The transition towards a circular bioeconomy

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The end of an era

“The Stone Age didn't end because we ran out of stones”, Yamani, 1973
“The shift to a European bioeconomy is now irreversible”. An exclusive interview with John Bell
What is the bioeconomy?

An economy using biological resources from the land and sea, as well as waste, as inputs to food and feed, industrial and energy production. It also covers the use of bio-based processes for sustainable industries. Bio-waste for example has considerable potential as an alternative to chemical fertilizers or for conversion into bio-energy, and can meet 2% of the EU renewable energy target.
The Circular Economy

"A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles." Ellen MacArthur Foundation

The global economy currently works on a strategy of extraction, production and abandonment. Although this has generated growth, it has inherent limitations in the long term, with certain resources finite or increasingly constrained, particularly when coupled with a growing population that is becoming wealthier.

The circular economy is unlikely to be a key fundamental value driver for many stocks at this stage, but we do think that the move to a more circular economy will be a disruptive trend in the next few years. Companies that move first to innovate and adapt should be well placed.
Bioeconomy and Circular economy

I don’t think the Bioeconomy can be reduced to a part of the circular economy only – the two concepts are interlinked in the areas like waste. But the bioeconomy involves a paradigm shift across the whole economy. It is genuinely disruptive by envisaging to move beyond a fossil based economy to a sustainable economy where carbon based production economy is progressively complemented by an economy whose production, consumption, valorisation and growth is based on smarter and sustainable use of renewable biological resources including waste. It envisages a new growth engine for the next economy that Harnesses technology to open out innovative uses of biological resources for materials, energy, products and services in big key sectors of the European economy – such as agrifood, marine, cities, forestry, chemicals, plastics, pulp and renewable energy. It provides a new context for sustainable and globally competitive economic development. The Circular economy interlinks with the bioeconomy but may not fully capture This ambition.

(An interview with John Bell, Il Bioeconomista, 19 January 2016)
Bioeconomy: More than Circular Economy

**Bioeconomy**
- Renewability
- Saving fossil resources
- Climate friendly
- Improve productivity and sustainability

**Agriculture & Forestry**
- BioInnovation Agriculture & Forestry Smart Farming
  - precision agriculture
  - internet of Farm Things
  - robotics and automation
  - artificial intelligence
  - soil nutrient supply
  - soil sensors, plant sensors, animal sensors
  - low cost genotyping, gene editing
  - next generation breeding
  - microbiota in livestock and environment
  - higher conversion efficiency: increase output while reducing impact on the environment
  - sustainable intensification

**BioInnovation Chemicals**
- innovative molecules
- new chemicals and materials
- new functionalities & properties
- more nature compatible
- less toxicity
- green and sustainable chemistry

**BioInnovation Smart Processing**
- new efficient, short pathways
- low energy
- lower toxicities
- elimination of harsh chemicals
- lower temperature
- lower pressure
- from oxidation to reduction
- high efficiency
- synthetic biology

**BioInnovation Products**
- new functionalities & properties
- more nature compatible
- new applications
- less toxicity

**Organic recycling**

**Chemicals & Materials**

**Cascading Remanufacture Recycling**

**Bio-based products**
- share, maintain, reuse, redistribute

**Bio-energy & Biofuels**

**Food & Feed**
- food quality and safety
- functional food ingredients
- bioactive phytochemicals
- food nutrients with new functionality

Graphic available at bio-based.eu/graphics
Towards the bioeconomy

"Europe needs to make the transition to a post-petroleum economy. Greater use of renewable resources is no longer just an option, it is a necessity. We must drive the transition from a fossil-based to a bio-based society with research and innovation as the motor. This is good for our environment, our food and energy security, and for Europe's competitiveness for the future."

Máire Geoghegan-Quinn
Commissaria europea per la Ricerca, l’Innovazione e la Scienza.
The European Strategy

The European Commission has adopted a strategy to shift the European economy towards greater and more sustainable use of renewable resources. With the world population approaching 9 billion by 2050 and natural resources finite, Europe needs renewable biological resources for secure and healthy food and feed, as well as for materials, energy, and other products. The Commission's strategy and action plan, "Innovating for Sustainable Growth: a Bioeconomy for Europe", outlines a coherent, cross-sectoral and inter-disciplinary approach to the issue. The goal is a more innovative and low-emissions economy, reconciling demands for sustainable agriculture and fisheries, food security, and the sustainable use of renewable biological resources for industrial purposes, while ensuring biodiversity and environmental protection.
The European Strategy focuses on three key aspects:

1. developing new technologies and processes for the bioeconomy;

2. developing markets and competitiveness in bioeconomy sectors;

3. pushing policymakers and stakeholders to work more closely together.
The Chemical Industry of the Future – The Biorefinery

Industrial Biotechnology has the potential to trigger a paradigm shift in the chemical industry through the step-by-step establishment of biorefinery. An increasing number of chemicals and materials, like base chemicals, polymers, industrial catalysts, enzymes and detergents are produced using biotechnology.

In 2010, the sales of industrial chemicals created using biotechnology in at least one step of the production process equalled 92 bn euro globally, 228 bn euro in 2015 and this is expected to increase to 515 bn euro in 2020 (on average around 20% per year).

GREEN CHEMICAL MARKET

WORLD MARKET 2011:
2,3 BILLION $

OUTLOOK 2020:
NEARLY 100 BILLION $

DRIVING THEMES:
• WASTE MINIMISATION IN CHEMICAL PRODUCTION PROCESS
• REPLACEMENT OF EXISTING PRODUCTS WITH LESS TOXIC ALTERNATIVES
• SHIFT TO RENEWABLE FEEDSTOCK
Turmoil in the Chemical/Biotech Market
The LEGO Group announced a significant investment of DKK 1 billion (approximately € 135 million) dedicated to research, development and implementation of new, sustainable, raw materials to manufacture LEGO® elements as well as packaging materials.

New toys: Bio-based bricks
Jul 2014 – GREENPEACE Campaign against SHELL & LEGO = 6 million views!
Oct 2014 – LEGO won’t renew SHELL contract, ending its 55 years partnership.
June 2015 – LEGO Sustainable Materials Centre created, to develop sustainable new materials by 2030. LEGO to invest $135 million and hire 100 researchers.

DELL: 100% sustainable packaging by 2020, incl. closed loop recycling and Newlight Air carbon Plastic.

IKEA: 100% RENEWABLE / RECYCLABLE PLASTIC for all of its Plastic materials used in home furnishing products globally.

MAR 2016: IKEA announced a supply, collaboration, and technology license agreement that will supply IKEA with AirCarbon PHA resins from Newlight’s commercial-scale production facilities and enable IKEA to produce Air Carbon thermoplastic under a technology license.

Under the agreement IKEA will purchase 50% of the material from Newlight’s 23 ktpa plant in the USA and up to 450 ktpa.

2015 TESLA Facts
- Sales: ~50,580 cars
- Market Cap: ~$32 Billion
- EBITDA: Negative

Mar 16: Model 3 became most successful car launch ever; with 325,000 pre-orders in a week (14bn)

NORWAY TO BAN NEW SALES OF GAS POWERED CARS BY 2025

Norway Facts
- 8th Oil Exporter
- Statoil = 30% of GDP
- 25% New Car’s Electric
The bioeconomy: from niche to norm

More than 400 participants gathered at the Bioeconomy Investment Summit in Brussels on the 9-10 November to discuss how investment can bring speed and scale to the European Bioeconomy. In his opening speech, Carlos Moedas, Commissioner for Research, Innovation and Science said: “Commissioner Hogan, our fellow-Commissioners and I, are working together to create the right conditions for investments. We’re working to ensure that current and future EU policies are coherent, so that the European Bioeconomy can succeed.” He stressed the great potential to create employment, diversify Europe’s energy sources and increase industry-driven GDP, stating

“the bioeconomy must go from niche to norm”.

A European bioeconomy should contribute significantly to the goals formulated at COP 21 on greenhouse gas emission reductions, holding the global temperature rise below 2°C, using sustainable biomass in the most effective and efficient ways to produce food, materials, chemicals and energy.
Level playing field and new markets

Innovation and competition are important principles for a flourishing bioeconomy. That means simplifying policy, reducing administrative burdens, levelling the playing field between sectors, ensuring a return on investments within Europe, and creating new markets. A clear and stable legal framework is necessary for investment. If there is a strong, clear, established and stable policy in Europe, business will respond to these signals and invest.
Education and training

Education, training, communication and (worldwide) outreach is crucial for a future bioeconomy. This start with promotion and accessibility of existing knowledge and the need to invest in the transfer of knowledge (open access). A strong interconnection among education providers, producers, workers, citizens, researchers and innovators should be supported and facilitated.
The BioCircular Economy

Bioeconomy is an integrated part of a sustainable circular economy, without being subservient. The European Circular Economy Package offers great opportunities to reuse the vast majority of all bio waste and (unexploited) biomass stocks by 2030. We want to cooperate to deliver the bioeconomy contribution to the goals, targets and ambitions formulated in the Circular Economy Package. This involves systemic and efficient approaches across sectors, particularly innovation policy measures that aim to optimise bio-economy value networks and minimise waste and loss.
Creating (large scale) demand is the number-one trigger for a thriving bioeconomy in the EU. At the current low oil price, the bioeconomy has little chance to emerge. Introduce ambitious and mandatory targets for biosourced products in public procurement, together with a voluntary labelling scheme, as in the US BioPreferred Program. Special attention should be given to SMEs, supporting their innovation, for example by public procurement policies.
Bio-based vs Oil-based

Budget and investments. In times of historically low oil and coal prices a bioeconomy will only gradually emerge. In light of the COP 21 targets on GHG reduction, we cannot afford to wait. The IMF estimated the global subsidies on fossil fuels in 2015 at 5.3 trillion USD. We do not ask for a European equivalent to this subsidy, but we do plead for a modest fraction of that amount to be invested in the bioeconomy: 5 bln. Euro per year for the period 2017-2025 in a European investment agenda that includes flagships, pilots, R&D, innovation and mutual learning.
USDA Biopreferred

The USDA BioPreferred® Program
Established by the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) and strengthened by the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill), and the Agriculture Act of 2014 (H.R. 2642 2014 Farm Bill), the USDA BioPreferred program is charged with transforming the marketplace for biobased products and creating jobs in rural America. The program’s mandatory federal purchasing initiative and voluntary “USDA Certified Biobased Product” label have quickly made it one of the most respected and trusted drivers in today’s biobased marketplace.
Strategic Goals
The mission of the BioPreferred program is to facilitate the development and expansion of markets for biobased products. To accomplish this mission, the program has two broad strategic goals: 1) to advance the biobased products market and 2) to increase the purchase of biobased products government-wide. As of March 2015, there are approximately 20,000 products in the BioPreferred program’s database.
USDA Biopreferred

Mandatory Federal Purchasing
Private and public purchasers now look to the USDA BioPreferred program to ensure that their purchases are biobased. Beginning in 2005 with its first designations of six product categories, the program has now designated 97 product categories representing approximately 14,000 products that are included in the mandatory federal purchasing initiative. The program offers purchasers of biobased products a universal standard to assess a product’s biobased content. By providing a central product registry through its online catalog, accessible at www.biopreferred.gov, the BioPreferred program enables purchasers to find and compare products, such as cleaners, lubricants, and building materials, including carpet, and insulation, from all participating manufacturers; thus, encouraging manufacturers to compete to provide products with higher biobased content.

The seven major overarching sectors that represent the U.S. biobased products industry’s contribution to the U.S. economy are:

- Agriculture and Forestry
- Biorefining
- Biobased Chemicals
- Enzymes
- Bioplastic Bottles and Packaging
- Forest Products
- Textiles

This report specifically excludes the following sectors: energy, livestock, food, feed, and pharmaceuticals.
USDA Biopreferred

The Number of Jobs Contributed to the U.S. Economy by the U.S. Biobased Products Industry in 2014: 4.2 Million, up from 4.0M in 2013.


The Jobs Multiplier: 2.76

For every 1,000 Biobased Products jobs, 1,760 more jobs are supported in the United States, up from 2.64 in 2013.

Figure 6: Key Findings of the U.S. Biobased Products Industry in 2014

Figure 5 shows the contributions of the biobased products industry to employment.

Figure 5: Total Employment and Value Added to the U.S. Economy by the Biobased Products Industry in 2014.
Is Italy doing well in the Bioeconomy?
Bioeconomy in Italy

- Relevant bioeconomy stakeholders
- Clusters development (SPRING)
- Research and development facilities to provide support
- Industry partners available as collaboration partners
- Educated workforce
- Several biorefineries with private investments which are more than 1.0 billion € and 1600 people employed
Italian Bioeconomy
The Italian Bioeconomy Strategy

MAIN PILLARS:

**Research and innovation** to increase productivity but also the quality of products and sustainability of every sector making up the bioeconomy.

**Interconnection of sectors**, in particular amongst those of the agro-food industry and those of chemical and energy valorisation of residual and lignocellulosic biomasses. In Italy there are well over 3 million hectares of land that are no longer farmed, vast agricultural areas that today can be regenerated to produce local biomass and/or industrial one to feed our biorefineries. In Italy every year 15 million tonnes of by-products and waste from the food industry are generated: a huge problem for the industry producing it, a very interesting feedstock for our biorefineries. Other relevant opportunities can derive from more substantial integration between biorefineries and thus the production of biobased chemicals, biomaterials and bioenergy and the forestry sector which today boasts a wealth of wood biomass guaranteed by over 13 million hectares of woodland, on average not very much used. But also from chemical and energy valorisation of non-food biomasses (algae, posidonia but also microorganism) generated by our seas. The bioeconomy offers us an unmissable opportunity to make the most of the biodiversity at our disposal, biomass in all its forms, as well as of the residues and organic waste.

The strategy must be seen as the starting point for a more direct political action, with investments, better coordination between central and regional level, the creation of a market also through the right education and information of public opinion. Some incentives would also be useful, to mitigate the costs of biological products which are higher than traditional products, aimed at getting in line with Europe.”
Bioeconomy: A Compelling Sector to Drive Italy’s Growth

- Economic activities based on processes using biological sources to generate sustainable economic, social and environmental development

The Vision

Italy’s bioeconomy to be a significant contributor to the nation’s economy by 2020 and beyond

Bioeconomy has the potential to:

- Make the country more competitive internationally
- Creation of value added jobs
- Enhance food security and healthcare
- Create greener economy as the country shifts towards a low-carbon economy
- Increase Nation’s income by exploiting our bio-resources to high value products using biotechnology
THANKS FOR YOUR ATTENTION

For more information:

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