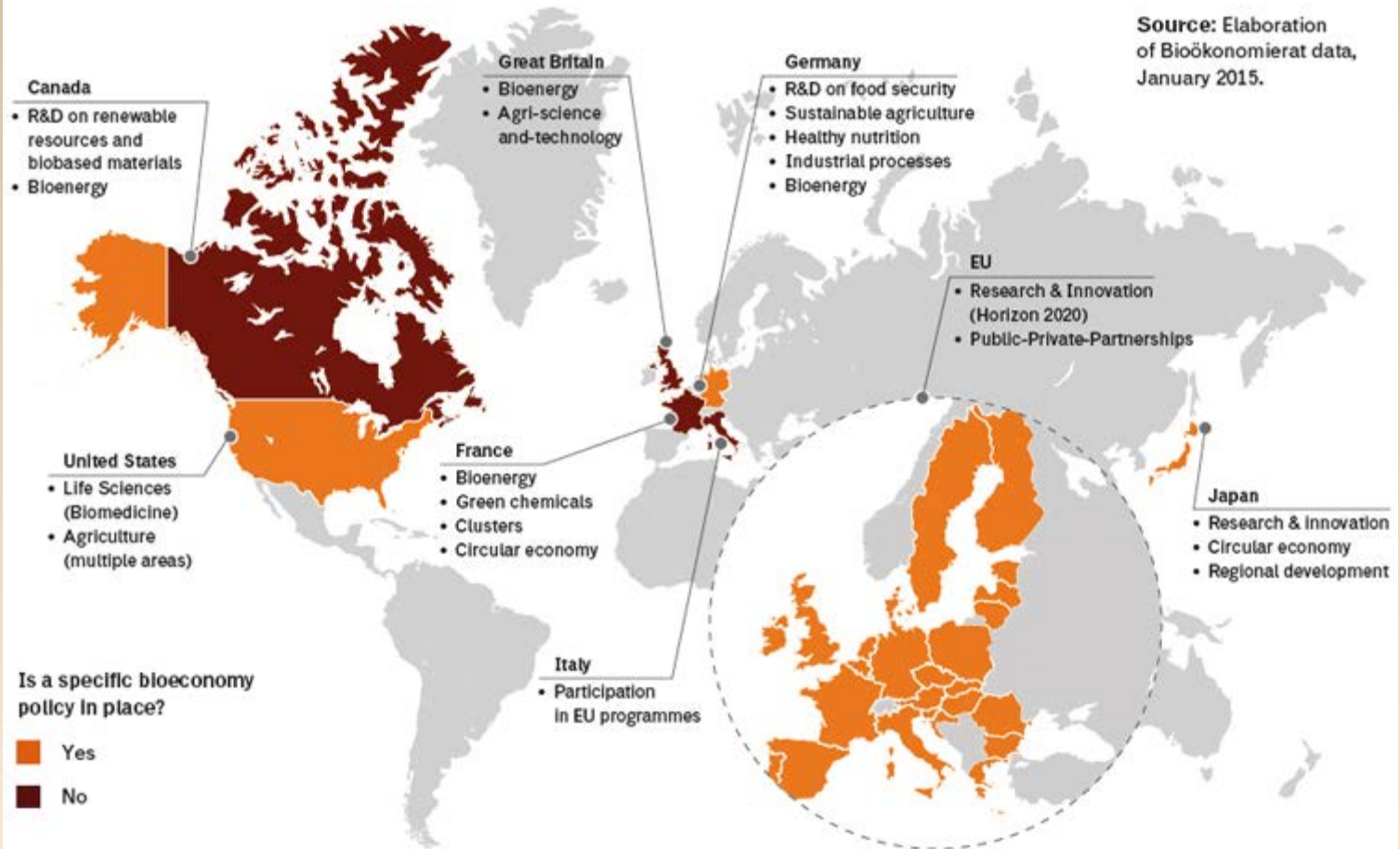
Political support

International Bioeconomy Policy

Source: Bioökonomierat.



G7 countries' bioeconomy policies: main areas of funding



Practical examples

EU biobased products

http://ec.europa.eu/growth/sectors/biotechnology/bio-based-products_en

The world first 100 % bio-PET Coca-Cola bottles in Milan Expo 2015 year.

PlantBottle packaging uses patented technology that converts natural sugars found in plants into the ingredients for making PET plastic bottles, fully recyclable

Today, PlantBottle packaging accounts for 30 percent of the Company's packaging volume in North America and 7 percent globally, some 6 billion bottles annually, making The Coca-Cola Company a large bioplastics end user.



Bioplastic AWARDS

World First 100% Bio-PET Polyester Shirts

in Taiwan 2016 demonstrated the world first 100 % bio-polyester shirt made entirely from renewable raw materials

This development of 100 %bio PET plastics to textile application showed the tremendous potentials **for changing the textile industry to use more sustainable bio-materials**

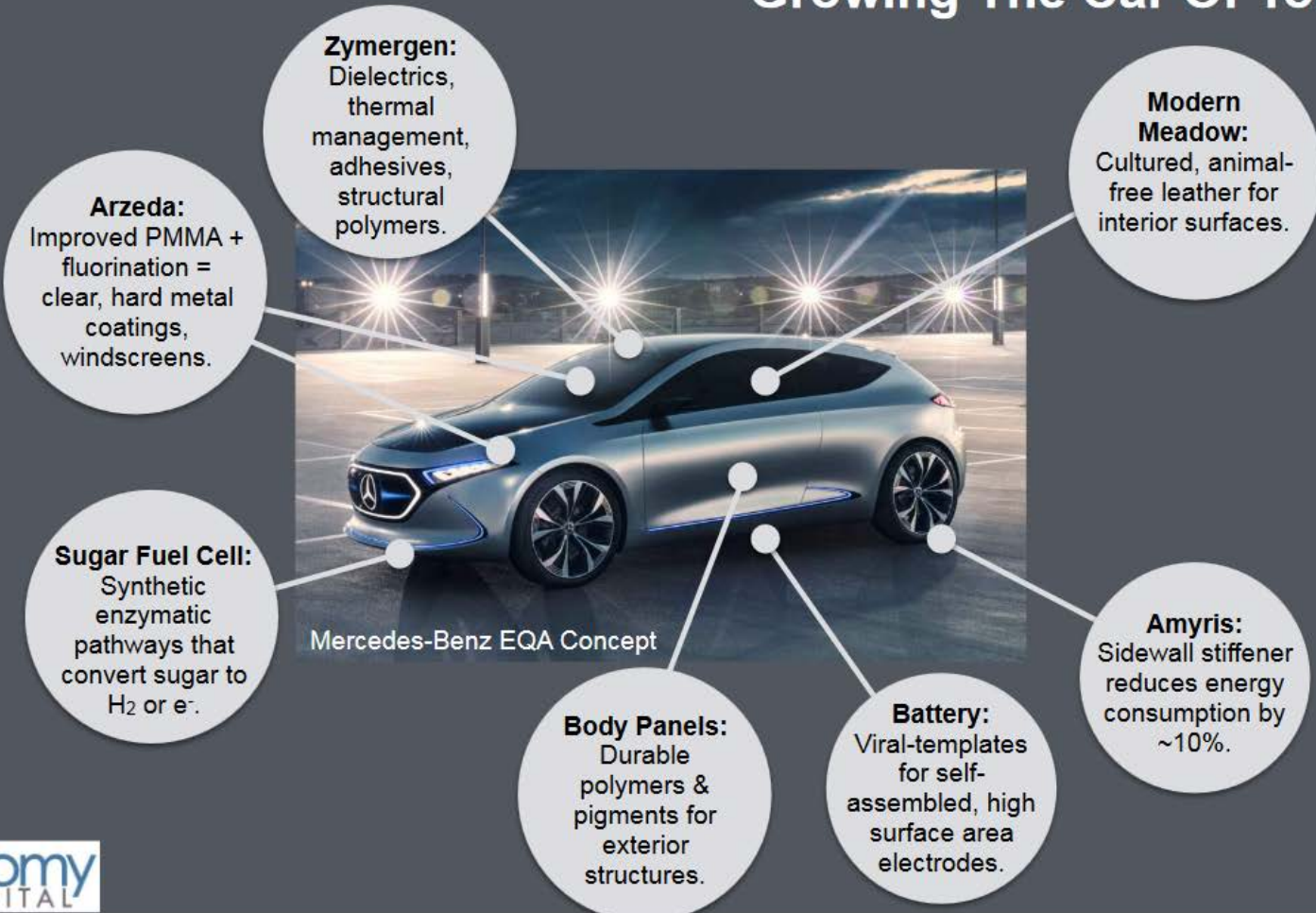


Candybar-wrapper made from (waste potato) starch based film

Bioplastic AWARDS

http://www.bioplasticsmagazine.com/en/events/bioplastics_award_2016.php
http://www.bioplasticsmagazine.com/en/events/bioplastics_award_2016.php

Growing The Car Of Tomorrow





Is Bioeconomy sustainable way of economy?

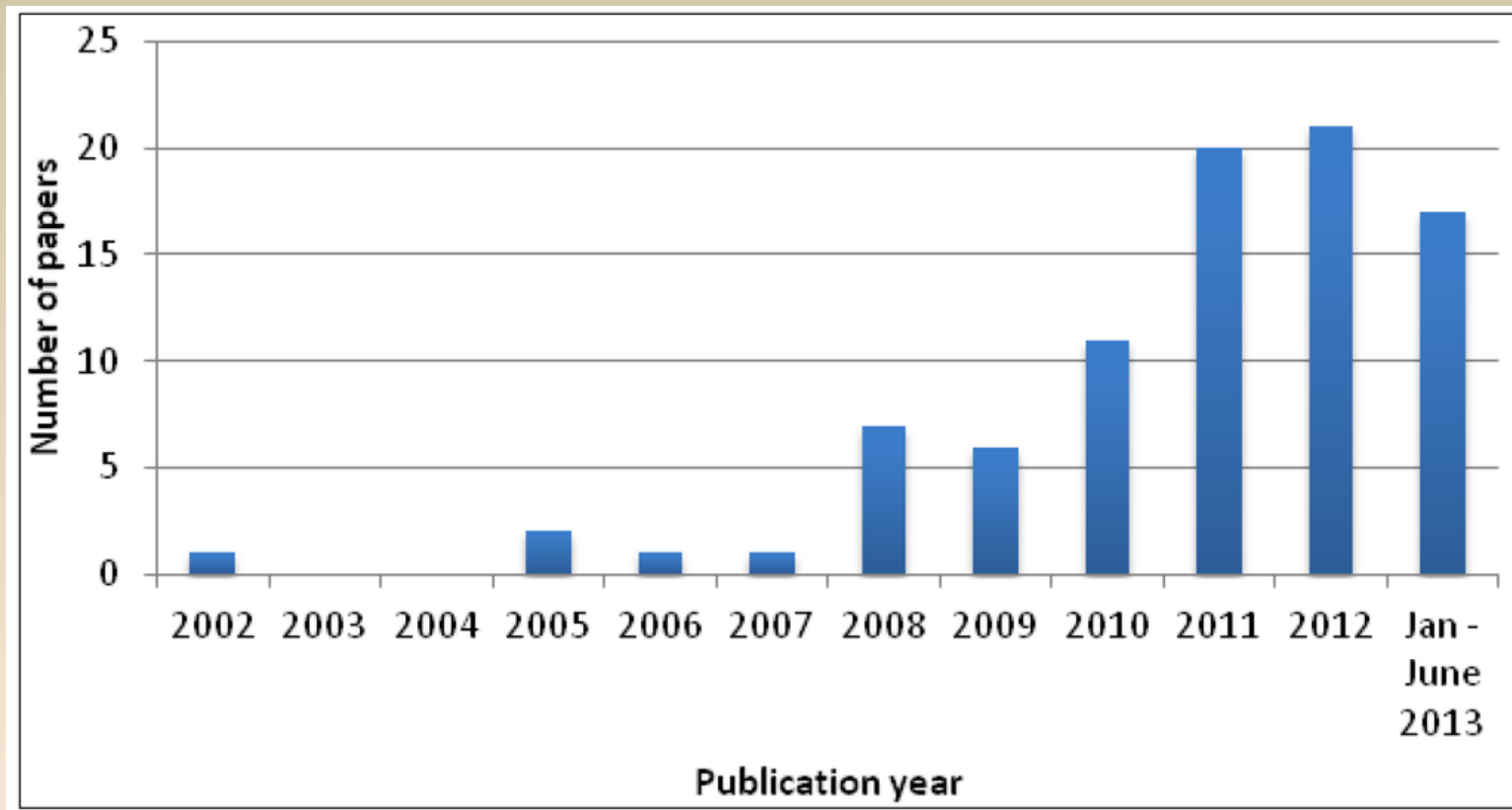
Bioeconomy is expected to contribute to achieving all of the seventeen Sustainable Development Goals (SDGs), and in particular to SDGs 1 & 2 (Zero Hunger & Good Health and Well-Being), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

Sustainable Development Goals

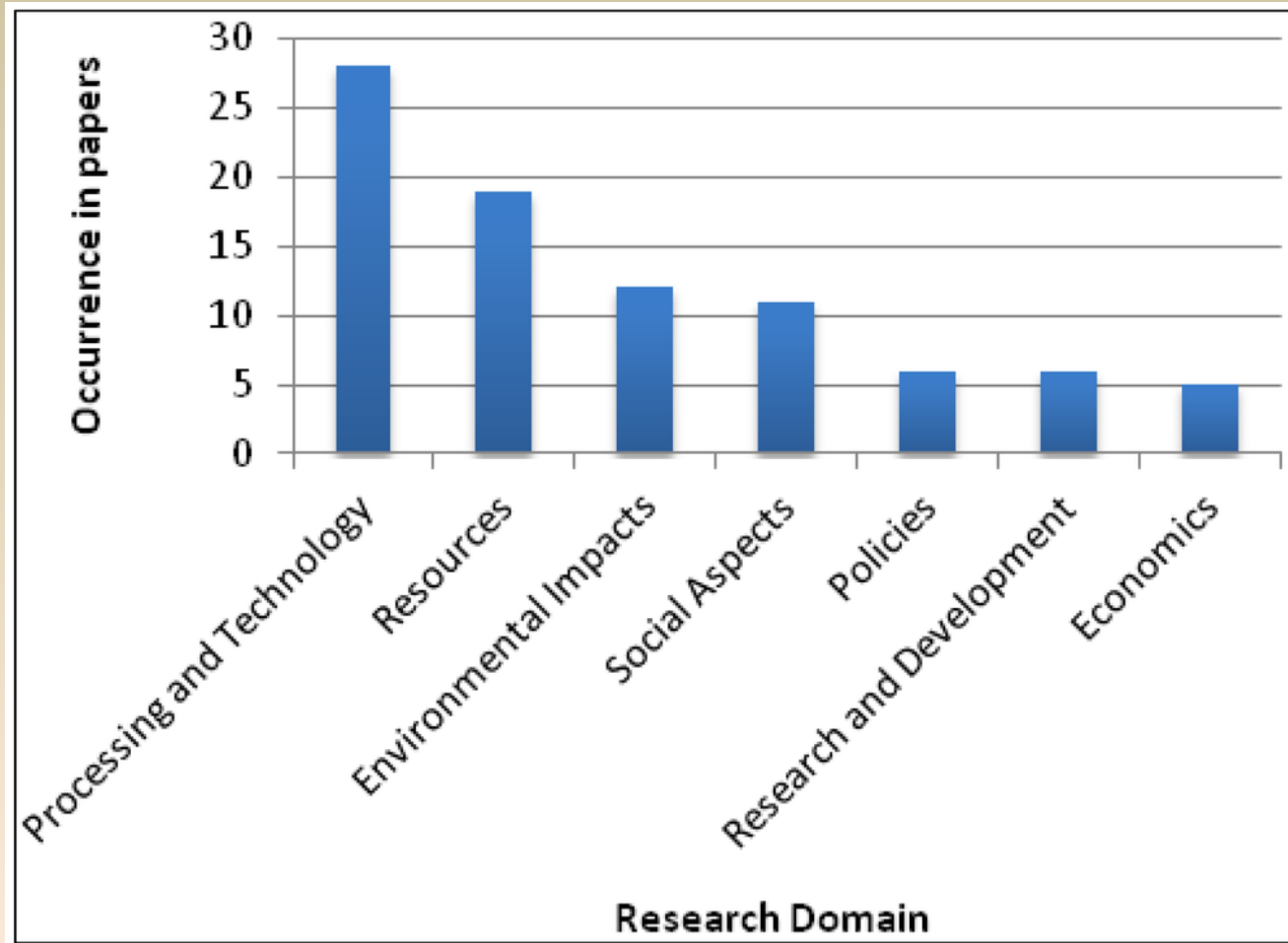


The 17 sustainable development goals (SDGs) to transform our world 2030 Agenda for SD. The goals were developed to replace the [Millennium Development Goals](#) (MDGs) which ended in 2015.

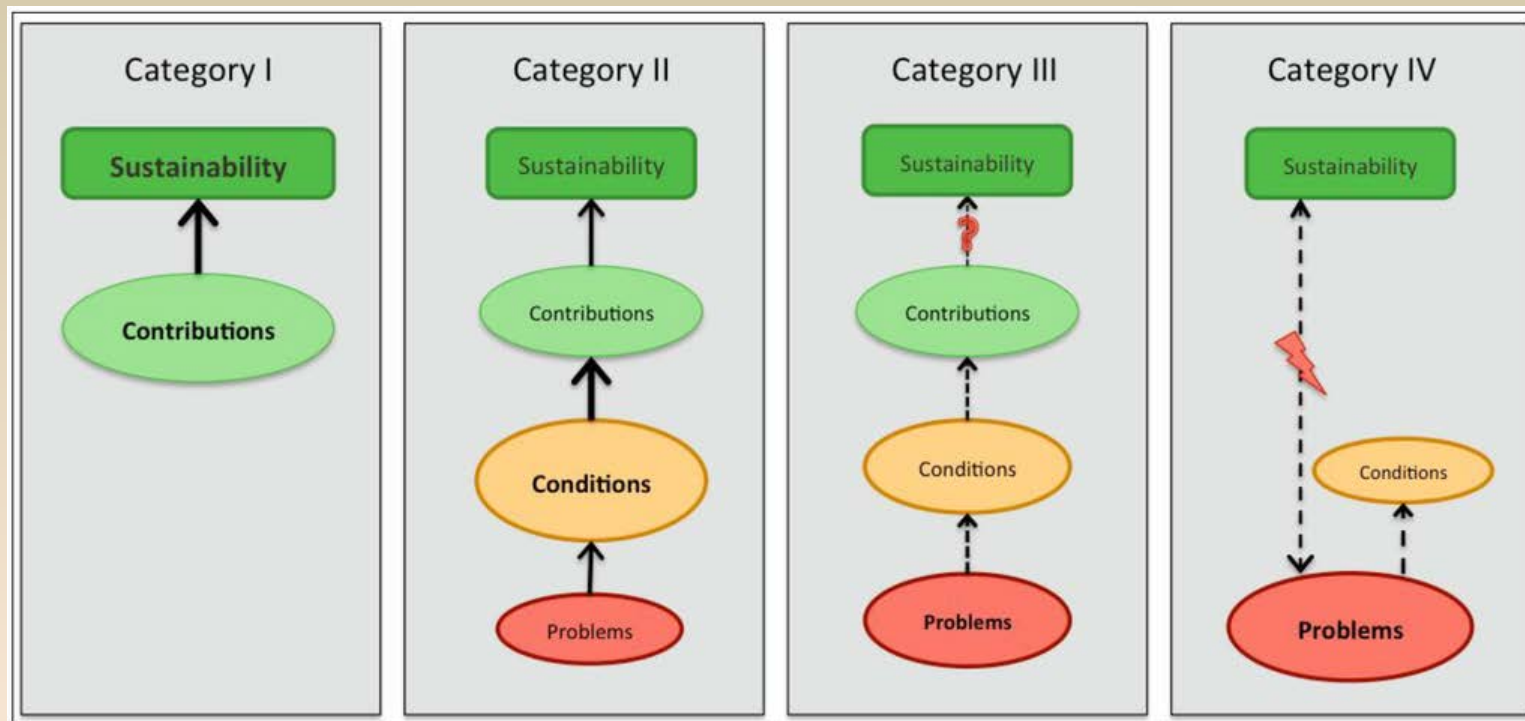
Sustainability and bioeconomy number of publication in scientific literature



Research domains regarding the bioeconomy



Schematic presentation of the four categories of papers, based on the relation between contributions, conditions and problems.



MAIN POTENTIAL RISKS OF GLOBAL BIOECONOMY

Biomass is renewable, but the soil on which it grows is limited

Changing the competition for:

FOOD, LAND AND WATER

C02 Energy Neutrality???

Pressure to Soil

Food prices

Land Grabs

Attempts to gain access to lands to grow large quantities of biomass, as well as for food, are resulting in market speculation and investment in land - “land grabs” around the world.

International Land Coalition indicates about 44% of recent land grabs have been for the purpose of growing bioenergy crops.

Estimates of Biomass Availability are Grossly Overestimated

“Abandoned cropland” includes large areas of land where **tropical forests were destroyed** for plantations and cattle ranching and where soil degradation and water depletion now make agriculture difficult.

References to large areas of available **“marginal lands”** is fictional

as it is based on devaluation of the many uses of lands by indigenous peoples, peasant farmers, pastoralists, and for biodiversity, water and soil protection.

DEFORESTRATION

Large-scale deforestation in support of biofuels production, either directly or indirectly.

The direct link between deforestation and biofuels is when forests are cleared to establish biofuels crops (Fargione *et al.*, 2008).

The indirect link is when biofuels production moves on to croplands or pastures, and causes new forest clearing to relocate agriculture (Searchinger *et al.*, 2008).

Industrial Tree Plantation - Impacts On Biodiversity

Intensification of Agriculture and GMO

One possible result of limited access to new land is that existing managed lands will be **used more intensively, with increased inputs of capital, labor and materials such as fertilizers.**

SUSTAINABLE WAY OF BIOECONOMY

- **Scale - Regional dimension**
- **Resources- Wastes, Algay, CO2**
- **Demand site of economy**
- **Circular economy**

BIOECONOMY FOR RURAL REGIONS

ENERGY BALANCE

In the **petro-economy**, most rural areas (especially agricultural areas) **used more energy than they produced**, and rising energy costs hurt them.

In the **bioeconomy**, where rural areas will produce more energy than they consume, **they become the beneficiaries.**

REGIONAL CHALLENGES

From a long-term perspective, the “glocal” nature of bioeconomy—global and local at the same time

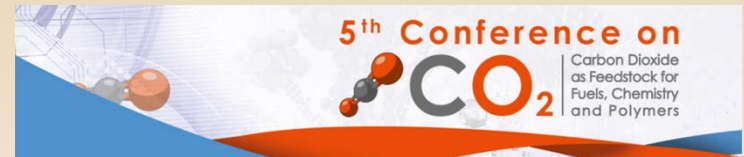
Opens up new business opportunities for rural regions and entrepreneurs

The importance **of local knowledge** enhancing local capabilities, while also accommodatig diversity and complexity.

WASTES AS A SOURCE FOR BIOECONOMY

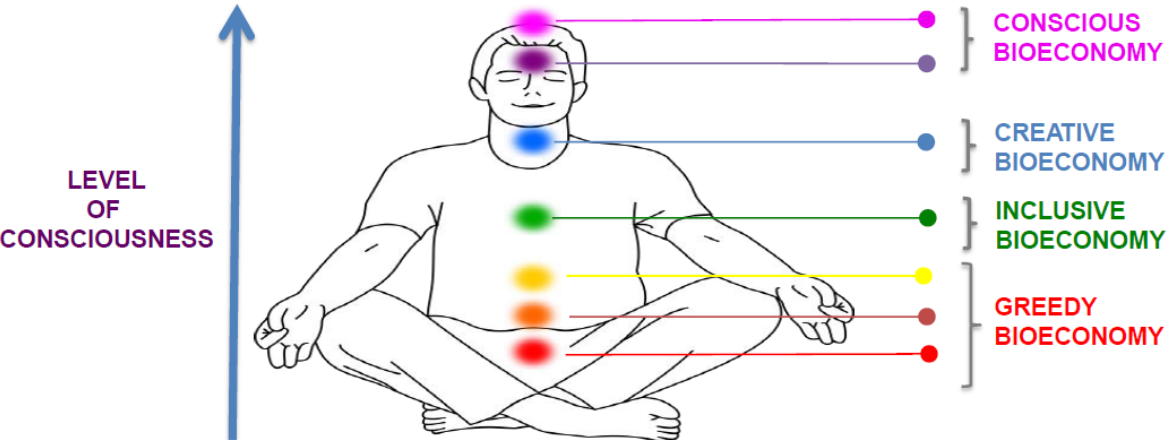
- Agricultural wastes as straw etc.
- Food industry wastes
- Municipal wastes
- Cleaning plant sediments
- **Alga biomass and the industrialisation of photosynthesis**

CO₂- MATERIAL FOR BIORAFINERY

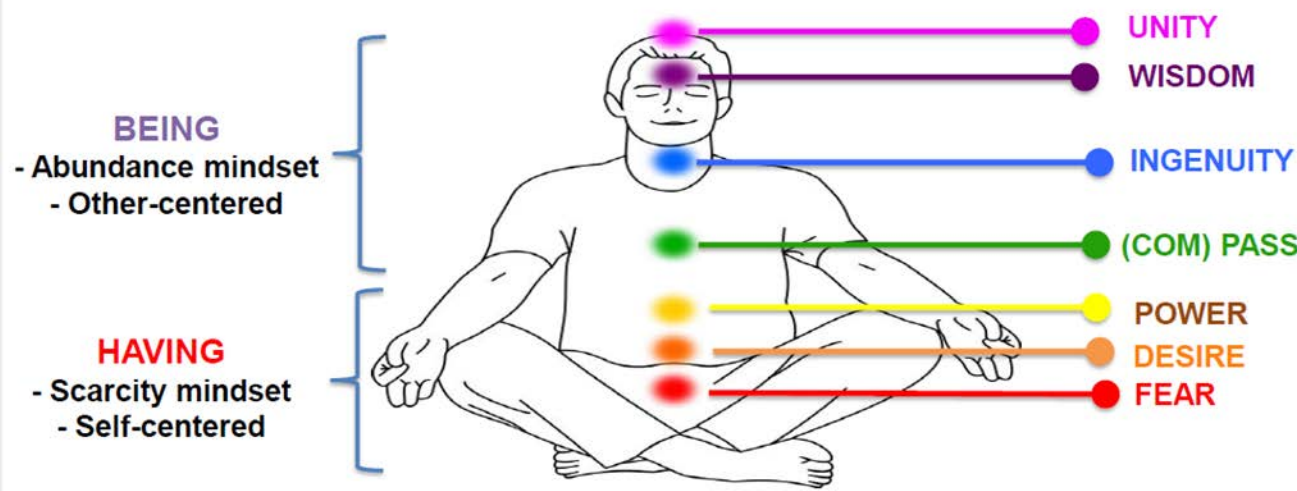


Four conceptual models for **CO₂ biosequestration** and the synthesis of biobased products, as well as an **integrated CO₂ biorefinery** model, are proposed.

Let's co-create the bioeconomy **consciously**



Frugal innovators = **conscious** innovators



Thank you for your attention

