European Commission

A Bioeconomy for Europe

Using resources from land and sea for a post-petroleum economy

Thomas Arnold
DG RTD-F

THINKFOREST FORUM ON "BUILDING THE BIOECONOMY: INSIGHTS FROM EUROPEAN STRATEGIES"
Helsinki, 07/06/2016



EU Forests





EU Forests

- ✓ Forest and other wooded land: 42% of total EU land
- ✓ Forest-based industries provide 3.5 million jobs
- ✓ A lot of diversity across Europe

Welcome to the forest!

European Commission

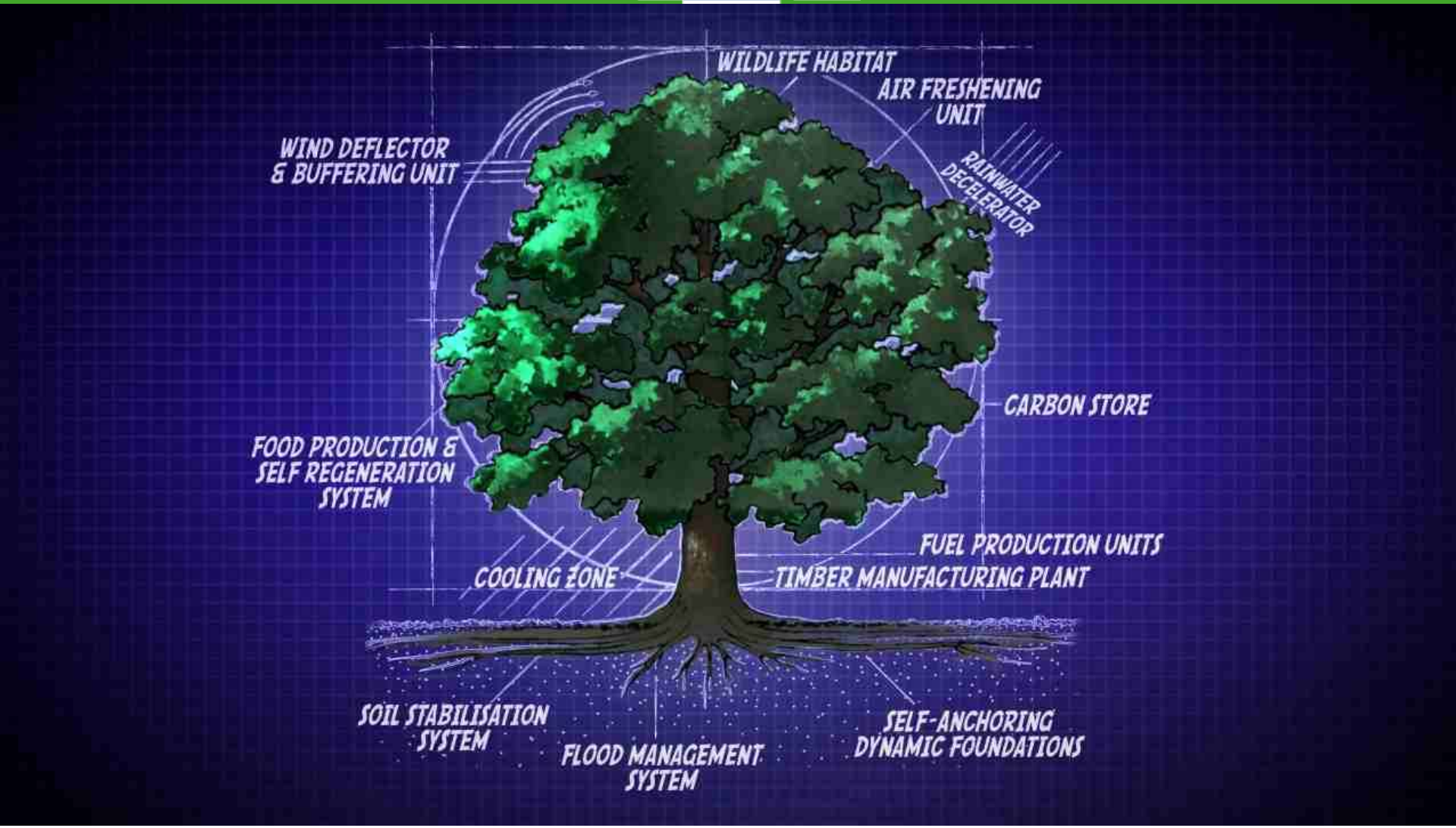
What do you see in the picture?

- Place for recreation?
- Biodiversity?
- Carbon sequestration?
- Carbon storage?
- Protection of soil and water?
- Wildlife?
- Wood for buildings, furniture or energy?
- Air quality?
- Quality of life?
- Mushrooms?
- Bear´s garlic?

All of the above?

Agriculture and Rural Development

We have demands, they have solutions…



Agriculture and Rural Development

Looking #BeyondWood

Policy conference

Brussels, European Commission, 23 May 2016

http://ec.europa.eu/environment/forests/conference.htm

"Wood remains the main source of financial revenue from forests and forest biomass represents the most important source of renewable energy in the EU. However, forests also provide a large range of other products, such as cork, resins, mushrooms, nuts, game or berries as well as ecosystem services whose value is increasingly recognised on the market.

Taken altogether, the value of these forest ecosystem services is a multiple of the value of wood production alone, *and their contribution to employment, wealth and well-being is significant.*

So far, the ***only 'negative emissions' process that works at scale*** *and can be manipulated by humans is the carbon sink of land. "*

Vice-President Katainen

Recreation, tourism, hunting

"Finland is a good example: timber and forestry are more important than for any other European country, given the extent of the country's forests. ***But this does not mean that Finnish forests are to be treated as wood production facilities only.*** *The country's summer house culture and public access rights of forests have fostered in the Finnish people a close relationship with nature, its values and its processes. The start of the berry picking season around July is something most Finnish families are looking forward to."*

Vice-President Katainen

New innovative products

"So-called bio-based products, i.e. those from bio-refineries in which wood (or other) biomass is refined instead of fossil fuels, can replace many of their fossil-based counterparts. This applies not ***only to low-value bio-fuels but moreover to higher-value bio-plastics, bio-textiles, bio-medicines, bio-cosmetics****"*

Vice-President Katainen

Sustainability

"The Commission's revision of the Renewable Energy Directive should not only ensure that wood and other biomass used for bio-energy be from sustainable sources but also that they be used sustainably, i.e. efficiently, so that less be needed overall. This fits with the principles of the ***Circular Economy, which also seeks to encourage the cascading use of wood, i.e. use, then re-use or recycling before energetic use****."*

Vice-President Katainen

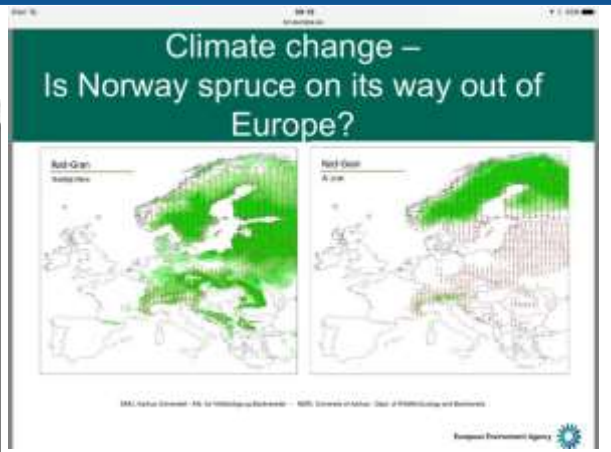
Sustainable management and use of forests

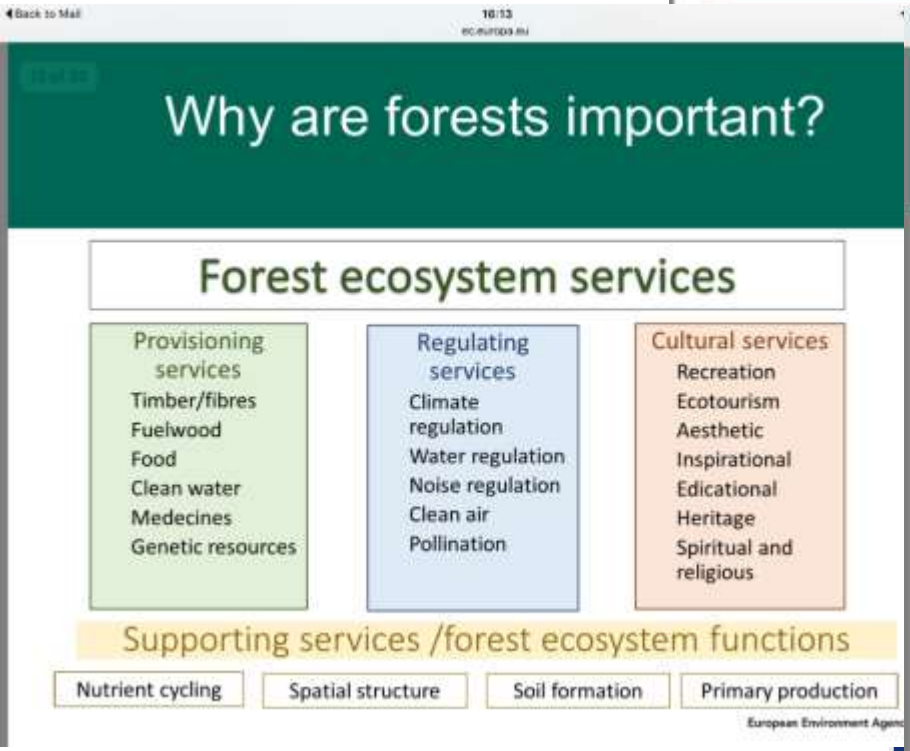
*"In the forest-based sector, a **vast range of specialised SMEs are currently providing key services** on e.g. forest mapping and management planning; eco-tourism; nature and landscape conservation and management studies; forest health and risk management services; development of forestry infrastructure; harvesting, processing and marketing of forest-based products; etc. Their role in essential in advancing the forest-based bioeconomy, which is an essential part of rural economies in Europe. Innovative solutions applicable throughout the forest-based value chains are specifically expected from their side."*

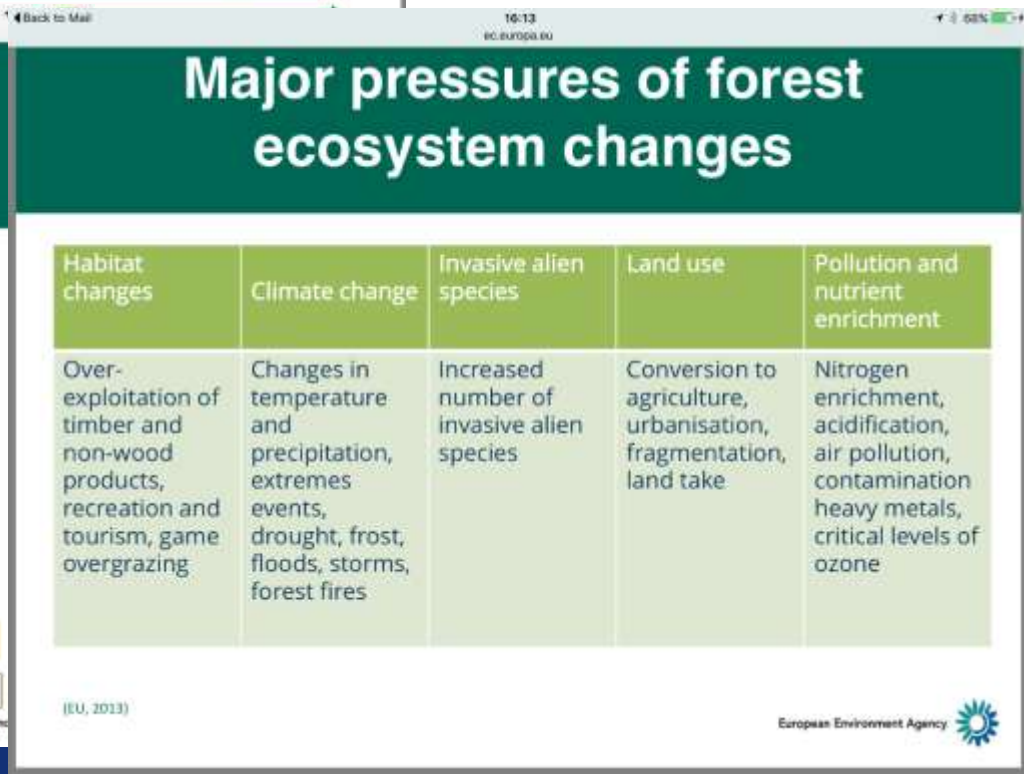
Vice-President Katainen

European Commission

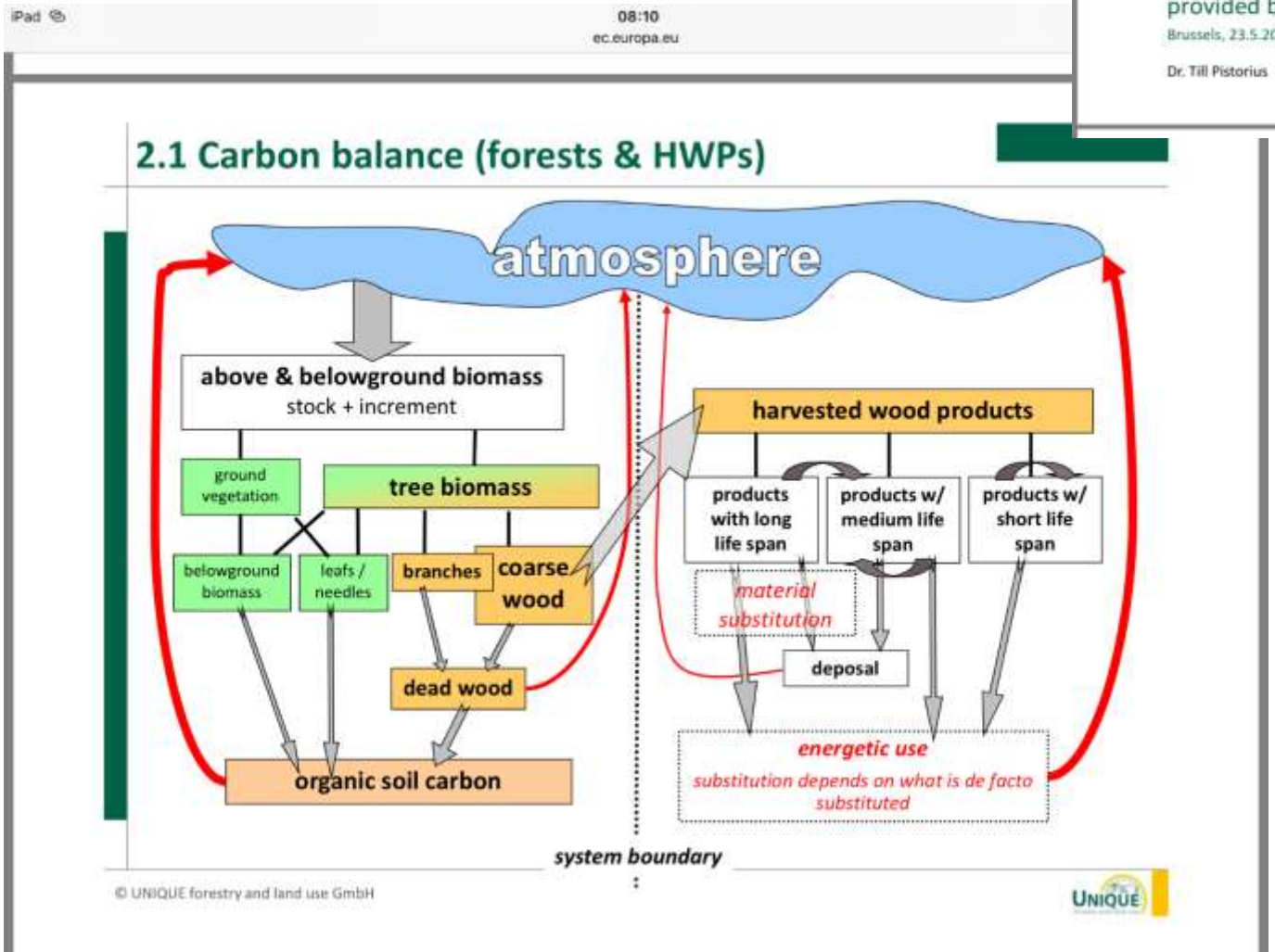
Beyond wood – some conference flashlights





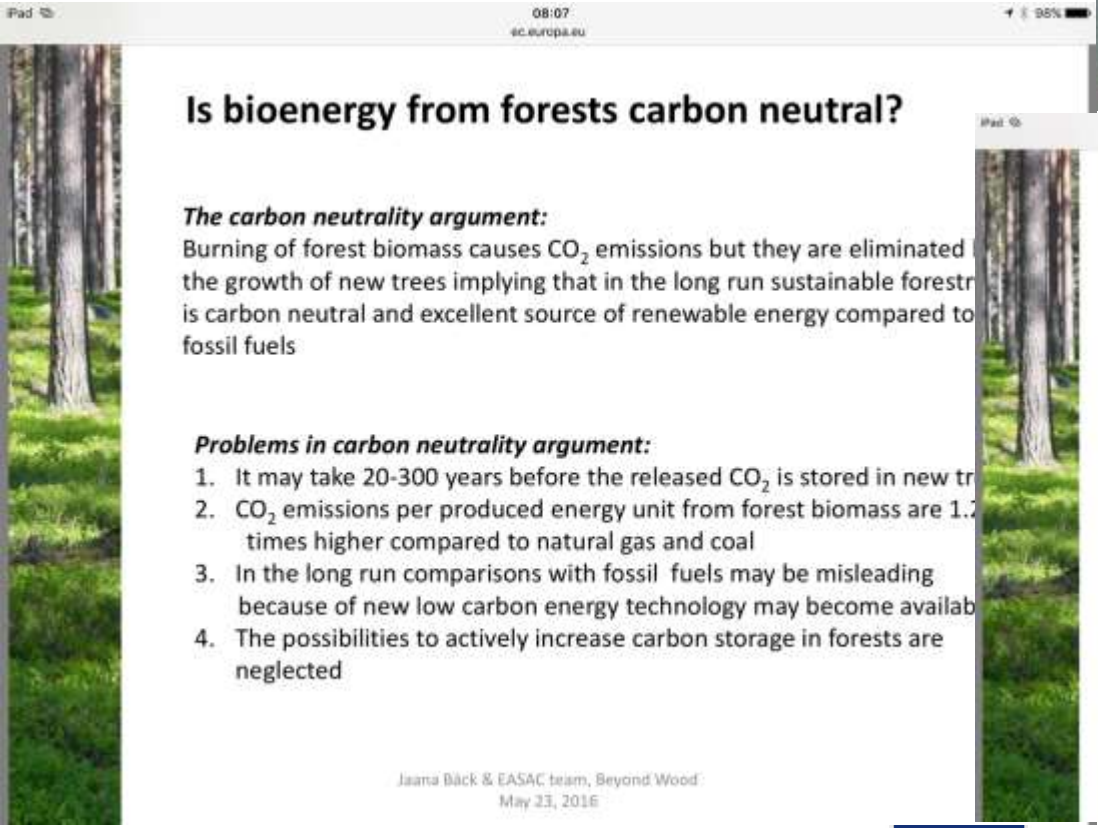


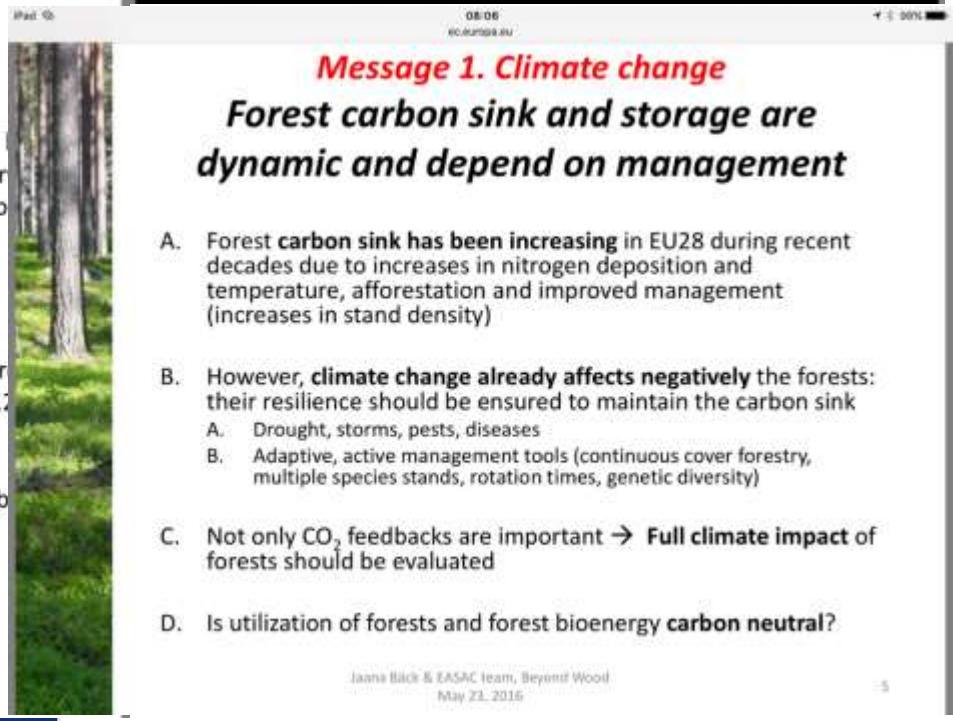
Beyond wood – some conference flashlights



European Commission

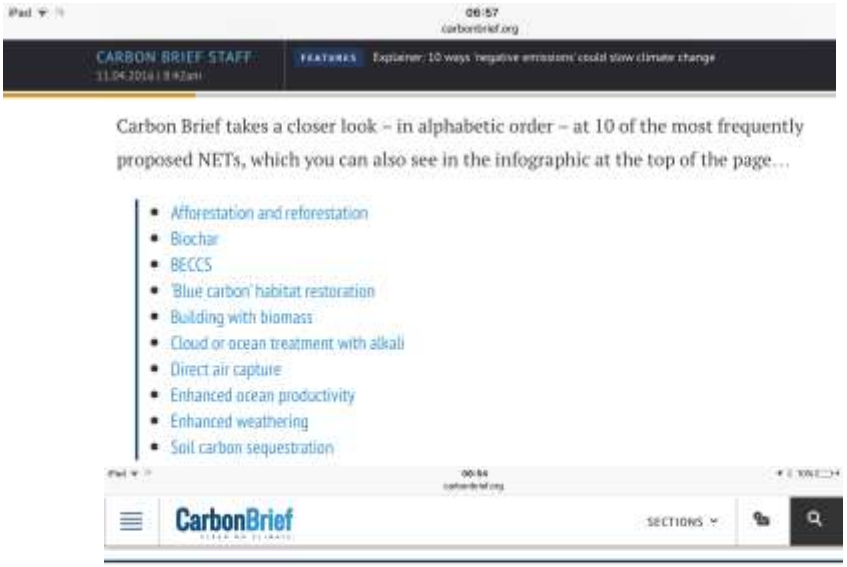
Beyond wood – some conference flashlights





Negative emission technologies

Negative emission technologies



Carbon Brief takes a closer look – in alphabetic order – at 10 of the most frequently proposed NETs, which you can also see in the infographic at the top of the page…

- Afforestation and reforestation
- Biochar
- BECCS
- 'Blue carbon' habitat restoration
- Building with biomass
- Cloud or ocean treatment with alkali
- Direct air capture
- Enhanced ocean productivity
- Enhanced weathering
- Soil carbon sequestration

FEATURES | April 11, 2016

Explainer: 10 ways 'negative emissions' could slow climate change

The Paris Agreement, adopted at the COP21 climate talks in December, sets out a global aim to limit average global surface temperatures to "well below 2C" above pre-

Afforestation and reforestation

Afforestation means planting trees where there were previously none. Reforestation means restoring areas where the trees have been cut down or degraded. Because trees take up CO_2 from the atmosphere as they grow, planting more trees means boosting how much CO_2 forests absorb and store. As a method of removing CO_2 from the atmosphere, this is one of the most feasible options, although it still has drawbacks and uncertainties.

Reforestation is almost universally desirable in its own right, particularly if it means re-planting native trees, and is already widely recognised and used to tackle climate change. Many countries are already practising it, such as Brazil, which has pledged to restore 12m hectares of forest. The UN's Clean Development Mechanism provides a financial incentive for countries to increase their forest stocks.

Estimates suggest that afforestation and reforestation can sequester CO_2 at a rate of 3.7 tonnes per hectare per year, and comes with an associated cost of $20-100 per tonne.

One potential obstacle to afforestation is land availability and suitability. This depends on a range of factors, including global population, diet, the efficiency and intensity of agriculture, and rising competition from bioenergy. Planting vast areas of forests could also cause complex changes in cloud cover, reflectivity, and the soil-water balance. All of these could also have an impact on the Earth's climate.



EU Forests

- ✓ Nature-based solutions
- ✓ Eco-system services
- ✓ Non-wood forest products (NWFP)
- ✓ Innovative wood value chains (nanocellulose, Tree-Shirts, biobased construction)
- ✓ Forest-based industries in BBI
- ✓ Bioenergy

Overview

1. *Conclusions*
2. *What is bioeconomy*
3. *EU bioeconomy facts and figures*
4. *Why EU Bioeconomy strategy?*
5. *What is EU Bioeconomy policy?*
6. *Bioeconomy and Horizon 2020*
7. *Investments, markets and regulatory environment*
8. *EU Bioeconomy strategy review*
9. *EU regions are key players for the bioeconomy*
10. *The food pillar of the bioeconomy*
11. *Looking forward: Rising interfaces and new complexities*
12. *Flashlights: Bioeconomy today, or maybe tomorrow?*

Key takeaways

Bioeconomy concept is getting stronger in Europe and globally due to expected environmental, economic and social impacts, such as on jobs, climate change and food security.

In Europe, it is part of important **EU Policies** such as circular economy, industrial renaissance and renewable energy and resource policies, also increasingly on **national level**, with research and innovation supported under…

…priorities of EU **Horizon 2020 programme** (2014-2020) – Societal Challenge 2 and in separate but **complementary** industry-led programme **BBI JTI**

We need to take into account **framework conditions** (e.g. standards, national policies and priorities, access to finance) in order to deliver fully on the expectations of the Bioeconomy concept.

Key takeaways (2)

Forests cover over 40% of EU land area. EU forest-based sector accounts for up to four million jobs, mostly in rural areas. Forest-based products represent ca. 8% EU manufacturing added value, with further potential

Beyond high value of wood and non-wood products, forests are crucial **ecosystems**, supplying key services for society: climate change mitigation, soil and water protection, biodiversity, clean air, leisure and recreation.

Sustainable management of forests and provision of ecosystem services are shared challenges and political objectives at European level, including for research and innovation policy. There is a significant portfolio of research projects under FP7 and Horizon 2020.

EU **Bioeconomy Strategy** is currently under review. MS input in this process will be much appreciated. The Strategy will be updated, if deemed necessary, to better encompass decarbonisation and circularity while also promoting industrial renaissance, dynamic regional economies and the renewal of key sectors (agri-food, forestry, waste, marine, chemical, construction).

Conclusions (1)

- ***Bioeconomy is gaining momentum**, with several EU Member States currently developing national bioeconomy strategies (following the good examples set by Finland and Sweden), and with a variety of research and innovation funding opportunities available at EU level via Horizon 2020, the Structural Funds (ESIF) and also via the Juncker Fund for strategic investments (EFSI).*

  ***Forest-based sector is, and remains, important for the development of EU policies in general**, including for research and innovation policy. There is a significant portfolio of research and innovation projects, and coordination activities, under FP7 and under Horizon 2020, through a number of instruments launched under the annual work programmes, including the Joint Undertaking Bio-Based Industries (BBI).*

  ***Supporting the role of the forest-based sector in the Bioeconomy is instrumental in reaching a number of EU's goals**, including the strengthening of Europe's competitiveness and the stimulation of investment for job creation (Item 1 in Juncker's Agenda for Jobs, Growth, Fairness and Democratic Change).*

Conclusions (2)

***Finnish and Swedish support to the bioeconomy is important and appreciated**, with national and supra-regional bioeconomy strategies and initiatives building on the initiatives already undertaken at EU level, in particular the European Bioeconomy Strategy.*

***European Bioeconomy Strategy is currently under review**, also to assess its contribution to the circular economy. It will update the strategy in 2017, if necessary, in order to better encompass decarbonisation and circularity while also promoting industrial renaissance, dynamic regional economies and the renewal of key sectors (agri-food, forestry, waste, marine, chemical, construction, ...)*

***Very complex challenges require a high level of policy coordination across a range of policies that are key to the bioeconomy**. Defining a coherent bioeconomy policy needs to be considered within the context of climate, energy, and agriculture objectives (addressing food security, natural resource scarcity, fossil resource dependence, etc.), while achieving sustainable economic growth.*

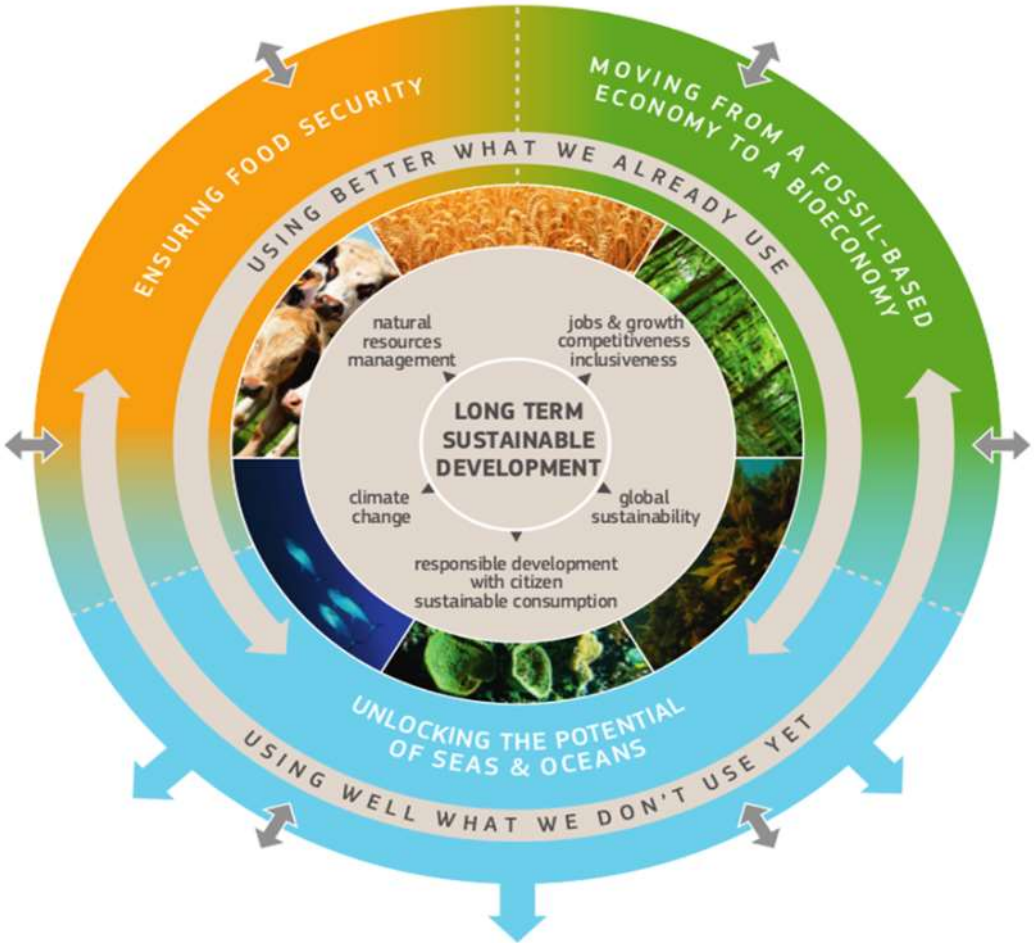
Conclusions (3)

- ***Role of forests in 'de/re-carbonisation' of Europe is important in context of EU energy and climate objectives.*** *Forests have capacity to sequestrate carbon in living biomass and soils, but also play a key role in substitution of fossil fuels by both wood products (e.g. wood constructions) and bioenergy. Based on the on-going work on this, the Commission will come up with a legislative proposal for the sector Land use, land use change and forestry (LULUCF) before the summer, and for the bioenergy next year*
- ***EFI plays an important role in conveying to its members key messages on forest research and innovation at the pan-European level,*** *and also in helping shape EU policy development, through involvement in various projects, stakeholder engagement activities and publications such as "ThinkForest" forums.*
- ***Your views on the future of the bioeconomy and on what we can do further at EU level are welcome****. Furthermore, do you see specific aspects related to the Bioeconomy (notably for forestry) that are limitedly treated the Circular Economy package so far and would be relevant to be taken up in the context of the EU Bioeconomy Strategy review?*

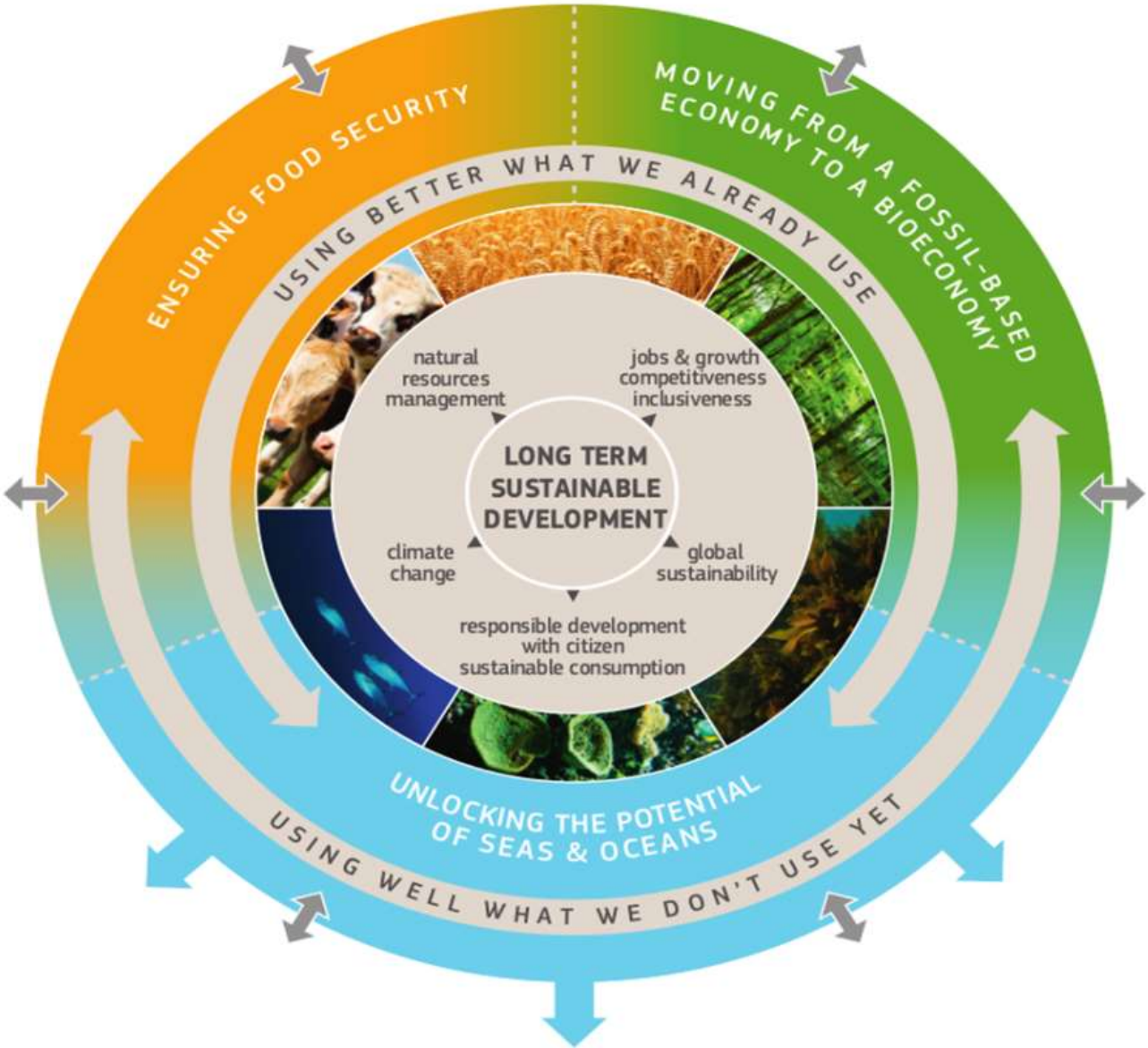
2. WHAT IS BIOECONOMY

" The Bioeconomy encompasses those parts of the economy that use **renewable biological resources** from land and sea to produce food, bio-materials, bio-energy and bio-products."

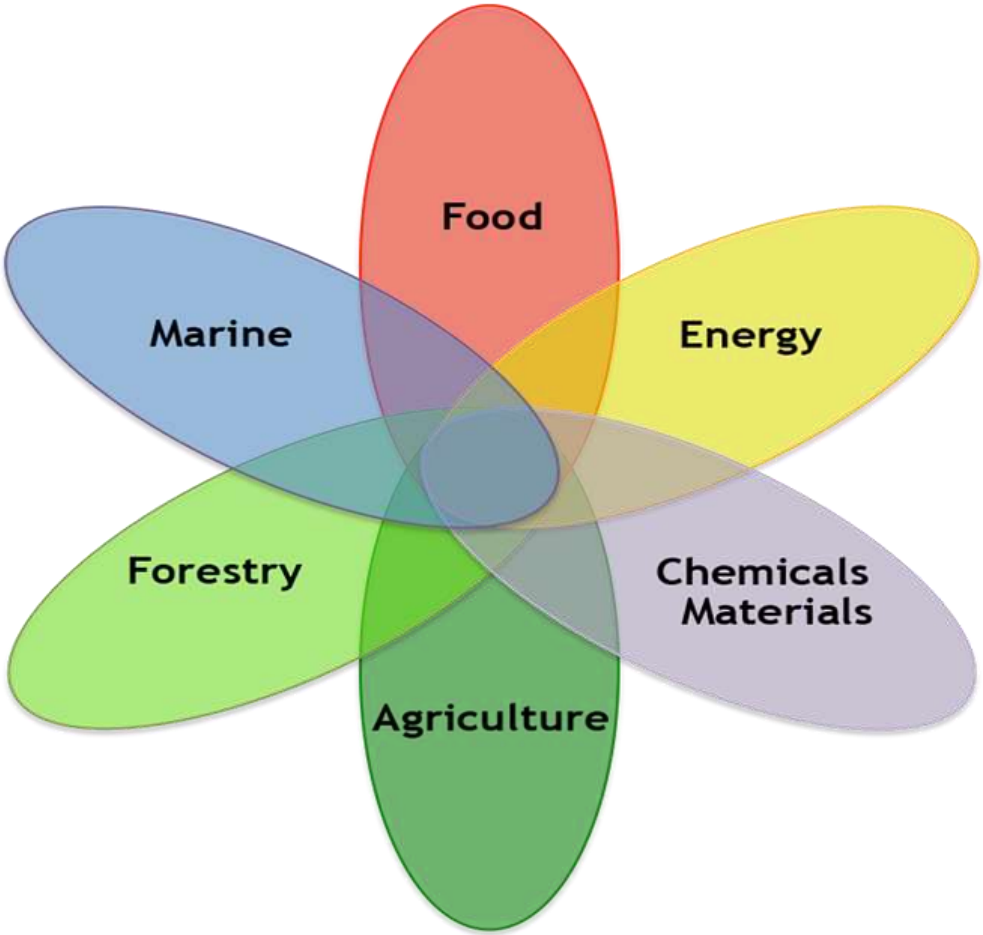
EU Bioeconomy Strategy, 2012



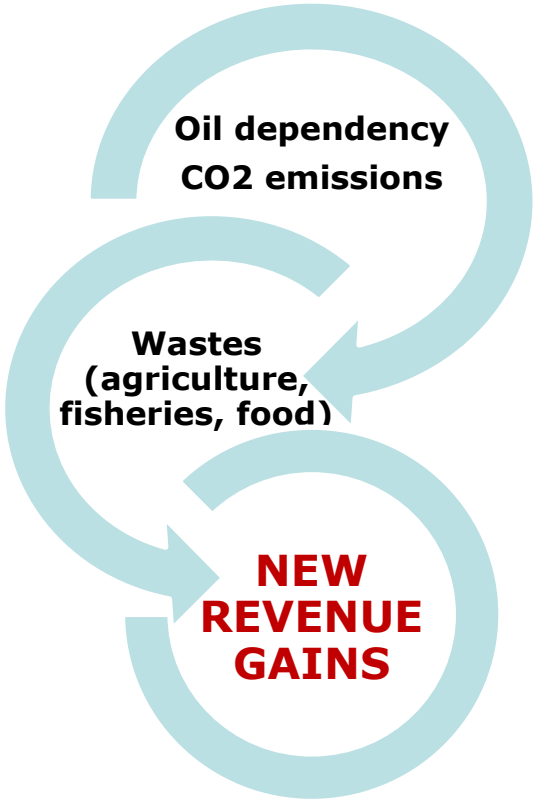
European Commission



Bioeconomy -



Using biological resources to produce "more and better, from less"

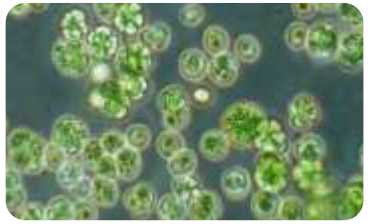


Source: SCAR (Standing Committee on Agricultural Research)

Research and innovation enable the creation of new bio-based value chains

Primary production

Sugar beets



Algae

Wood residues

Waste

Biological waste

Fish waste

Cosmetics

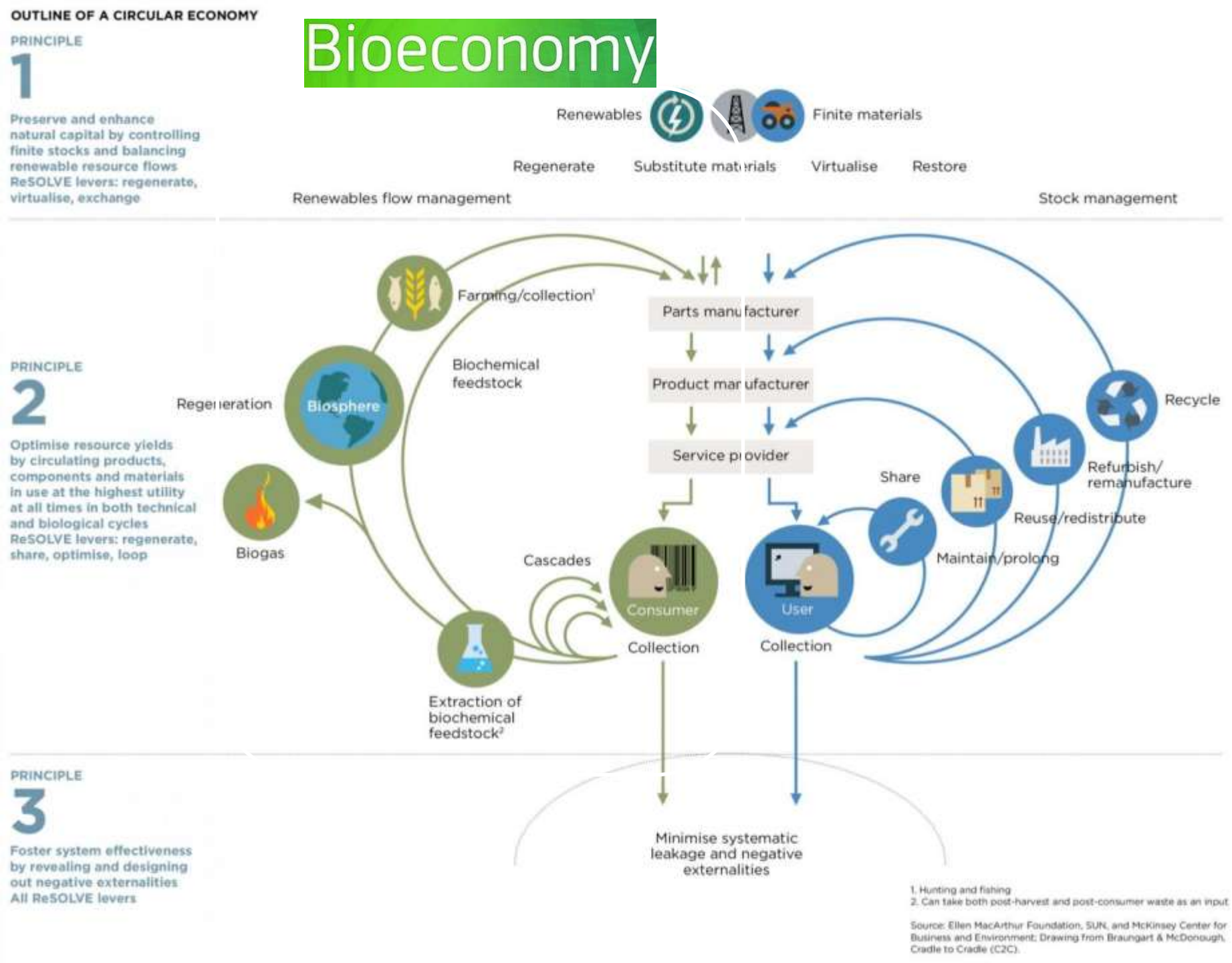
Plastic bottles
Natural colourants for candy

Dashboards

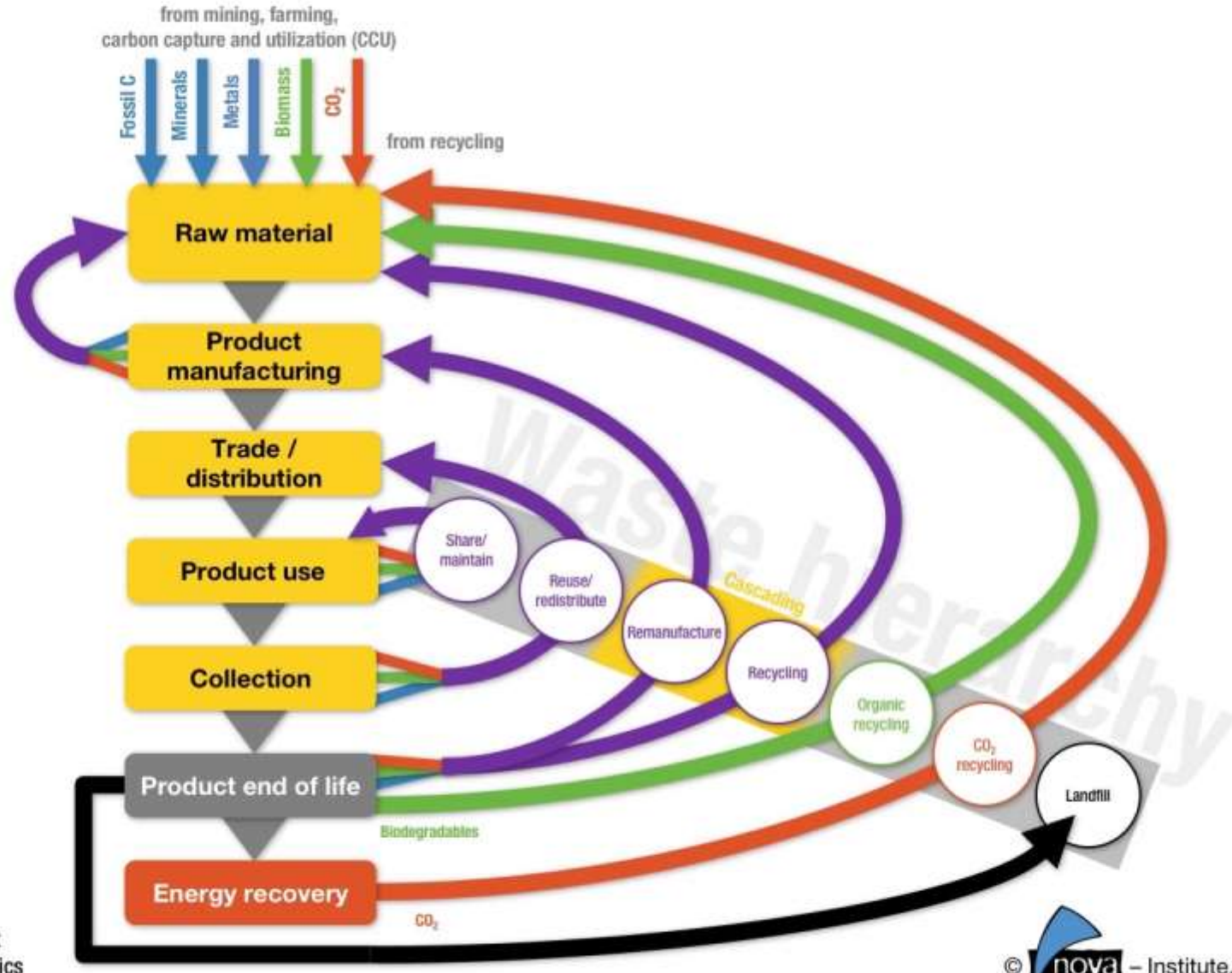
Bio-based plastics

Pharmaceuticals

Bioeconomy


OUTLINE OF A CIRCULAR ECONOMY
PRINCIPLE
1
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange
Renewables
Finite materials
Regenerate
Substitute materials
Virtualise
Restore
Renewables flow management
Stock management
PRINCIPLE
2
Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop
Farming/collection[1]
Parts manufacturer
Biochemical feedstock
Product manufacturer
Regeneration
Biosphere
Service provider
Recycle
Refurbish/ remanufacture
Share
Reuse/redistribute
Biogas
Cascades
Consumer
User
Maintain/prolong
Collection
Collection
Extraction of biochemical feedstock[2]
PRINCIPLE
3
Foster system effectiveness by revealing and designing out negative externalities
All ReSOLVE levers
Minimise systematic leakage and negative externalities
1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input
Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

Comprehensive Concept of Circular Economy

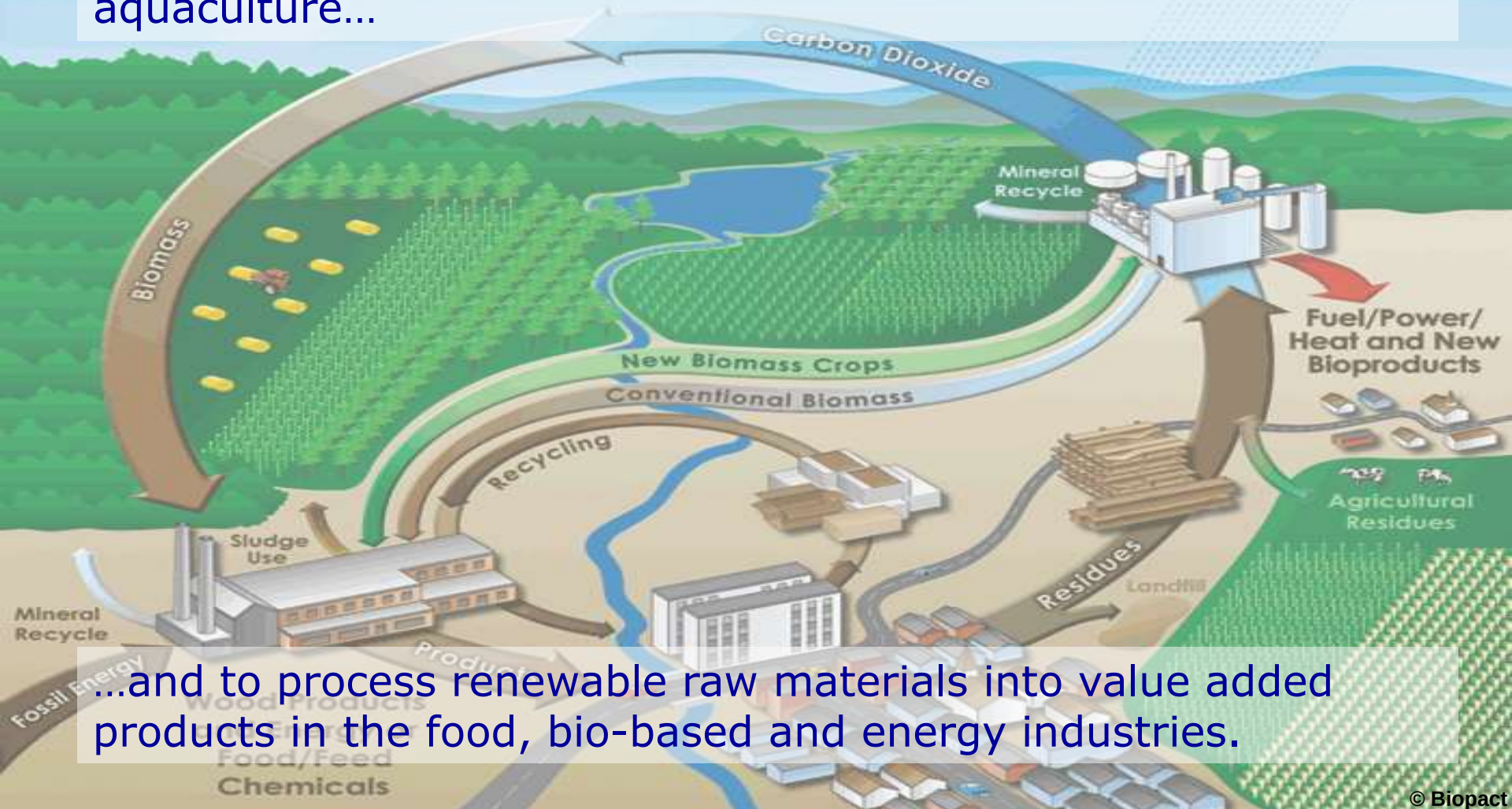


Graphic available at
bio-based.eu/graphics

The Bioeconomy for sustainable competitiveness

European Commission

Using research and innovation to produce renewable raw materials sustainably in agriculture, forestry, fisheries and aquaculture…



…and to process renewable raw materials into value added products in the food, bio-based and energy industries.

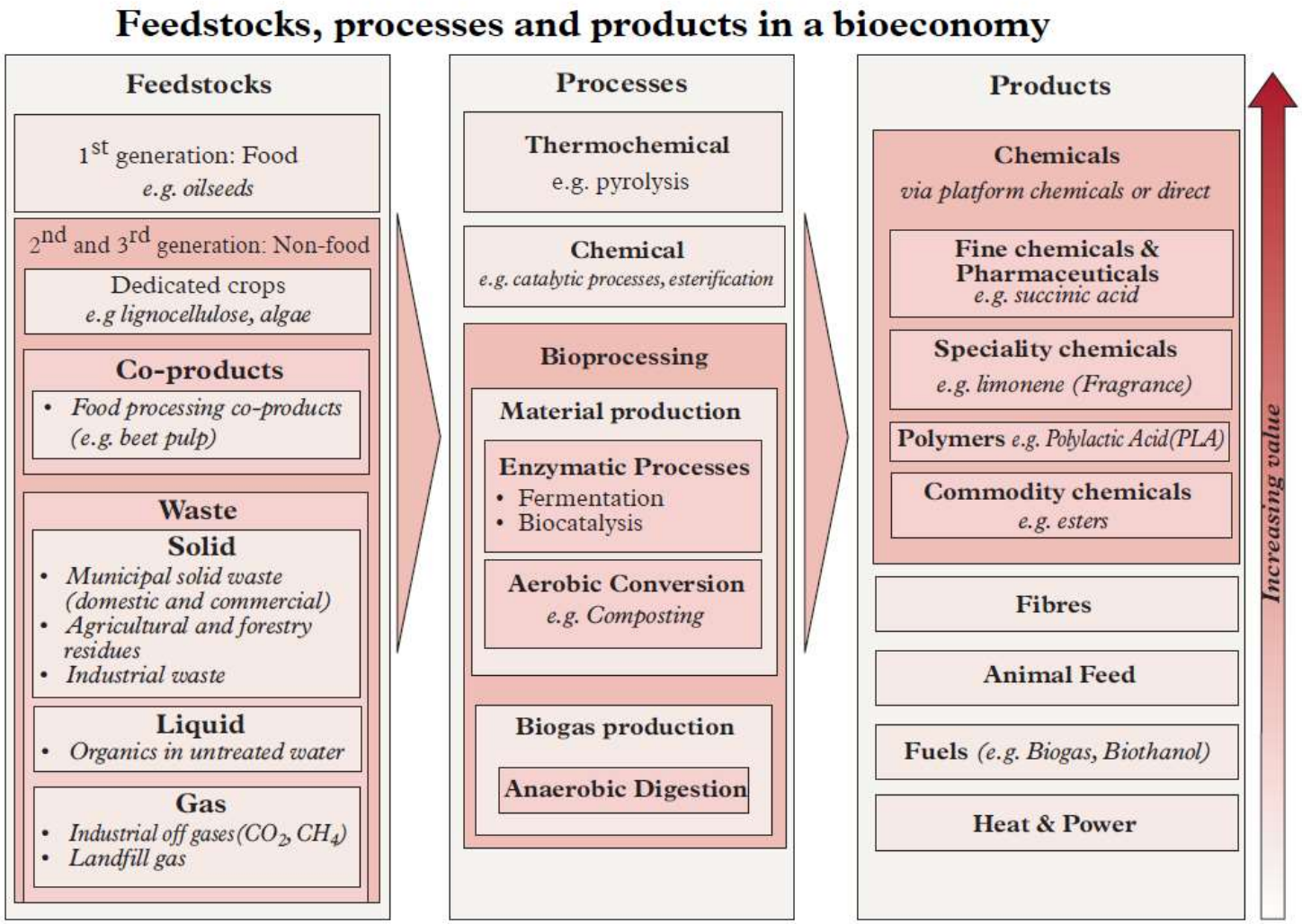


Figure II.6: Bio-based feedstocks, processes and end products sorted by value-added creation (House of Lords 2014)

3. EU BIOECONOMY FACTS AND FIGURES

The Bioeconomy in the European Union in numbers

Facts and figures on biomass, turnover and employment (IPTS 2015)

"***The bioeconomy is the production of biomass and the conversion of biomass into value added products, such as food, feed, bio-based products and bioenergy***. *It includes the sectors of agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. The definition used in this document includes also manufacturing of bio-based textiles. It is important to note that these figures do not take account of the full potential of the marine bioeconomy and figures provide only a partial picture of its value.*

Documenting the bioeconomy is a challenge for science and research *because official statistics only report on traditional sectors with no distinction between synthetic and bio-based production (e.g. manufacture of synthetic textile vs bio-based textile). Therefore, indicators for the bioeconomy are estimated based on a combination of multiple sources."*

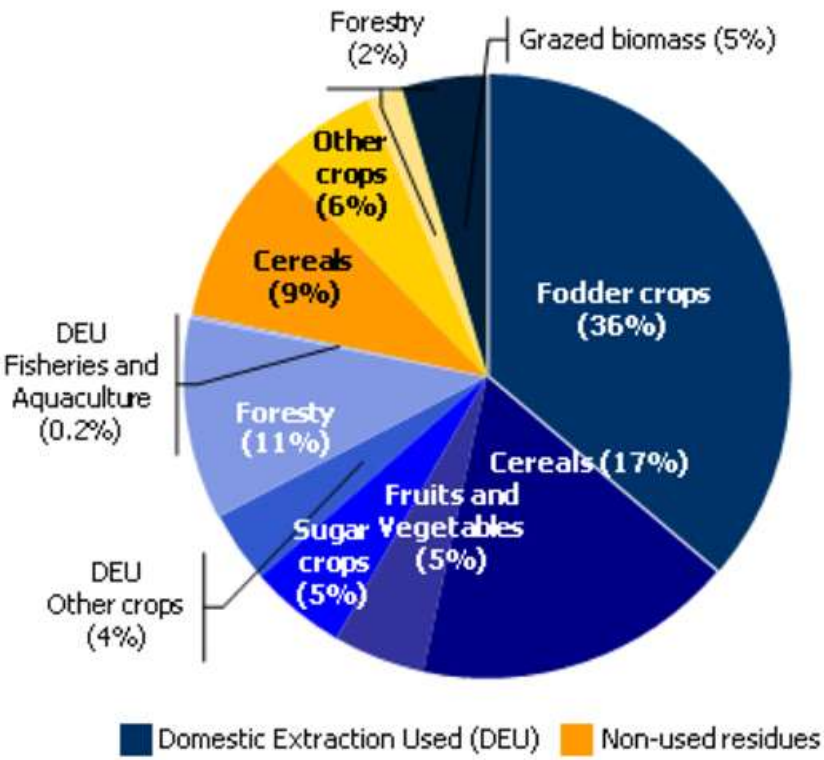
Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

Domestic extraction of biomass in the European Union

The bioeconomy in the EU,

- uses 1600 to 2200 million tonnes of biomass produced within Europe yearly … while 450 to 680 million tonnes of biomass produced remain unused.
  - One part of it needs to remain unused to maintain soil fertility. The conditions needed to take advantage of the rest remains a key question to be addressed.
- uses **agricultural biomass as the first source of supply.**
- imports approximately 15% of all biomass consumed, including processed products.
- and exports almost the same amount of biomass.

Figure 1. Estimation of domestic extraction of biomass in the European Union (% of total volume of dry matter, 2013)



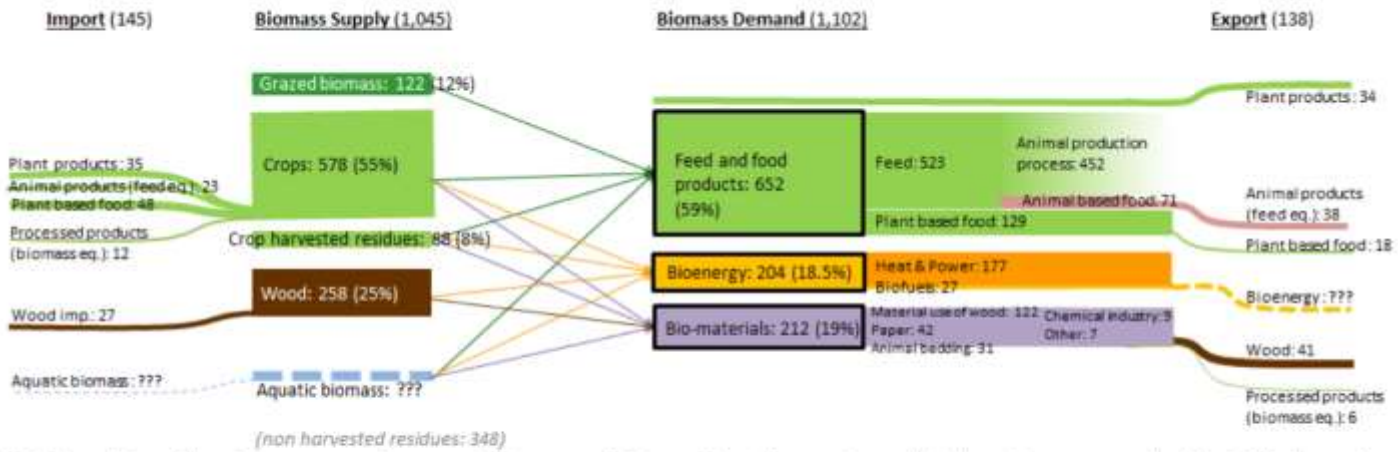
DEU: Domestic Extraction Used = harvested production + used residues

Source: Based on DataM – Biomass estimates, database elaborated by the European Commission/Joint Research Centre IPTS and nova Institut

Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

Preliminary biomass balance in the European Union

Figure 2. Preliminary biomass balance in the European Union (million tonnes of dry matter, EU-28, 2013)



In the European Union the biomass is mainly consumed for ***food and animal feed purposes, which represents 61% of the whole biomass consumption****. Animal feed use alone represents 48% of the total use of biomass. The sectors of bioenergy and biomaterials are similar in terms of the quantity of biomass they consume. Each of them consumes around 18% of the whole biomass. Within bioenergy, biofuels represents around 2% of the biomass consumed in the European Union.*

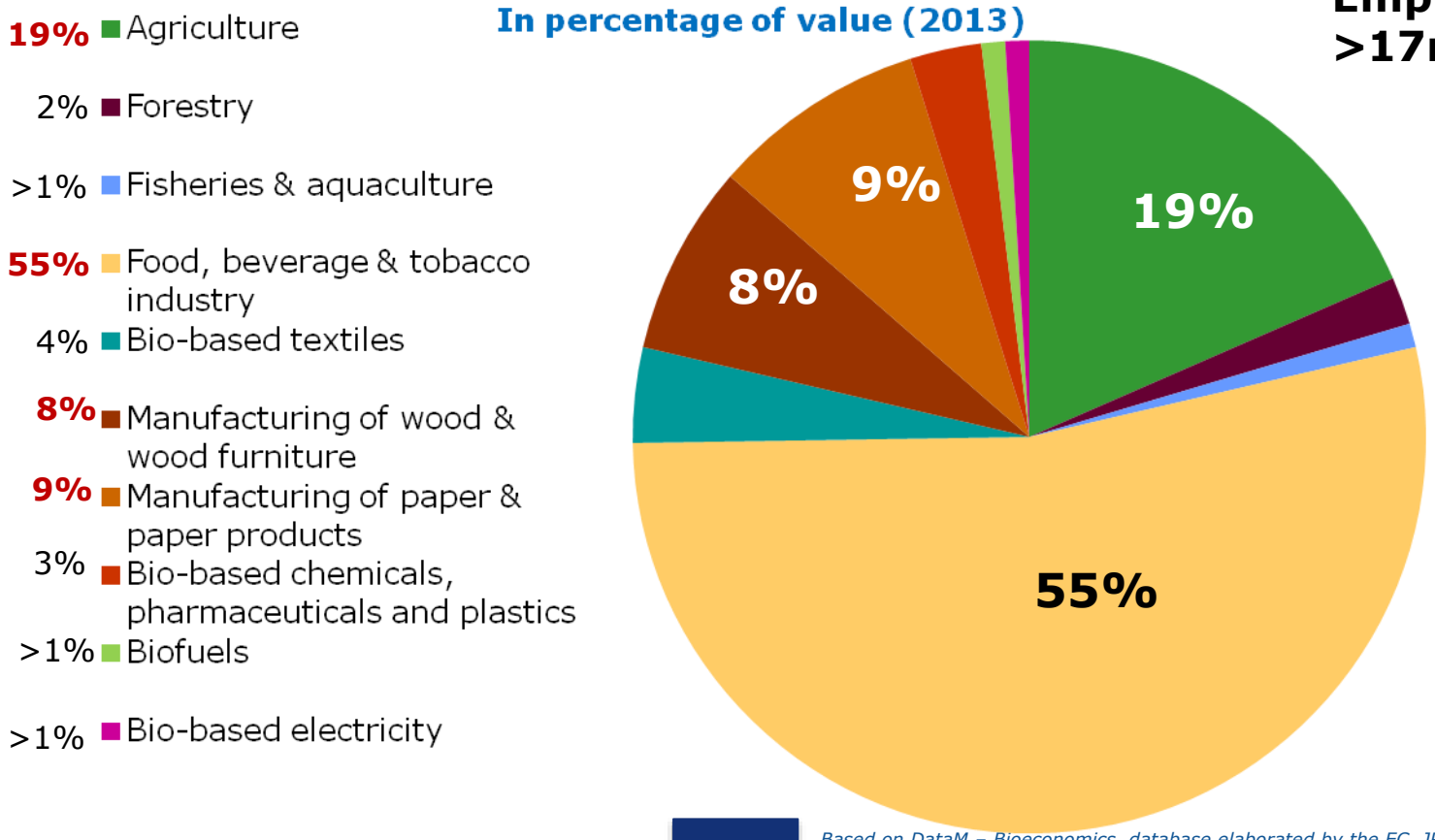
Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

Bioeconomy is key for Europe

2 trillion euro turnover

Employs >17m people

Turnover in the EU-28 by the bioeconomy sector
In percentage of value (2013)



Based on DataM – Bioeconomics, database elaborated by the EC, JRC IPTS & Nova Institut

The European bioeconomy generates a turnover estimated at around 2 trillion euros and employs more than 17 million of persons

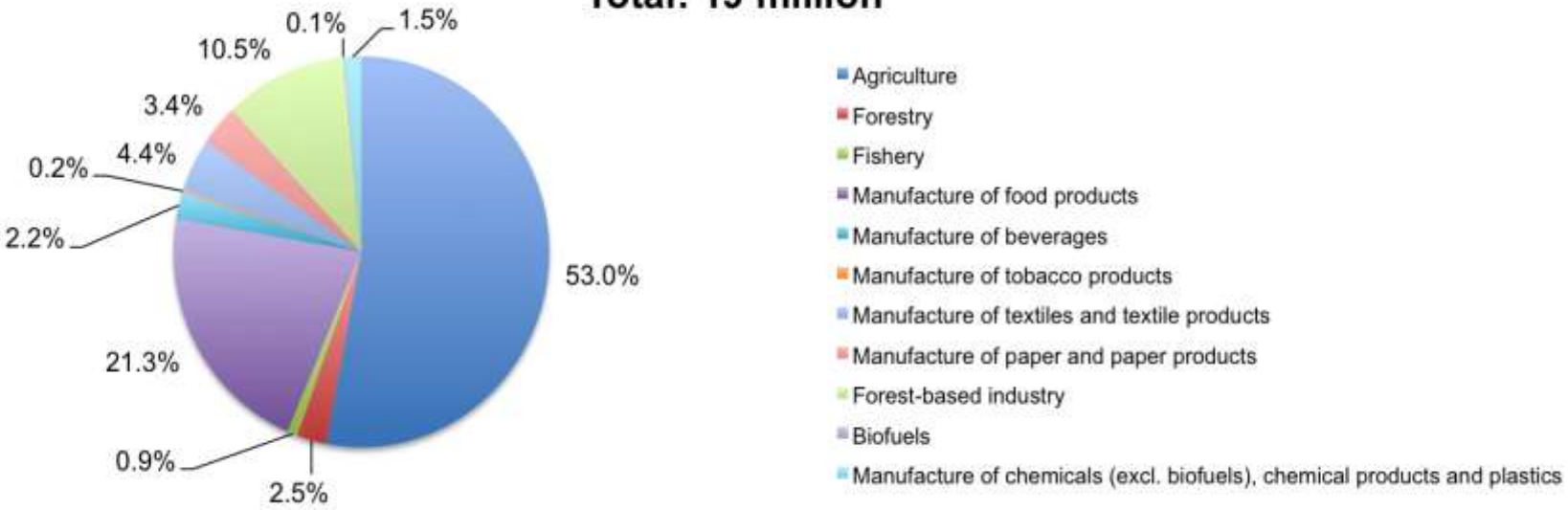
*The **agricultural and the "food, beverage and tobacco" sectors** are leading the European bioeconomy in terms of turnover and employment, followed by the **wood and paper industry**.*

*Slightly **more than a half of the European bioeconomy turnover comes from the "food, beverage and tobacco" sector, 19% comes from agriculture**, followed by the "manufacturing of wood and wood furniture" and the "manufacturing of paper" with 9% and 8% respectively.*

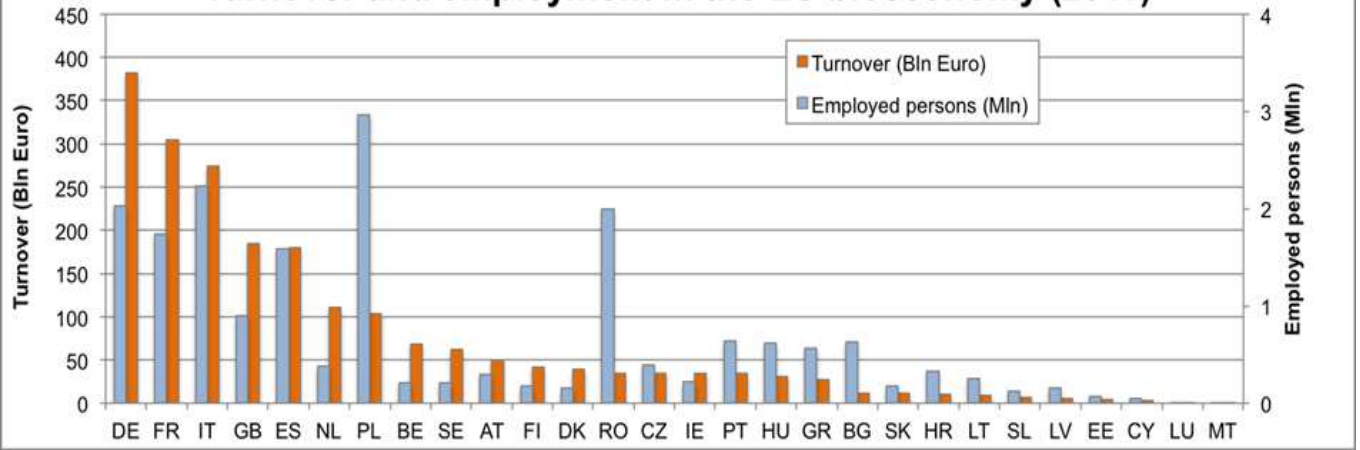
*The overview is different when looking at the employment indicators compared to the turnover indicators. **The agricultural sector employs slightly more than half of the people employed in the European bioeconomy, a quarter is employed in the "food, beverage and tobacco" sector and another quarter in the "manufacturing of wood and wood furniture" and the "manufacturing of paper".***

Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

Employment in the EU bioeconomy (EU28, 2011), Total: 19 million



Turnover and employment in the EU bioeconomy (2011)



Source: SCAR 4, Annex 2

Bioeconomy of the 28 EU Member States is reflecting national historical, territorial and economic specificities (1)

1. Bioeconomy dominated by Agricultural employment

- **In Romania, Greece, Poland, Slovenia, Ireland, Portugal and Croatia, agriculture employs more than 60% of the total people employed in the bioeconomy.**

2. Bioeconomy geared toward the Agro-Food industry and Bio-based chemical industries

- **The turnover generated by the "food, beverage and tobacco" sector in the Netherlands, Belgium, France, Denmark, Germany, Italy, the United Kingdom, Spain, Luxembourg and Ireland is above the European Union average.**
- **Additionally, these countries demonstrate a turnover per person employed in biochemical industries higher than 260 thousand euros per person. The term "Biochemical industries" comprises here of bio-based chemistry, biobased pharnaceticals and bio-based plastics.**

Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

Bioeconomy of the 28 EU Member States is reflecting national historical, territorial and economic specificities (2)

3. Turnover of the bioeconomy primarily generated by Forestry and downstream industries

- **Finland, Sweden, Latvia and Estonia generates more than 40% of their bioeconomy turnover in forestry, the manufacturing of wood and wood furniture and pulp and paper sectors. Sweden and Finland also show an orientation towards the bio-based chemical industry as described in group 2.**

4. Non-specialised bioeconomies

- **Bulgaria, the Czech republic, Hungary, Lithuania, Malta and Slovakia show a more mixed bioeconomy with no strong orientation as described for the other member states. Despite Austria showing an orientation towards biochemical industries, it was not classified in group 2 because of a clear absence of orientation towards the agri-food sector, and inversely for Cyprus.**

Source: Ronzon, T., Santini, F. and M'Barek, R. (2015). The Bioeconomy in the European Union in numbers. Facts and figures on biomass, turnover and employment. European Commission, Joint Research Centre, Institute for Prospective Technological Studies, Spain, 4p., https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/documents/BioeconomyFactsheet_Final.pdf

4. WHY EU BIOECONOMY STRATEGY?

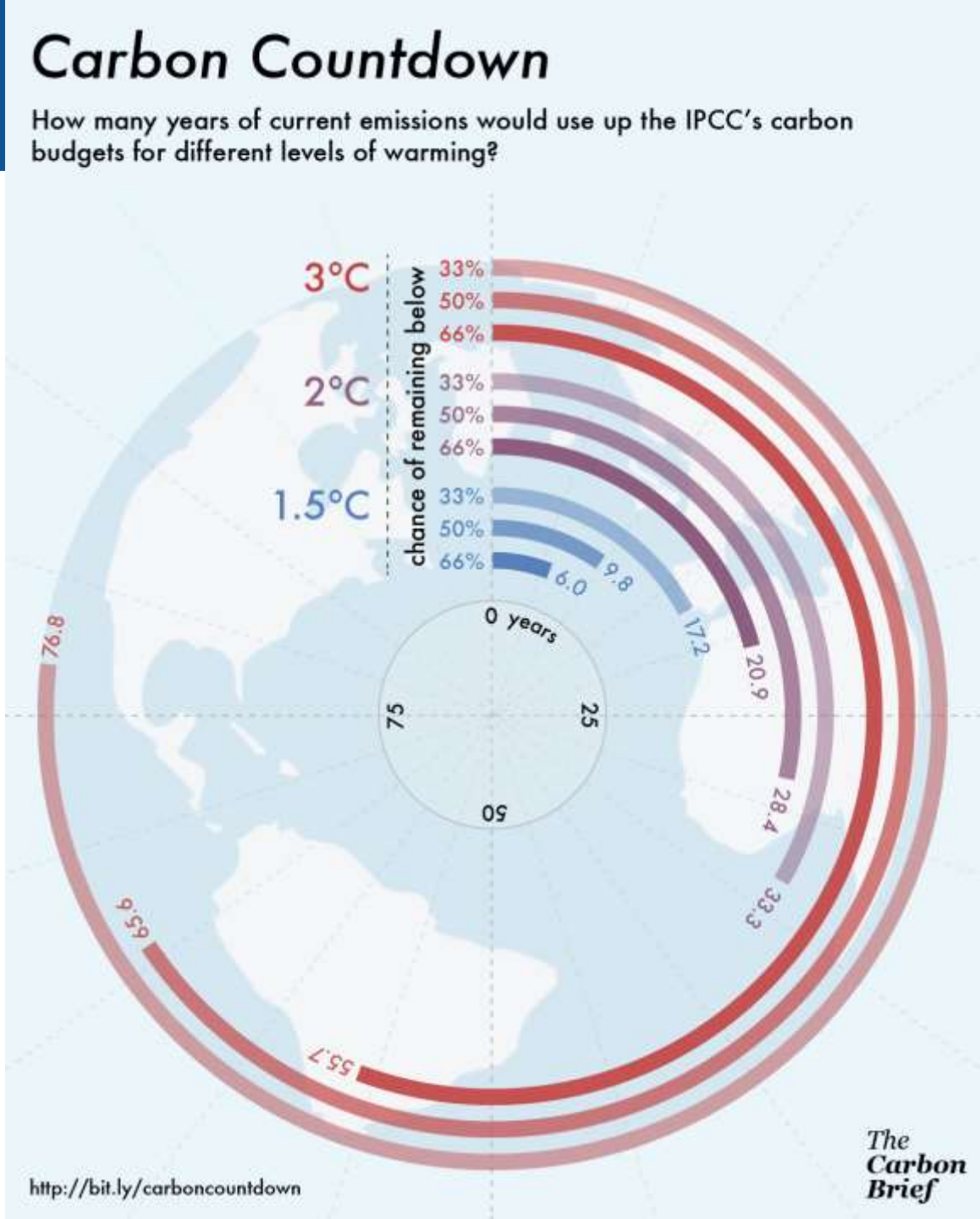
Why a European bioeconomy strategy?

*In order to cope with an **increasing global population**, **rapid depletion of many resources**, **increasing environmental pressures** and **climate change**, **Europe needs to radically change its approach to production, consumption, processing, storage, recycling and disposal of biological resources.** The Europe 2020 Strategy calls for a **bioeconomy as a key element for smart and green growth in Europe.** Advancements in bioeconomy research and innovation uptake will allow Europe to improve the management of its renewable biological resources and to open new and diversified markets in food and bio-based products. Establishing a bioeconomy in Europe holds a great potential: it can **maintain and create economic growth and jobs in rural, coastal and industrial areas**, **reduce fossil fuel dependence** and **improve the economic and environmental sustainability of primary production and processing industries.** The bioeconomy thus contributes significantly to the objectives of the Europe 2020 flagship initiatives "Innovation Union" and "A Resource Efficient Europe".*

COM(2012) 60 final

- **Six years left to remain confidently (66%) below 1,5°C with current emission levels**
- **21 years to remain below 2°C**
- **3°C warmer in 2070**

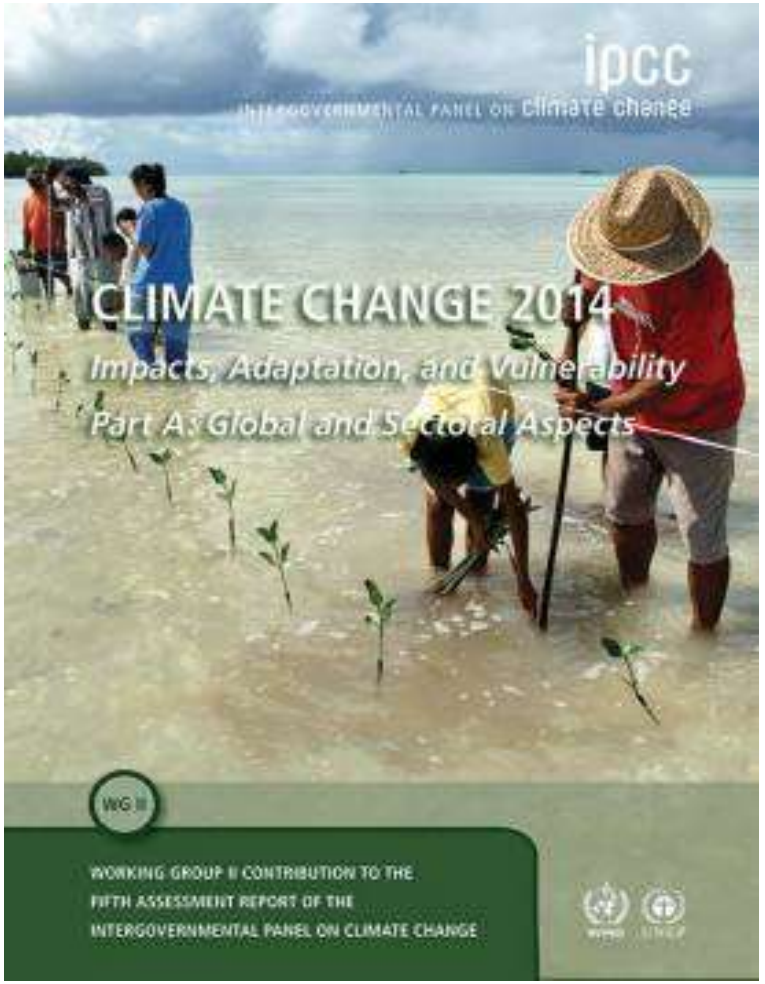
http://www.carbonbrief.org/the-ipccs-priorities-for-the-next-six-years-1-5c-oceans-cities-and-food-security



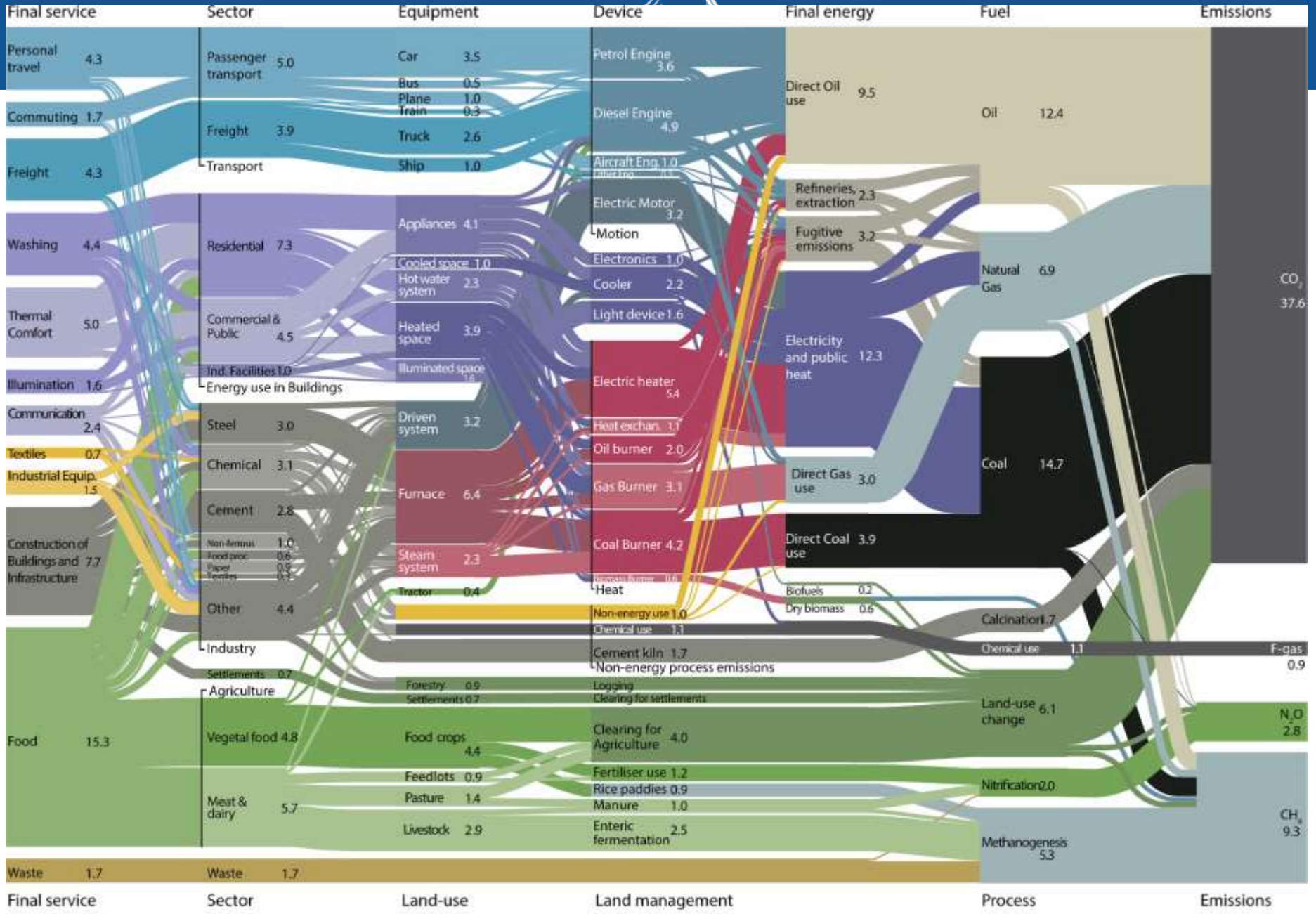
Food is first to be hit by climate change, possibly badly

"Increasing magnitudes of warming increase the likelihood of severe, pervasive, and irreversible impacts.[…] Global climate change risks are high to very high with global mean temperature increase of **4°C** or more above preindustrial levels in all reasons for concern (Assessment Box SPM.1), and include **severe and widespread impacts on unique and threatened systems, substantial species extinction, large risks to global and regional food security**, and the combination of high temperature and humidity **compromising normal human activities, including growing food or working outdoors in some areas for parts of the year (high confidence). "**

IPCC, Climate Change 2014: Summary for policymakers.



Food (30%) + Construction (15%) = 45% GHG

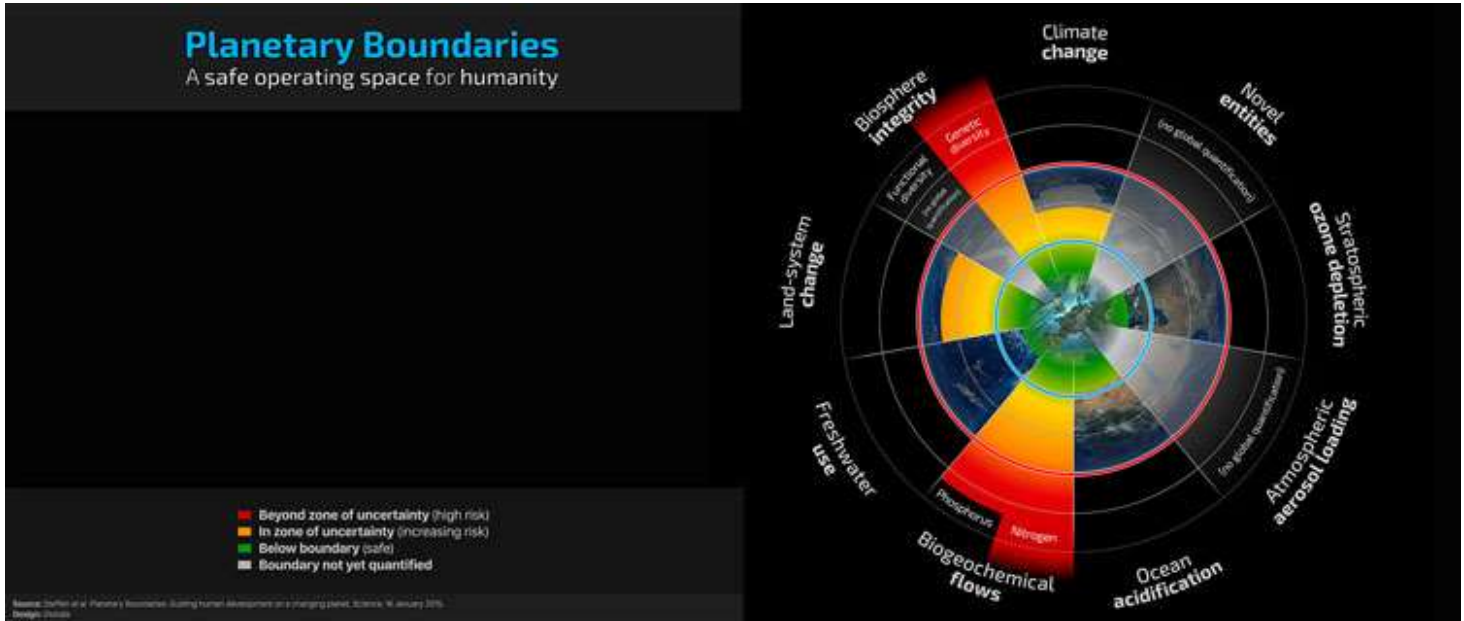


Total GHG emissions (2010): 50.6 Pg (Gt) CO_2e Source: Bajž elj et al (2013), http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3797518/pdf/es400399h.pdf

Planetary Boundaries 2.0 - All crossed boundaries relate to bioeconomy and FNS

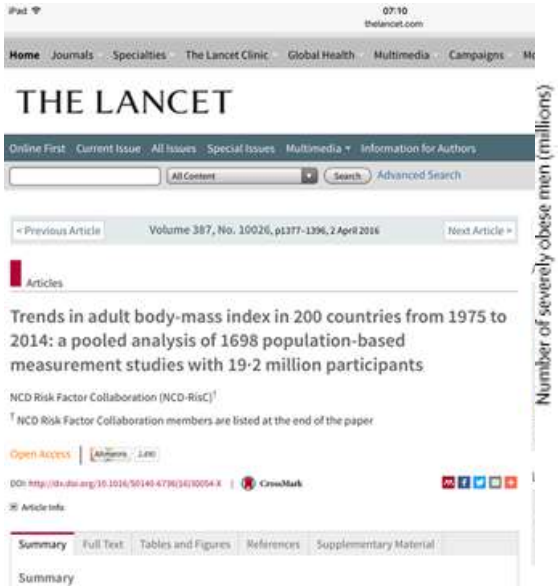
"As Science publishes the updated research, four of nine planetary boundaries have been crossed

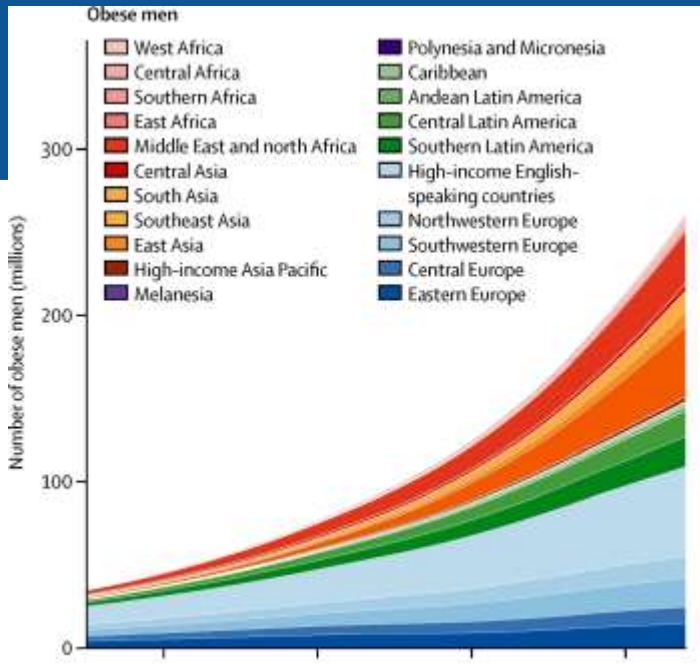
Four of nine planetary boundaries have now been crossed as a result of human activity, says an international team of 18 researchers in the journal Science (16 January 2015). **The four are: climate change, loss of biosphere integrity, land-system change, altered biogeochemical cycles (phosphorus and nitrogen).**" **Stockholm Resilience Centre**

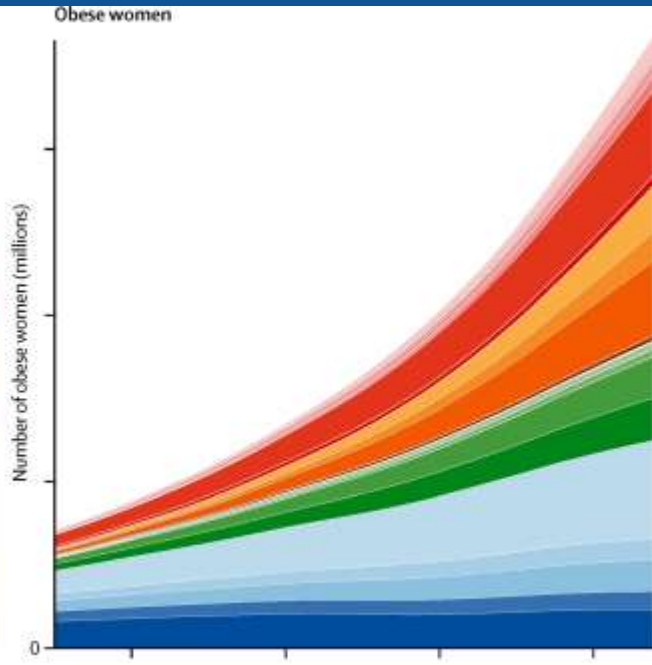


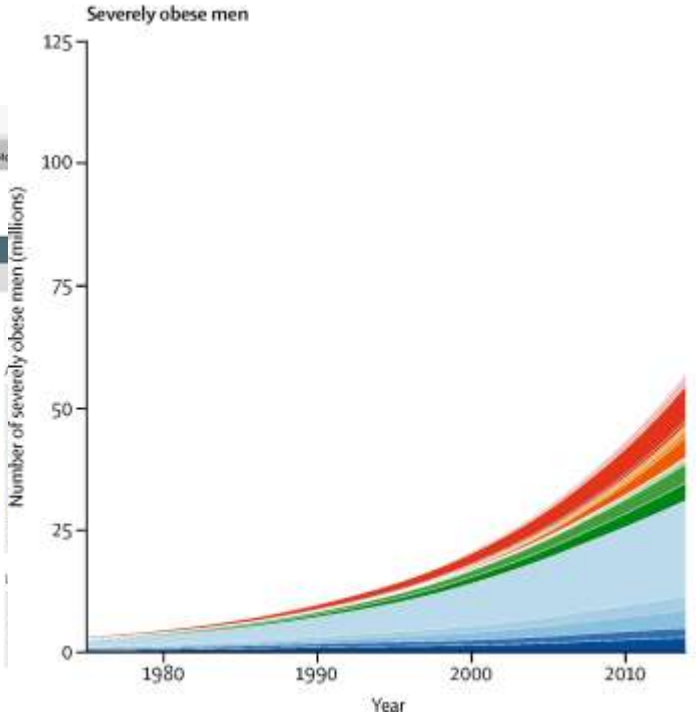
Today globally more obese than undernourished (Lancet 2016)

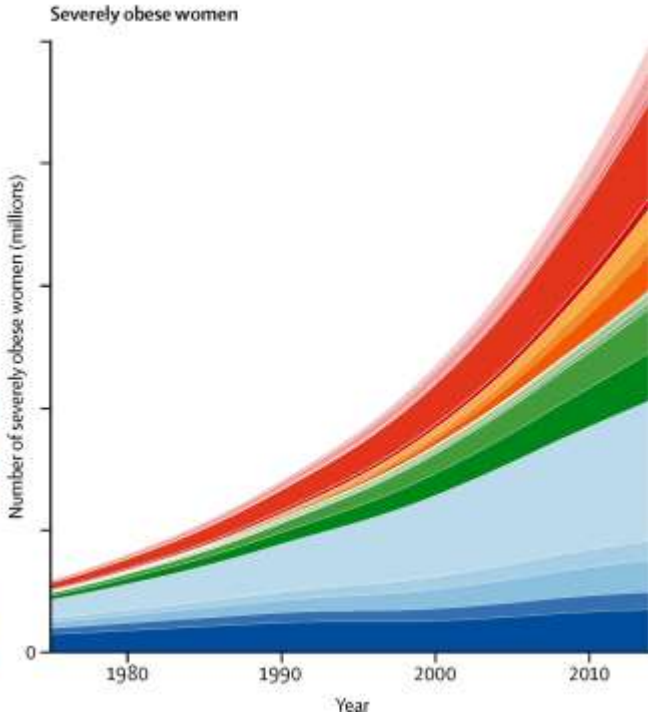
With current trends zero chance to meet obesity targets











http://www.thebookblog.co.uk/2015/03/all-the-refuse-of-the-world/

SDGs – All directly or indirectly relevant to bioeconomy or FNS

Source: German Bioeconomy Council, Maisei/fotolia.com (flags), jktu_21/fotolia.com

Bioeconomy Policies around the World

Source: German Bioeconomy Council, Maisei/fotolia.com (flags), jktu_21/fotolia.com

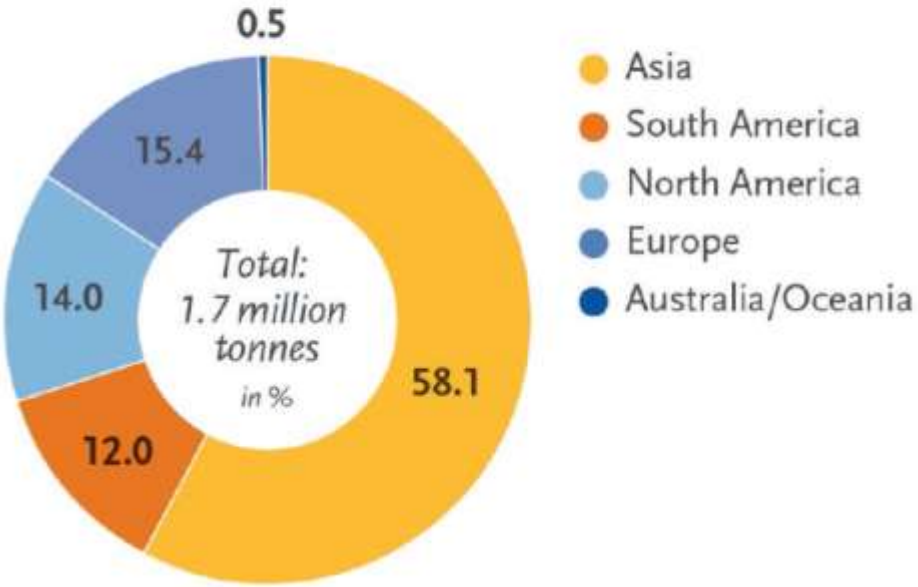
IN EUROPE:

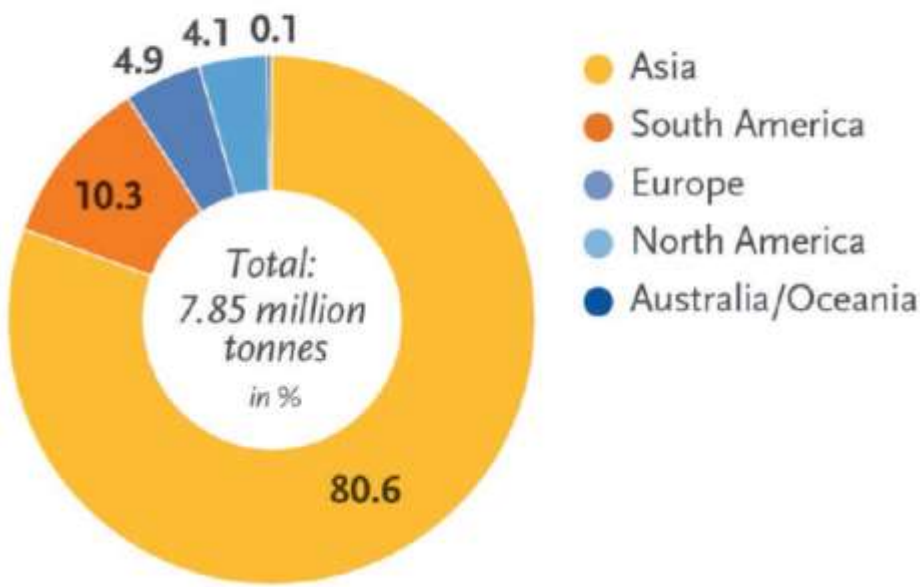
Several MS have adopted **national Bioeconomy Strategies**.

More than 10 Regions are investing in Research on Bioeconomy (ESIF)

Finland and **Poland** the most involved countries

(Source: eye@RIS3)



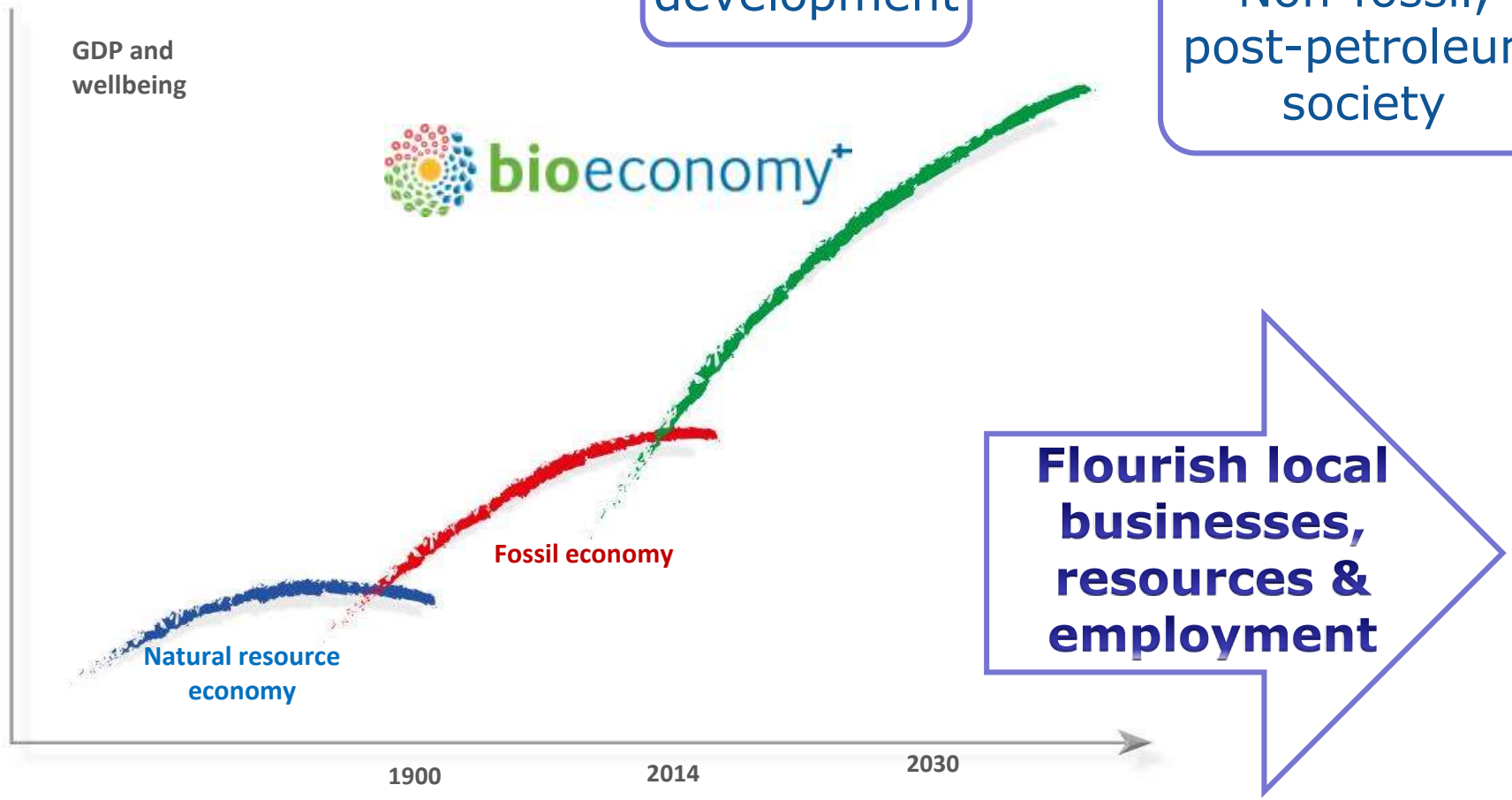


Europe needs to act to remain competitive for industrial production and attract investment in the bioeconomy

Source: European Bioplastics, Institute for Bioplastics and Biocomposites, nova-Institute (2015).

Sustainable development

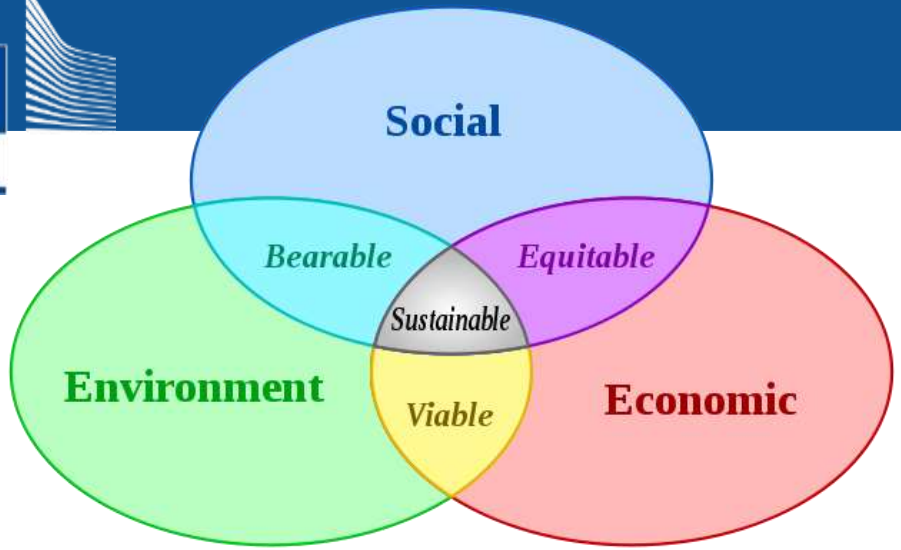
Non-fossil, post-petroleum society



Flourish local businesses, resources & employment

Source: Finnish Bioeconomy Strategy, 2014

European Commission



Sustainability - *conditio sine qua non* for a robust and resilient economy in the Anthropocene

"In practice, sustainability refers to efforts to align economic development with environmental protection and human well-being. Sustainability is commonly characterized in terms of the interdependence among three broad dimensions—environment, economy, and society—while considering both present and future generations. The diagram to the right represents these dimensions as nested, with a resilient and robust economy existing within a healthy society dependent on an intact and functional environment."

https://cfpub.epa.gov/roe/sustainability.cfm

5. WHAT IS EU BIOECONOMY POLICY?

EU Bioeconomy Policies

- Bioeconomy Strategy Communication (2012)
- Bioeconomy Observatory
- Bioeconomy Panel
- National Bioeconomy Strategies
- European Industrial Renaissance Comm. (2014)
- Juncker Agenda (2014)

EU Bioeconomy Strategy introduced in 2012

European Bioeconomy Strategy - Aims

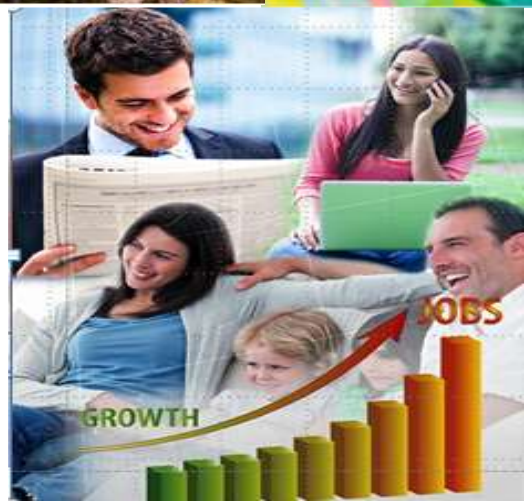
*The **Bioeconomy Strategy and its Action Plan aim to pave the way to a more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of renewable resources for industrial purposes, while ensuring environmental protection**. They will **inform research and innovation agendas** in bioeconomy sectors and **contribute to a more coherent policy environment**, **better interrelations between national, EU and global bioeconomy policies** and a **more engaged public dialogue.** They will seek synergies and respect complementarities with other policy areas, instruments and funding sources, which share and address the same objectives, such as the Common Agricultural and Fisheries Policies (CAP and CFP), the Integrated Maritime Policy (IMP), environmental, industrial, employment, energy and health policies.*

COM(2012) 60 final

Social, environmental and economic impact

- Replacing fossil sources and reducing GHG emissions
- Enhancing energy security.
- Potential for new, innovative & green products
- Huge potential for growth and jobs
- Important part of a circular economy

…but difficulties times (low oil prices, access to financing, competition between energy/material use of biomass)



EU Bioeconomy Strategy & Action Plan

Investment in R&I and skills

- **Horizon 2020 (€3,8b SC2)**
- Increase multi-disciplinary & cross-sectoral R&I
- ESIF - Smart Specialisation
- EFSI

Policy interaction & stakeholder engagement

- EU Policy coherence
- Development of regional and national bioeconomy strategies
- Bioeconomy Panel
- Bioeconomy Observatory
- International cooperation

Enhancement of markets & competitiveness in bioeconomy

- Sustainable intensification of primary production
- Expansion of new markets
- Increase EU competitiveness
- **BBI JU**

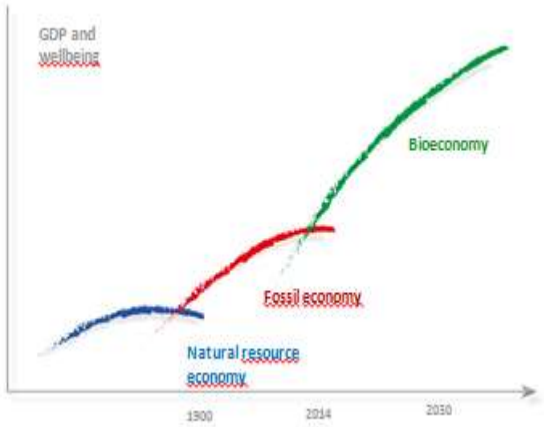
From Bio-economy to bio-industry

- "Bio-economy" is not an established sector, but at the cross-road between many different sectors involving a wide range of diverse actors
- Boundaries between biomass and waste are fluid, as "bio-based" products may be defined in different ways
- Where to start from: from premium products or from low hanging fruits?

Bio-based industries: the new wave of industrialisation

- The bio-based industries sector in the EU is currently of about 57 billion € in annual turnover with 300,000 direct and indirect jobs.
- Bio-based industries increase EU competitiveness through re-industrialisation and sustainable growth and strengthen rural economies.
- Worldwide, the race is on! Almost 1800 biorefineries to be commissioned globally until 2022*. $1.4 billion of public funding was allocated to the development of advanced biofuels in the US in 2011.

*Pike Research



Bioeconomy Strategy – Enhancement of New markets in Bioeconomy Sectors (2012)

- **Establish a Public Private Partnership (PPP) on bio-based industries**; Promote the setting up of networks for integrated and diversified biorefineries;
- Sustainable intensification of primary production; improve understanding of biomass/biowaste availability and demand; develop **sustainability criteria/indicators and assessment approaches**;
- Support expansion of new markets, e.g. by developing **standards and labels for bio-based products; facilitate procurement for bio-based products**;
- Develop science-based approaches to inform consumers about product properties; **encourage informed lifestyle choices.**

Bioeconomy Observatory

A 3-year project for setting-up of the Bioeconomy Observatory was launched in February 2013.

The Observatory is a source of data and information about bioeconomy, including:

- **Statistics on research investments**
- **Policy mapping**
- **Bioeconomy country profiles**
- **Data visualisation**
- **Analytical reports**

biobs.jrc.ec.europa.eu

Bioeconomy Panel

30 members representing:

- Business and producers
- Policy-makers and public administrations
- Scientists and researchers
- Civil society organisations

2 Thematic Working Groups on:

- Biomass Supply
- Development of markets in the bioeconomy

➢ 1 contact group with the **Bioeconomy Observatory**

ec.europa.eu/research/bioeconomy/policy/panel_en.htm

For a European Industrial Renaissance

COM(2014) 14 final

- Recognises the **central importance of industry** for creating jobs and growth, and of mainstreaming industry-related competitiveness concerns across all policy areas.

- **Bio-based products:** granting access to sustainable raw materials at world market prices for the production of bio-based products. This will require the application of the cascade principle in the use of biomass and eliminating any possible distortions in the allocation of biomass for alternative uses that might result from aid and other mechanisms that favour the use of biomass for other purposes (e.g. energy)

Overall EU context

10 Juncker priorities

1. **A new boost for jobs, growth and investment**
2. A connected digital single market
3. **A resilient Energy Union with a forward looking climate change policy**
4. **A deeper and fairer internal market with a strengthened industrial base**
5. A deeper and fairer EMU
6. A reasonable and balance free-trade agreement with the U.S.
7. An area of justice and fundamental rights based on mutual trust
8. **Towards a new policy of migration**
9. A stronger global actor
10. A Union of democratic change

Agenda for Jobs, Growth, Fairness and Democratic Change (2014)

A new start for Europe

President Juncker's Agenda for Jobs, Growth, Fairness and Democratic Change (2014)

A new boost for jobs, growth and investment	• To mobilise up to € 300 billion in additional public and private investment in the real economy over the next three years.
A resilient Energy Union with a forward-looking climate change policy	• We need to diversify our energy sources, and reduce the high energy dependency of several of our Member States.
A deeper and fairer Internal Market with a strengthened industrial base	• We need to bring back industry's weight in the EU's GDP back to 20% by 2020 from less than 16% today.
A stronger global actor	• To combine national and European tools, and all the tools available to the Commission, in a more effective way than in the past.
A Union of democratic change	• Making the European Union as a whole more democratic.

Next steps for the EU Bioeconomy policy: ..with the support of MS and EU Regions

PRIORITIES	ACTIONS
Boost investments	- Financial Instruments - **EIB/InnovFin** - Synergies with **ESIF** *(SoE, Widening participation)* - Link with other programmes (**EFSI**, COSME…)
Favorable policy environment	- Identify and address **regulatory & financial or other** barriers /gaps/needs
Address Knowledge gaps	**- Study** to map EU regions BE Plans – RIS3 (2016) - **Bioeconomy Knowledge Centre**
Increase stakeholders engagement	**- KEP-Knowledge Exchange Platform** - Bioeconomy Stakeholder Panel - Smart Specialisation Platforms, Networks *(ERRIN, ERIAFF)*

http://s3platform.jrc.ec.europa.eu/guides

6. BIOECONOMY AND HORIZON 2020

European Commission

The EU Framework Programme
for Research and Innovation

HORIZON 2020

Excellent Science
Competitive Industries
Better Society

Research and Innovation

What is Horizon 2020?

- ***An €80 billion research and innovation funding programme (2014-2020);***
- ***A core part of Europe 2020, Innovation Union & European Research Area:***
  - *Responding to the economic crisis to invest in future jobs and growth*
  - *Addressing people's concerns about their livelihoods, safety and environment*
  - *Strengthening the EU's global position in research, innovation and technology*

What is Horizon 2020?

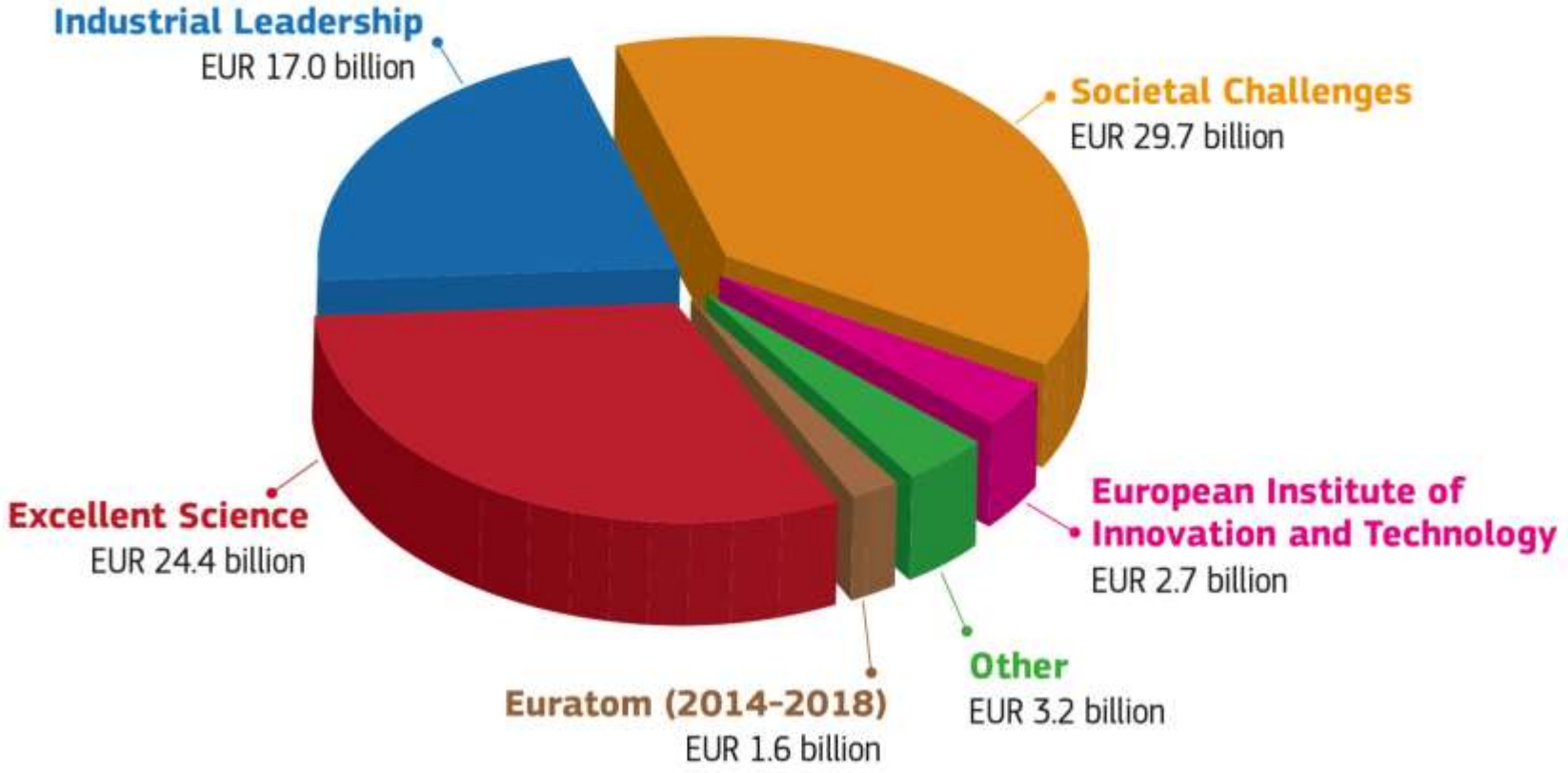
Largest research and innovation programme globally - The European Union programme for research and innovation for 2014-2020

- An integrated programme coupling research to innovation
- Challenge based
- Strong focus on SMEs
- Major simplification
- Open to the world (new priority of Commissioner Moedas)

€ 79 billion from 2014 to 2020

European Commission

HORIZON 2020 BUDGET (in current prices)



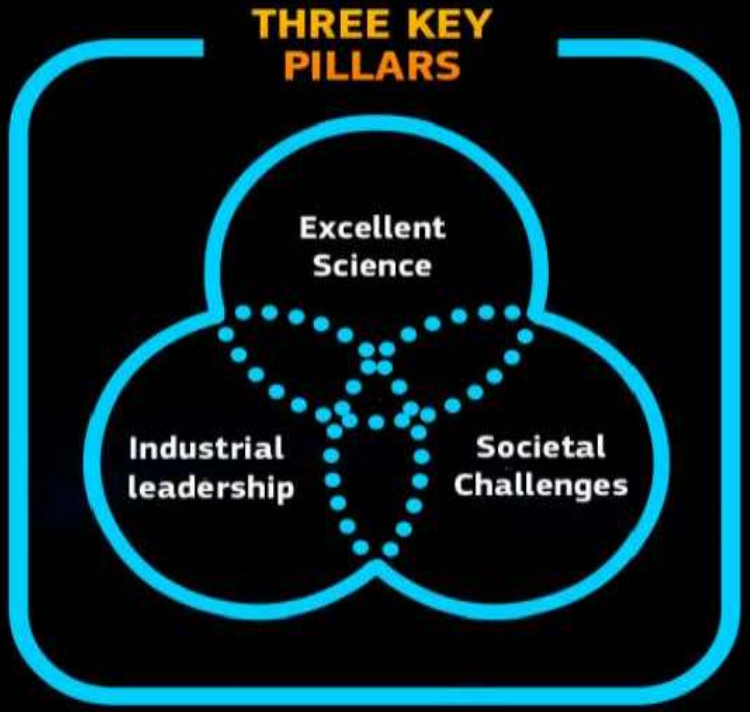
THE EU FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020

Research and Innovation

THE EU FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020



Research and Innovation

Priority 3.
Societal challenges

1. Health, demographic change and wellbeing
2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy
3. Secure, clean and efficient energy
4. Smart, green and integrated transport
5. Climate action, resource efficiency and raw materials
6. Inclusive, innovative and reflective societies
7. Secure societies

Societal Challenge 2: Food Security, Sustainable Agriculture and Forestry, Marine and Maritime and Inland Water Research and the Bioeconomy

Objectives:

- Sufficient supplies of safe, healthy and high quality food and bio-based products,
- productive and resource-efficient primary production systems,
- competitive and low carbon supply chains.

Making the best from our biological resources

accelerating the transition to a sustainable European bioeconomy

EU Bioeconomy Strategy

Societal Challenge 2: Food Security, Sustainable Agriculture and Forestry, Marine and Maritime and Inland Water Research and the Bioeconomy

Activities:

Agriculture and forestry

Agri-food sector for a safe and healthy diet

Aquatic living resources

Bio-based industries and bioeconomy

Marine and maritime research

Horizon 2020 – Societal challenge 2: Food Security, Sustainable Agriculture and Forestry, Marine and Maritime and Inland Water Research and the Bioeconomy

2.4. Biobased industries and bioeconomy

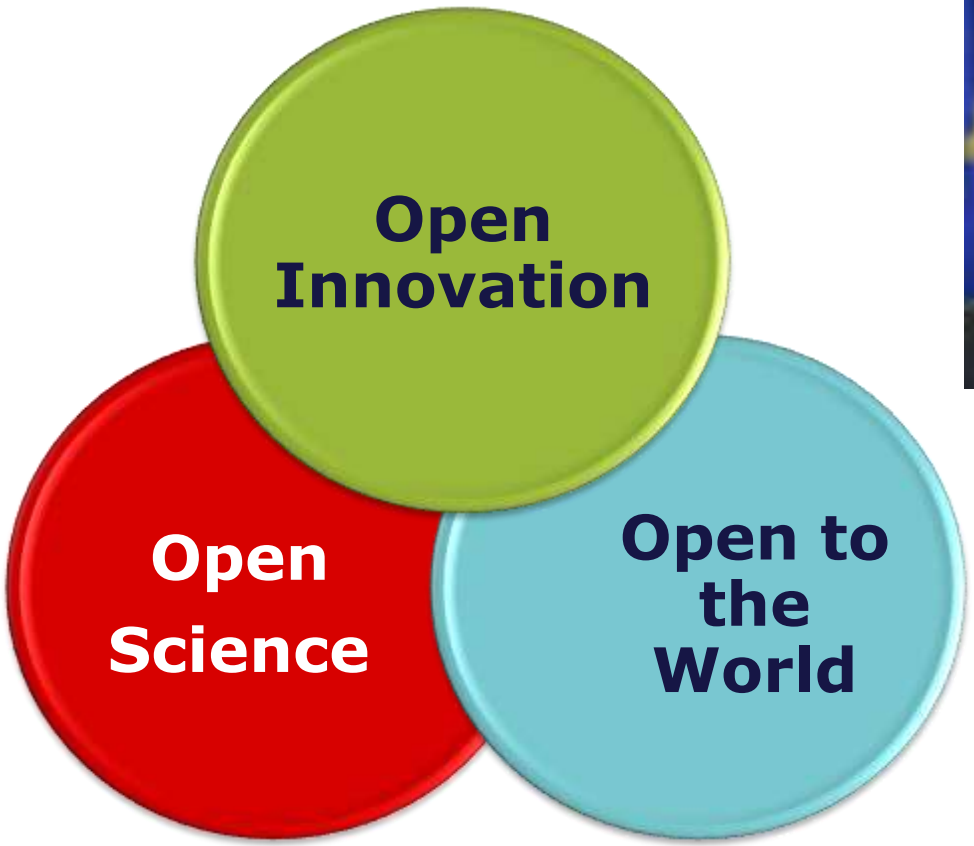
Feedstock	• 2.4.1. Fostering a sustainable biomass supply and building new value chains
Biorefineries*	• 2.4.2 Optimising efficient processing through R&D and upscaling in large-scale demo/flagship biorefineries
Supporting market development	• 2.4.3 Developing markets for bio-based products and optimising policy frameworks

* Mainly implemented through the **BBI-JU**

Forestry in Societal Challenge 2

The Specific programme implementing Horizon 2020 makes specific reference to the forestry sector under SC2 - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy, ***sub-activity 2.1.4 – Sustainable forestry.*** *There, specific reference is made to multifunctional forest production systems, tree health, ecosystem services, sustainable supply of biomass with due consideration to economical, ecological and social aspects of forestry, including owners' needs and regional differences.*

Commissioner Moedas - three priorities



Priorities of Commissioner Carlos Moedas for Research and Innovation

- *Open Innovation:*
  - **to capitalise on the results of research and create a vibrant innovation ecosystem, involving far more actors in the innovation process, from researchers, to entrepreneurs, to users, to governments and civil society**
- *Open Science:*
  - **increase the excellence of European science through policies that reinforce openness and integrity of science**
- *Open to the World:*
  - **a more active engagement through science diplomacy and global scientific collaboration**

Moedas' Priorities TO DO List

Open Innovation

Boost Private Investment:
- European Fund of Funds
- Maximise use of EFSI

Maximise Impact:
- Seal of Excellence
- European Innovation Council
- Merge digital into thematic priorities (health, energy, food, water)
- 2nd wave of simplification

Regulatory reforms:
- Scientific Advice Mechanism
- Tech Refit/ Beta Regulation
- Policy Support Facility

Open Science

Openness:
- European Science Cloud
- Open Access/ Open Data

Research Integrity
- New Standards
- Ombudsman/ enforcement

Open to the World

- **Global Research Areas** (Latin America/Asia)

- **Specific initiatives:**
- PRIMA
- SESAME
- South Atlantic

OPEN INNOVATION

Removing barriers and investing in Bioeconomy to unlock its full potential

	DELIVERABLES
"Revise Bioeconomy Strategy" as "Key Circular Economy" action	• EU Bioeconomy Strategy & Action Plan revised 2017 • Joint Research Agri Council – Bioeconomy + FNS + Research in Agri(Q4 2016)
Food & Nutrition R&I Strategy	• Partnership Food Industry – Personalised Nutrition & Diet, Low Waste/Resources; • World Food Day 2016 FNS Innovation Summit • Food Research Area: 4 Priorities & Partnership Data Governance Investment Alignment
Building Bioeconomy Regions	•Seal of Excellence bioeconomy funded by ESIF •Future Danube bioregion initiative?
New Biobased Industrial flagships	•BioBased Industries joint undertaking annual call for proposals 3,7 bn •5 Demonstrator biorefineries + KPIs
Blue Growth & Innovation	•Blue Med Initiative 2015-17 •BONUS Renewal 2016 -17 •Demonstrators Algae & Aquaculture, multipurpose offshore platforms, technologies
Access to Finance Bioeconomy	• New EIB-EIF risk financing instruments for blue bioeconomy agriculture and food investment (2016+)

OPEN SCIENCE

Opening Bioeconomy to build a societal consensus on Bioeconomy

	DELIVERABLES
Open Access to Science - Bioeconomy Data	• Pilot "Food Commons" Open Science • Open Access to Data in SC2 Work programme 2016/2017
Science Open to Citizens	• EU wide citizen dialogue public engagement project on SC2
Engaging Citizens in Science	• Ocean Literacy • Clean oceans campaign, yearly prize • G7 - Ocean Litter engagement
Building stakeholders consensus on Bioeconomy	• Bioeconomy Stakeholders Panel Event – April 2016 (NL) • Bioeconomy Manifesto for Europe (end 2016)
Science for Security of Citizens	• Food Safety "One Health" Animal/Human Health EJP 2016

OPEN TO THE WORLD

European Commission

Building a Global framework for the Bioeconomy

DELIVERABLES

EU – Africa Partnership on Food and Nutrition Security FNS and Sustainable Agriculture	• Roadmap EU/AU Addis Abeba event 2016 • Thematic focus: Sustainable Production, Nutrition & Health, Food Safety & Trade
PRIMA – Mediterranean partnership for food security and water availability	• PRIMA CSA 2016: Water & agriculture
Towards an All Atlantic Ocean Research Alliance	• EU-Brazil MoU on Marine Cooperation on 17 Nov 2015 • EU-US-Can Transatlantic Ocean Research Alliance • Arctic Cooperation
EU-China Flagship Initiative on Food, Agriculture and Biotechnologies and EU-Asean on aquaculture	• EU-China flagship 2015 • EU-Asean 2016
Global Bioeconomy Forum	• Global Bioeconomy Summit 2015 • International Bioeconomy Forum 2017

7. INVESTMENTS, MARKETS AND REGULATORY ENVIRONMENT

Investment, markets and regulatory environment

- Bioeconomy and Structural Funds (ESIF)
- Access to finance (InnovFin - EU Finance for Innovators)*
- Market conditions and regulatory environment

* incl. ongoing study on addressing funding gaps in bio-based industries & blue economies (Dec 2015)

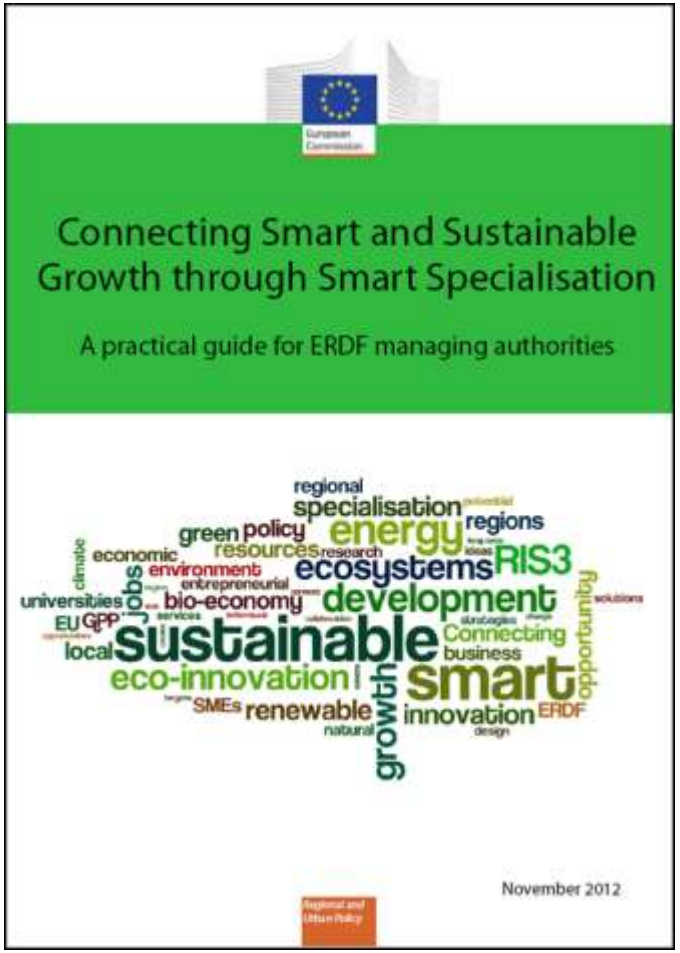
Bioeconomy and Structural Funds

Bioeconomy is an area to be considered when developing Smart Specialisation Strategies and planning priorities for Regional Development Funds!

- Major opportunities for new economic growth and job creation;
- Cross-cutting approaches, engaging a wide range of stakeholders.

European Bioeconomy Strategy:
http://ec.europa.eu/research/bioeconomy

Smart Specialisation Strategy Guide:
http://ec.europa.eu/regional_policy/sources/docgener/presenta/green_growth/greengrowth.pdf



Access to finance

- **Guidelines on BBI-ESIF synergies** developed by BIC

- WHAT can be co-funded in a given project
- HOW to approach these synergies

http://bbi-europe.eu/sites/default/files/documents/Guidelines_BBI_H2020.pdf

- "Bioeconomy Investment Summit" in Brussels *on 9-10 November 2015 organized by the European Commission*

Registration is free - will open by summer's end

http://ec.europa.eu/research/bioeconomy/news-events/news/20151109-programme_en.htm

European Commission



InnoVFin

EU Finance for Innovators

The new generation of Horizon 2020 financial instruments



Horizon 2020 Access to Risk Finance - Basics

1) What support will be on offer?

- Risk-sharing (loans and guarantees); risk finance (equity)

2) For who or what?

- *RDI-driven/ innovative SMEs & small midcaps*
- Ambitious RDI projects (by companies, stand-alone projects, etc.)

3) To serve which purpose?

- Stimulate investment in R&D&I, notably by the private sector
- No market distortion: intervention only to address financing gaps (notably due to high risk), and as such help translate R&D results to the market

4) Key figures (2014-2020)

- 3bn€ from EU + 3 bn€ from EIB group as risk buffers

➔ will result in total debt financing of > 24bn€ (of which >5.5bn€ for SMEs)

➔ expected overall economic impact incl. private investment = 48bn€

InnovFin Product Overview

SMEs	Mid-Caps	Large Caps	Advisory
InnovFin SME Guarantee (Guar.: 25K€ to 7.5 mio€)	InnovFin MidCap Guarantee (Guar.: 7.5 to 50 mio€)	InnovFin Large Projects (Loan: 25 to 300 mio€)	InnovFin Advisory
InnovFin SME Venture Capital	InnovFin MidCap Growth Finance (Loan: 7.5 to 25 mio€)		

direct products - EIB group is directly issuing a loan to a borrowing project (loan covers up to 50% of total project's costs)

indirect products - EIB group is offering (counter-)guarantees to an intermediary partner bank which then issues loans to borrowing projects ((counter-)guarantees cover up to 50% projects' costs)

Notes: "Guar." stands for guarantees & counter-guarantees; SMEs = SMEs and small Midcaps (=< 499 FTEs);
Link to flysheets on InnovFin products: http://www.eib.org/products/blending/innovfin/products/index.htm

Horizontal aspects related to bioproduct markets

Standards

- What does term the bio-based product cover? How it is being used? Helping to clear uncertainties for companies, governments and consumers. European Standards as essential elements in aggregating demand of existing and new bio-based products.
- E.g. bio-based polymers, bio-lubricants, bio-solvents and bio-surfactants, Sustainability aspects (Final EN 16751 expected mid-2016), Life Cycle Assessment (Final EN 16760 expected mid-2016).
- EC-mandated work of CEN Technical Committee 411 'bio-based products'.

Labelling

- Voluntary scheme EU Eco-label of environmental excellence provided that products fulfil the criteria on environmental performance.
- E.g. bio-lubricants, taking into account quantitative levels of bio-based contents.

Public procurement

- Green Public Procurement (e.g. biopolymers for packaging & other bio-based products, especially bio-based cutlery for large events), Public Procurement of Innovation (PPI) with Bio-Based Products and Services (BBPS).

Regulatory environment

Initiative InnovREFIT (Regulatory Fitness and Performance Programme)

- Favorable regulatory environment (EU and Member States)
- Access to and sustainability of biomass
- Market-pull measures
- Citizens and consumers expectations

8. EU BIOECONOMY STRATEGY REVIEW

EU BIOECONOMY STRATEGY REVIEW

European Commission

ROADMAP

1st SEMESTER 2016:

Jan: Stakeholder interviews (NL Presidency)

Mar: Member States workshop

Apr: Stakeholders Panel, Utrecht Conference
Competitiveness Council

May: Agri- Council

Jun: Stakeholders Panel
New Bioeconomy Observatory web-site

2nd SEMESTER 2016:

Sept: Expert Group BioE Review

Nov: MANIFESTO
Workshop OECD/FAO
Competitiveness + Agri Council

Dec: Expert Group Final Report

1st SEMESTER 2017:

Mar: **BioE ACTION PLAN – Draft**
WORKSHOP OECD/FAO/EUROSTAT/JRC

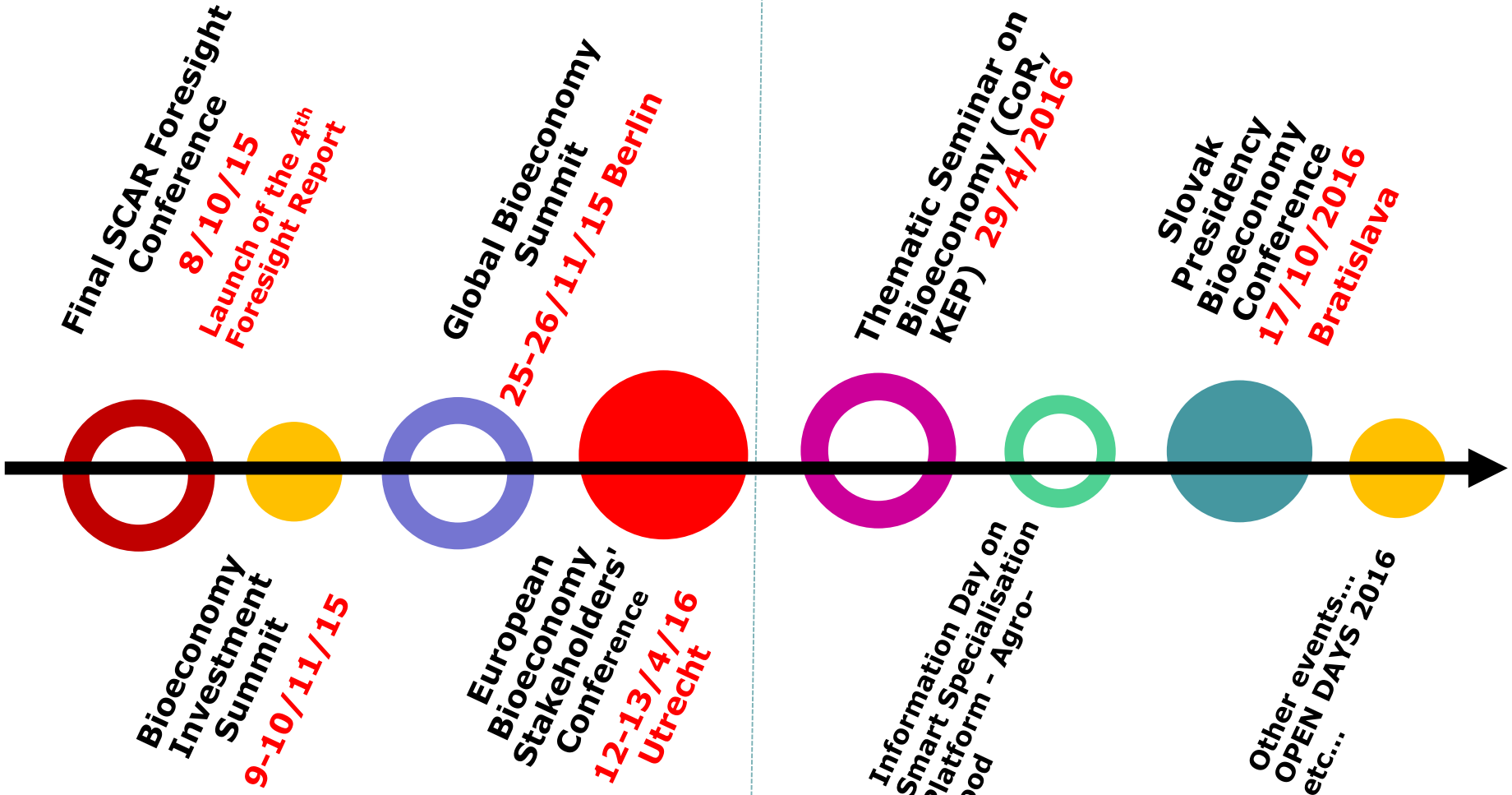
Apr: Member States Workshop

Jun: **BioE ACTION PLAN – Final draft**

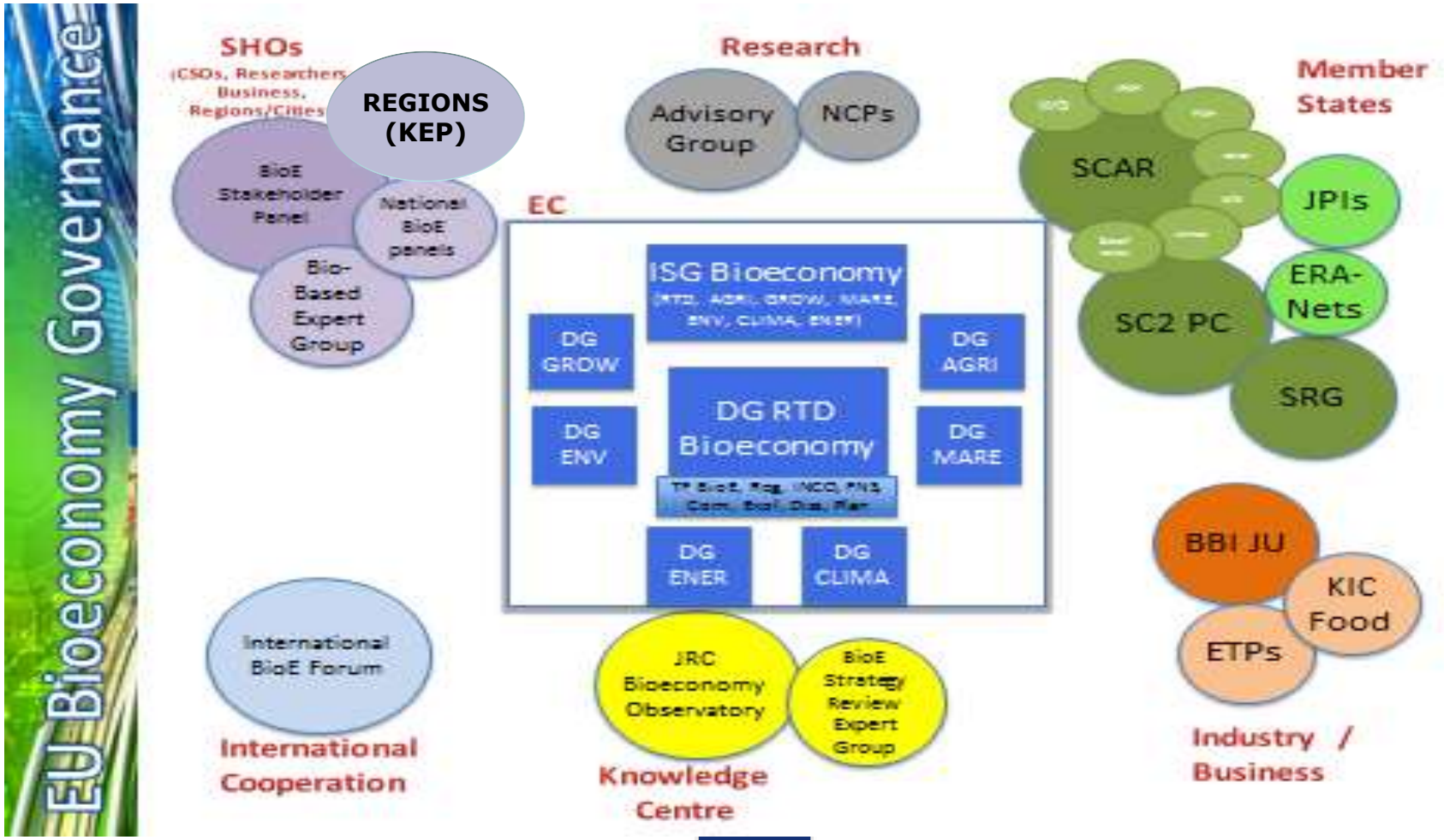
2nd SEMESTER 2017:

Sep: **BioE CONFERENCE (?)**
COUNCIL CONCLUSIONS

Calendar - events



We count on MS and EU regions for the review of the Bioeconomy Strategy



EUROPEAN BIOECONOMY STAKEHOLDERS MANIFESTO

European Commission

BIOECONOMY UTRECHT 2016

4th BioEconomy Stakeholders' Conference 2016

CHALLENGES & OPPORTUNITIES FOR EU REGIONS: (POINT 8)

- Need to revitalise **rural and coastal areas**.
- **Bioeconomy** for high-value production in the **regions**,
- New opportunities & jobs for farming, forestry and aquaculture.
- The **marine environment potential** as part of the circular bioeconomy.

GUIDING PRINCIPLES: (POINTS 16 & 17)

- Europe's **cities & regions** should play a key role for the BioE.
- We should fully **utilise the available biomass** and **better valorise the use of agricultural land...**
- **Marine production and aquaculture** offer new possibilities.

ACTIONS: (POINT 22)

- **Mutual learning** within & between regions, **peer-to-peer exchanges** at the EU
- **Link** between **regional bioeconomy strategies** and **smart specialisation**
- Creation of **new value chains**, **stairways of excellence**, **jobs and growth**
- **Redesign current agricultural-, energy and waste policies**

Stakeholders Manifesto

2. 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. Our vision has been built upon a solid historical basis.

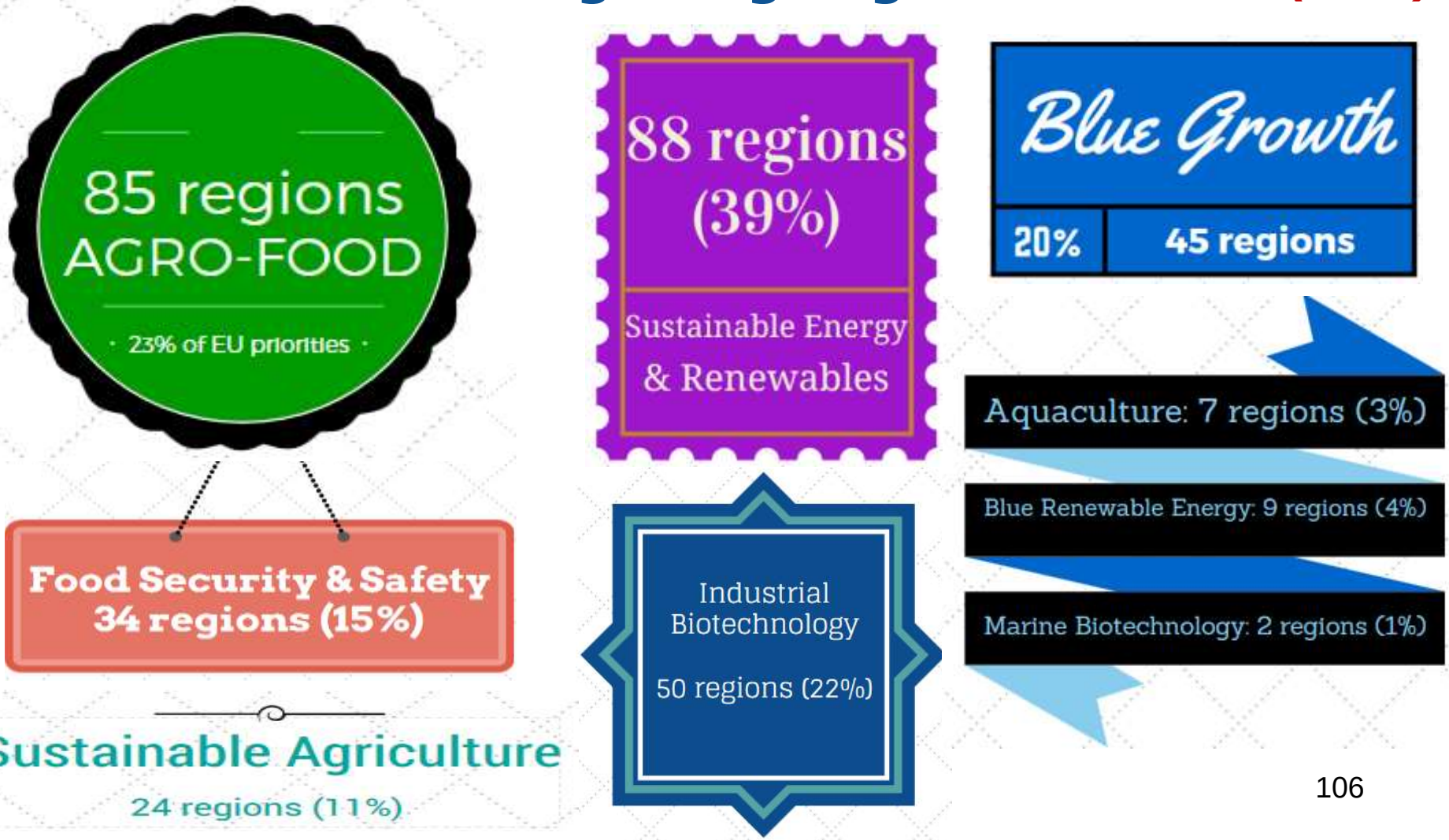
8. Europe needs to revitalise rural and coastal areas. A European bioeconomy will offer a **new perspective on high-value production in the regions**, as well as creating **new opportunities and jobs** for farming, **forestry** and aquaculture

16. A European bioeconomy will **diversify the revenues of the agricultural and forestry sectors** and develop a competitive, knowledge-intensive economy in rural Europe

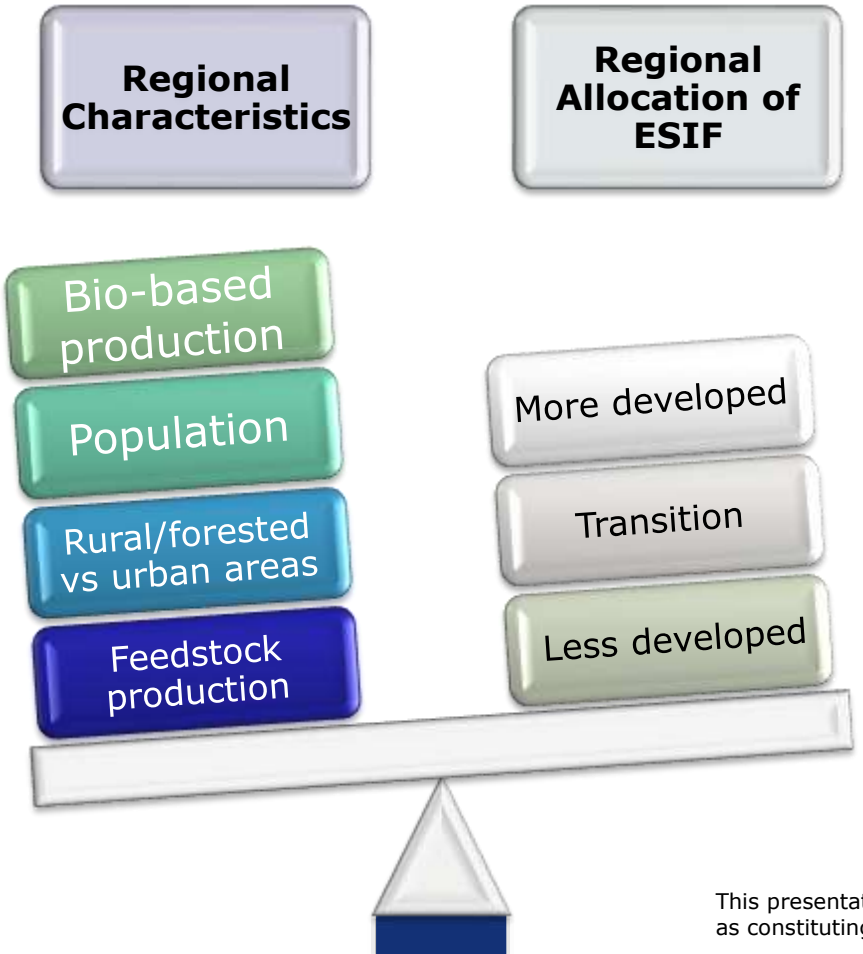
18. **Flagships** for a European Bioeconomy with potential for 'Public-Private Partnerships' are: biorefinery, biomaterials, new food systems (proteins from aquaculture, insects, plants), **building with innovative wood products,** biochemicals, artificial photosynthesis, marine biomass production and new molecular functionalities

9. EU REGIONS ARE KEY PLAYERS FOR THE BIOECONOMY

What areas are EU regions going to invest in? *(RIS3)*

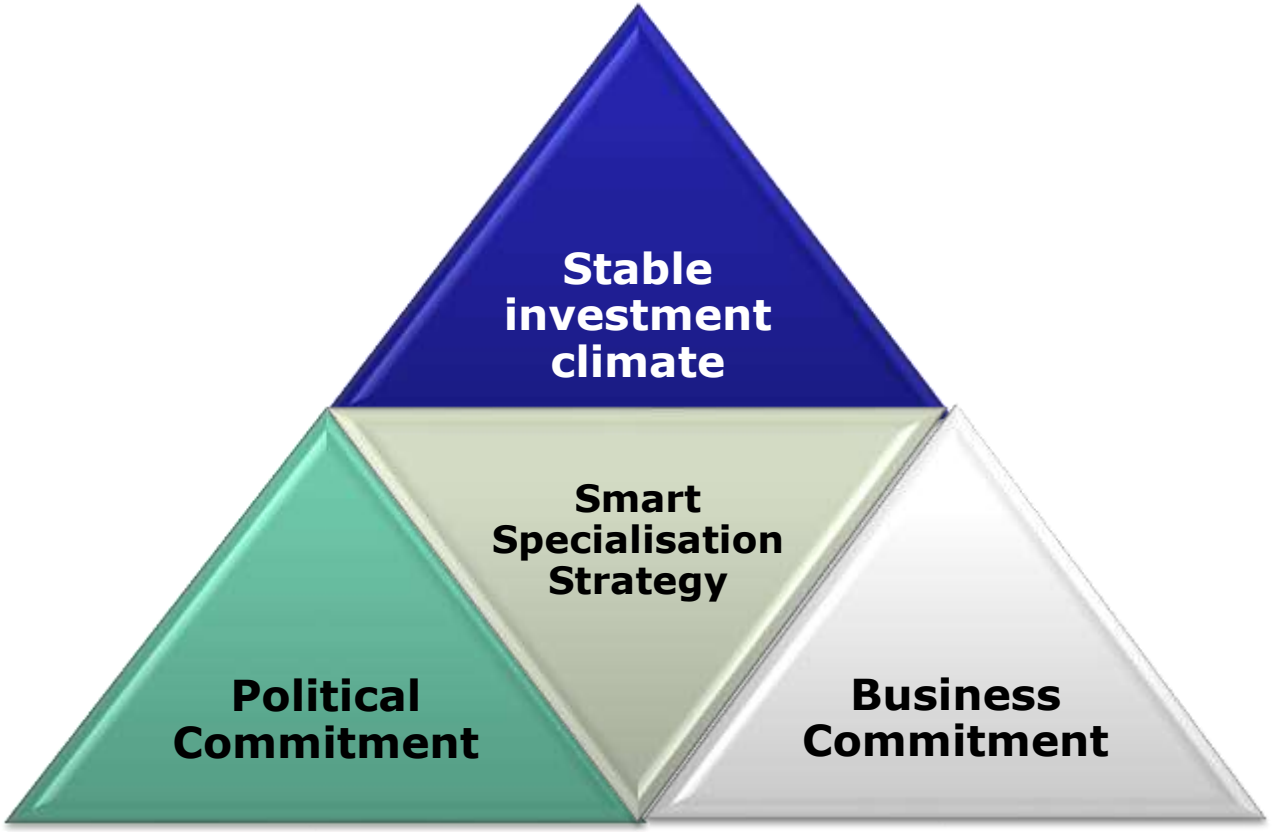


EU Regions' diversity is their advantage!



Regional Bioeconomy Strategy Development

4 fundamental ingredients



Source: ERRIN Consensus Document – How to build Effective Regional Strategies? (2016)

SUGGESTED ACTIONS ON THE GROUND FOR EU REGIONS:

→ Provide market **Supply** by **exploiting biomass**

→ Create market **Demand** by investing in **new value chains**

EU & regions needs to act fast
to remain competitive & attract investments

Regional Bioeconomy Strategy Development

7 Tips to remember!

1. **Learn from Best Practices!** *(various EC Guides, web-sites)*
2. **Link/create networks, clusters** *(Clusters Observatory)*
3. **Involve in existing initiatives** *(BBI JU, Vanguard)*
4. **Use available tools** *(eye@RIS3, Bioeconomy Observatory)*
5. **Look for inter-regional + macro-regional opportunities**
   Baltic, Danube
6. **Use public-procurement** for new bio-based innovative solutions
7. **Seek help!** *(Bio-NCPs, EIP-AGRI)*

Bioeconomy EU successful projects – For regions' inspiration!

Source photo: metsaboard.com

EFSI Aanekoski - FINLAND: Next generation **bio-product mill** for **boxboards and white linerboards**

FIRST 2 RUN PROJECT: (17m€, Sardinia) An **abandoned oil refinery transformed** into a **biorefinery**

MIRACLES PROJECT (12m€)

New technologies that uses algae for specialties useful in

CHIMIO PROJECT:

Facial cream & bioplastics made from crab shell

AQUARIS - Brussels:

Bioplastic production from municipal wastewater

Useful for you..

Bio-Based Industries Joint Undertaking (BBI-JU)

http://www.bbi-europe.eu/

SYNERGIES & SEAL OF EXCELLENCE (new website!)

http://ec.europa.eu/research/regions/

AGRI-FOOD SMART SPECIALISATION PLATFORM

http://s3platform.jrc.ec.europa.eu/agri-food (new initiative!)

VANGUARD INITIATIVE/ Bioeconomy Pilot Project

http://www.s3vanguardinitiative.eu/cooperations/bioeconomy-interregional-cooperation-innovative-use-non-food-biomass

GUIDES ON ESIF-H2020 SYNERGIES

http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/other/index.html
http://www.bbi-europe.eu/sites/default/files/documents/Guidelines_BBI-ESIF-Final.pdf

S3 KNOWLEDGE REPOSITORY

http://s3platform.jrc.ec.europa.eu/knowledge-repository

More info: Christina Nanou (DG RTD)
christina.nanou@ec.europa.eu

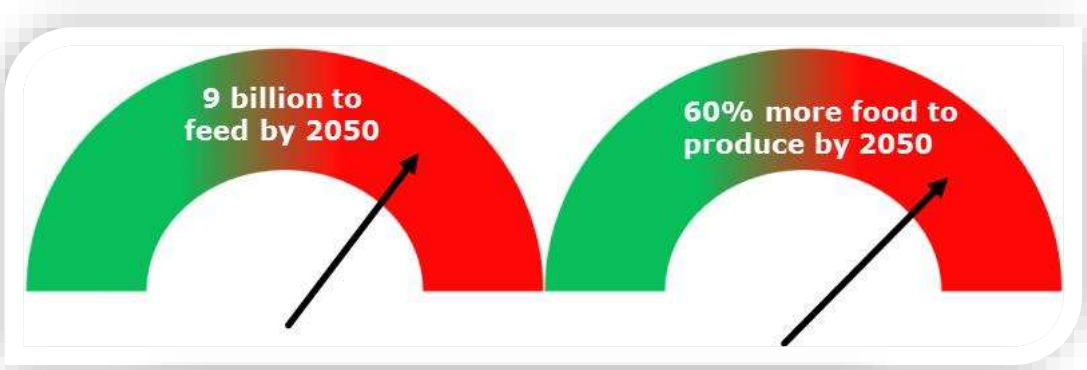
10. THE FOOD PILLAR OF THE BIOECONOMY

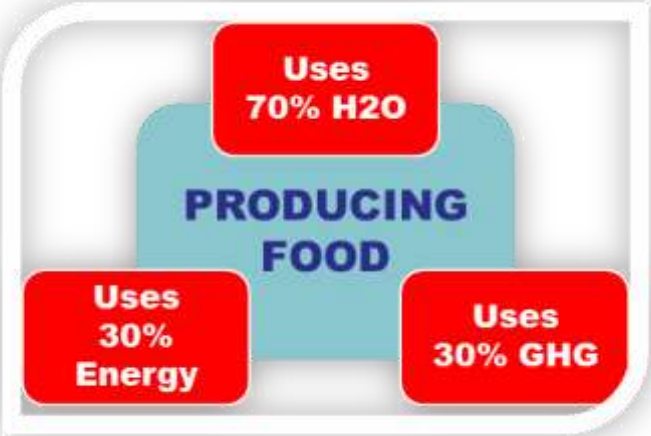
European Commission

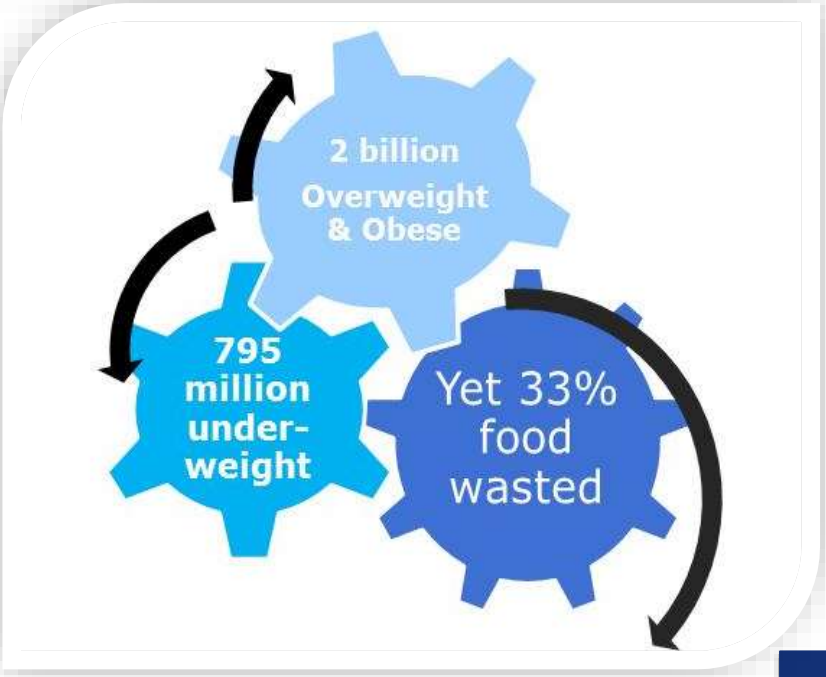
FOOD 2030

Research and Innovation for Future-proofing our Nutrition and Food Systems

The Perfect Storm







Food Systems

Healthy & Sustainable Diets

Land & Sea

Responsible

Competitive

Resilient

Sustainable

Diverse

Performant

Food & Nutrition Security

Food includes edible products deriving from land or sea (including inland waters) destined for human consumption or animal feed.

Food is far **more than just biomass** for life support: it has important historical, social, cultural, environmental and economic dimensions.

'**Food systems**' include the entire 'value chain' from inputs, to primary production (agriculture, aquaculture & fisheries), harvesting, storage, processing, packaging, distribution, waste streams, to consumer intake – *and back!*

They go beyond the production of sufficient food for all, but also respond [illegible] need to provide safe and nutritious food for **healthy** and **sustainable diets**

Today vs tomorrow: ***how to future-proof our food systems (2030+)?***

So what's the problem?

FNS is a growing challenge, and **R&I is key to finding solutions** to feeding the planet in a changing world, but the current EU FNS R&I landscape is:

- Fragmented and lacks policy coherence

- Underinvestment given the challenges lying ahead

- Suffering from an innovation gap, and low speed of market/societal/policy take-up

- Lacking cohesion & investment at industrial level to meet future needs

- Lacking a whole food system approach

- Not sufficiently capitalizing on the emerging trends and advances in how we can do better science and innovation

…all of these limit the impact of R&I for FNS…thus we propose a **new policy framework** (Food 2030) for more impactful EU R&I for FNS

FOOD 2030
Need for EU R&I Policy Framework

- An innovation facing a Food Systems approach integrating land and sea - from inputs to nutrition (and back)
- Will provide:
  1. A **policy framework** to better structure, connect and scale-up EU R&I, in a global context
  2. A **global platform** to convene stakeholders in Nutrition & Food Systems to tackle global societal challenges
  3. **Investment drive**r : A mean to step-up EU investment ambition and division of labour – PPP, P2P, financial instruments, EFSI
  4. A magnet for **Market Creating Innovation**

The Political Opportunity

Juncker Priorities

SDGs 2015-2030

COP21

World Food Day 2016

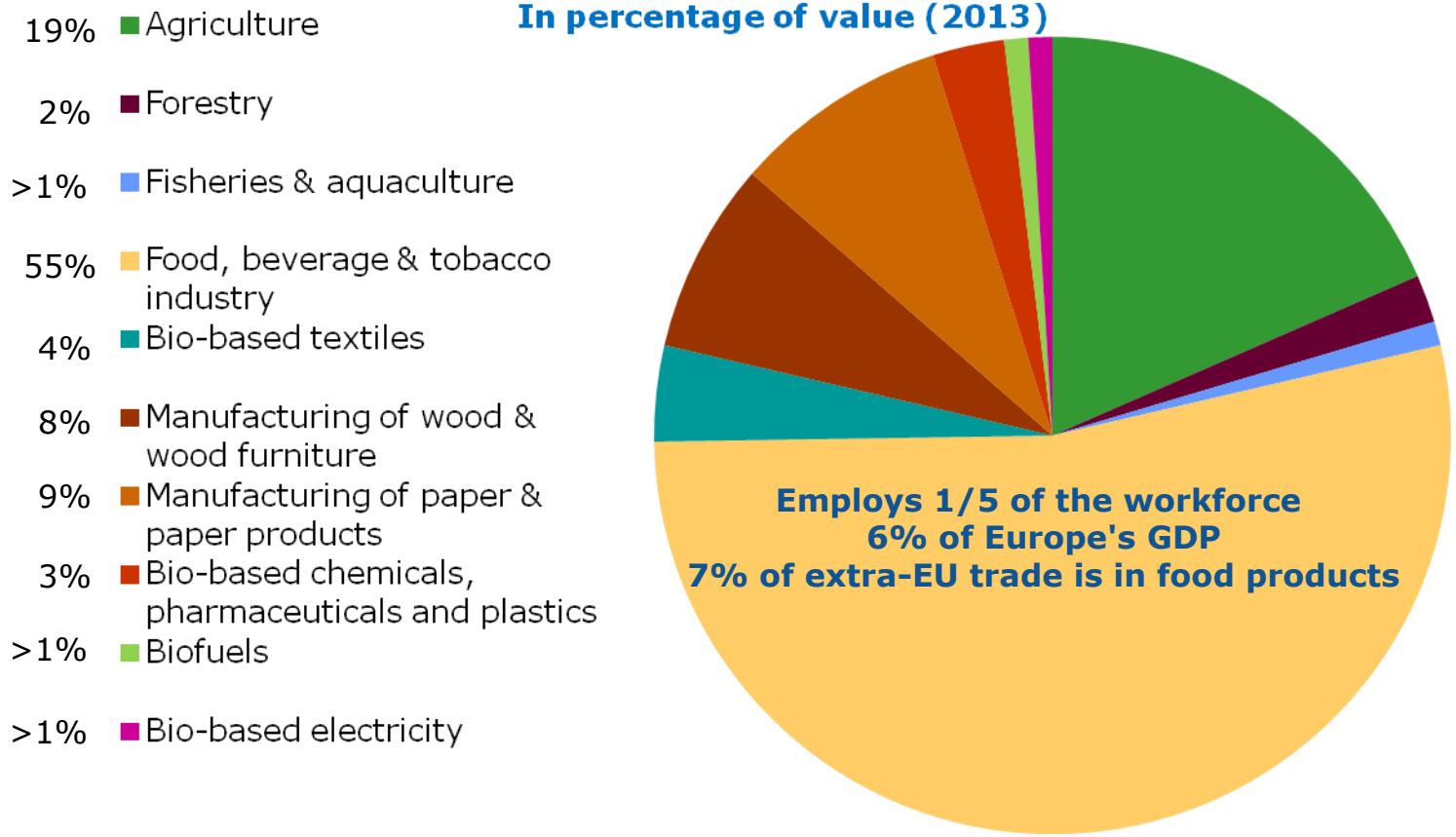
IPCC

CAP & CFP reforms

The Economic Opportunity

Agriculture, food, fisheries & aquaculture represent 75% of the bioeconomy in Europe

Turnover in the EU-28 by the bioeconomy sector
In percentage of value (2013)

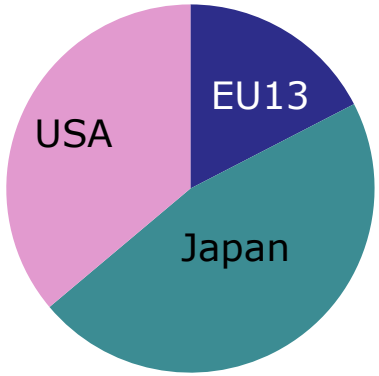


Based on DataM – Bioeconomics, database elaborated by the EC, JRC IPTS & Nova Institut

The Investment Opportunity

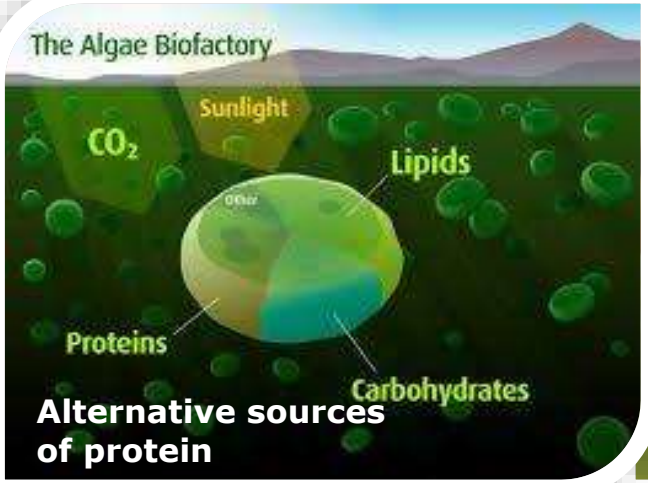
- Low investment in EU R&I food industry
- Historically the returns on agriculture investment have very long lag times of between 20 – 40 years.
- Return on R&I investment approx 9% in EU.
- US Venture capitalists have made more than $1B in investments in future food and experienced a 200% year-over-year growth in 2014
- We are not reaping the potential of EFSI measures in agriculture and food sectors

Food and drink private investment in R&D as a percentage of output, 2010 (%)



The Innovation Opportunity


Lab grown hamburger



Alternative sources of protein


© Hochschule Weihenstephan-Triesdorf, 2014, 3D printed peas

European Commission

FOOD 2030 Priorities

=> Nutrition: ↓ hunger & malnutrition, ↑ food safety & ↓ diet-related illnesses, and helping citizens adopt sustainable diets and healthy lives

=> Climate: Building a climate and global change-resilient food system (mitigation & adaptation)

=> Sustainability: Implementing sustainability & circular economy principles across the whole food system – e.g. food waste, sustainable and resource-efficient food production

=> Innovation: ↑ market-creating innovation & investment, while empowering communities – e.g. FOOD PPP, FOOD KIC, regions and Agri-food Smart Specialisation, food in cities, synergies between funds (H2020, EFSI, RDF, etc.)

FOOD 2030 Drivers

=> **Open Innovation:** ↑ Investment, ↑ innovation (place-based, broadbased, disruptive, market-creating, quadruple helix innovation), new business models, public/private collaboration

=> **Open Science:** Open access & data; multi-actor & public engagement; education, capacities & skills

=> **Research Breakthroughs:** ICT, food systems science & transdisciplinarity (e.g. smart personalised nutrition, consumer behaviour, multi-actor approach)

=> **Open to the world:** Global collaborations; MS R&I alignment and support (e.g. International Bioeconomy Forum, ASEAN aquaculture, EU-Africa HLPD)

What will FOOD 2030 deliver?

- R&I Policy coherence
- Investment Narrative (EFSI / EIC)
- Synergies (CAP / EFSI)
- Global cooperation platform (IBF)
- Public / Private Market Creating Innovation

FOOD 2030 - Engagement

FOOD 2030 Inter Service Task Force

- Met twice since March 2016: RTD (F,I,E,B,A), AGRI, DEVCO, MARE, CNECT, JRC, SANTE, CLIMA, ENV, GROW, SECGEN …
- Consultation & stocktaking towards building FOOD2030

FOOD 2030 CAB-DG 12th May 2016

- Staff Working Document – adoption in time for Oct Conf

FOOD 2030 Workshops

- Food systems Innovation – May 12
- Agri-Food Smart Spec Platforms – May 12
- Smart Personalised Nutrition – June 16

FOOD 2030 HL Conference

FOOD 2030 Pre-events - 12th Oct 2016 – afternoon:

- Four pre-event participatory workshops (14:00-17:30)
- Launch "Food Village" showcasing successful R&I initiatives (18:00)
- Icebreaker cocktail with keynote (18:00-20:00)

FOOD 2030 Conference – 13th October 2016

- Participation of Moedas & Hogan confirmed
- P. Bulke (CEO Nestlé) confirmed
- Innovators, entrepreneurs, panels on nutrition for healthy and sustainable diets, climate-resilience and circularity, investments & innovation.

11. LOOKING FORWARD: RISING INTERFACES AND NEW COMPLEXITIES

How to interface?

Bioeconomy and new Plastics Economy

1. *Create an effective **after-use plastics economy** by improving the economics and uptake of recycling, reuse and controlled biodegradation for targeted applications. This is the cornerstone of the New Plastics Economy and its rst priority, and helps realize the two following ambitions.*
2. *Drastically **reduce leakage of plastics into natural systems** (in particular the ocean) and other negative externalities.*
3. ***Decouple plastics from fossil feedstocks** by – in addition to reducing cycle losses and dematerializing – exploring and adopting renewably sourced feedstocks.*

How to interface?

Bioeconomy and Nature-based economy

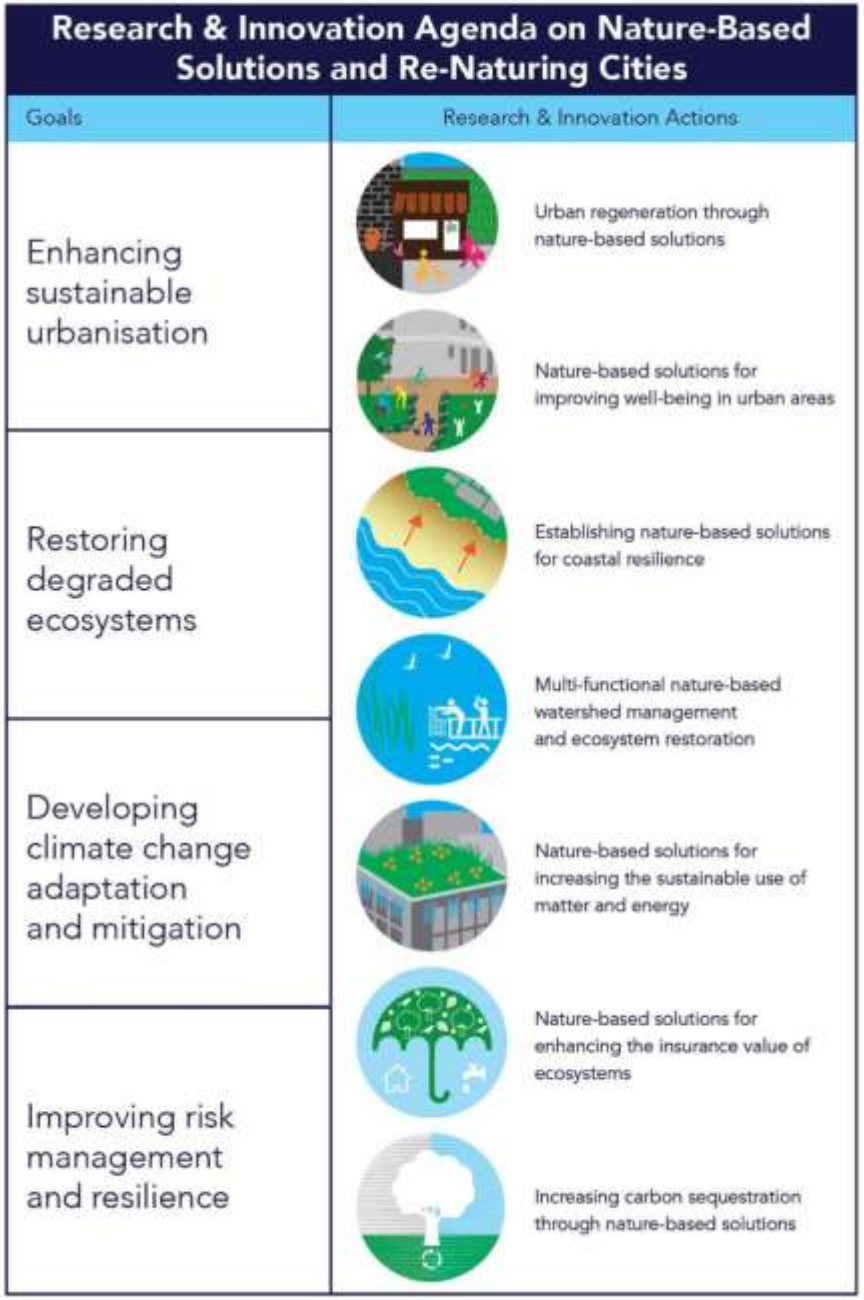
1. **Nature-based solutions harness the power and sophistication of nature to turn environmental, social and economic challenges into innovation opportunities.** They can address a variety of societal challenges in sustainable ways, with the potential to contribute to green growth, 'future-proofing' society, fostering citizen well-being, providing business opportunities and positioning Europe as a leader in world markets.
2. **Nature-based solutions are actions which are inspired by, supported by or copied from nature.** They have tremendous potential to be energy and resource-efficient and resilient to change, but to be successful they must be adapted to local conditions.
3. **Many nature-based solutions result in multiple co-benefits for health, the economy, society and the environment**, and thus they can represent more efficient and cost-effective solutions than more traditional approaches.

https://ec.europa.eu/research/environment/index.cfm?pg=nbs

How to interface?

Bioeconomy and Nature-based economy (2)

https://ec.europa.eu/research/environment/index.cfm?pg=nbs



How to interface?

Bioeconomy and Eco-Innovation economy

*"**Eco-industries** can be organised around three main functions:*

- ***Green industries** – e.g. environmental industries, clean-up, remediation, natural resources management, renewable energy, etc.*
- ***Industries greening** – other industries adopting eco-innovations and reducing their environmental impacts*
- ***Eco-innovative solution providers** – R&D, new business models, organisational/social innovation, integrators"*

http://publications.jrc.ec.europa.eu/repository/bitstream/JRC96826/kjna27376enn.pdf

How to interface?

Bioeconomy and Green growth

- "So-called 'green' living, once promoted for the sake of environmental quality and safety, is becoming a core value in reaching for a better life as well as an economic driver in itself
- It is important to define this '**green good life**' and '**green growth**' in a much broader sense than is usually applied, recognising the potential for innovation in every industry and activity
- The EU is already well positioned to play a major role in the development of these new markets.
- **The current technological potential, if intelligently and appropriately supported by shifting the playing field towards favouring 'green' economic growth, could accelerate that path and result in the creation of a 'European Way of Life'**, a new, sustainable and profitable ideal for middle class aspirations."

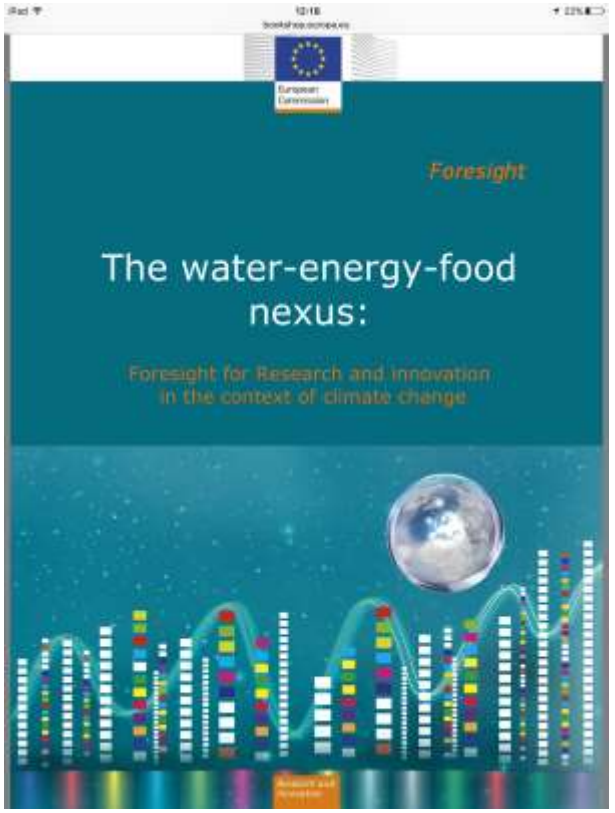
http://bookshop.europa.eu/en/changing-gear-in-r-i-pbKI0216237/?CatalogCategoryID=7QwKABstDHwAAAEjK5EY4e5L

How to interface?

Bioeconomy and Low carbon economy

"***The water, energy and food sectors are strongly inter-connected, and actions in one sector have marked impacts on the other two.*** *Ensuring the availability and affordability of water, food and energy is of vital strategic importance.*

The 'Study on water, energy and food Nexus: research and innovation in the context of climate change' points to ***opportunities for the EU to contribute to a resilient low carbon economy*** *by anticipating the early signals and potential for key research and innovation. "*



http://bookshop.europa.eu/en/the-water-energy-food-nexus-pbKI0215971/?CatalogCategoryID=7QwKABstDHwAAAEjK5EY4e5L

European Commission

How to interface?

Bioeconomy – Economics of ecosystems

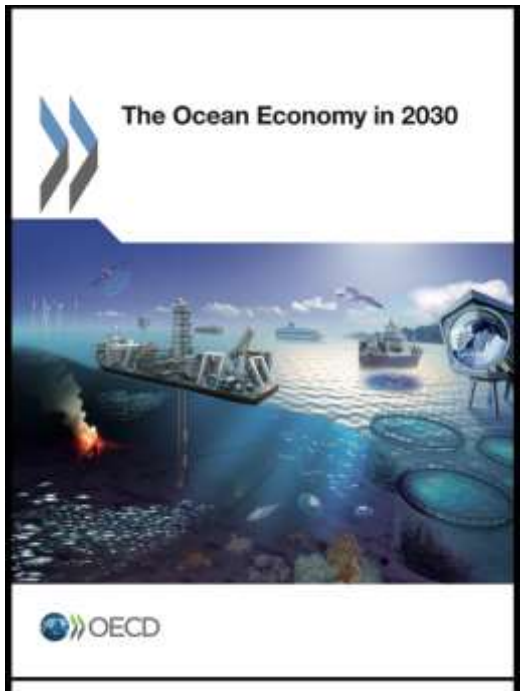
http://ec.europa.eu/environment/nature/biodiversity/economics/

How to interface?

Bioeconomy – Ocean economy

"For some, the ocean is the new economic frontier. It holds the promise of immense resource wealth and great potential for boosting economic growth, employment and innovation. And it is increasingly recognised as indispensable for addressing many of the global challenges facing the planet in the decades to come, from world food security and climate change to the provision of energy, natural resources and improved medical care. While the potential of the ocean to help meet these challenges is huge, it is already under stress from over-exploitation, pollution, declining biodiversity and climate change.

The ocean economy encompasses ocean based industries (such as shipping, fishing, offshore wind, marine biotechnologies), but also the natural assets and ecosystem services that the ocean provides."

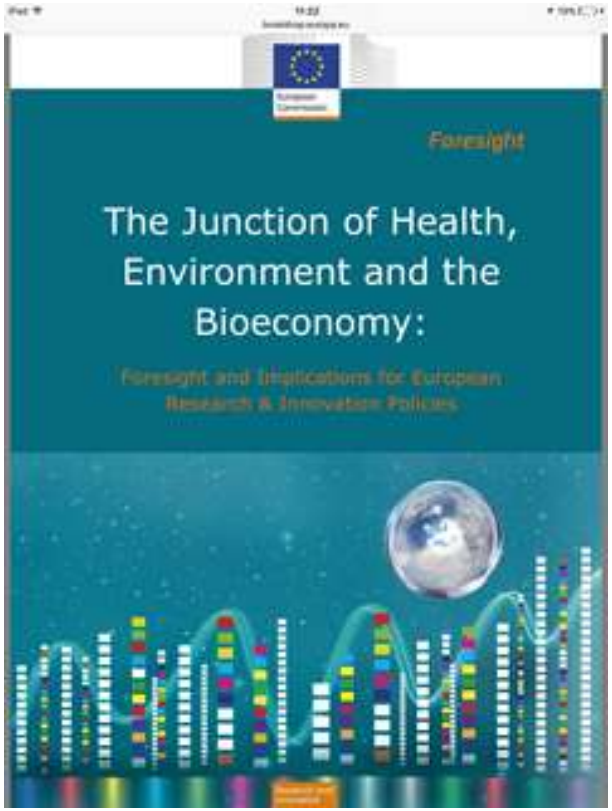


http://oecdinsights.org/2016/04/27/the-trillion-dollar-ocean/

How to interface?

Alignment health and sustainability agendas

*"Searching for '**triple-winners**', i.e research delivering benefits across the three fields allowed to identify four areas offering the most potential: **sustainable food improving human diets and minimizing risks to health and environment, circular economy, including the bio-economy, cities as testing grounds and demonstrators of triple-winners, holistic health (i.e. integrating life-style, environment and well-being).**"*

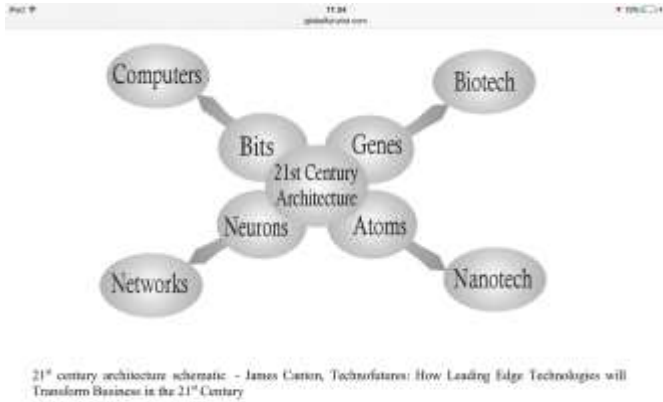


http://bookshop.europa.eu/en/the-junction-of-health-environment-and-the-bioeconomy-pbKI0514154/;pgid=Iq1Ekni0.1lSR0OOK4MycO9B0000Kkr1HCHM;sid=a49gn2dPbCJghDBhZPz-OAVqbFxmTCosdf0=?CatalogCategoryID=h2YKABstrXcAAAEjXJEY4e5L

European Commission

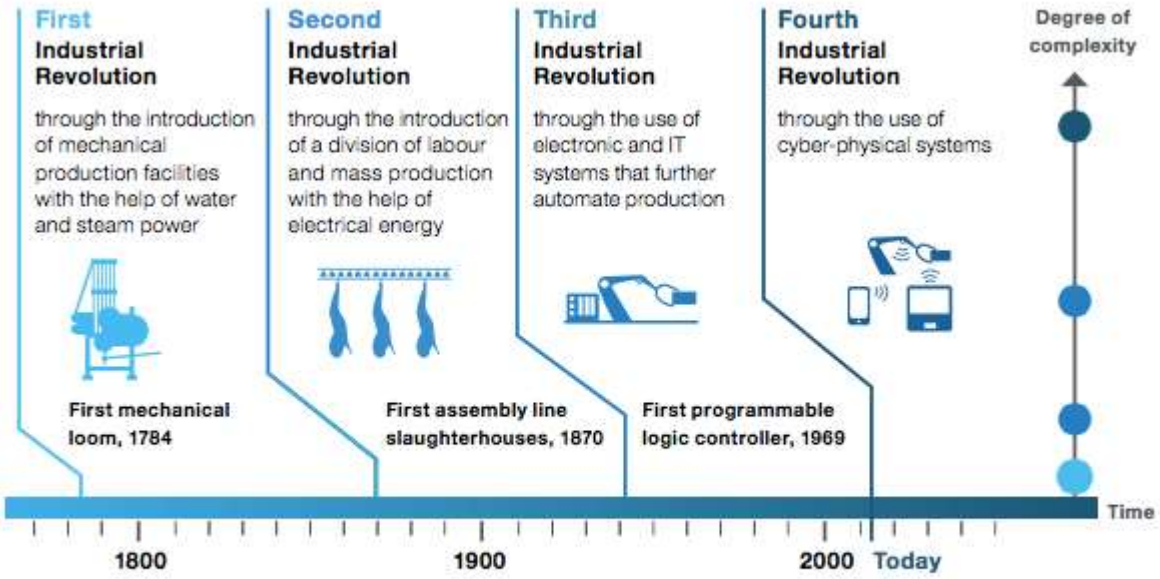
How to interface?

Forth Industrial Revolution, NBIC convergence and AI



21st century architecture schematic - James Canton, Technofutures: How Leading Edge Technologies will Transform Business in the 21st Century

Evolutionary Economics



Cyber-physical assistance systems are driving the fourth industrial revolution

Source: Siemens, Pictures of the Future, Spring 2013

European Commission

How to interface?

Education

Which skills for the transition to the low carbon economy and society?

- **All stages, including life-long**
- **All levels, including vocational training. Not only scientists and researchers**
- **Which skills for possible new sectors of the economy: urban agriculture, landscape stewardship, ecosystem management, nature based engineering, low carbon consulting etc.?**

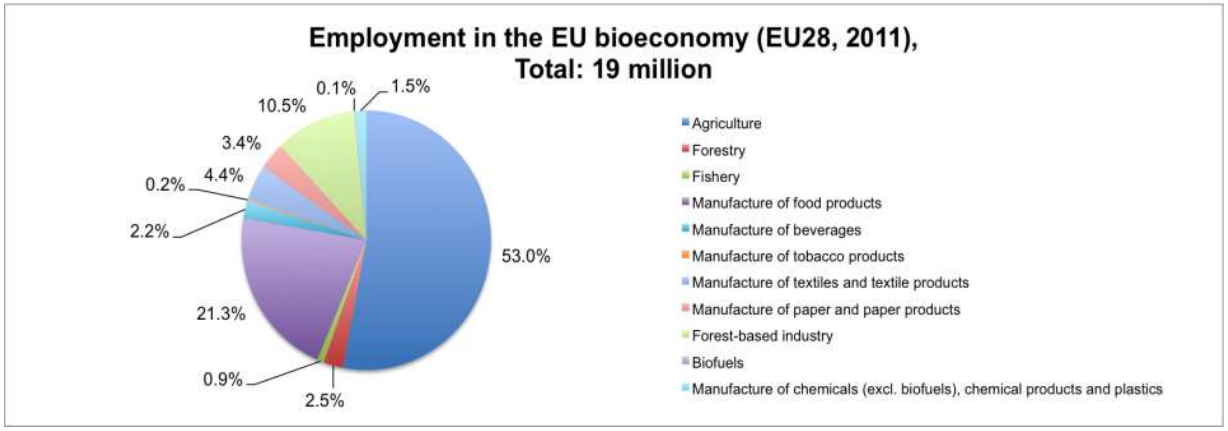
Top 10 skills

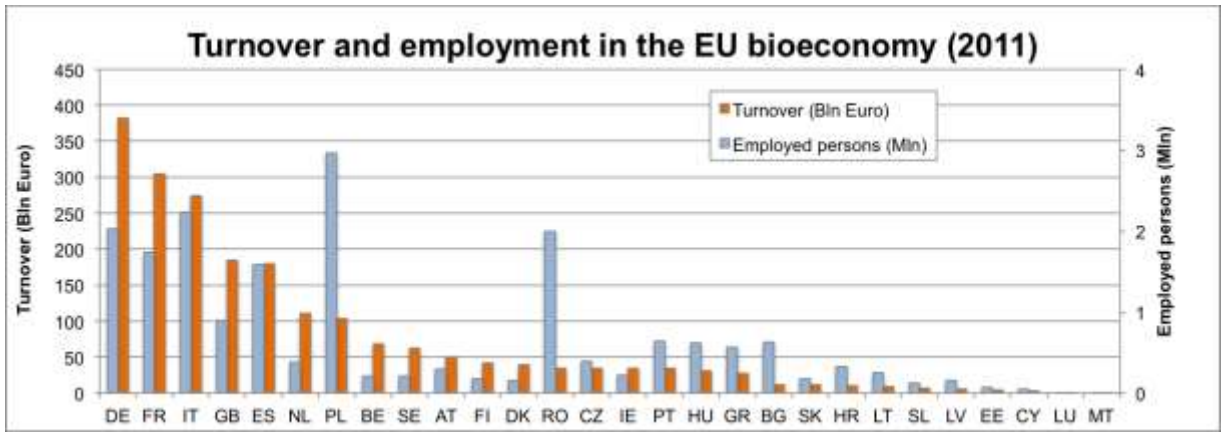
in 2020	in 2015
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgment and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgment and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive Flexibility	10. Creativity

Source: Future of Jobs Report, World Economic Forum

How to interface?

Employment and social affairs





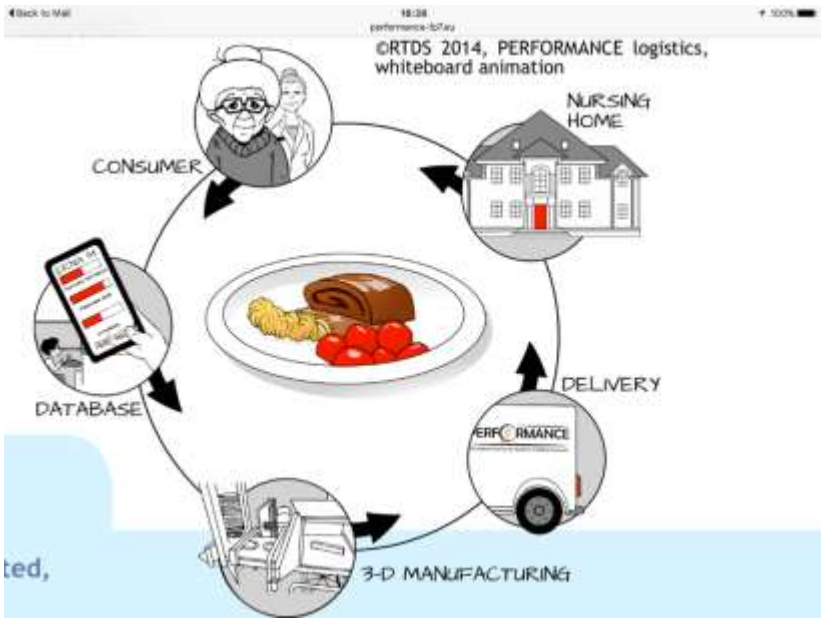
- *Which new jobs? How many and where in current and possible future bioeconomy sectors?*
  - **Rural, urban, coastal and ocean jobs?**
  - **Job potential from green growth? Impacts from robotisation**
- *Quid working poor in the food industry and other sectors? Quid precariat?*
- *Quid working conditions*
- *Towards post-employment society? Universal basic income and bioeconomy?*

Source; SCAR 4, Annex 2

How to interface?

Silver economy

- Much more than 3-D printed food for elderly with chewing problems



http://www.huffingtonpost.com/2014/03/24/sustainable-nyc_n_4886443.htm

European Commission

How to interface?

Collaborative and Sharing Economy

- *E-commerce, with or without middleman?*
- *Volontary engagement (even more in post-employment society?*
- *Collaborative research platforms. How to integrate open science and open innovation?*
- *What future knowledge sourcing and IPR strategies in a collaborative economy*

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How to interface?

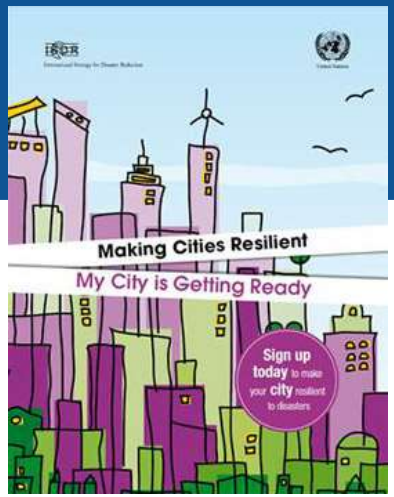
Citizen Biotech Economy

European Commission

ICLEI Local Governments for Sustainability

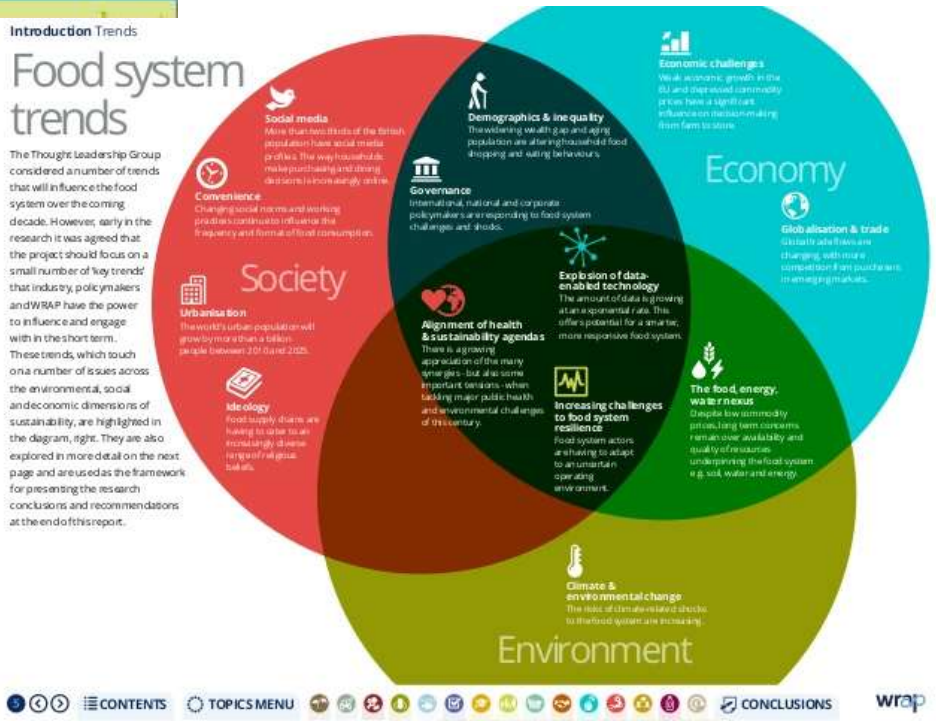
How to interface?

Resilience



https://www.hud.ac.uk/research/researchcentres/gdrc/internationalcollaborationsandnetworks/unisdrmakingcitiesresilientcampaign/

- *Resilience overtaking short-term profitability?*
- *Need for an adaptability and diversity strategy for food system?*
- *New challenges to resilience: crisis, systemic disruption, disasters, hybrid threats, war*
- *Can the European Bioeconomy do anything to preserve peace?*



Source: WRAP, http://fr.slideshare.net/sustainablebrands/food-futures-from-busin

European Commission

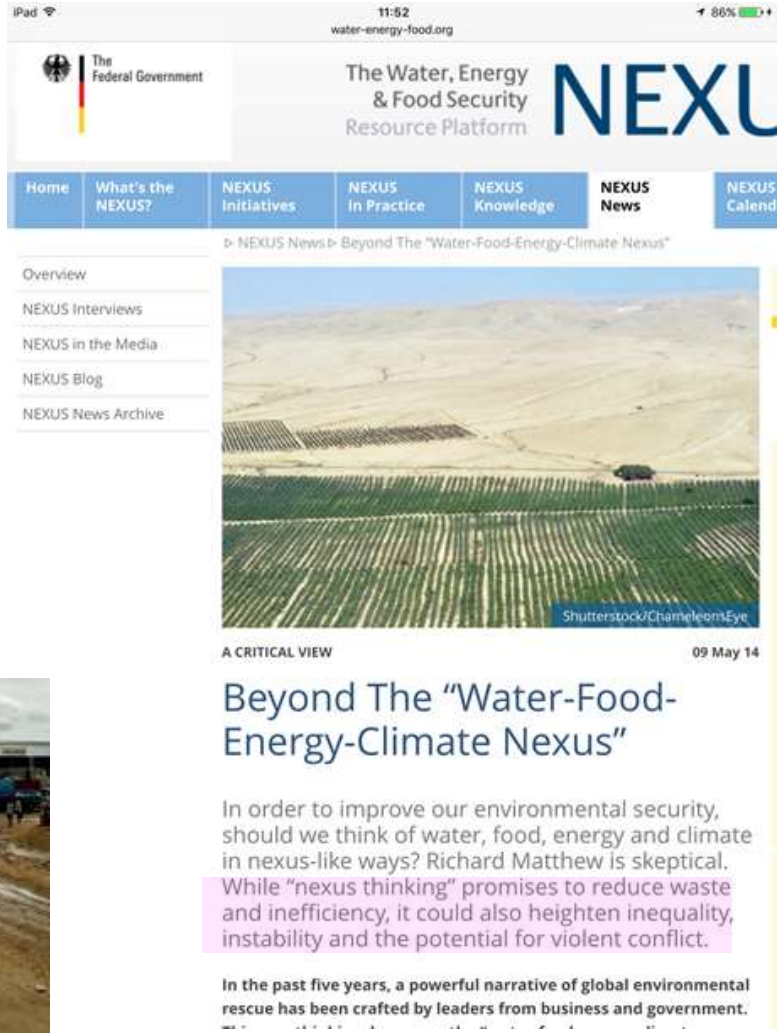
How to interface?

Bioeconomy and Peace

How to interface?

Security externalities and migration

"Nexus thinking is eloquent and compelling on the subjects of efficiency and innovation, but silent on the topics of equity and security. The billion plus people who remained destitute at the end of the twentieth century have now migrated into peri-urban squalor, lost land, assumed debts, remained illiterate, acquired drug-resistant pathogens, grown in numbers, and amassed cheap Cold War weapons and mobile phones.[…].
It would be wise to add equity and security to the nexus."



http://www.water-energy-food.org/en/news/view__1696/beyond-the-water-food-energy-climate-nexus.html

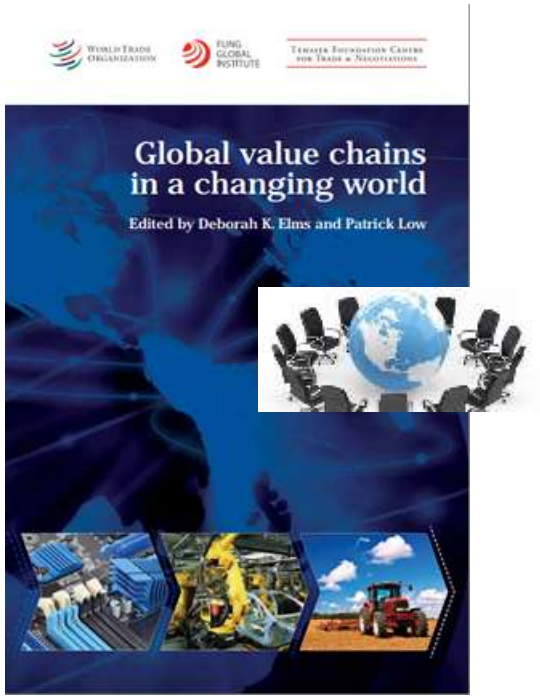
European Commission

How to interface?

Globalisation vs. identity, community, roots

- *What co-existence between globalized value chains and community-based solutions? Food choices? Locally preferred?*
- *Citizen-consumer values to drive sustainability of supply in bioeconomy?*

http://www.globalharvestinitiative.org/index.php/2015/06/a-role-for-the-committee-on-world-food-security-cfs-in-icn2-implementation/



12. FLASHLIGHTS: BIOECONOMY TODAY, OR MAYBE TOMORROW?

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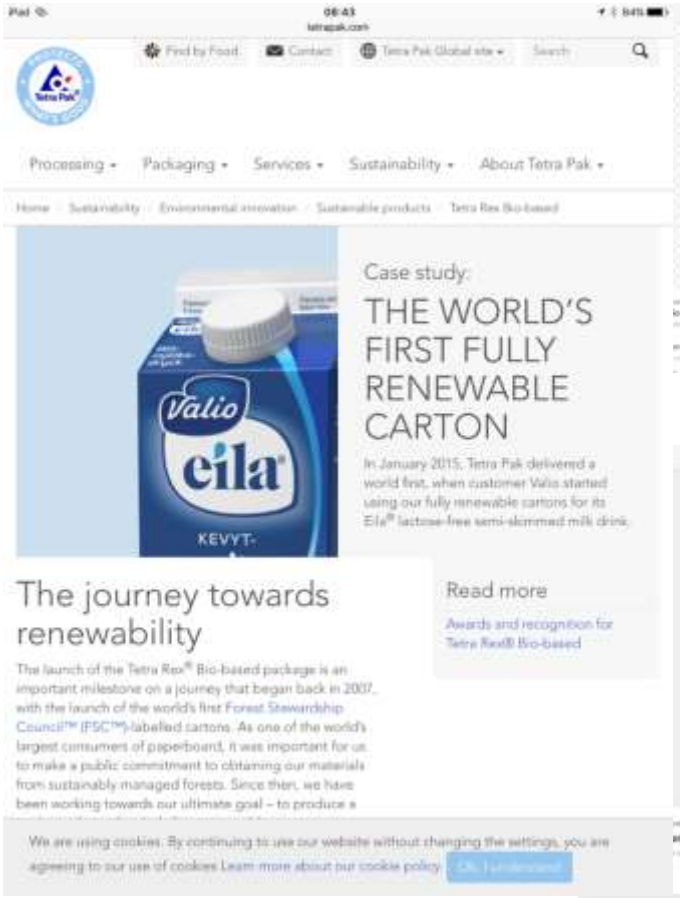
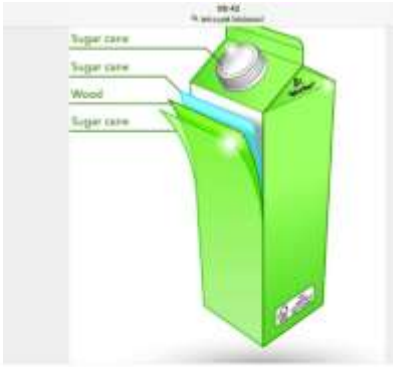
Wood-based packaging





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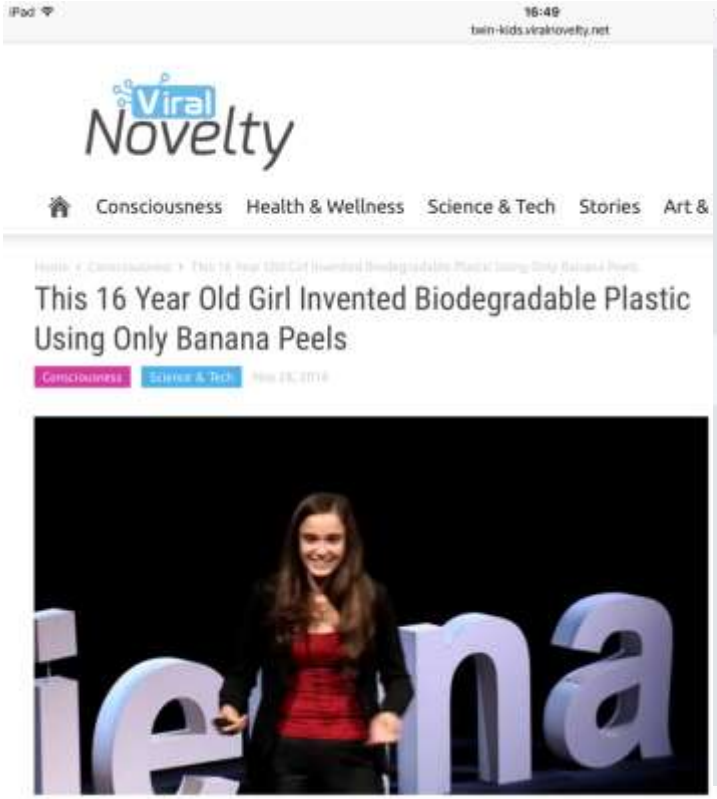
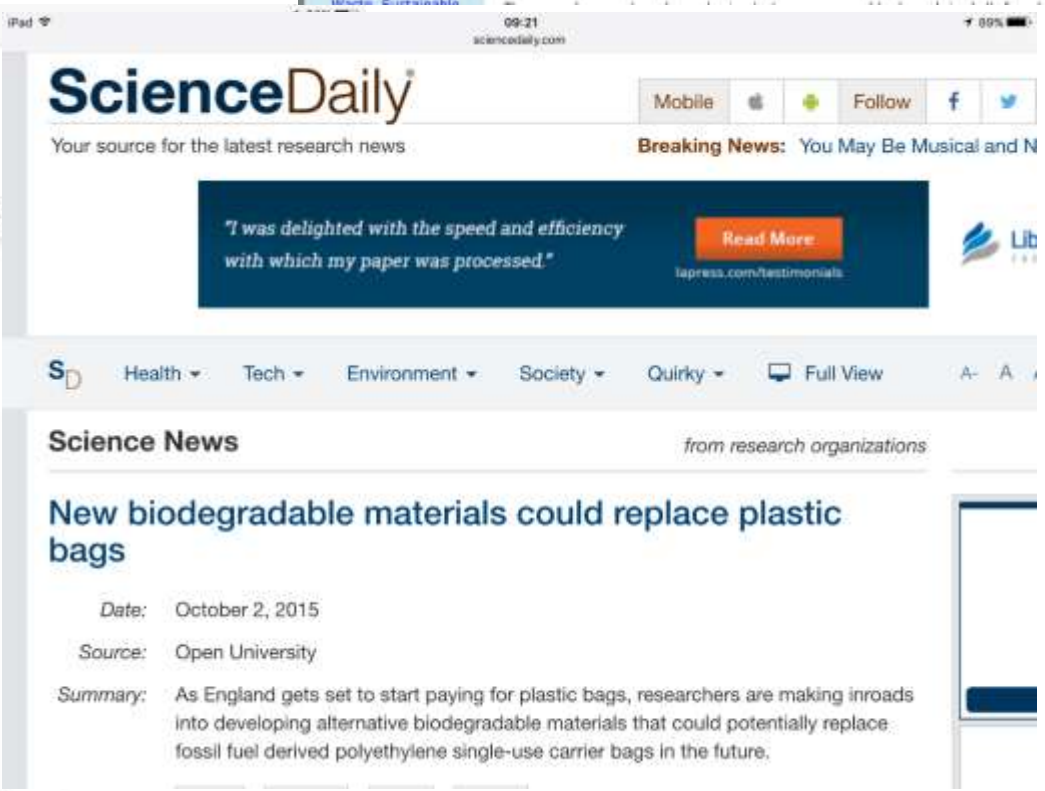
Plastics – biobased not always biodegradable and vice versa





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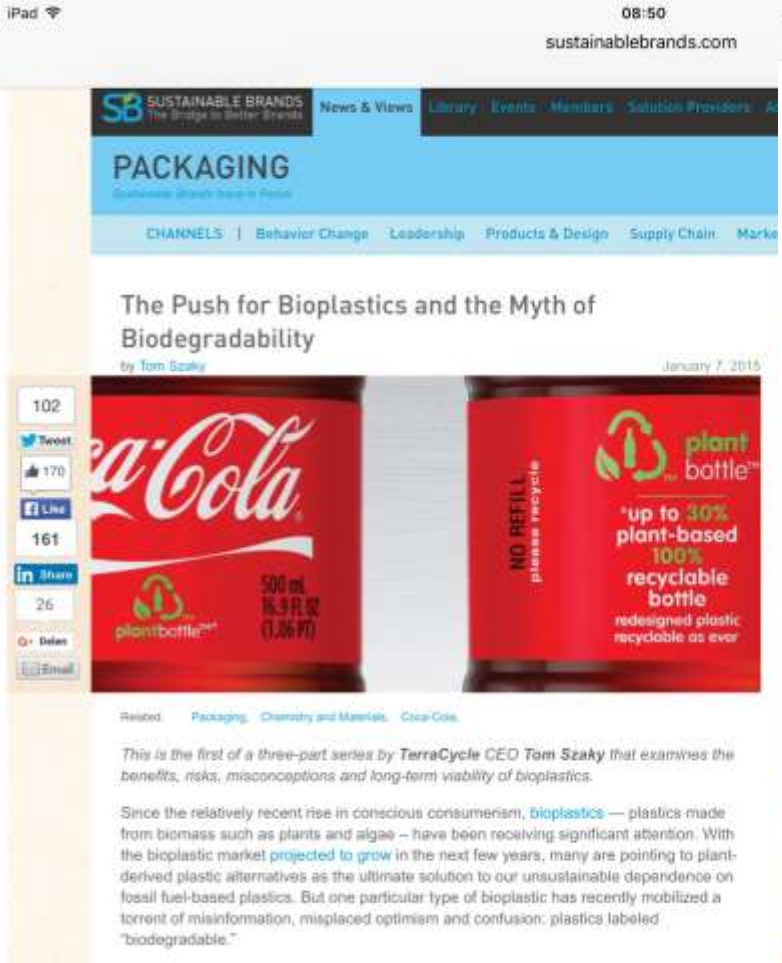
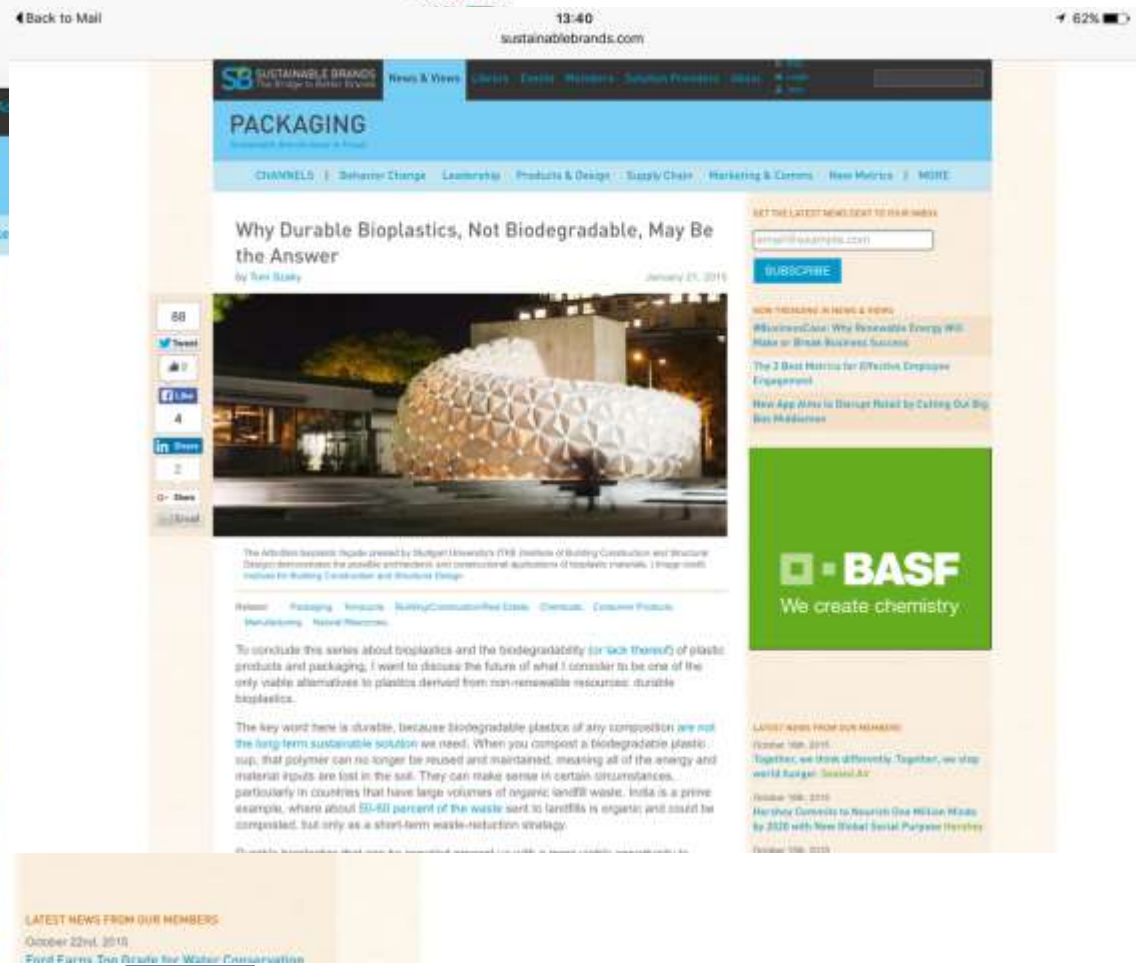
Biodegradable versus durable





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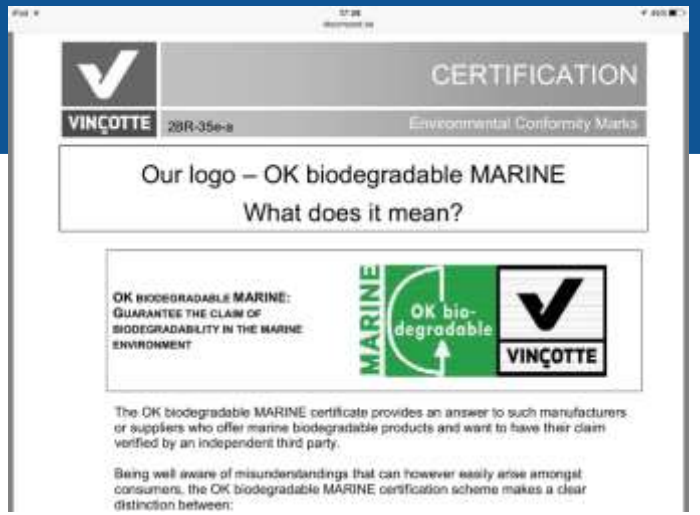
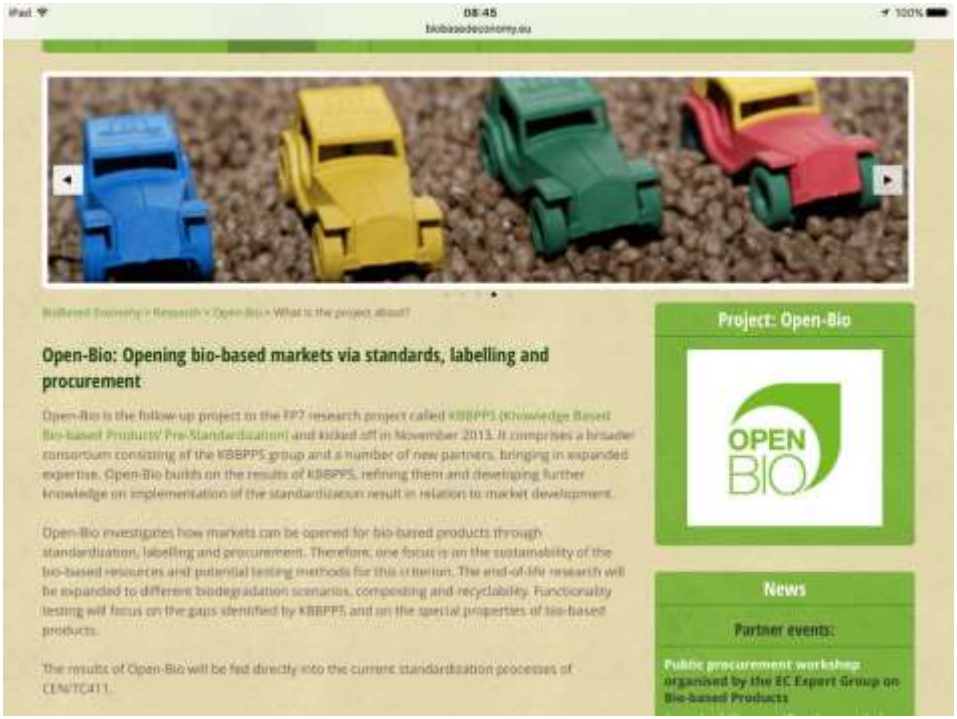
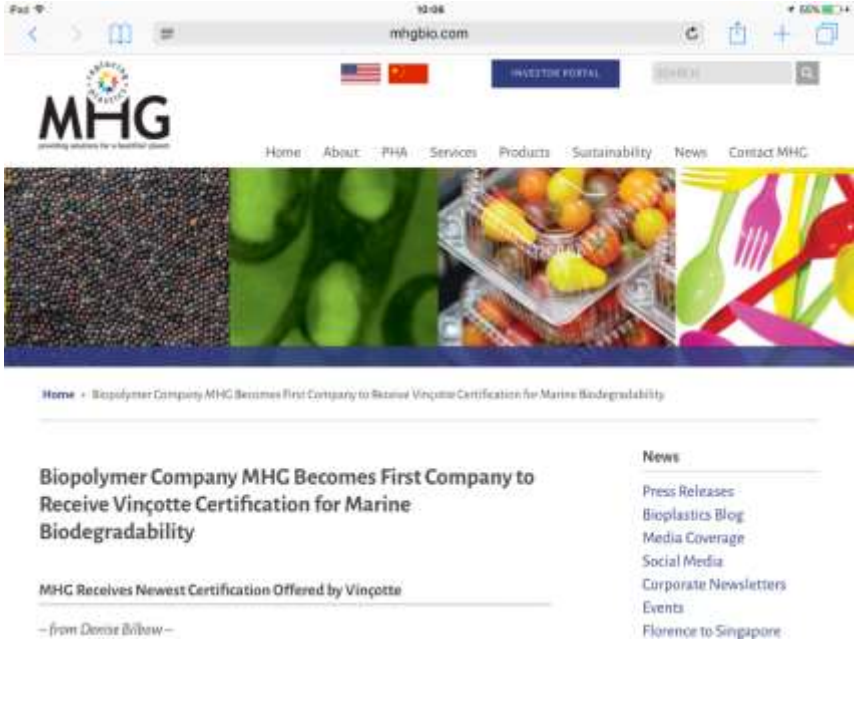
Building biobased markets through strong standards and regulation







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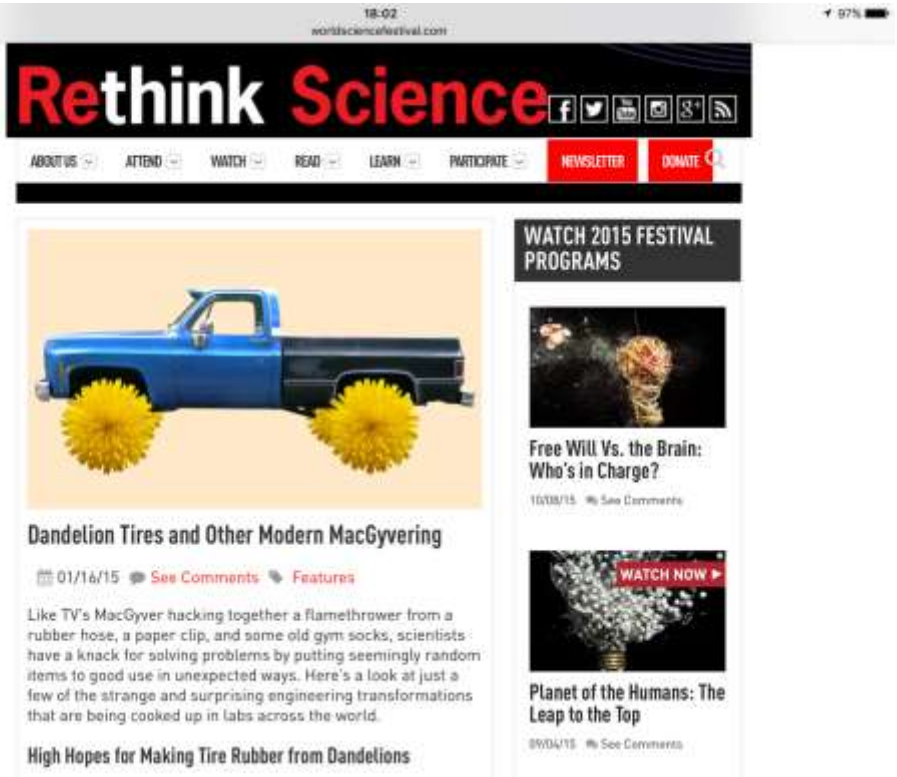
Biobased products in automotive and aviation industries



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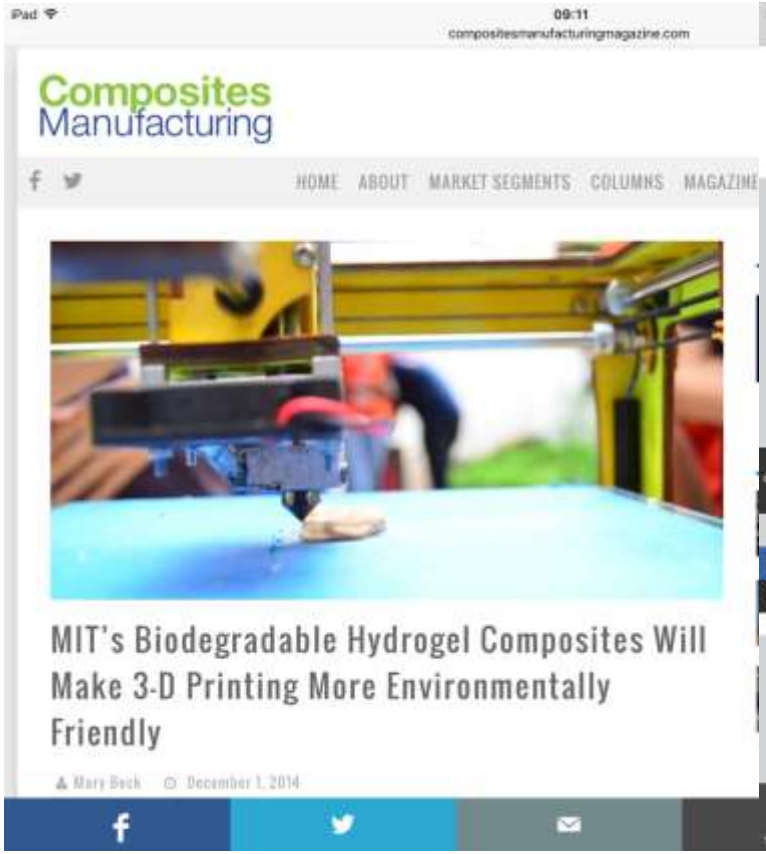
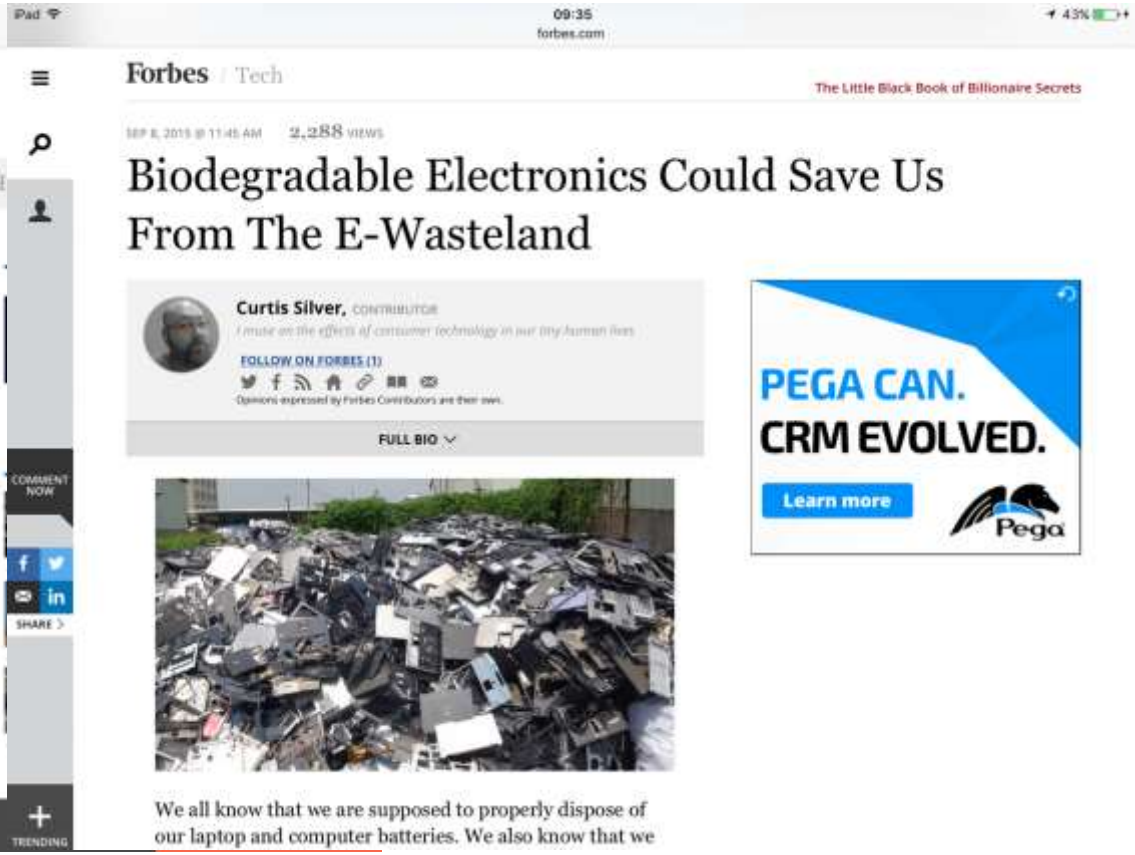
Cross-industry mainstreaming of biobased and biodegradable materials





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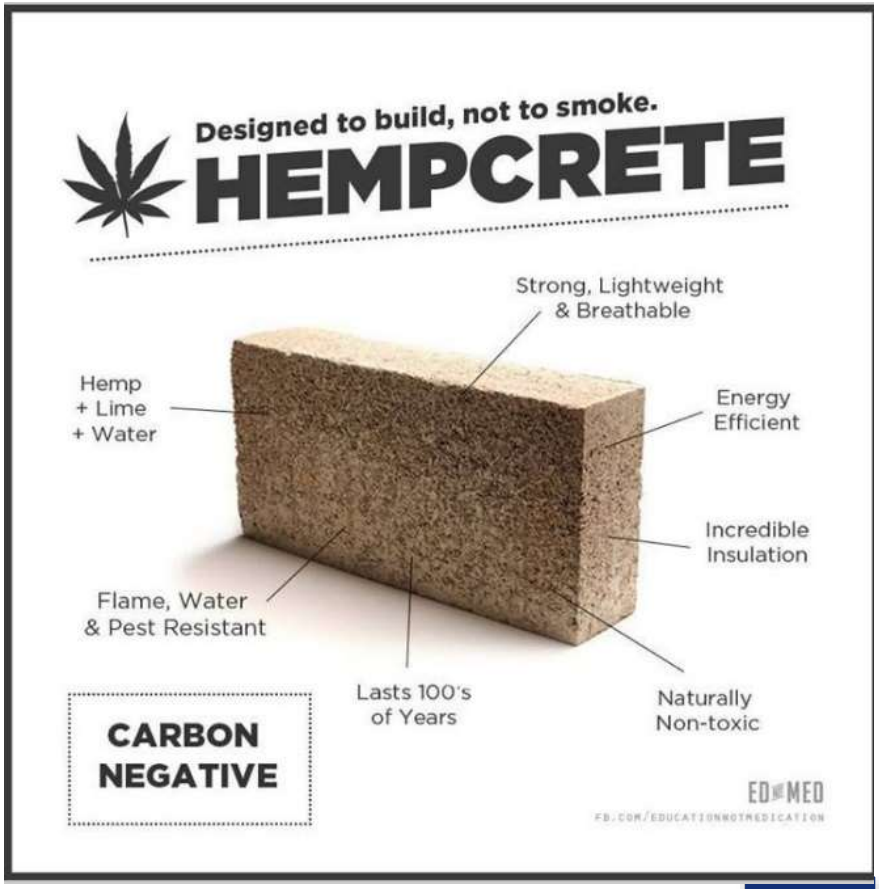
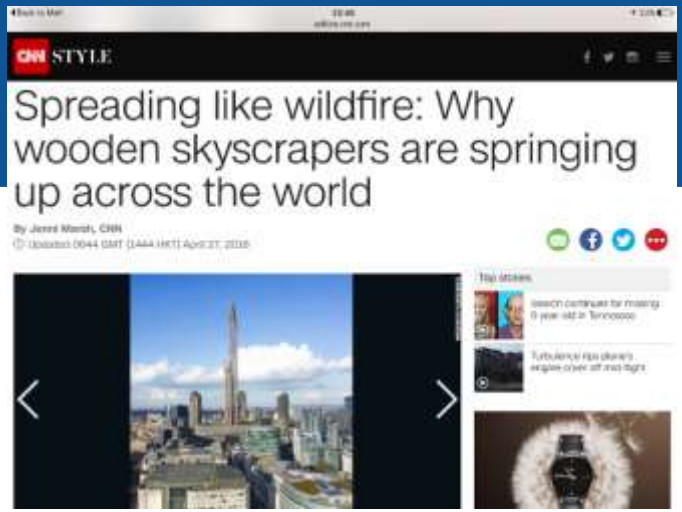
New bio-construction materials





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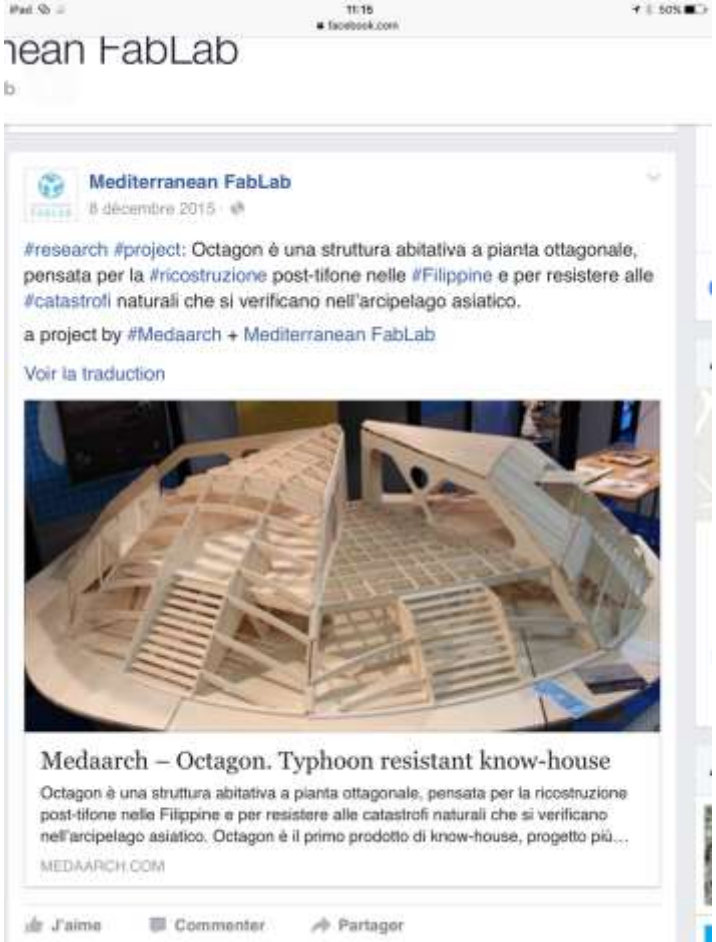
New aesthetics and functionalities of wood-based products



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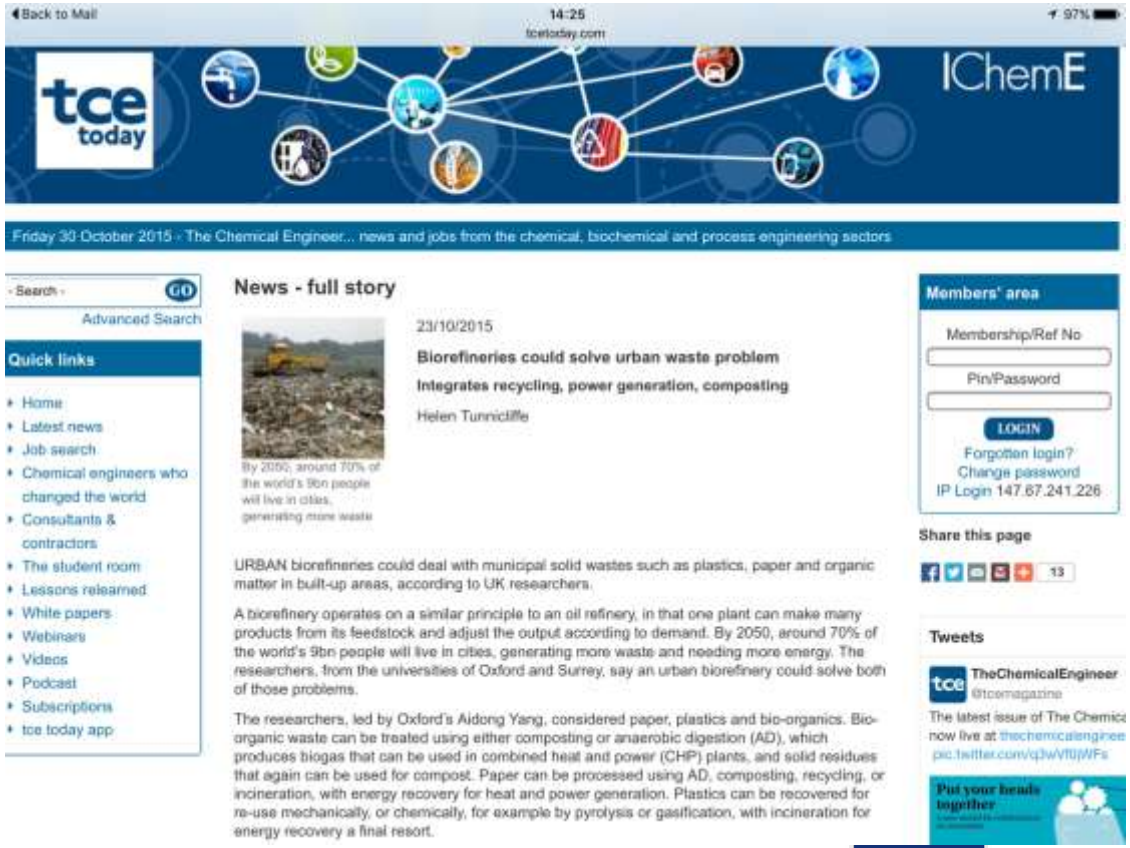
Re-thinking waste management



G7 GERMANY
2015 | Schloss Elmau

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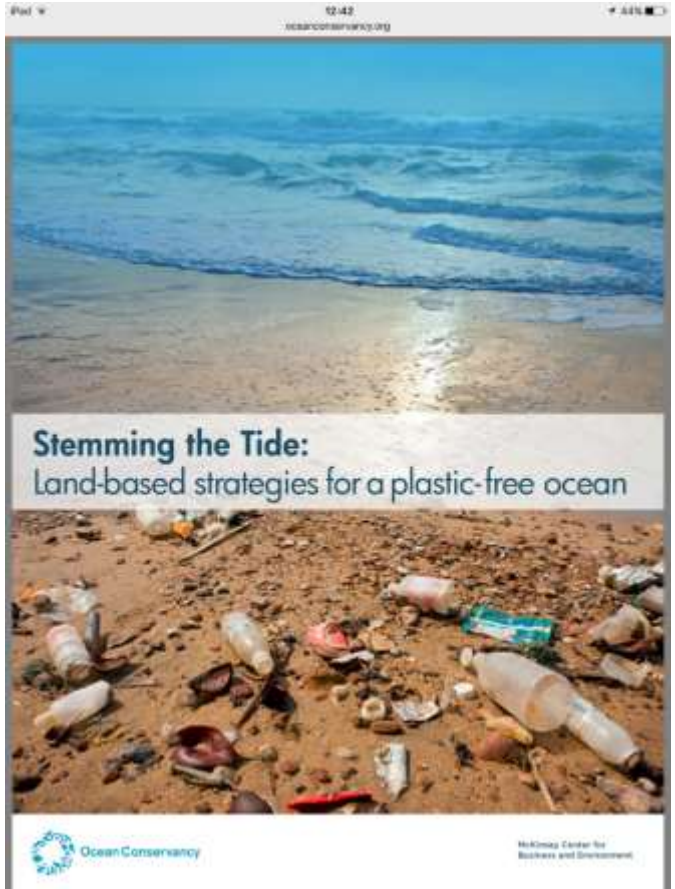
Fighting marine pollution



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Re-inventing cosmetics
Chasing micro-plastics

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Is this Bioeconomy?

Fabric-recycling technology in the textile industry

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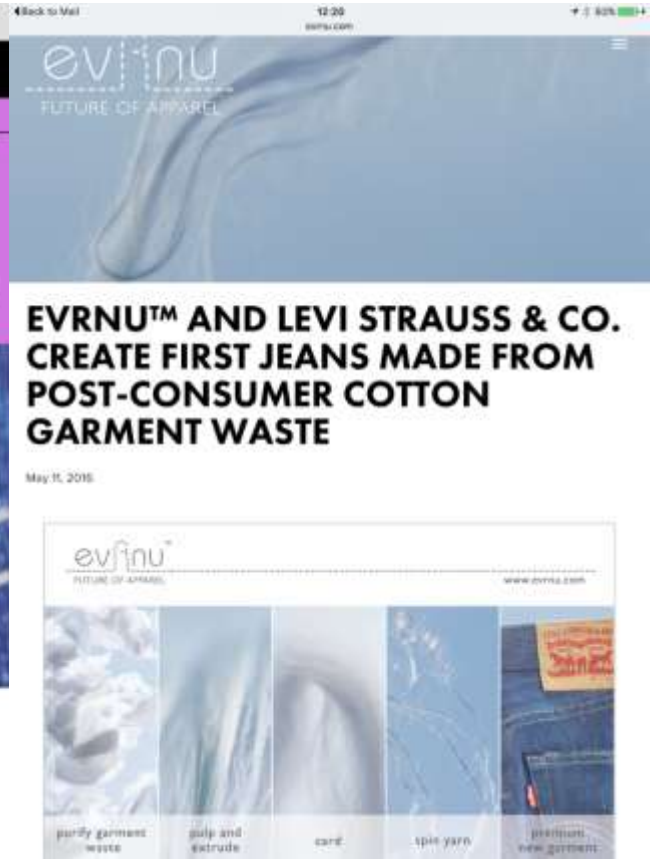
3 MINUTE READ

Levi's Made The First Ever 100%-Recycled Cotton Jeans

It uses a new technique that dissolves fabric and then re-spins the thread, making it even stronger than before.

ADELE PETERS | 05.13.16 | 8:00 AM

This newest pair of Levi's started as five old T-shirts. Using a new fabric-recycling technology, Seattle-based startup Evrnu worked with Levi's to dissolve the used clothing into a new, high-quality thread. That thread was then used to make the new pants. It's a process that could ultimately start to replace water-intensive cotton grown in the field with cotton saved from discarded clothes.



evrnu FUTURE OF APPAREL

EVRNU™ AND LEVI STRAUSS & CO. CREATE FIRST JEANS MADE FROM POST-CONSUMER COTTON GARMENT WASTE

May 11, 2016

Source: http://www.evrnu.com/blog/

Is this Bioeconomy?

Smart textiles and wearables

24 Jun '15

UGent offers platform to "smart textile" researchers

by Andy Furniere,
Recent articles: Altarpiece exhibition takes visitors on a mythical garden walk, 800 extra teachers for refugee children, New school registration system leads to more diverse social mix

SUMMARY

Researchers and engineers working on innovations in textiles for clothes, carpets and other applications gather tomorrow in Ghent

Salon at MIAT

The fourth edition of the Smart Textiles Salon takes place tomorrow in Ghent's Museum of Industry, Labour and Textile (MIAT). Every two years, Ghent University (UGent) provides a platform to international researchers working with so-called smart textiles. UGent researchers are internationally renowned for their innovations in the field.

Smart textile uses integrated electronic technology, like sensors, which can be used for a multitude of applications. It can, for example, be used in clothing to protect firefighters, analyse the condition of patients and determine athlete fitness.

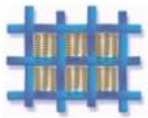
The Smart Textiles Salon gathers the latest innovations and prototypes in the international field. The department of textiles at UGent and the university's Centre for Microsystems Technology (CMST) will also showcase their work.

WEARABLE ELECTRONICS

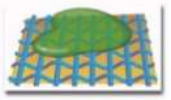
- They can be used in wearable textiles to dial telephones, pager messages and control music from MP3 players.
- Examples include a business suit with a mobile phone incorporated, a child's anorak with a tracking device, sportswear to monitor heart rate, aerobic outfits with music players incorporated, and club wear which changes colour etc.

Nano Technology

- Nano-particles are permanently attached to cotton or synthetic fibers. The change occurs at the molecular level, and the particles can be configured to imbue the fabric with various attributes. Nano-technology combines the performance characteristics associated with synthetics with the hand and feel of cotton



Nano-fibers attached to cotton fibers



Nano-fibers cause liquids to roll off

- Nano-fibers 1/1000 the size of a typical cotton fiber are attached to the individual fibers. The changes to the fibers are undetectable and do not affect the natural hand and breathability of the fabric

Source: Slideshare

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Phytomining – Phytoremediation

USDA United States Department of Agriculture
Agresearch Magazine

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Jun 2000 - Contents | PDF | + Share

Forum—*Using Superplants To Clean Up Our Environment*

Phytoremediation is an innovative use of green plants to clean up our environment. The term comes from the Greek word for plants ("phyto-") that can detoxify, or remediate, soil or water contaminated with heavy metals or excess minerals.

Think of the industrial wastes, toxins, and byproducts that emerge from our daily activities—everything from sewage sludge from cities to toxic heavy metals from mines or factories to chemicals from agriculture. Produced and used in moderation and disposed of properly, these compounds aren't a threat to human health or the

New Scientist

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FEATURE 19 March 2014

Metal-eating plants could mine riches through roots

By Katia Moskvitch

Why mine for metals when we can cultivate them? *(Image: Pierluigi Longo)*

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- News & Events

Homepage > Innovation & Technology > Technological Focus

Phytoremediation – Remediation technologies for contaminated soils promoted by trees and herbaceous plants

Soil pollution by heavy metals (as arsenic, mercury, nickel and copper), organic and chlorinated compounds is one of the most relevant environmental problems. Eni has long been involved in identifying and implementing technologies for removing soil pollutants or reducing them to levels not dangerous for human health, with the aim of extending the portfolio of low-impact remediation technologies available to **Syndial**, eni's company for environmental remediation.

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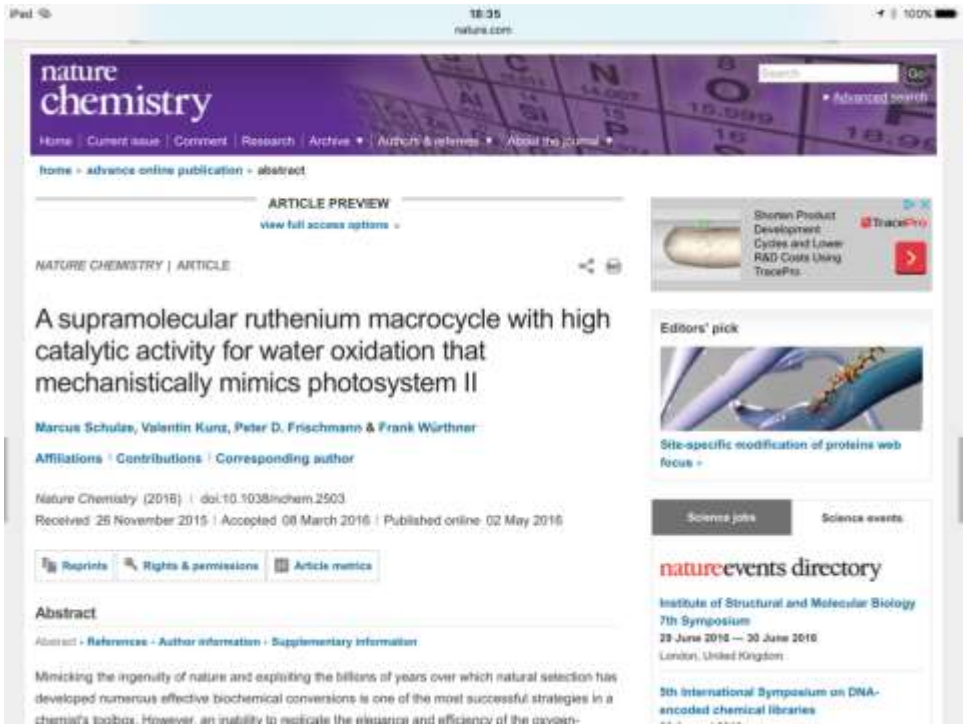
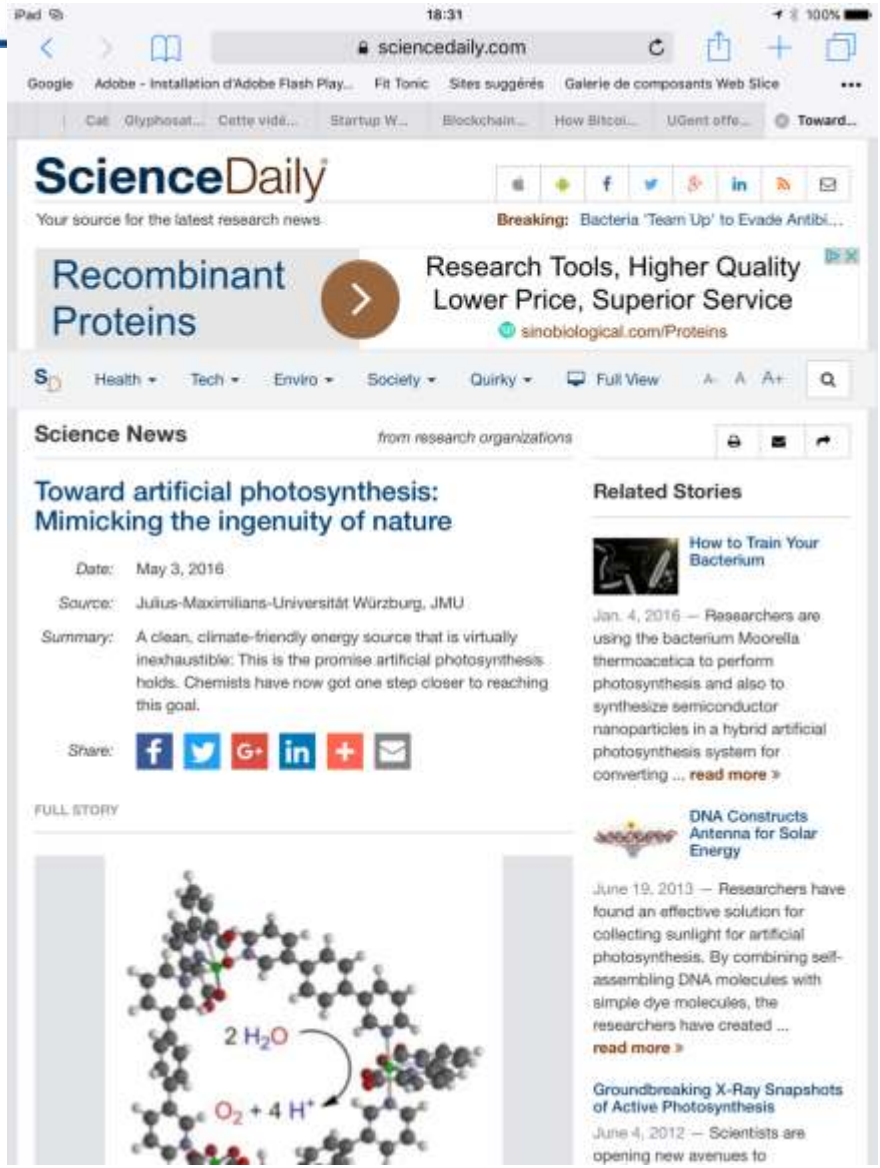
Artificial Photosynthesis





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Bio-inspired and bio-mimicry

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Bio-lightning

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DAILY NEWS 26 February 2016

Glow-in-the-dark bacterial lights could illuminate shop windows

LABIOTECH.eu
The European Biotech News Website

CATEGORIES LOCATIONS EVENTS JOBS

What if we could use less electricity to light today's civilizations? Glowee is a French start-up willing to take on this challenge by using genetically modified bacteria to produce light. I had the chance to talk with the company's CEO Sandra Rey and will give you my thoughts.

It all started from a student project in a design college. Back in 2013, the team behind the project won the ArtScience Prize, created by a professor from Harvard. Traction from the market was visible and large companies started to contact them, but they had nothing scientifical yet. So they decided to launch the startup and joined an incubator in Paris.

"But we had no idea on how to produce light with bioluminescence" told me Rey. In September last year, the ArtScience Prize winners started working on the science. They inserted gene producing lighting proteins into bacteria. The micro-organisms were then cultivated in a specific medium in order to avoid the later to be consumed too fast and to keep it as transparent as possible. Today, Glowee is able to produce a bioluminescent solution lighting capable of lasting up to 40 hours. *"The lighting intensity is basically close to a nightlight."*

European Commission

Is this Bioeconomy?

Bio-Refitting of cities

http://www.huffingtonpost.com/2014/03/24/sustainable-nyc_n_4886443.html

http://www.bbc.com/future/story/20140402-a-vision-of-new-york-in-2050

http://www.terreform.org/projects_urban-new-york-city-state.html

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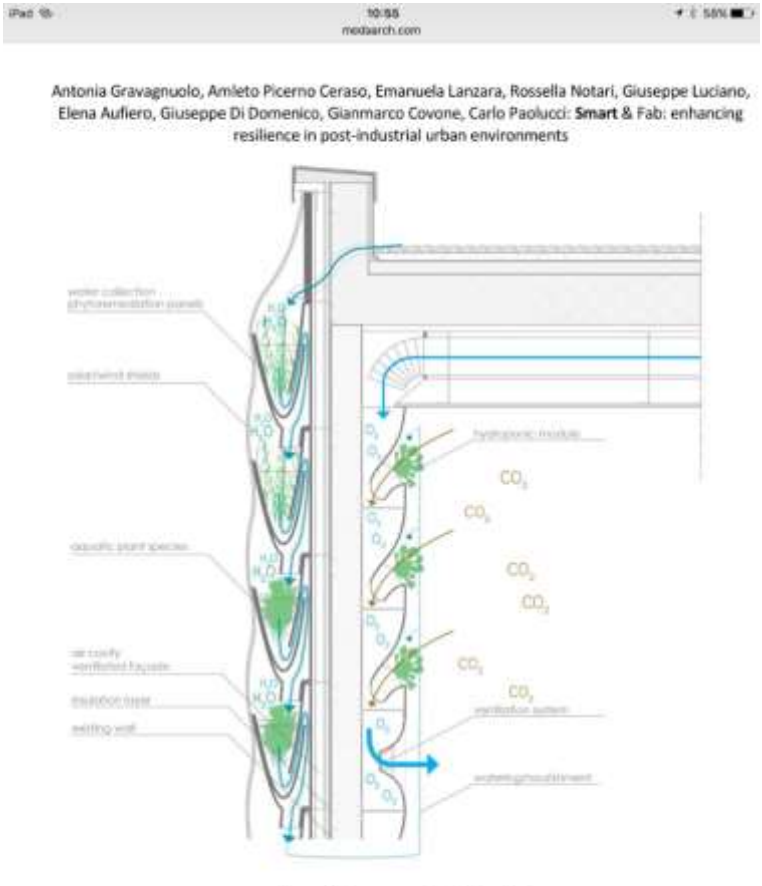
Bio-retrofitting and bio-designing of buildings?



York University

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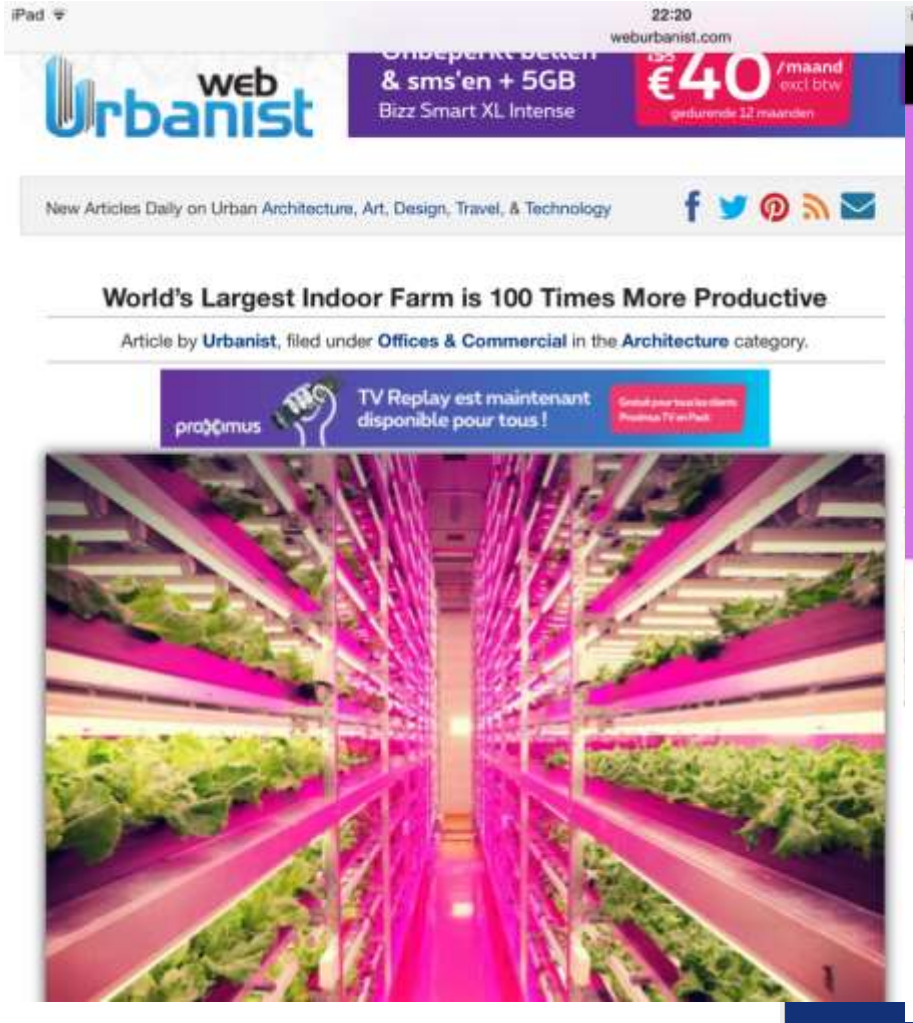
Urban agriculture for sustainable food cities



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Aquaponics


Back to Mail 10:04 foodialogues.com

THE FOOD DIALOGUES

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WHAT ROLE WILL AQUAPONICS AND HYDROPONICS PLAY IN FUTURE FARMING?

Editor's Note: USFRA's FoodSource is a place to get information on the most asked questions by today's consumers. After reviewing the topics, if visitors still have questions, they can submit their own on our website. This post is based on a recent question submitted through FoodSource.

Raising fish and plants together can be done – and can be accomplished successfully and sustainably. Aquaponics and hydroponics systems are quickly moving from the realm of experimental to commercial as researchers and growers alike have turned the systems into working models of sustainable food production. Aquaculture, for example, is one of the fastest growing segments of the U.S. and global agricultural economies, growing at a rate of 6.5 percent per year, according to the Fisheries Technologies Associates, Inc. The 2007 USDA census of agriculture counted 6,409 farmers and ranchers reporting freshwater aquaculture sales in the US. Total sales were $1.4 billion.


Aquaponics: the future of food? - FT.com

FT Magazine

Aquaponics: the future of food?

Tim Smedley

A process being perfected in an east London warehouse, involving 12 tanks of fish and vast trays of salad leaves, may change the way we make produce

You have viewed your allowance of free articles. If you wish to view more, click the button below.

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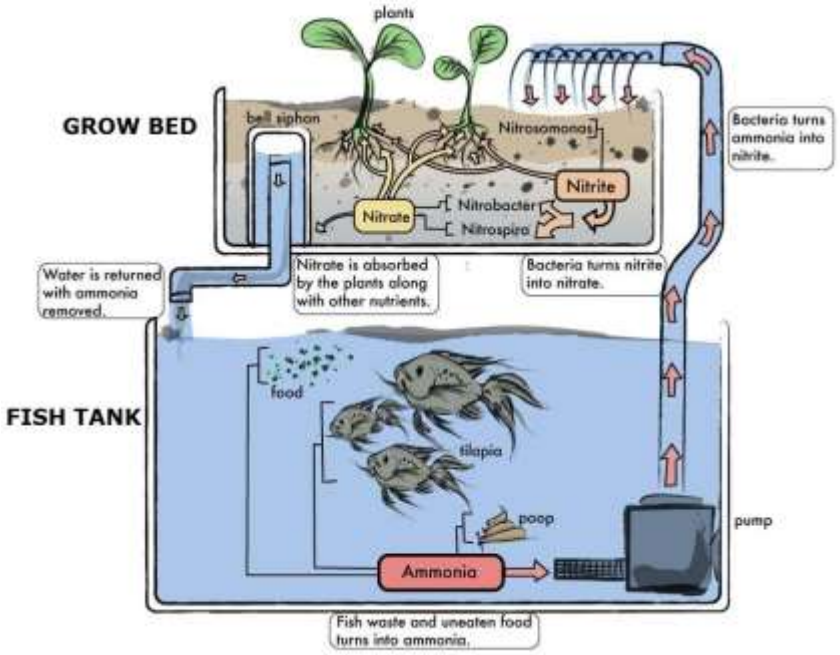
AQUAPONICS BASIC DIAGRAM

http://kanat.jsc.vsc.edu/student/grzyb/main.htm



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Is this Bioeconomy?

Digital home aquaponics?

iPad 10:35 65%
medaarch.com

Ricordate che il nostro sistema è alla sua prima versione e potrebbe essere migliorato dal vostro ingegno! Inoltre, considerate che i risultati potrebbero cambiare, in relazione sia alle tecnologie CNC, sia ai sistemi elettronici utilizzati.

Da questo progetto ci auguriamo di innescare un'interessante rete, quella che potremmo chiamare col nome di ***wikifood*** (magari, perché no, creando anche un sito ad hoc, tipo *www.wikifood.net*), dove poter incontrarci per condividere e sviluppare nuovi sistemi di produzione di cibo e trovare risorse immediatamente utili, con l'intento di diffondere un sistema di "*how to grow almost anything*".

Scaricate il nostro progetto, per ricrearvi il vostro *Hydroponic house system* e **condividete** pure con noi le vostre modifiche o i risultati della vostra coltivazione idroponica in-house.
Buon lavoro ed... *enjoy **your** meal!*

Scarica qui i file del progetto: Download Hydroponic House System

RICERCHE SIMILI

iPad 10:40
medaarch.com

In attesa della nuova edizione, la sesta, di digitalMed, come spin-off dei risultati ottenuti dalla nostra scorsa Summer School, abbiamo deciso di mettere a punto un **sistema per la coltura in idroponica di piccoli ortaggi in-house** e rilasciare in open source sia i file di stampa 3D, sia la documentazione relativa al montaggio dell'intera struttura e al sistema di controllo realizzato con Arduino.

Rendere open-source questa ricerca, ci sembra il modo migliore per diffondere l'utilizzo di pratiche che, nel quotidiano, possono migliorare nettamente la qualità della nostra vita.

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Edible landscapes and food sharing

Incredible Edible Todmorden unlimited

http://pm22100.net/pages/enercoop/I/Incredible_edibles.html

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Neglected and forgotten crops revolution

Belgomarkt, Bruxelles

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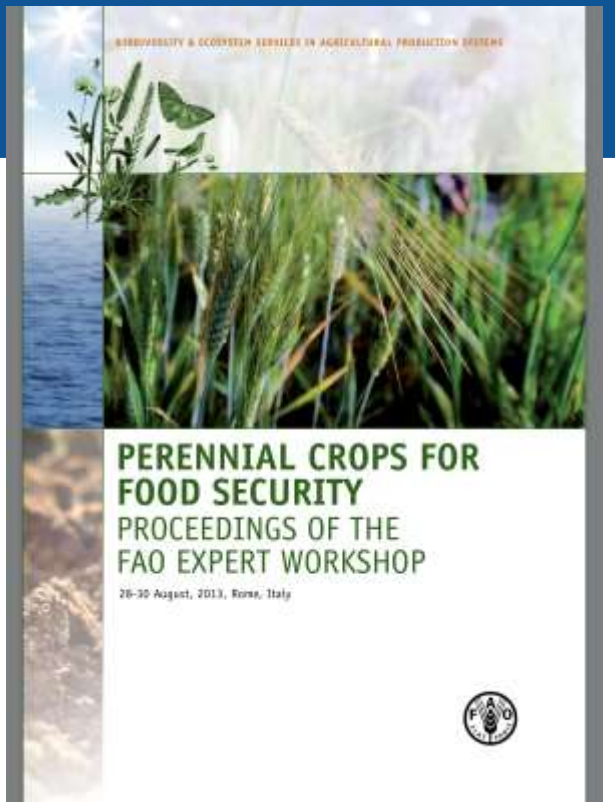
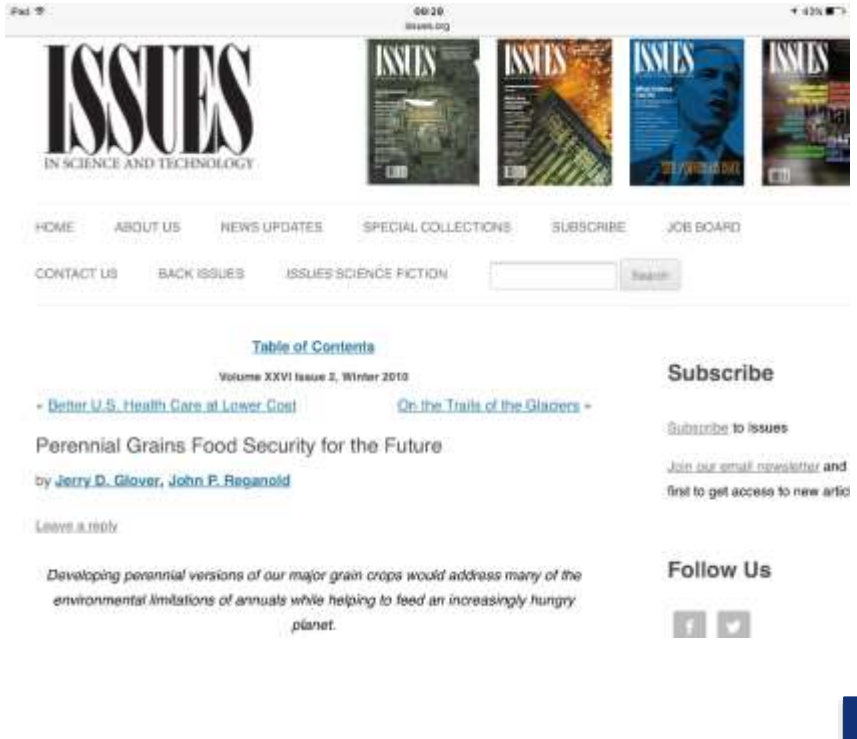
Perennials





"Perennial cereals, legumes and oil species *represent a paradigm shift in agriculture and hold great potential to move towards sustainable production systems. today, most agronomic practices used to grow annual crops require excessive water consumption, significant amounts of synthetic mineral fertilizers, labour, emissions of co2 and disrupt natural biological processes. Perennial crops instead are more rustic, improve soil structure and water retention capacity and contribute to increase climate change adaptation and mitigation practices and promote biodiversity and ecosystem functions."*

http://www.fao.org/3/a-i3495e.pdf

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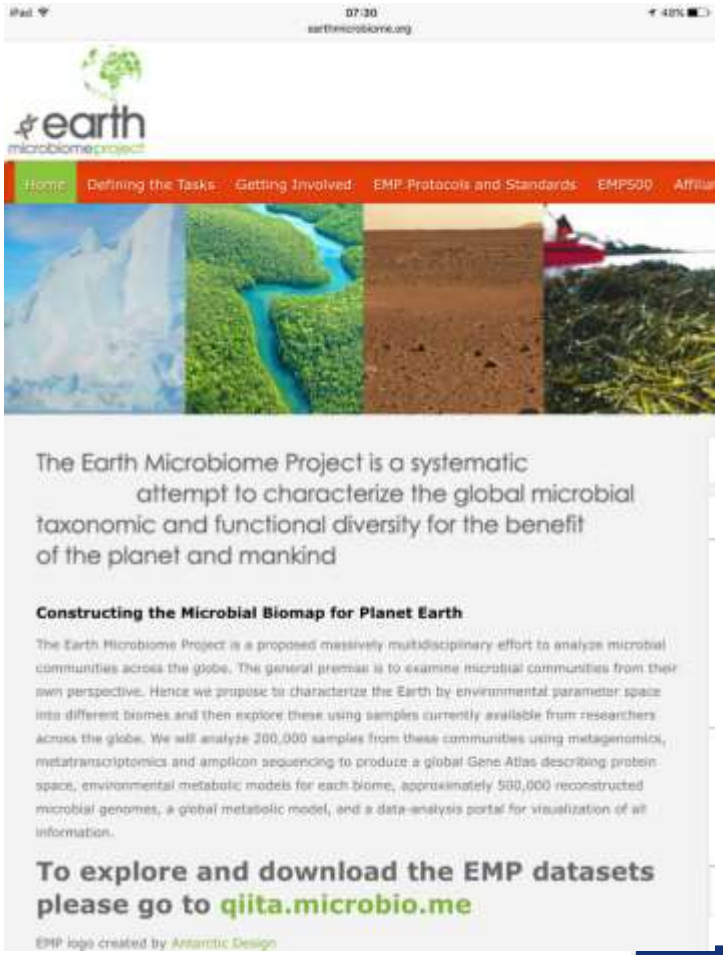
Mapping the puzzle of microbiome potentials



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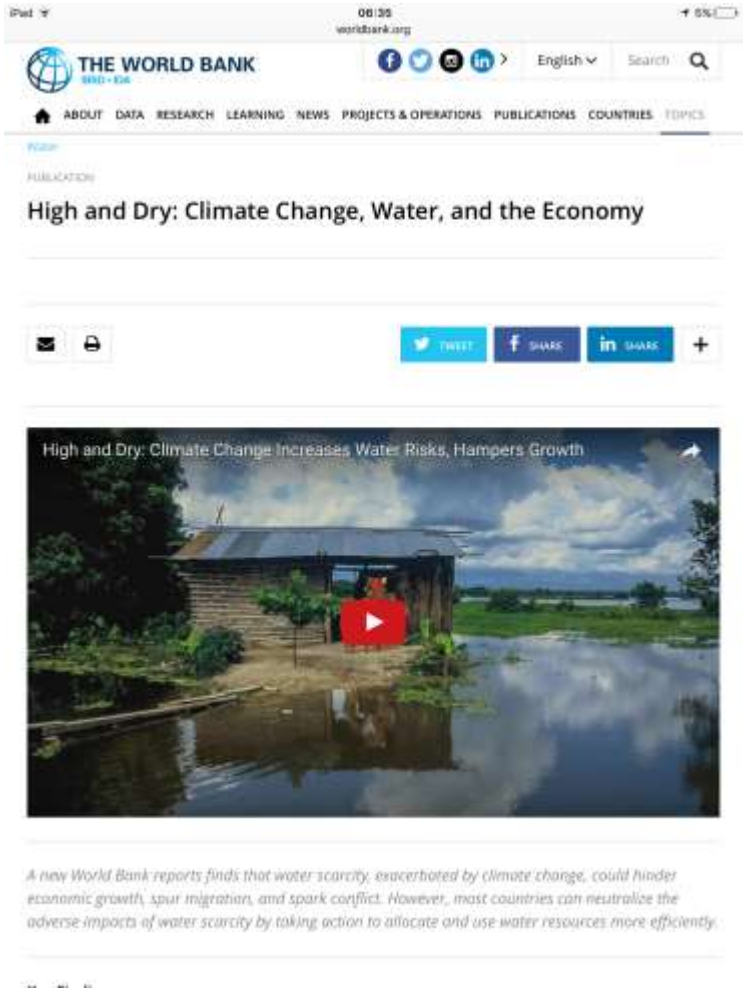
Re-thinking the water nexus



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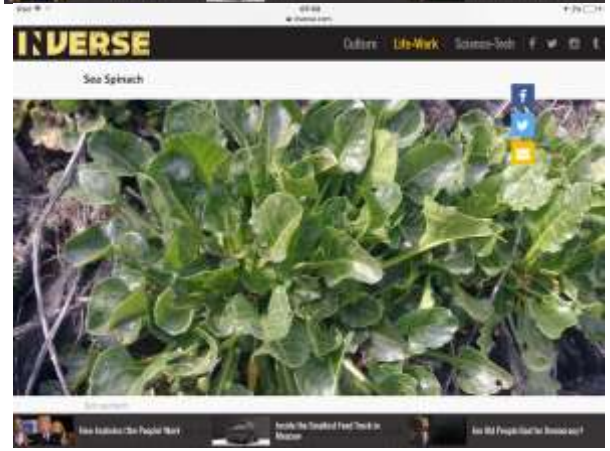
Saltwater agriculture



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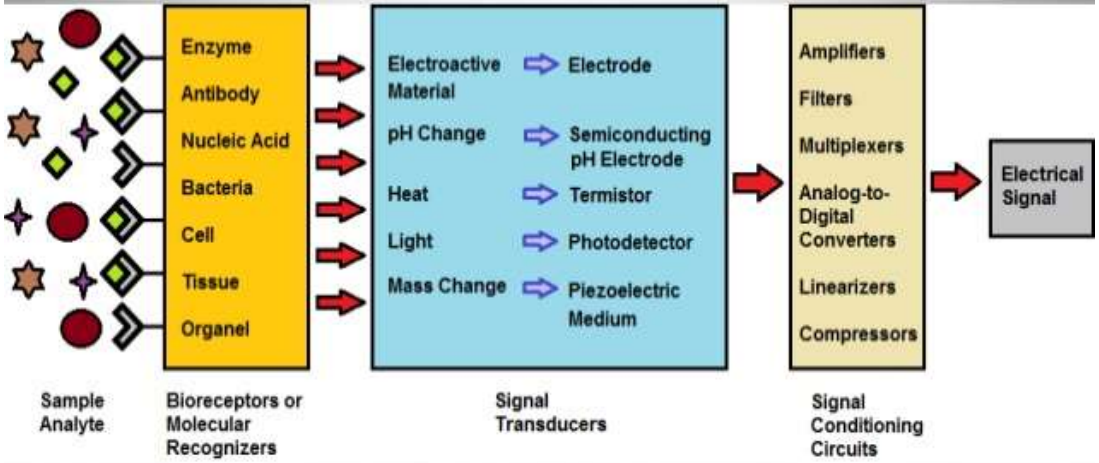
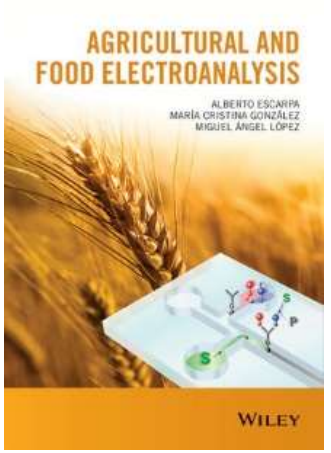
Biosensors in agriculture

What are biosensors?

- Biosensors are analytical devices which converts a biological response into an electrical signal.



Working principle of biosensors



http://fr.slideshare.net/shalinihospet/biochips-47904927

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Swarm robotics

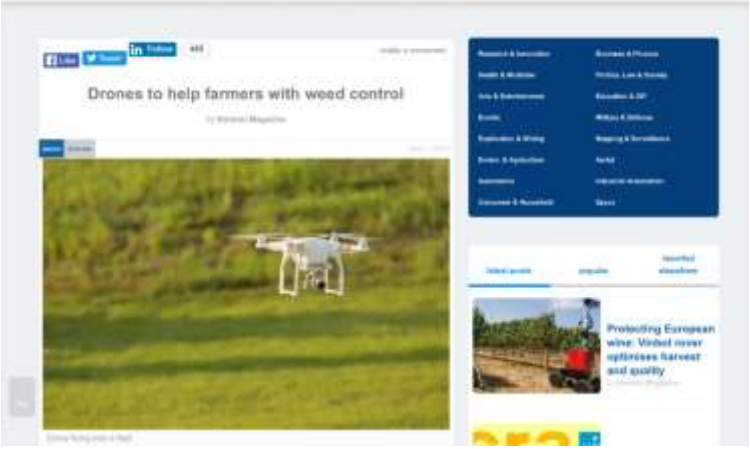
Sweet Pepper Harvesting Robot

Sweeper

ICT Robotic Use Cases project in the H2020 programme of the EU

ATTRACT YOUNG PEOPLE BACK TO AGRICULTURE WITH ROBOTIC FARMING

The agricultural sector is growing rapidly due to booming World population. On the other hand the farmers' population is being reduced due to age and health factors. The younger generation is not attracted to this profession due to its nature and lack of prestige being a farmer. But the market demand for agricultural products keep on increasing. Due to this, the demand exceeds supply in a big way, pushing up the prices.



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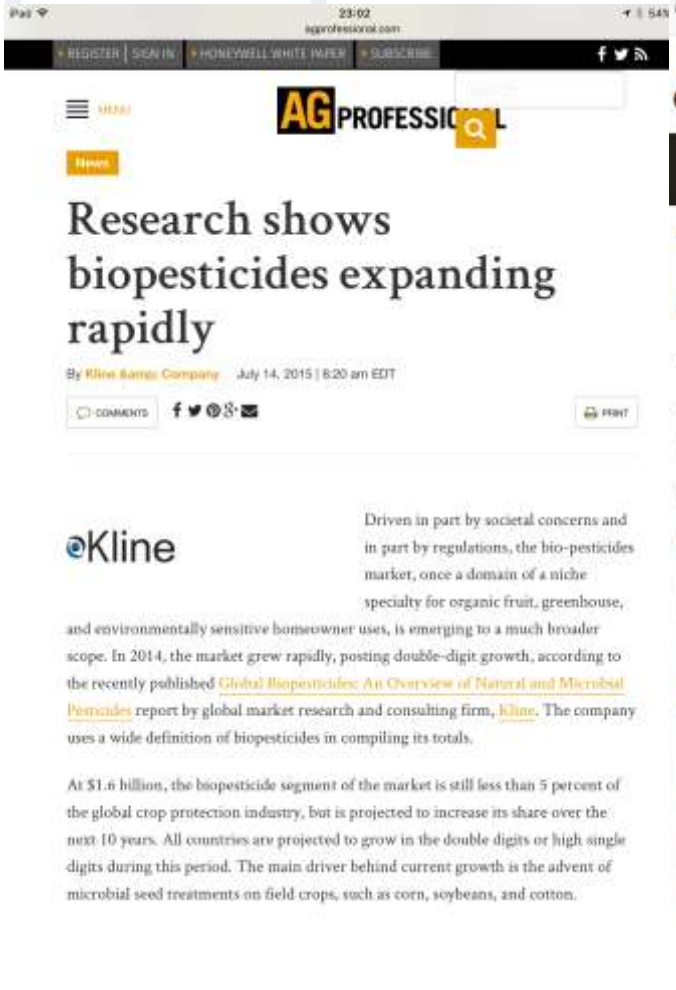
Re-thinking plant protection



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Cyborg husbandry

DIGITAL TRENDS

THE MANUAL

CYBORG COCKROACHES WITH SENSOR 'BACKPACKS' COULD HELP FIND DISASTER VICTIMS

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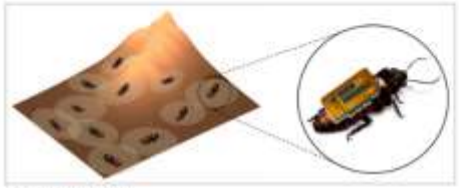
Cyborg swarm maps unknown environments



(Credit: Edgar Lobaton.)

Remember the much-debated "biobots" (remotely controlled cockroaches — see How to remotely control cockroach cyborgs and Kinect tracks bionic rescue roaches) created by researchers from North Carolina State University?

Well, here's an update: they have now developed software that allows for mapping unknown environments — such as collapsed buildings — based on the movement of a swarm of the insect cyborgs.

"We focused on how to map areas where you have little or no precise information on where each biobot is, such as a collapsed building where you can't use GPS technology," says Dr. Edgar Lobaton, an assistant professor of electrical and computer engineering at NC State and senior author of a paper on the research.

"One characteristic of biobots is that their movement can be somewhat random," Lobaton says. "We're exploiting that random movement to work in our favor."

Here's how the process would work in the field.

1. A swarm of biobots would be equipped with electronic sensors and released into a collapsed building or other hard-to-reach area.
2. The biobots would initially be allowed to move about randomly. Because the biobots couldn't be tracked by GPS, their precise locations would be unknown. However, the sensors would signal researchers via radio waves whenever biobots got close to each other.
3. Once the swarm has had a chance to spread out, the researchers would send a signal commanding the biobots

The Atlantic SUBSCRIBE SEARCH MENU

Here Come the Swarming Drones

Insect-inspired aerial vehicles could evolve into useful minions to track, map, and respond to climate change.

MARY CATHERINE ELLIOTT OCT 31, 2014 TECHNOLOGY

Since the dawn of entomology (more or less), scientists have been pondering the question posed so eloquently in "High Hopes," a song Jimmy Van Heusen and

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Traditional knowledge for the future

La Milpa, in the Nahuatl language of the Aztecs literally means 'what's planted in the field'. This agricultural method is able to produce food all-year-round from a small plot of land, a Milpa can grow up to 15 different crops at once, all feeding from each other and supporting the soil. Based on the natural cycles and seasons of the land; it's sustainable, with crop rotations and periods of fallow and it is said to be one of the richest and more complex organic ecosystems ever found. The green movement and the demand from consumers searching for milpa to table alternatives, has created a new wave of small, modern farmers that are taking this two and a half thousand year old baton and carrying it into the future, hailing La Milpa as the key to food security, sustainable farming and the protection of local biodiversity.

https://dublin.sciencegallery.com/events/2016/04/futurefeastingmexicanbanquetbookedout

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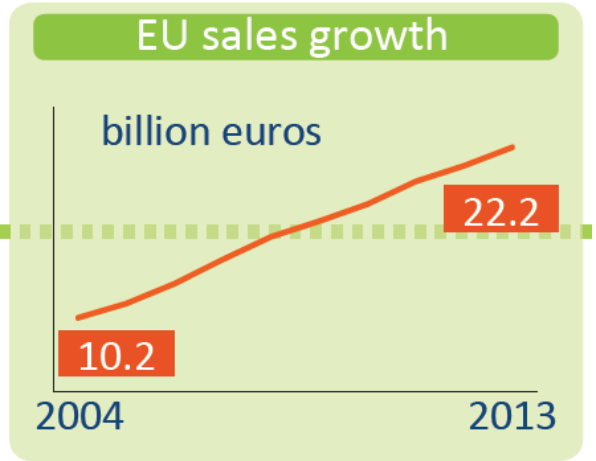
Organics



Source; European Parliament Research Service
https://epthinktank.eu/2015/05/20/organic-food/

Marché bio les Tanneurs, Bruxelles

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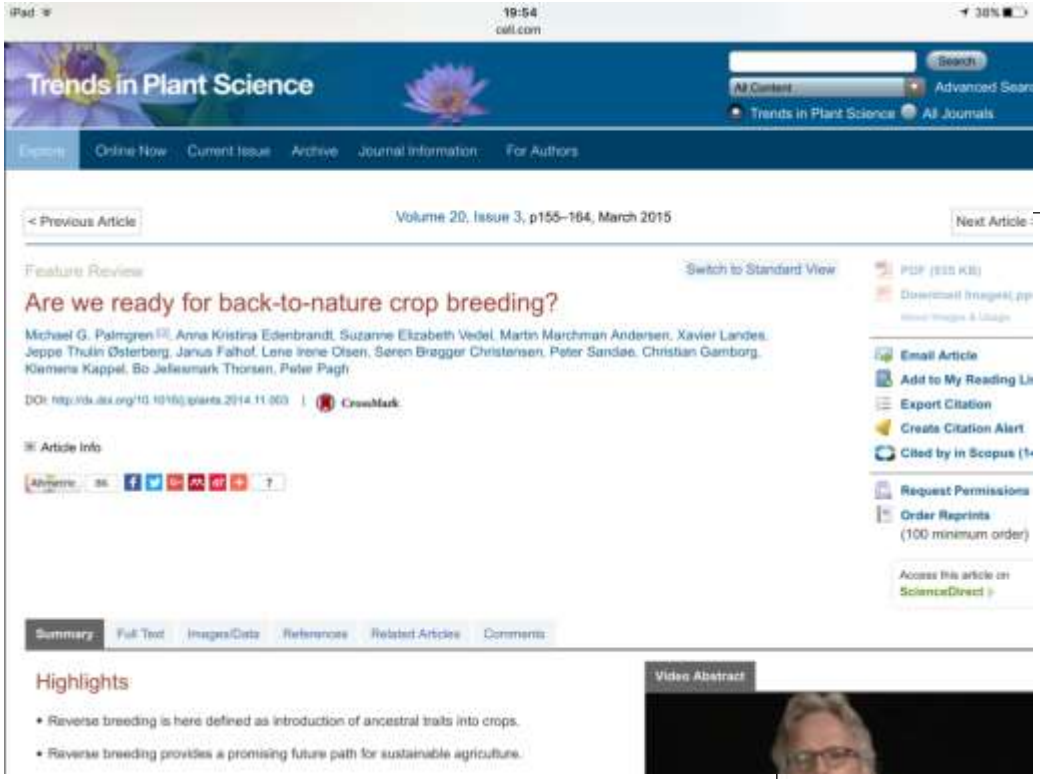
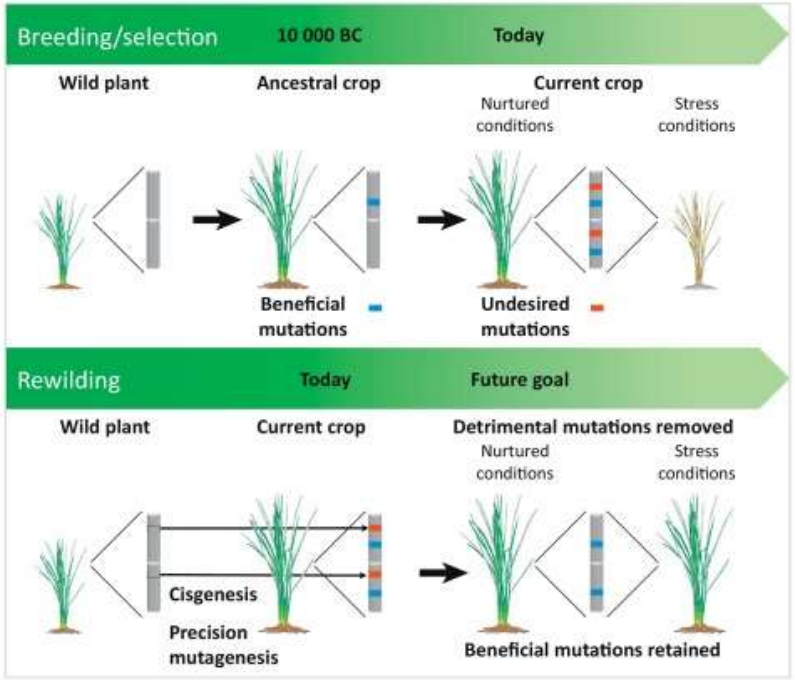
Rewilding





TRENDS in Plant Science

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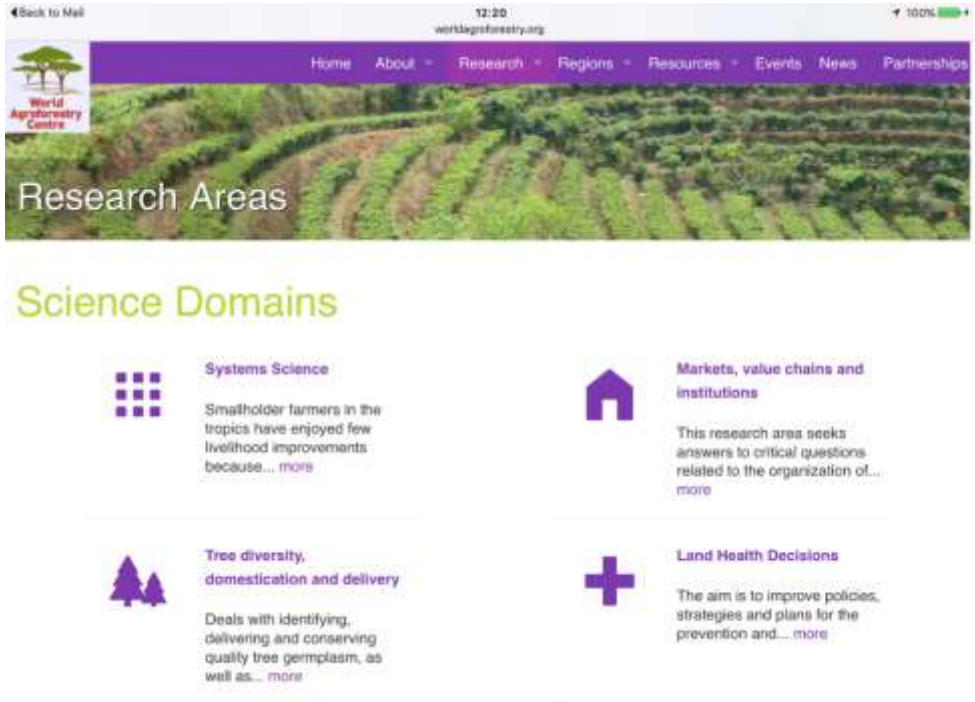
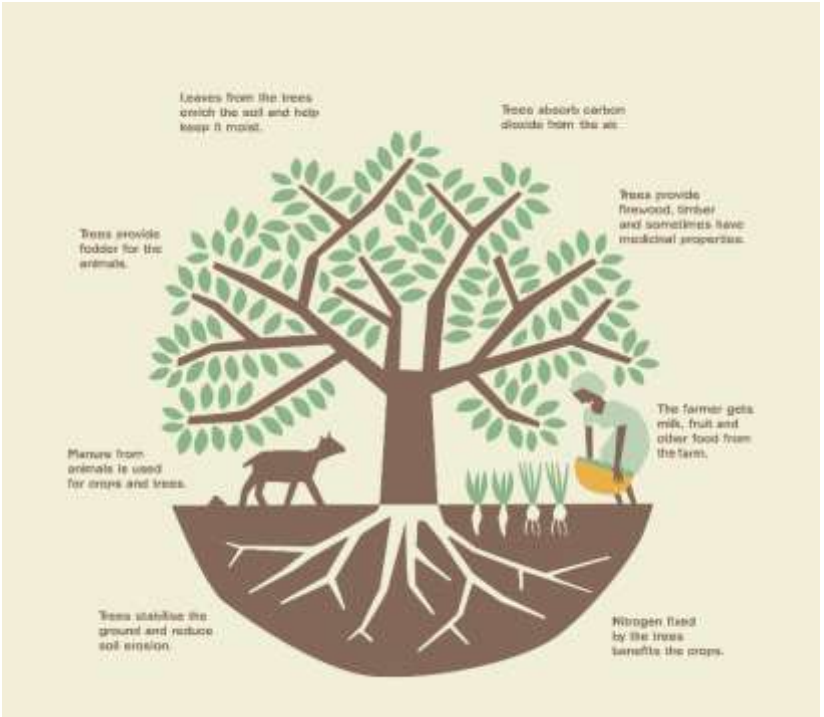
Agroforestry

http://www.thesolutionsjournal.com/node/971





http://www.viagroforestry.org/what-we-do/agroforestry/

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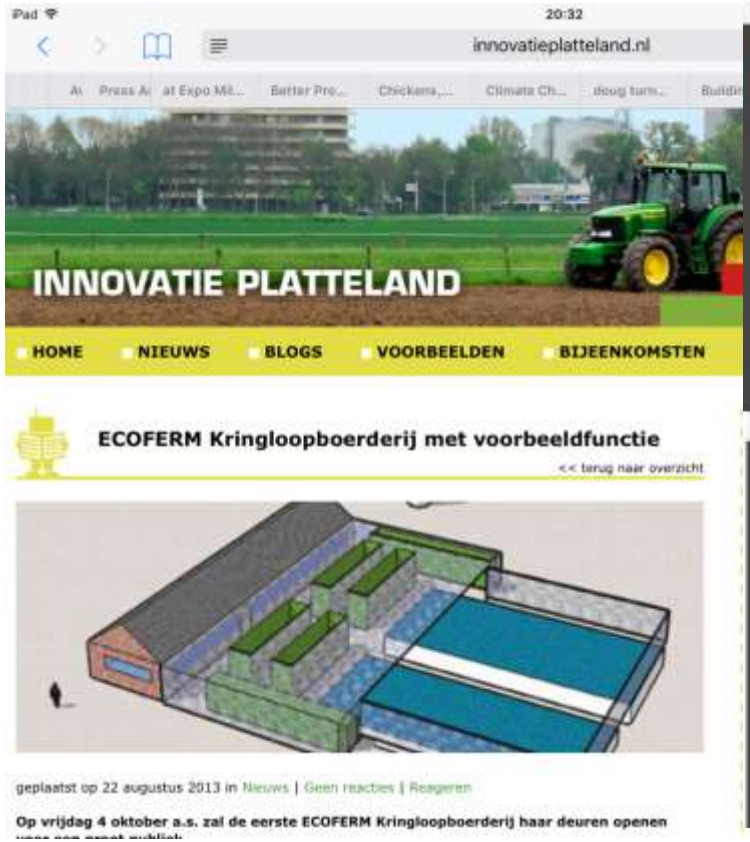
Circular farms



(http://www.slideshare.net/JanDeWilt/ecoferm-montpellier-15062015

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Integrated landscape stewardship in multifunctional business models

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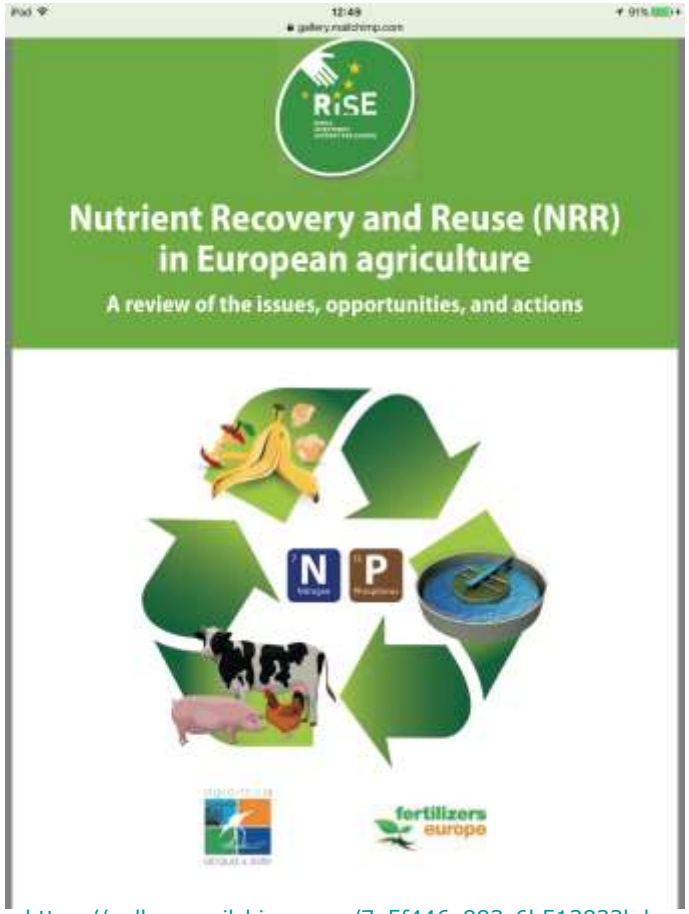
Mainstreaming Nutrient Recovery and Reuse globally



https://gallery.mailchimp.com/7e5f446a883c6b513832bd781/files/NRR_RISE_2016.pdf?mc_cid=3c2d1f1d16&mc_eid=04e2ad0549

"**Every ton of nutrient which is intercepted from a waste flow and processed into a form suitable to be used to fertilize crops represents a ton less which would have leaked into water, the air, or the atmosphere, or ended up in land fill.**

Europe can perform a leadership role in improved nutrient management. Since the transition is unavoidable this would also create first mover advantage and economic opportunities."

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Re-thinking human waste and toilet technology

Back to Mail 22:48 60% horizon-magazine.eu

HORIZON

The EU Research & Innovation Magazine

29 October 2015

by Michael Allen

Urine can be turned into commercially available fertiliser. Image credit: Shutterstock/ Peter Gudella

Office blocks and universities could turn pee into commercially available phosphorus and nitrog fertilisers, thanks to a bioelectrical reactor in development by researchers across the EU.

Fresh urine contains approximately nine grammes of nitrogen and one gramme of phosphorus per litre, ar average person produces between one and one-and-a-half litres a day which currently goes to waste. Researchers believe human urine could provide 18 % of the phosphorous and 25 % of the nitrogen curren used for soil fertilisation in the EU.

By extracting these compounds rather than flushing them down the sewer, we could reduce energy-intensive ammonia production and cut our reliance on imported phosphorous ore.

'We require phosphorus to ensure the production of crops and, with a growing human population and almost no phosphorus reserves in Europe, we rely on imports,' said Dr Philipp Kuntke, from Dutch water research firm Wetsus, who was involved in the project, known as ValuefromUrine.

It's possible thanks to urine-separation toilets and urinals, which stop it being diluted by other wastewater streams.

It means the EU-funded project, which finishes next year, has been able to develop a three-step process that uses a bioelectrical

> 'With a growing human population and almost no phosphorus reserves in Europe, we rely on imports'
>
> *Dr Philipp Kuntke, Wetsus*

Salt

The innovation turning human waste into a powerful stink-free resource

Vast Energy Value in Human Waste

in Ghana, fertilizer pellets from fecal sludge are becoming a reality

theguardian

Power to the poop: one Colorado city is using human waste to run its vehicles

From The Editor | May 22, 2014

'Peecycle' Please: Will Urine Separation For Nutrient Recovery Take Off?

Is it feasible to separate nutrient-rich urine before it reaches the wastewater treatment plant?

Fertile Ground For Research

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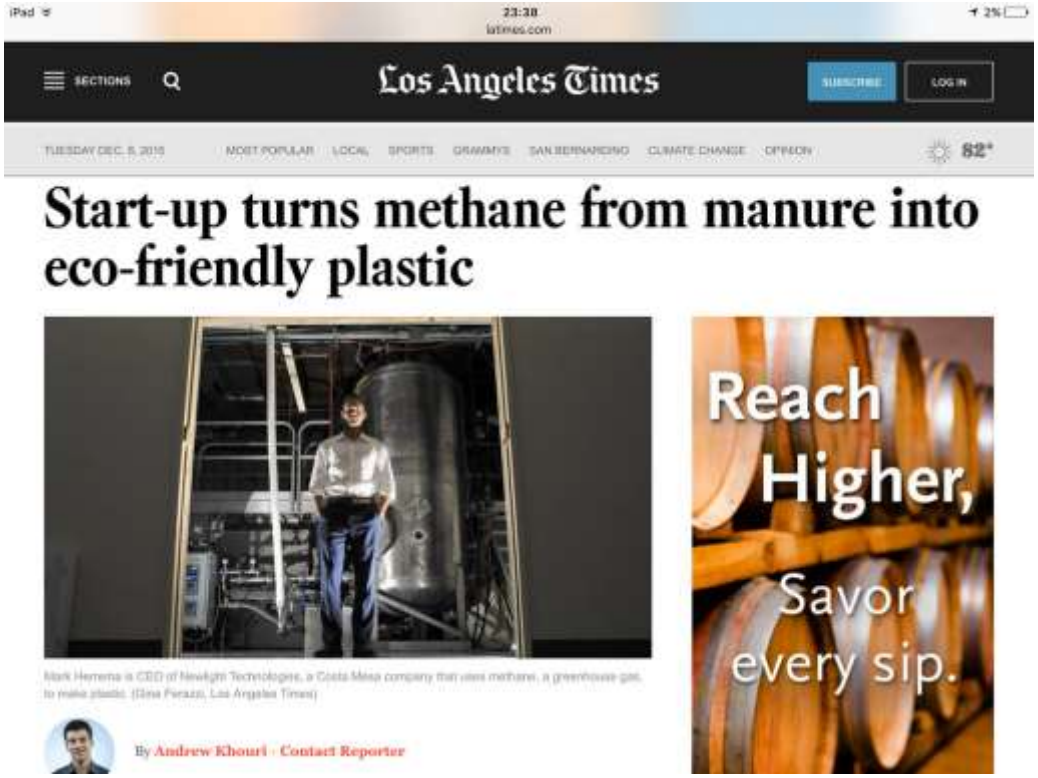
Re-thinking bio-circularity



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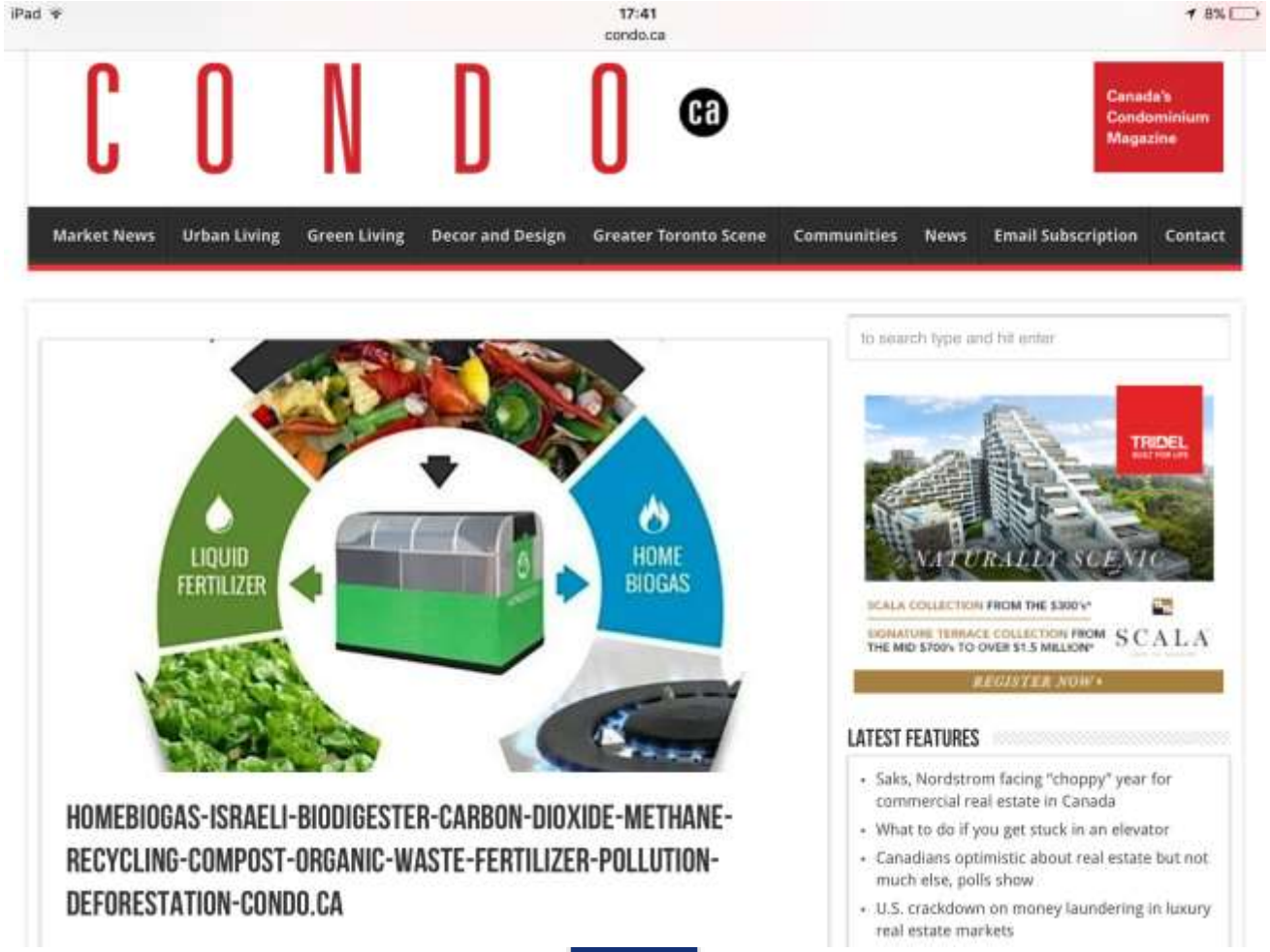
Circular home energy solutions



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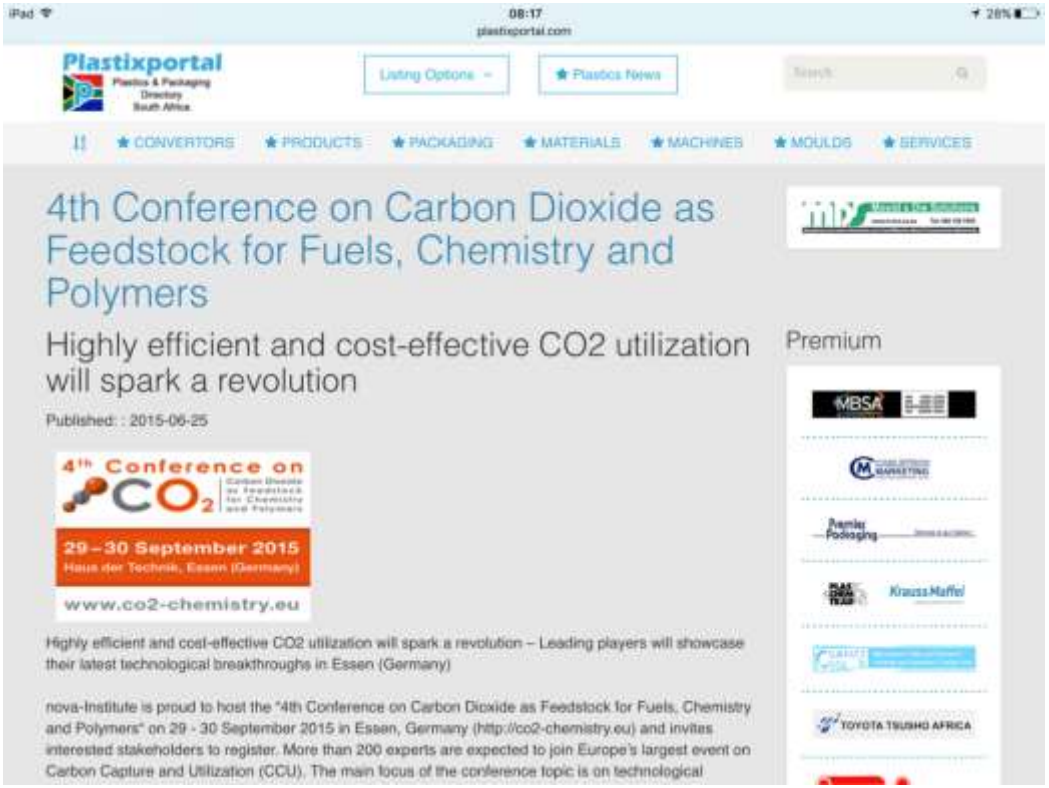
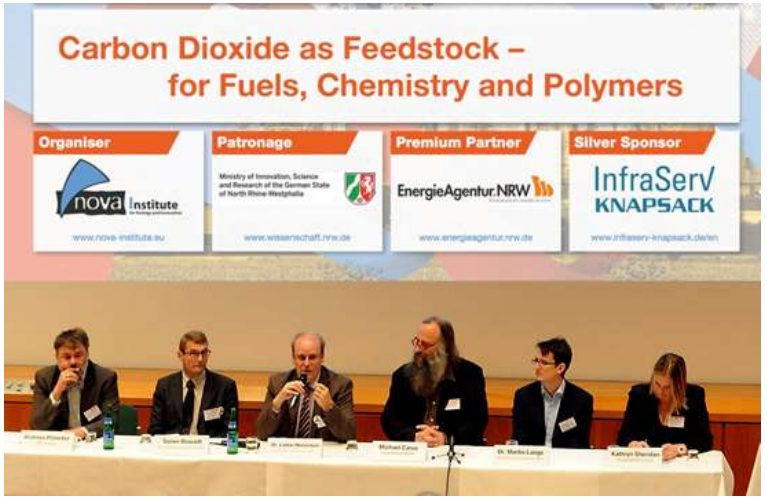
Greenhouse gases as feedstock





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Re-thinking use of primary biomass

Avoiding Bioenergy Competition for Food Crops and Land

Creating a Sustainable Food Future, Installment Nine

by Tim Searchinger and Ralph Heimlich - January 2015

213 More

Installment 9 of *Creating a Sustainable Food Future* shows that any dedicated use of land for growing bioenergy inherently comes at the cost of not using that land for growing food or animal feed, or for storing carbon.

It recommends several policy changes to phase out forms of bioenergy that use crops or that otherwise make dedicated use of land.

DOWNLOAD 741.7 KB / PDF

PUBLICATION

CONTACT:
Tim Searchinger

PROJECTS:
World Resources Report

TOPICS:
Climate, Energy, Food

TAGS:

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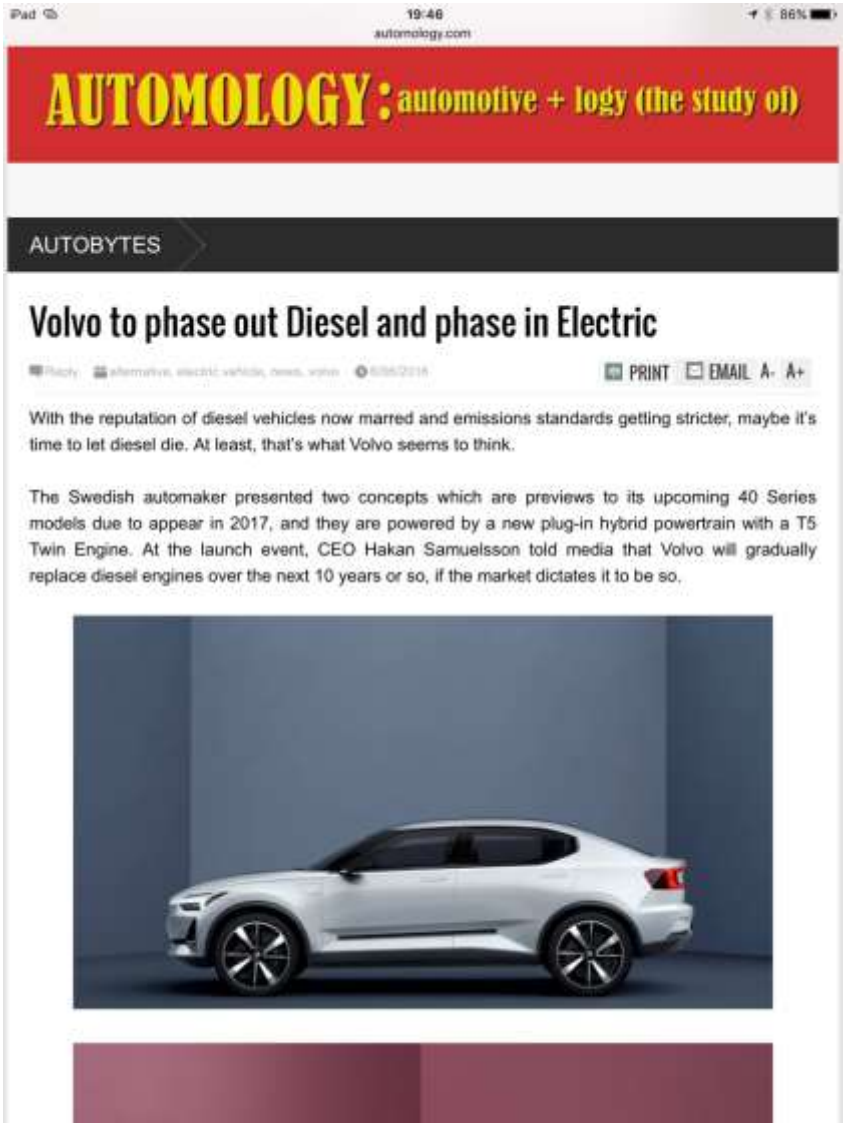
Towards end of combustion engines – noise or trend?



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Sustainability challenge of scaling up aquaculture

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Off-shore agriculture

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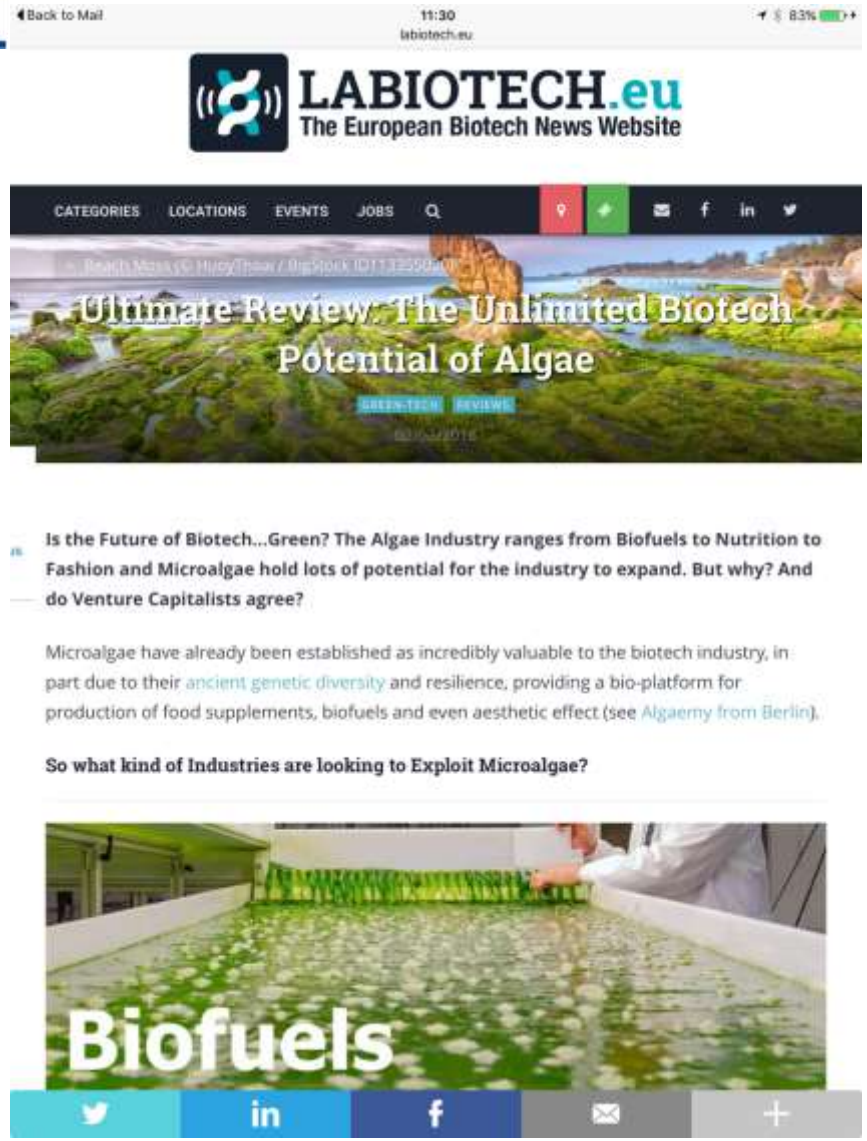
Algae economy

AQUAFUELS
ALGAE TOWARDS BIOFUELS



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Seasteading

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TECH INSIDER TECH

Floating cities could be a reality by 2020

Danielle Muoio
May 29, 2016, 3:55 PM

FACEBOOK LINKEDIN TWITTER EMAIL PRINT

Floating cities could be the future of living.

The Seasteading Institute made waves in 2008 (sorry, not sorry) when notable VC Peter Thiel decided to co-found the project. The floating cities are meant to serve as politically autonomous experiments with their own economies.

The project still seems far from completion, but the Seasteading Institute remains committed to its 2020 goal of bringing the futuristic cities to life. Here's a closer look at their plan.

View As: One Page Slides

Source: Seasteading Institute

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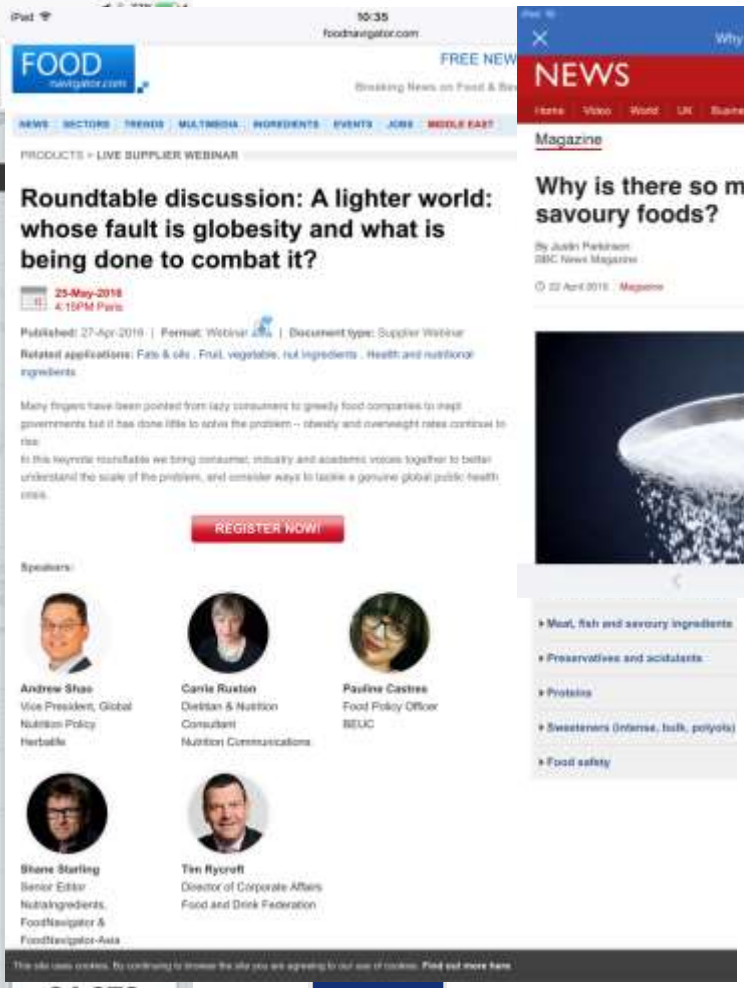
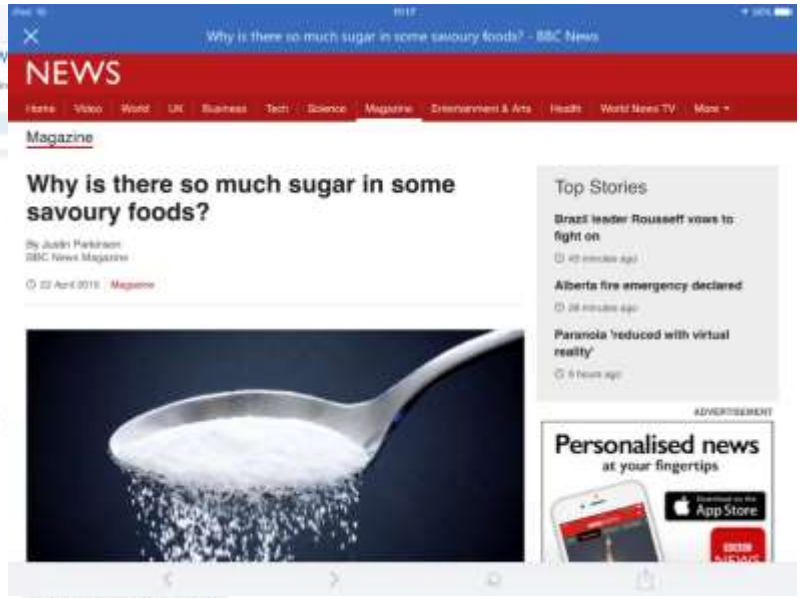
Food industry innovating itself out of junk food





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Low-impact foods

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What's Next

Why low-impact diets are the next big opportunity

Matt Loose and Aimee Watson
Wednesday, November 5, 2014 - 4:00am

Window Farm.

Matt Loose
Director
SustainAbility

Aimee Watson
Analyst
SustainAbility

What if everyone could have access to food that meets their dietary needs without preventing future generations from meeting theirs? That's the idea at the heart of sustainable nutrition. Increased attention to the environmental impacts of food types drives interest in sustainable nutrition, helping spur innovation and interest in those foods that can deliver nutritional value with a reduced environmental footprint.

The agricultural footprint — the land required to grow the

FOOD navigator-usa.com

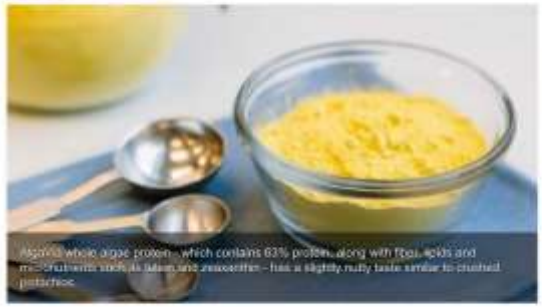
FREE NEWSLETTER

"We are the catalyst for discoveries that spark the senses and transform the everyday"

NEWS SECTORS TRENDS MULTIMEDIA INGREDIENTS EVENTS JOBS

Earth's first superfood? Solazyme's whole algae protein gains traction as formulators seek more vegan options

By Elaine Watson+



New sources of protein from edible insects to hemp are being incorporated into a growing number of products from bars to beverages. But does microalgae have what it takes to become a serious player in the so-called 'alternative proteins' market?

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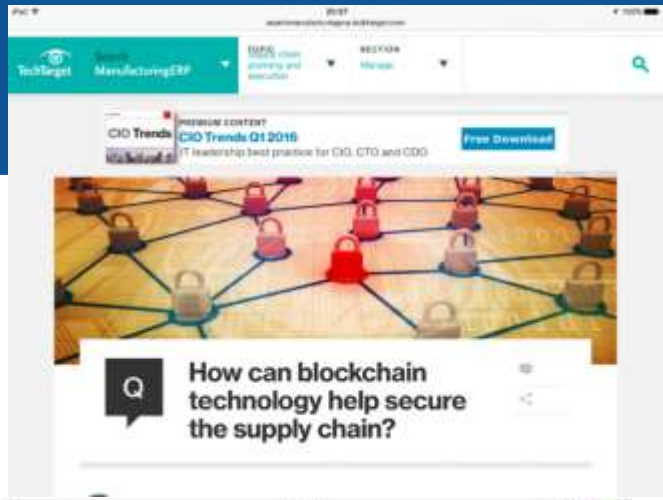
Provenance technology for supply chain traceability



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Marketing uglies and recycling food waste

Delhaize, Drôles de legumes

Brussels Beer project, Beer from recycled bread

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Re-thinking food packaging (or no-packaging)

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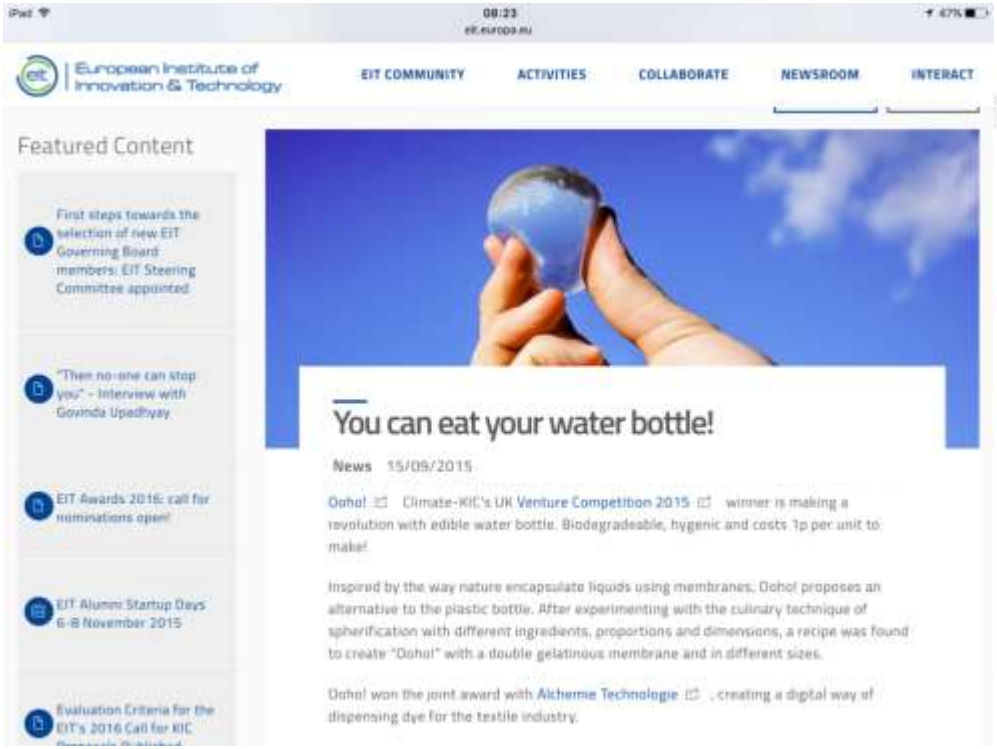

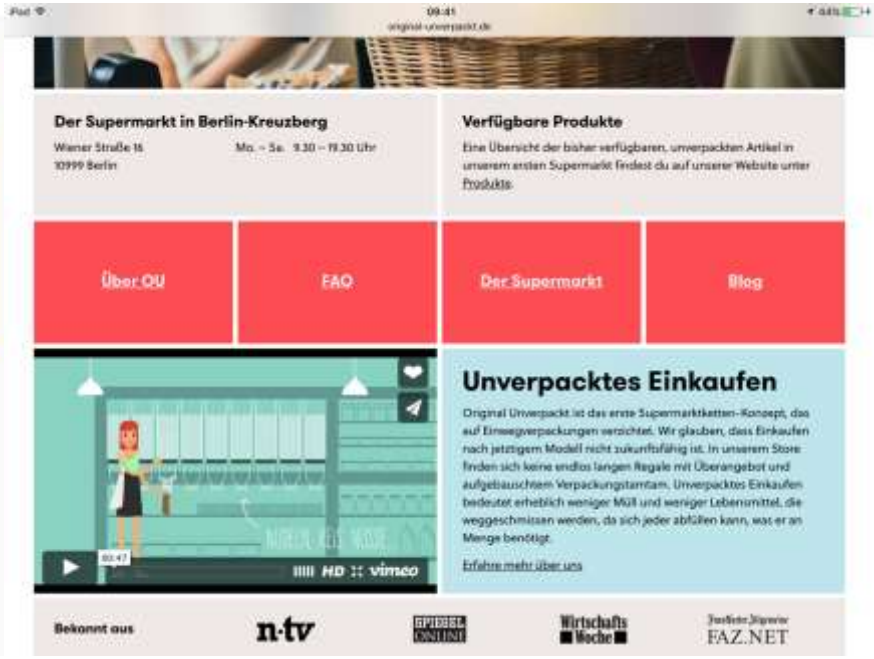

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Personalized nutrition advice

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Nutraceuticals

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Alternative sources of protein

Food Research: High Quality Plant Proteins

Published: 17 March 2015

Plant-derived proteins provide an ideal answer to the increasing demand for nutritious protein-rich food, now and into the future as population growth further increases the need for proteins. However, many plant proteins available today have lost functionality during the isolation and drying processes. Scientists around the world are trying to find ways to

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Insects


SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 5 October 2015

PUBLISHED: 8 October 2015

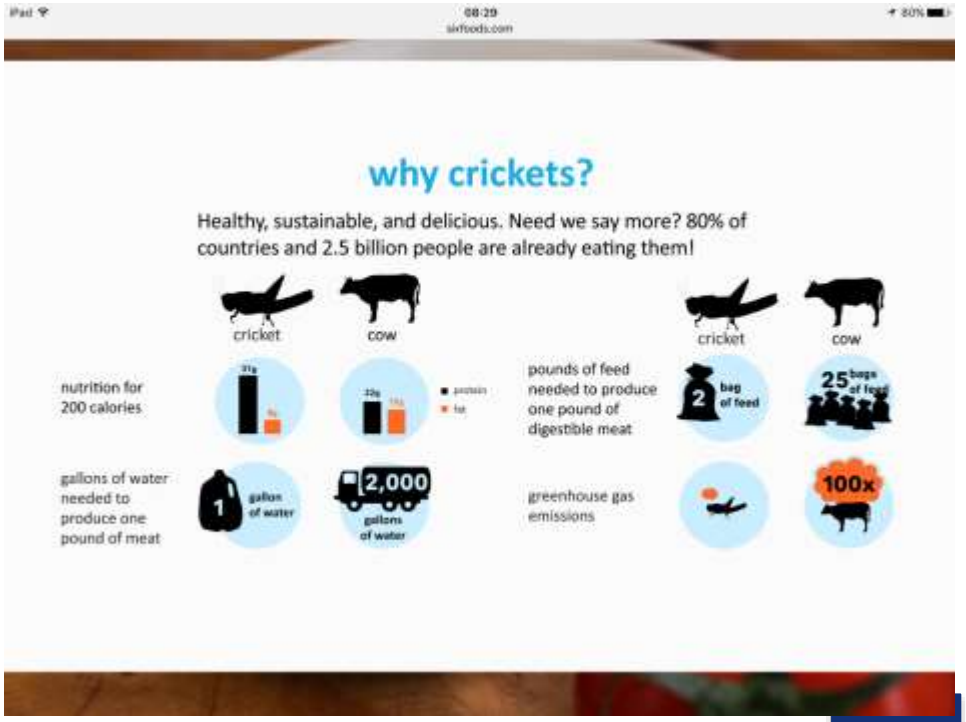
doi:10.2903/j.efsa.2015.4257

Risk profile related to production and consumption of insects as food and feed

EFSA Scientific Committee

Abstract

The present opinion has the format of a risk profile and presents potential biological and chemical hazards as well as allergenicity and environmental hazards associated with farmed insects used as food and feed taking into account of the entire chain, from farming to the final product. The opinion also addresses the occurrence of these hazards in non-processed insects, grown on different substrate




theguardian

Food & drink industry The innovators

Are Britain's foodies ready to eat insects?

Low carbon footprint and production cost are frequent arguments used by those lobbying for insects to be eaten as part of the western diet

Would you eat insects?

Shane Hickey

1,182

140

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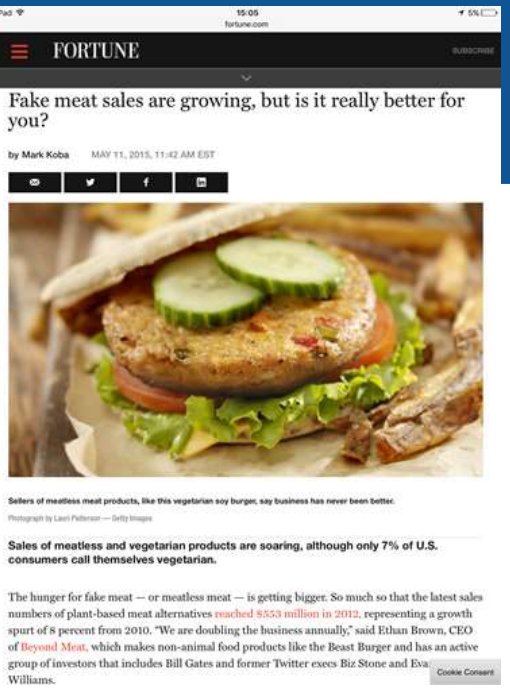
Plant-based meatsimilars


FORTUNE

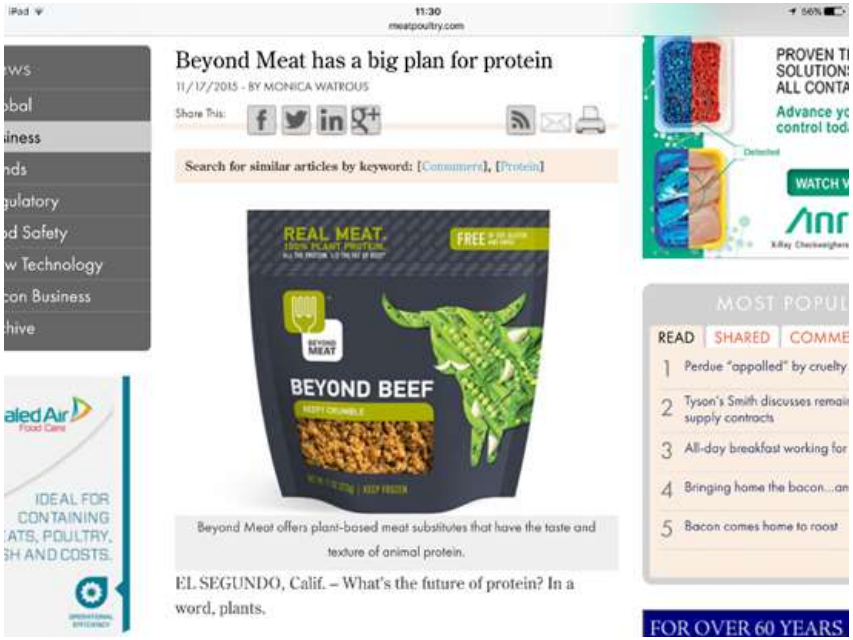
Fake meat sales are growing, but is it really better for you?

by Mark Koba MAY 11, 2015, 11:42 AM EST

Sellers of meatless meat products, like this vegetarian soy burger, say business has never been better.

Sales of meatless and vegetarian products are soaring, although only 7% of U.S. consumers call themselves vegetarian.

The hunger for fake meat — or meatless meat — is getting bigger. So much so that the latest sales numbers of plant-based meat alternatives reached $553 million in 2012, representing a growth spurt of 8 percent from 2010. "We are doubling the business annually," said Ethan Brown, CEO of Beyond Meat, which makes non-animal food products like the Beast Burger and has an active group of investors that includes Bill Gates and former Twitter exees Biz Stone and Eva Williams.


Beyond Meat has a big plan for protein

11/17/2015 - BY MONICA WATROUS

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REAL MEAT. FREE

BEYOND BEEF

Beyond Meat offers plant-based meat substitutes that have the taste and texture of animal protein.

EL SEGUNDO, Calif. – What's the future of protein? In a word, plants.

IDEAL FOR CONTAINING ATS, POULTRY, SH AND COSTS.

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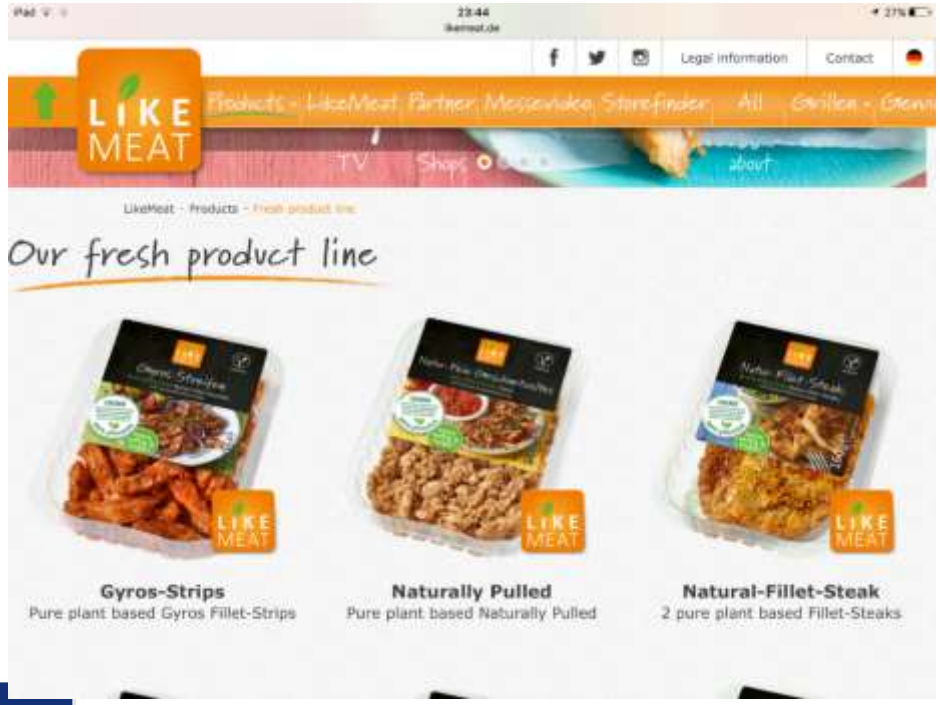
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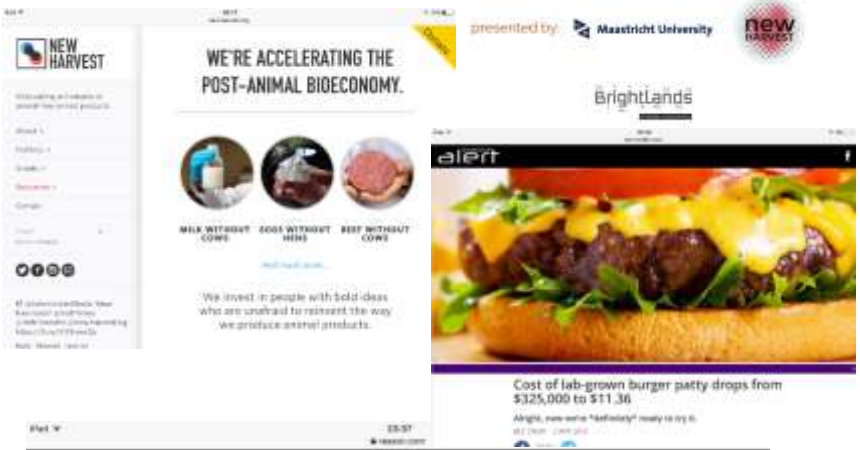
Post-animal bioeconomy



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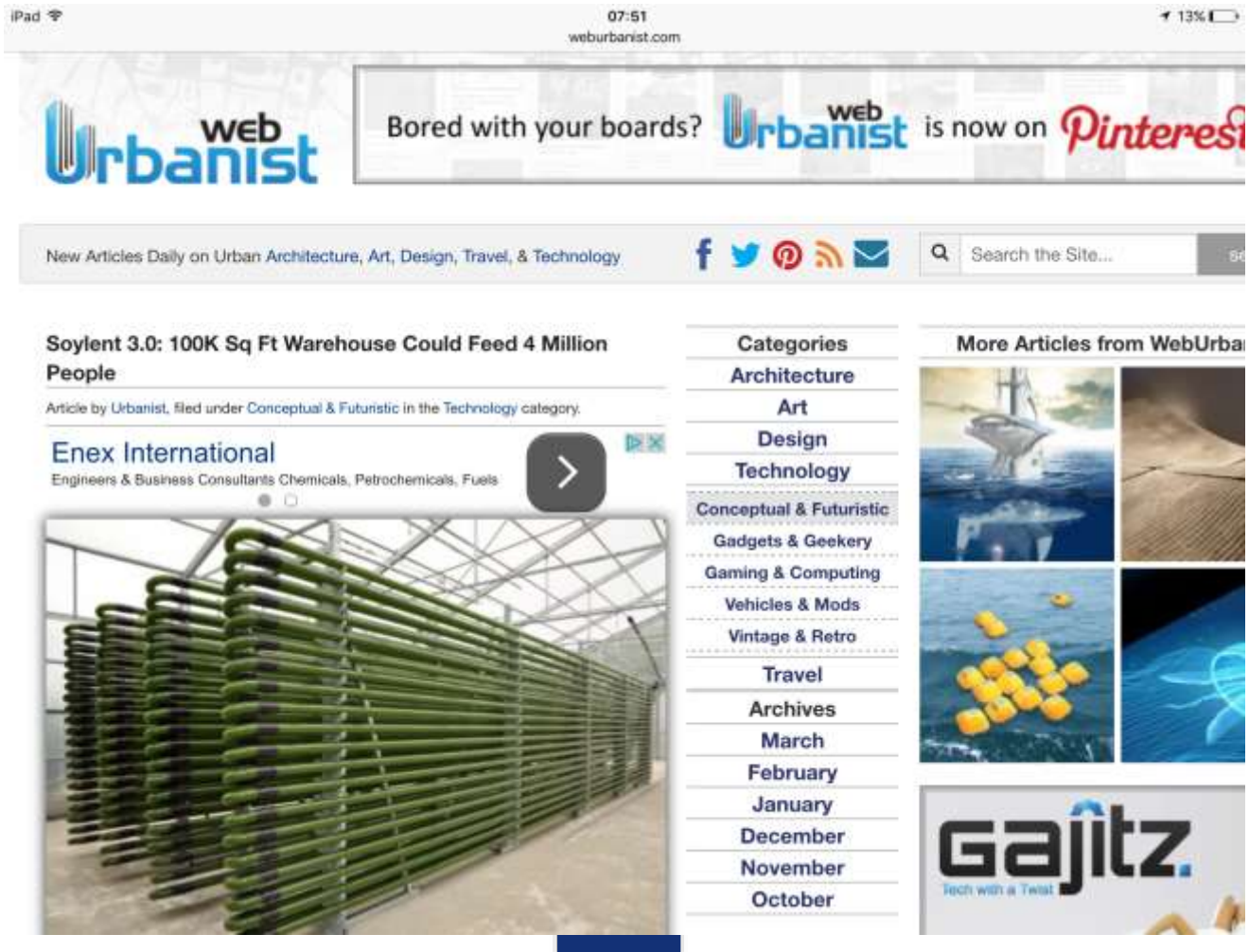
Factory-made meal replacements



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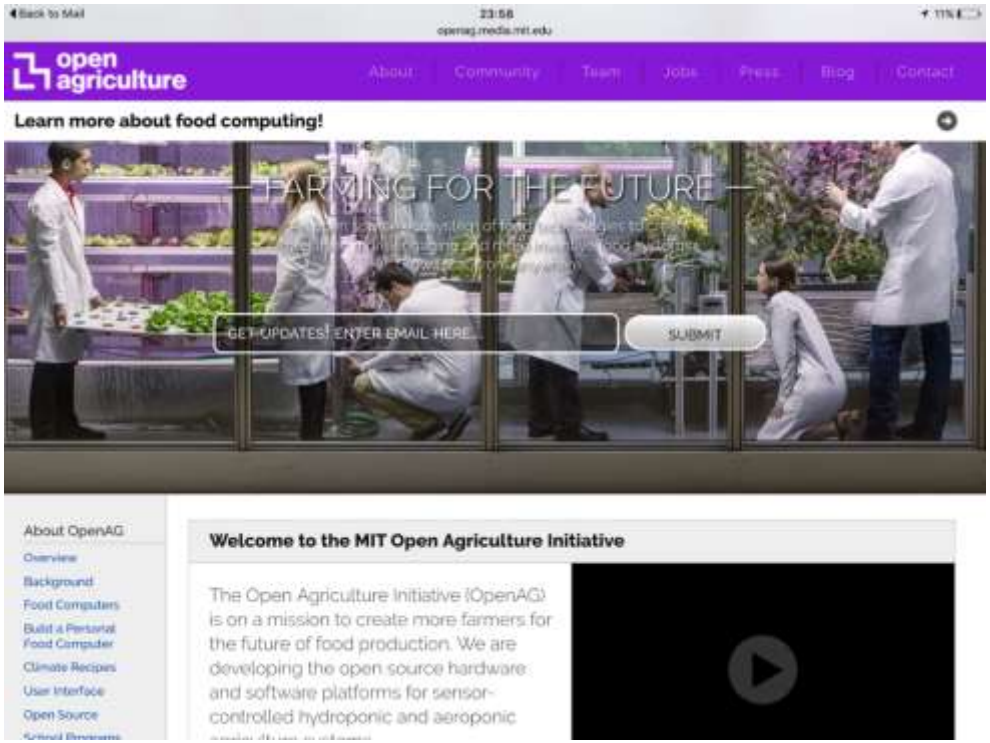
Ultralocal food



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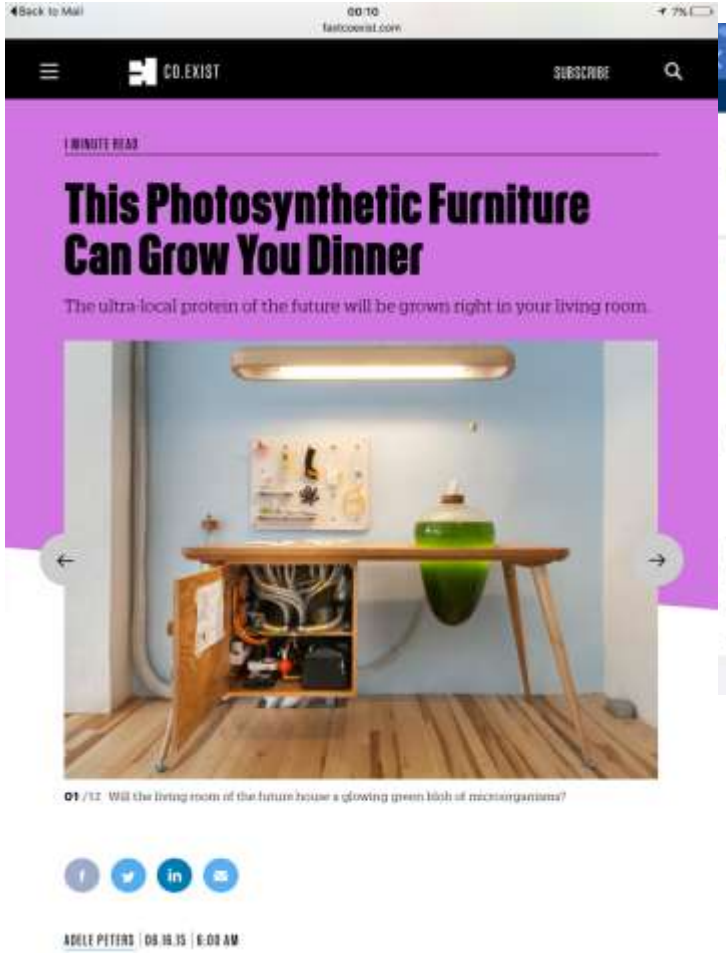
DIY Biology



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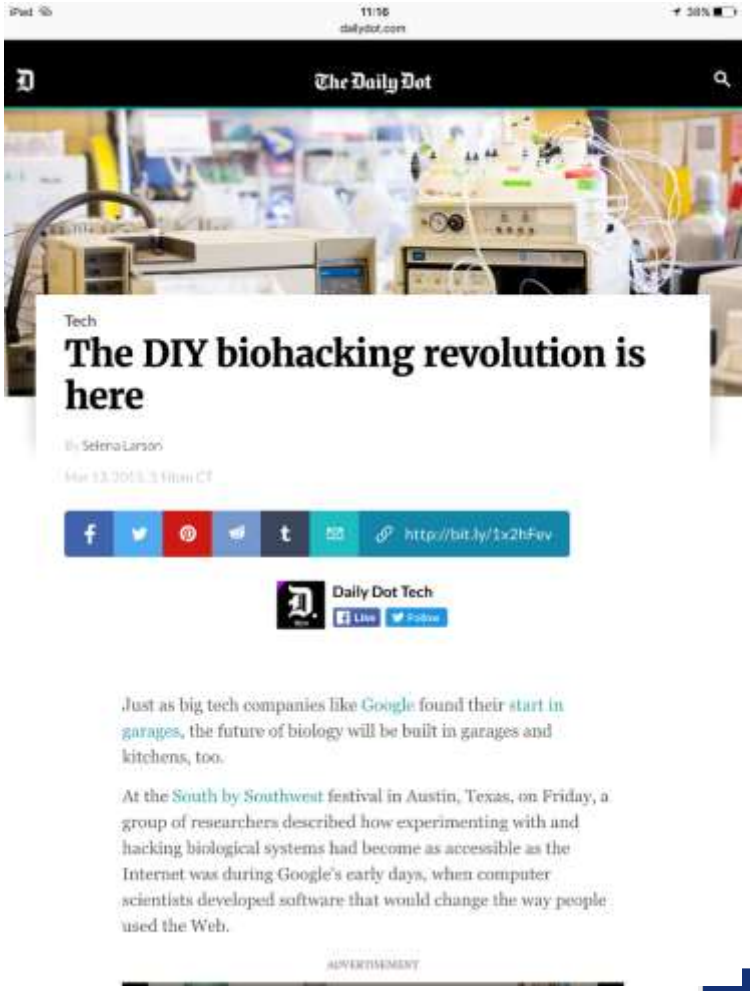
Wetware – the next frontier of garage innovation



The Daily Dot

Tech

The DIY biohacking revolution is here

By Selena Larson

http://bit.ly/1x2hFev

Daily Dot Tech

Just as big tech companies like Google found their start in garages, the future of biology will be built in garages and kitchens, too.

At the South by Southwest festival in Austin, Texas, on Friday, a group of researchers described how experimenting with and hacking biological systems had become as accessible as the Internet was during Google's early days, when computer scientists developed software that would change the way people used the Web.

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DIY biotech movement 'has potential to disrupt'

By Michael Pooler

Although the biotech industry's attitude towards DIY biotech has been "by and large dismissive", this belies the fledgling movement's disruptive potential, claims Cameron Clarke of Berkeley Bio Labs, which promotes commercial projects.

Proponents of the community of amateur synthetic biologists say this partly stems from its embrace of "open source" philosophy – the sharing of ideas, designs and coding in online forums. This enables developers to get feedback on their early-stage projects before pushing ahead with proprietary designs – an approach that has already accelerated the rise of 3D printing.

But comparisons between 3D printing and DIYbio should not go too far, scientists warn. They note that one is a simple manufacturing technique, whereas the other covers an entire field of scientific research. Their only similarity lies in a shared decentralised approach to development that is helping to drive down costs.

In addition, 3D printing is two decades ahead of much DIYbio research. Pioneers of 3D printing began work 20 years ago but the technique has only taken off in the past few years. As has the size of the market. It is now used to make everything from plastic figurines to complex parts for jet engines, and consultants at Wohlers Associates estimate that the global market for 3D printing products and services grew by one-third in

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Nitrogen on the Table – an argument for demitarianism

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Reducing meat and dairy consumption could help cut nitrogen pollution

© EU; Photo: P. Brandt

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The key findings of a United Nations Economic Commission for Europe (UNECE) special report on the influence of food choices on nitrogen emissions and the European environment were released at a press conference on Friday 25 April. They claim that halving the amount of meat and dairy eaten in Europe could slash nitrogen pollution from agriculture, improve health and boost food exports.

The report, co-authored by IES scientist A. Leip, quantifies, for the first time, how much our food choices affect pollutant nitrogen emissions, climate change and land-use across Europe. It shows how much cutting down on meat and dairy in our diets would reduce nitrogen pollution of air and water, and greenhouse gas emissions, while freeing up large areas of farmland for other purposes such as food export or bioenergy.

While nitrogen is an abundant element that occurs naturally in all organisms, it is also introduced artificially through fertilisation to replace nutrients in soil that have been removed during plant growth.

theguardian

Halving meat and dairy consumption could slash farming emissions

Adopting a 'demitarian' diet would lead to a 25-40% reduction in nitrogen emissions from agriculture in Europe, report shows

Herd of cattle with calves near Doonbeg, County Clare, West of Ireland. Photograph: Tim Graham/Getty Images

Adam Vaughan

Friday 25 April 2014 06.00 BST

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Greenhouse gas emissions from agriculture would be cut by 25-40% if Europeans cut their meat and dairy consumption by half, according to a UN report.

Scientists from the UN Economic Commission for Europe say that as well as cutting air and water pollution, adopting a "demitarian diet" - cutting meat and dairy consumption in half - would lead to a 40% cut in Europeans' intake of

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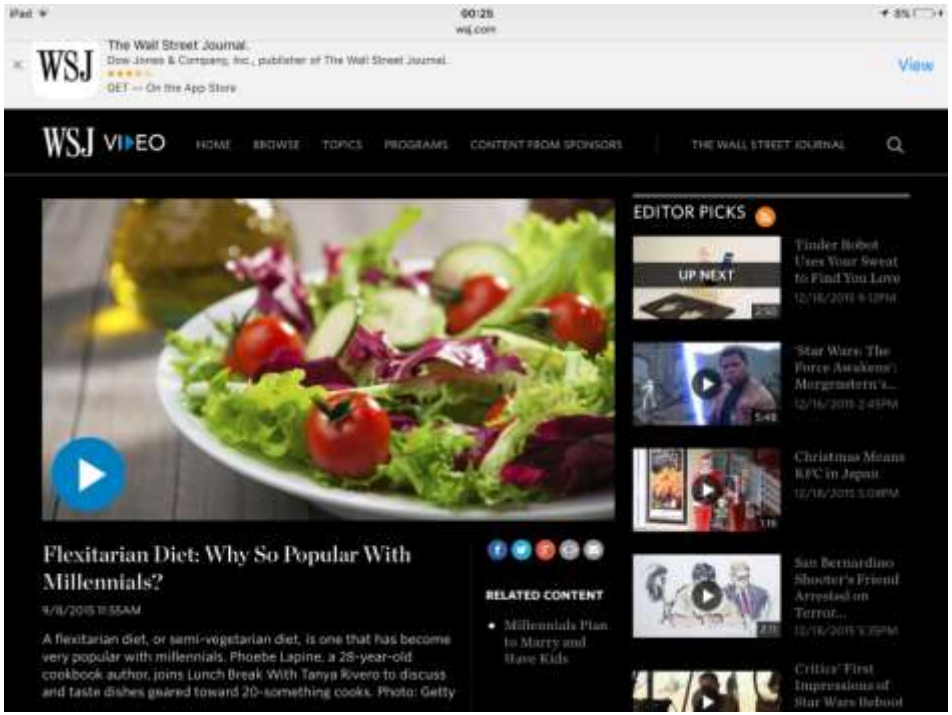
Co-leapfrogging globally towards sustainable and healthy diets



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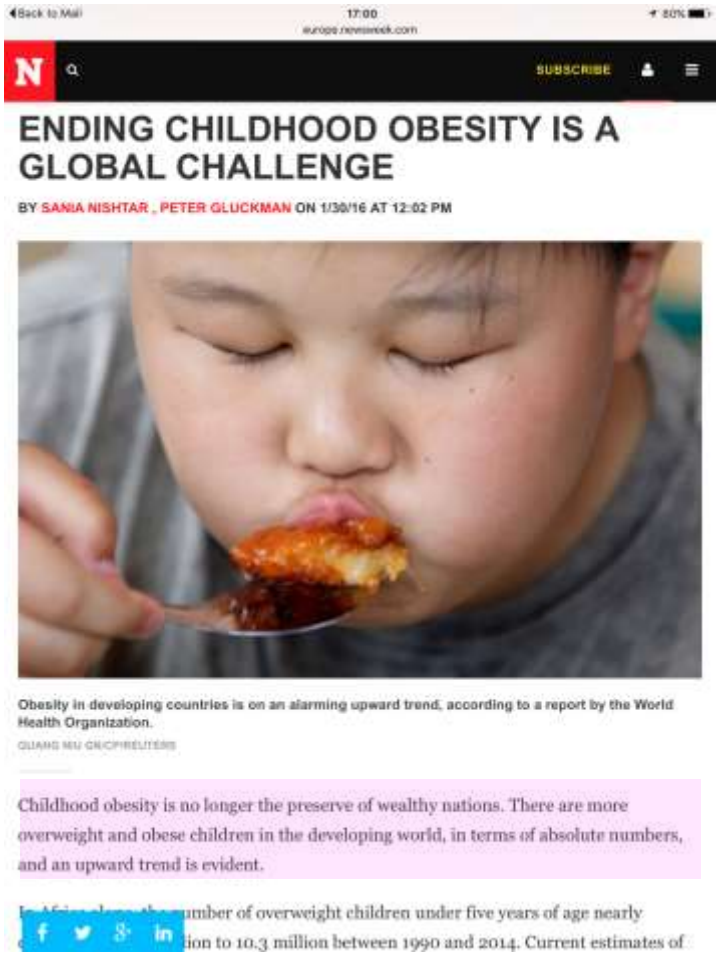
Co-leapfrogging globally beyond the convergence of diets?

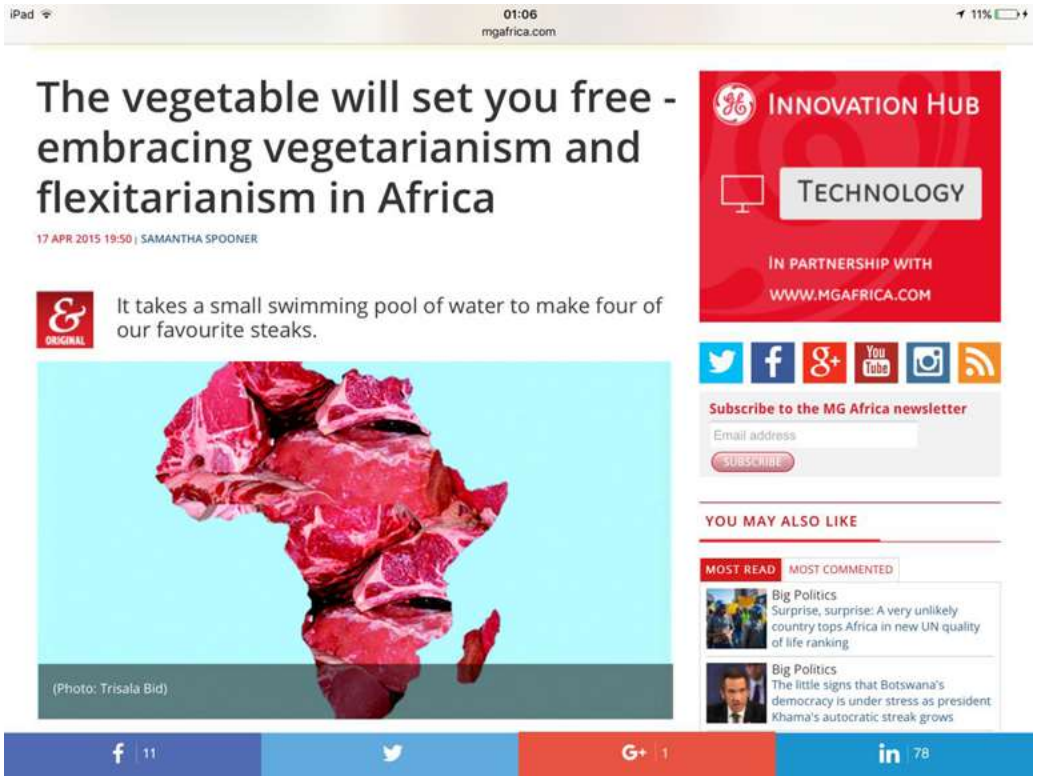


ENDING CHILDHOOD OBESITY IS A GLOBAL CHALLENGE

BY SANIA NISHTAR , PETER GLUCKMAN ON 1/30/16 AT 12:02 PM

Obesity in developing countries is on an alarming upward trend, according to a report by the World Health Organization.

Childhood obesity is no longer the preserve of wealthy nations. There are more overweight and obese children in the developing world, in terms of absolute numbers, and an upward trend is evident.



The vegetable will set you free - embracing vegetarianism and flexitarianism in Africa

17 APR 2015 19:50 | SAMANTHA SPOONER

It takes a small swimming pool of water to make four of our favourite steaks.

(Photo: Trisala Bid)

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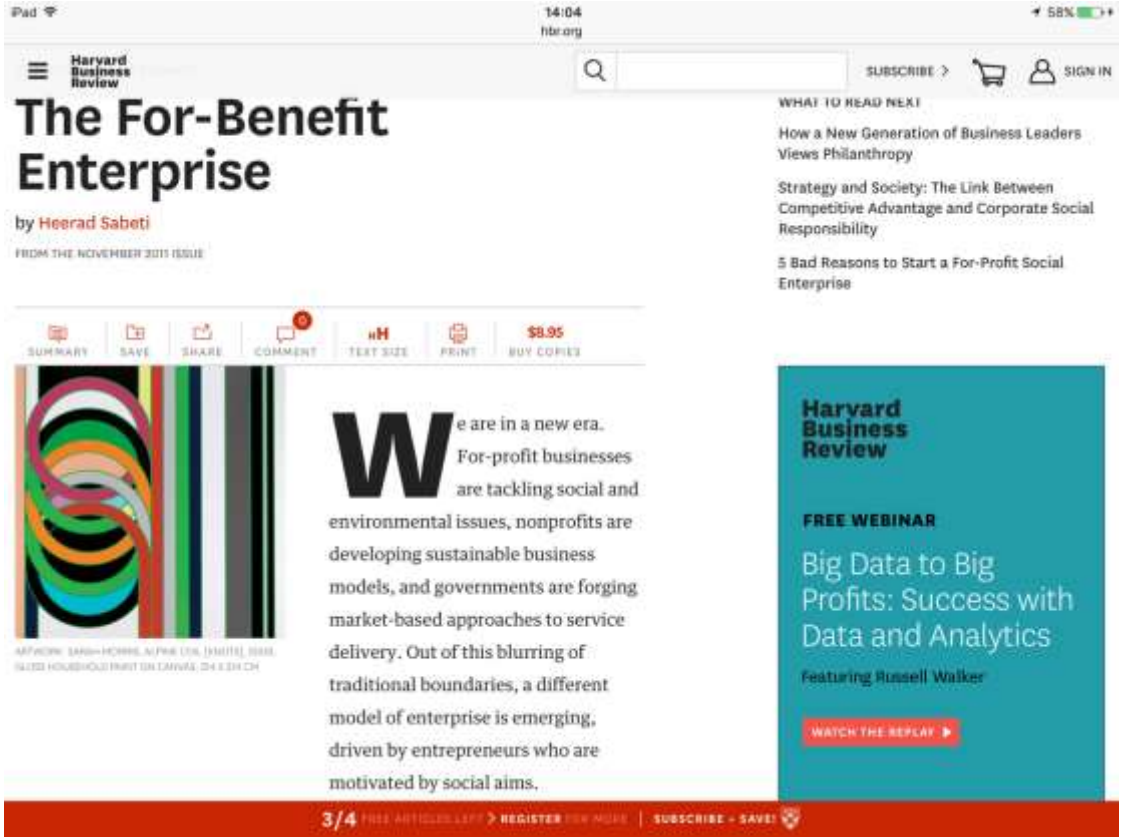
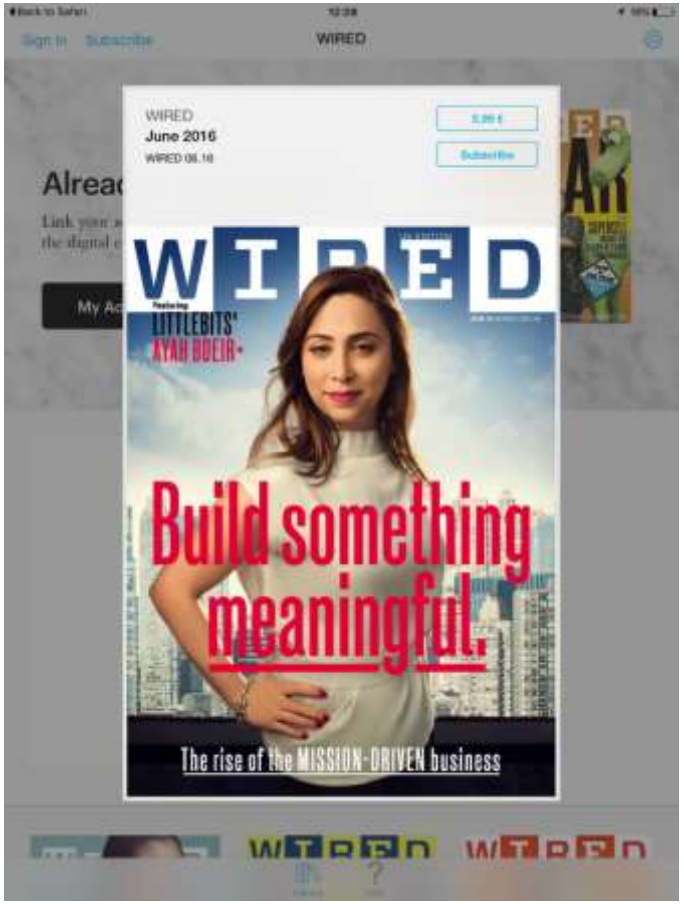
For purpose enterprises





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Circular business model for a biobased product

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Co-designing circularity

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Teaming up for Arctic protection

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McDonald's and global seafood providers in landmark move for Arctic protection

Press release - 25 May, 2016

Amsterdam, 25 May 2016 - Global brands, including McDonald's, Tesco, Iglo, Young's Seafood, Icelandic Seachill, alongside the Norwegian Fishing Vessel Owners Association, Fiskebåt, Russian fishing giant, Karat and Europe's largest processor of frozen fish, Espersen, have today said "no" to the further expansion of cod fishing into the previously-frozen Northern Barents Sea — an area twice the size of France. [1]

The ground-breaking agreement brokered by Greenpeace marks the first time the seafood industry has voluntarily imposed limitations to industrial fishing in the Arctic. This means that any fishing companies expanding into pristine Arctic waters will not be able to sell their cod to major seafood brands and retailers.

Back to Mail 09:52 greenpeace.org

1 of 3

Industry Group Agreement to Cod fishery in the northern part of North-East Atlantic (FAO area 27, ICES division IIb2 and Ib*)

We acknowledge that climate change and the melting of the ice sheet in the above areas has caused concern related to fishing activities in the vast area around Svalbard.

We acknowledge Greenpeace's role in bringing attention to the region under these changing circumstances.

We understand that the marine area around Svalbard have been identified in several scientific programs as important.

We recognise that the fisheries in the northern Barents Sea and Norwegian Sea including the marine areas around Svalbard are amongst the best regulated fisheries in the world. Most of these fisheries are independently certified by the Marine Stewardship Council (MSC) as compliant with their standard for sustainable and well-managed fisheries. Additionally there are many protected areas already established around Svalbard to safeguard ecological biodiversity.

We have agreed that from the *2016 season* the catching sector will not expand their Cod fishing activities with trawl gear into those areas where regular fishing has not taken place before. This is a precautionary measure *until* through initiatives such as those mentioned below the fishing activity in future years will be determined by improved knowledge replacing the need for this precautionary approach.

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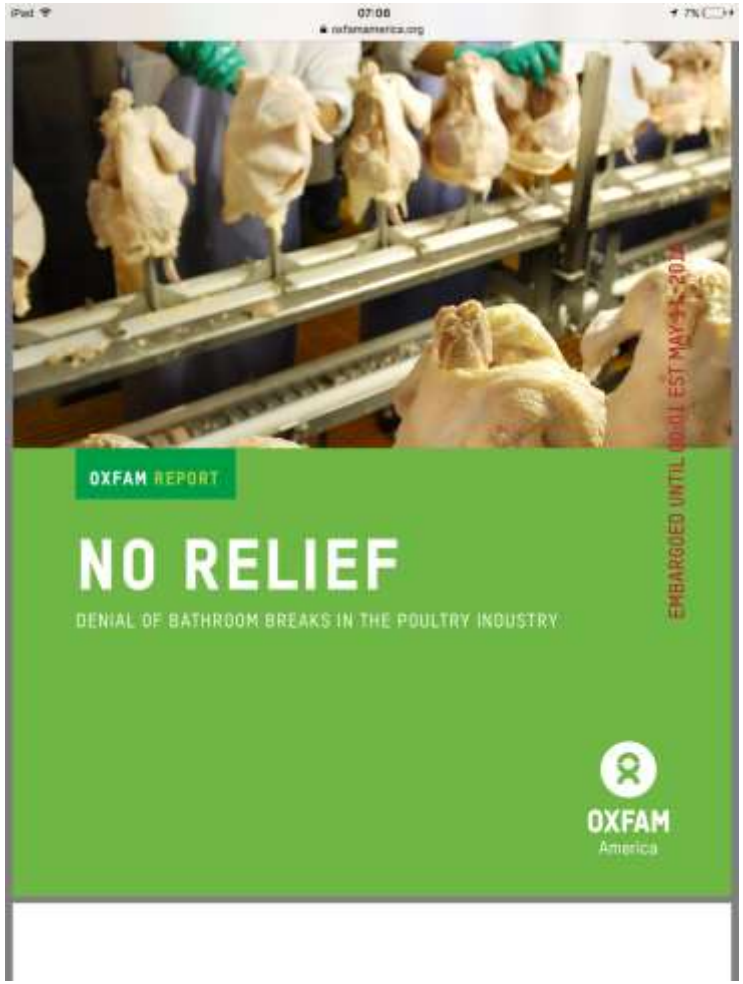
Re-thinking working conditions in food industry



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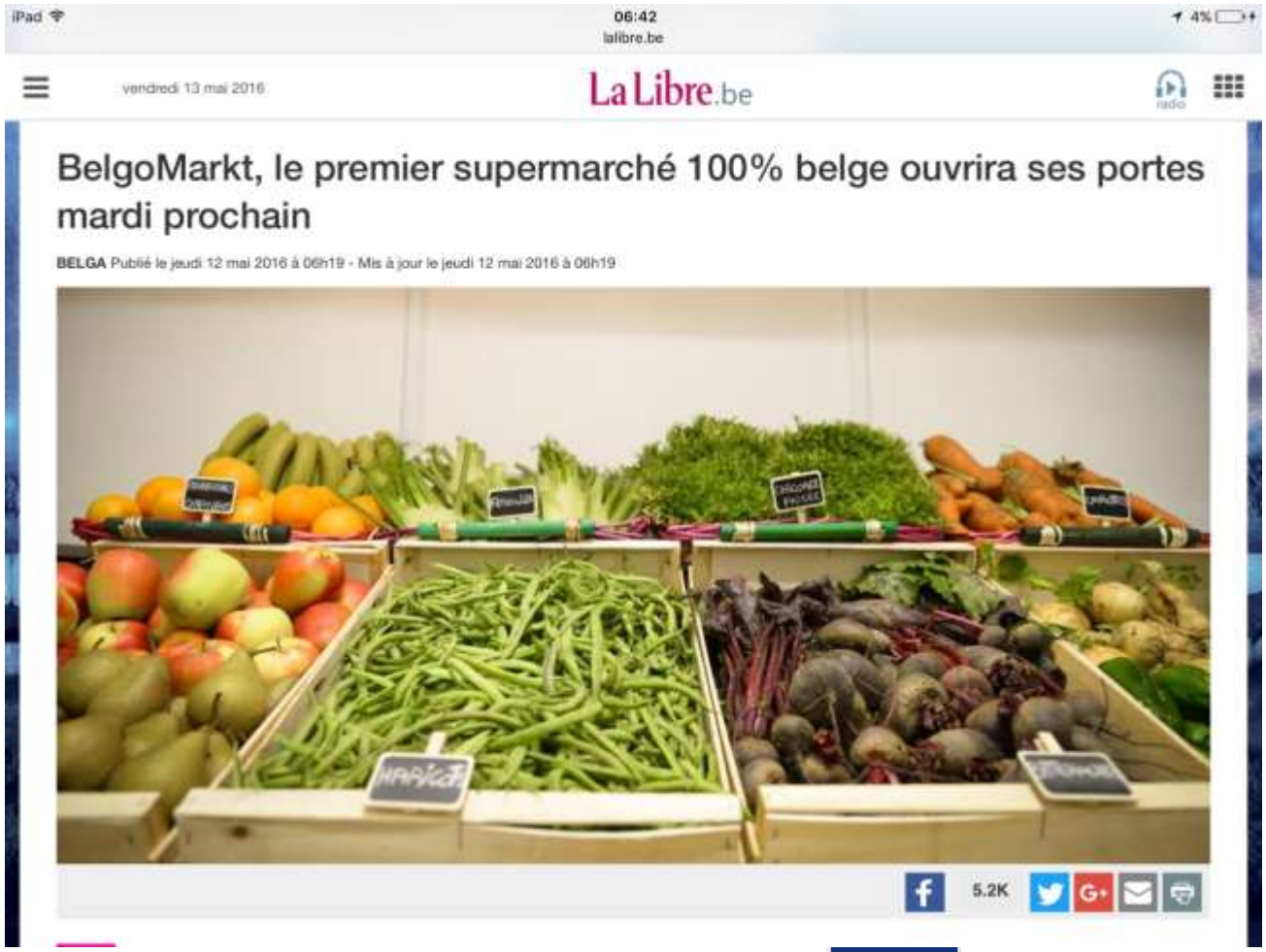
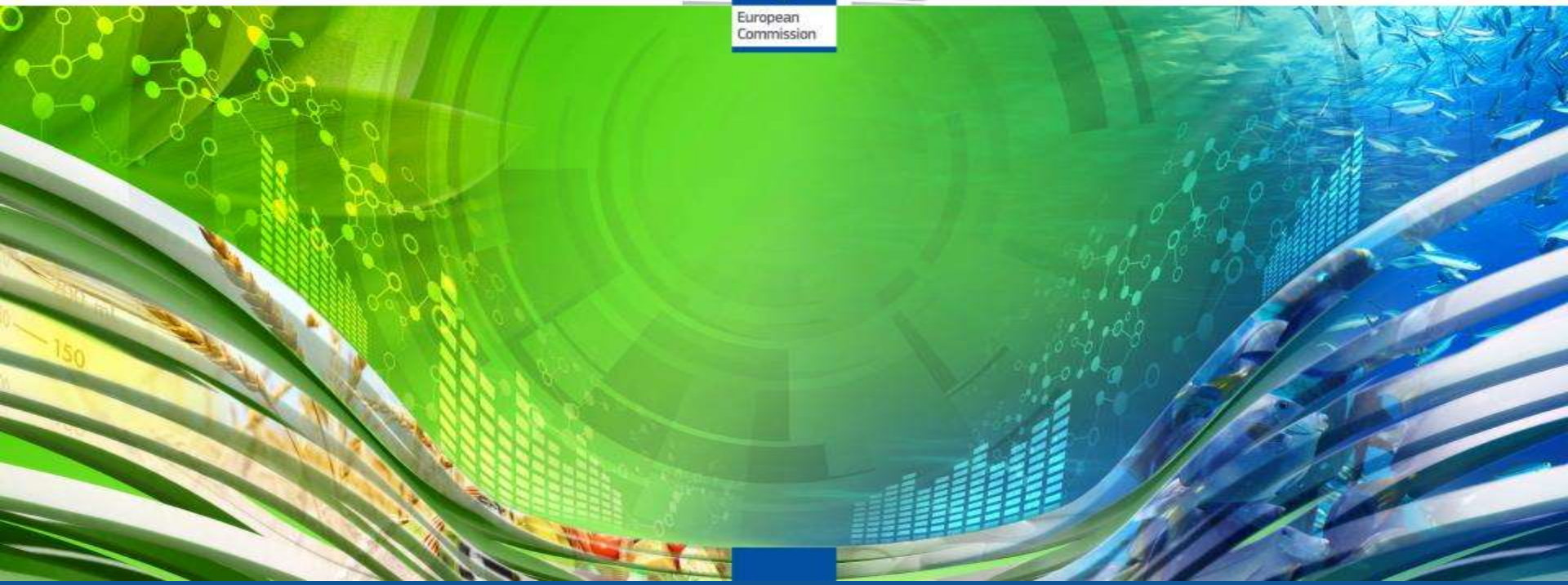
Business models for short circuits





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