

IUFRO 125th Anniversary Congress

D9. Towards a sustainable European forest based bioeconomy
Freiburg, 20.9.2017

Looking at bioeconomy from different perspectives: technological vs. social innovations approaches

Davide Pettenella, Mauro Masiero and Laura Secco

Outline

1. Introduction: a few key definitions
2. Two approaches to bioeconomy
3. Social innovations and role of science in implementing a bioeconomy policy
4. Some final considerations

1. Introduction: a few key definitions

Bioeconomy: various definitions

Bioeconomy...

- ... refers to the set of economic activities relating to the invention, development, production and use of biological products and processes. [It] is a world where **biotechnology** contributes to a significant **share of economic output** (OECD, 2009).
- ... encompasses the **production of renewable biological resources** and their conversion into **food, feed, bio-based products and bioenergy**. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries (EC, 2012)
- ... is based on the use of research and innovation in the biological sciences to create **economic activity and public benefit** (US National Bio-economy Blueprint, The White House Administration 2012)

Definitions of bioeconomy

A fuzzy word...

No consensus was found in the literature as to whether it presents:

- a **concept** (Cooper 2007, p. 27; Rose 2007, p. 6–7; Thorup Larsen 2007, p. 9; Schmid, Padel & Levidow 2012; Arancibia 2013, p. 79; McCormick & Kautto 2013, p. 2593),
- a **paradigm** (Kitchen & Marsden 2011, p. 753; Marsden 2012, p. 258),
- a **master narrative** (Levidow, Birch & Papaionnou 2012, p. 100)
- or a **discourse** (Cooper 2007, p. 37; Birch & Tyfield 2013).



(Staffas, Gustavsson, & McCormick, 2013) (Pülzl, Kleinschmit, & Arts, 2014) taken from material prepared by Carmen Rodriguez and Valentino Govigli

Different visions on bioeconomy

(Bugge *et al.*, 2016 – p.1)

- **bio-technology vision** that emphasises the importance of **bio-technology research and application** and commercialisation of bio-technology in different sectors of the economy
- **bio-resource vision** which focuses on processing and **upgrading biological raw materials**, as well as on supply and new value chains
- **bio-ecology vision** highlighting **sustainability** and ecological processes.

Vision	The bio-technology	The bio-resource	The bio-ecology
<i>Aims</i>	Economic growth, job creation	Economic growth (and environmental sustainability)	Sustainability (circular and self-sustained production model)
<i>Value creation</i>	Application and commercialisation of biotechnology	Processing biological resources, new value chains, new products (waste reduction)	Biodiversity, ecosystem services, prevention of soil degradation, high quality products with territorial identity
<i>Drivers of inn.</i>	R&D, scientists	Cross-sectoral collaboration to optimise land use	Identification of favourable organic bio-ecological practices
<i>Type of inn.</i>	Linear	Experts-network-based	Network-based
<i>Spatial focus</i>	Concentration in a few regions	Rural/peripheral regions	Place-based, rural/peripheral regions
<i>Main promoter</i>	OECD	EC	ETP (TP Organics)
<i>Target</i>	Consumers (industry, final market)	Consumers (final market)	Community
<i>Main investors</i>	Large-scale industry, TNCs	Associations, networks	Also SMEs


Dipartimento Territorio e Sistemi Agro-Forestali

UNIVERSITÀ DEGLI STUDI DI PADOVA

Currently dominant visions are the bio-technology and the bio-resource ones!

Example:

EU definition of bioeconomy comprises those **parts of the economy that use renewable biological resources** from land and sea – such as crops, forests, fish, animals and micro-organisms – **to produce food, materials and energy** (Europe's Bioeconomy Strategy, European Commission, 2012).

It "includes **agriculture, forestry, fisheries, food and pulp and paper production**, as well as parts of chemical, biotechnological and energy industries" (European Commission 2012b: 5).

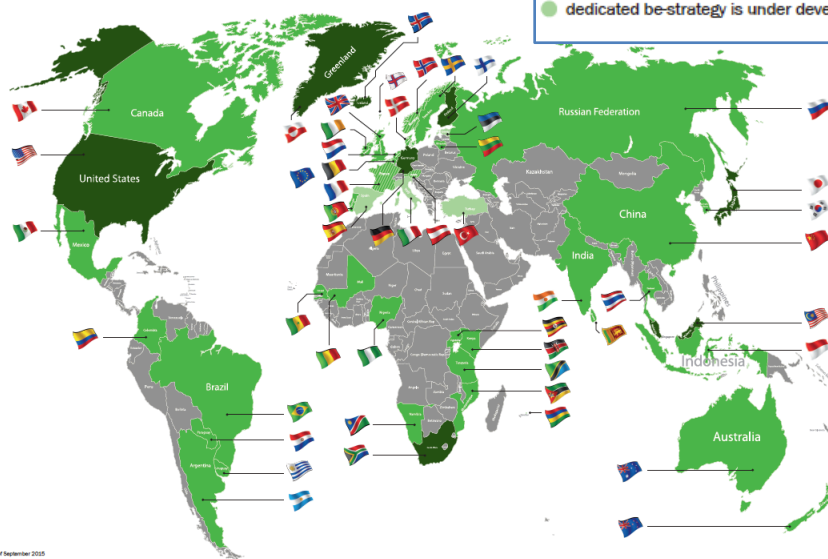
Other similar and connected terms ...

- Green economy
- Circular economy
- Circular bio-economy
- Bio-resources economy
- Bio-technology economy
- Knowledge-based bioeconomy
- ...

→ Borders/meanings not always clearly defined!

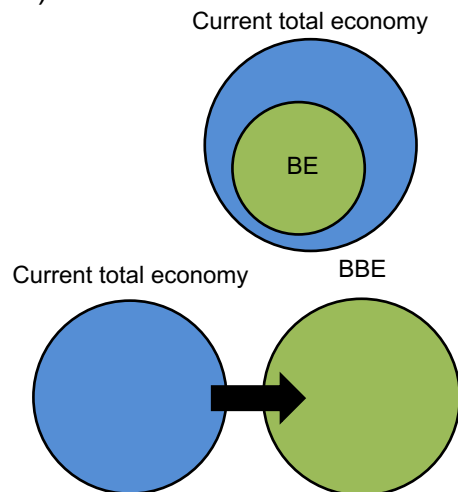
A global view: Bioeconomy Policies/Strategies around the World (www.gbs2015.com)

- dedicated bioeconomy strategy
- bioeconomy-related strategy
- be-related strategy; dedicated be-strategy is under development
- dedicated be-strategy is under development

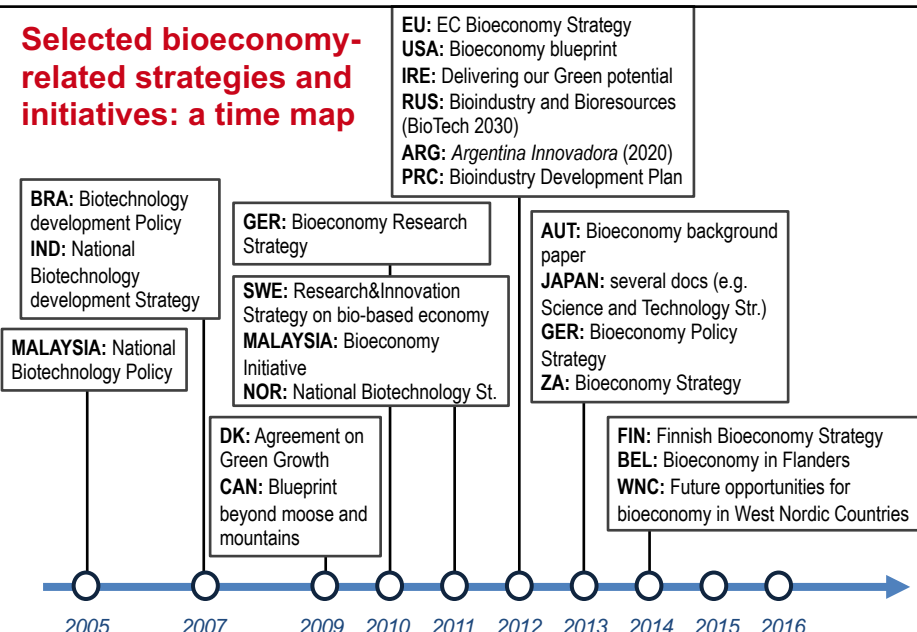


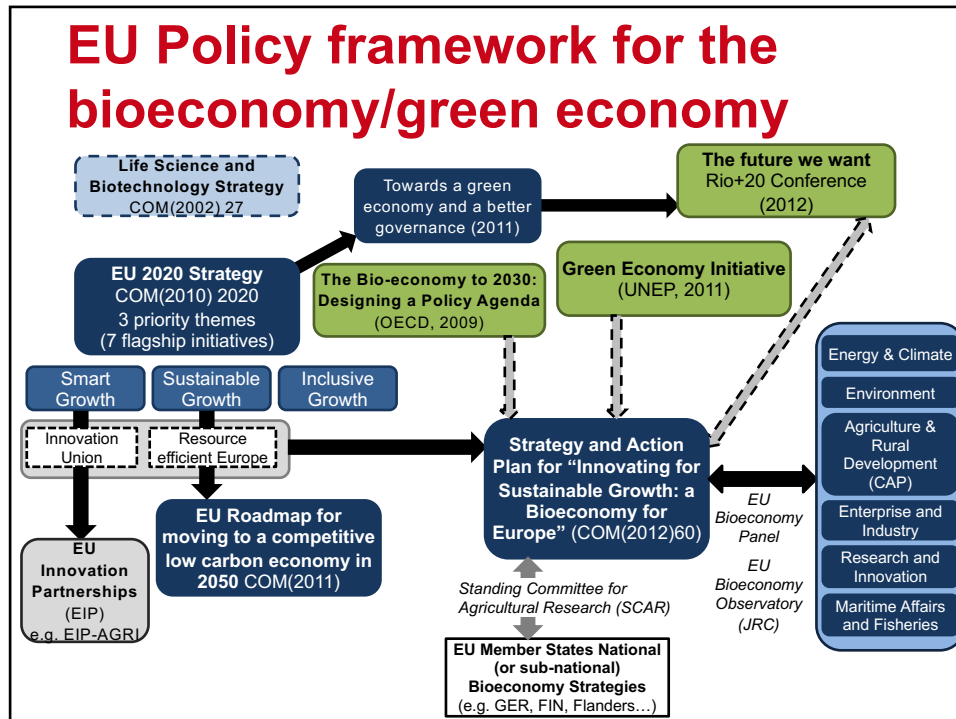
A difference that is not outspoken nor defined (Staffas *et al.*, 2013)

- **Bioeconomy (BE)** → a sub-part of the nation's total economy (often in relation to white biotech and life science)
- **Biobased economy (BBE)** → an economy where renewable resources instead of fossil ones constitute feedstocks for both energy, food, feed and materials



Selected bioeconomy-related strategies and initiatives: a time map





Five points about the bio-economy strategies and visions that demand critical attention (Staffas *et al.*, 2013)

- **Sustainability focus** → Sustainability is not heavily emphasized and it is over shadowed by economic growth
- **Measures of success** → Few measures are presented in the documents, but the importance of measures is highlighted
- **Scarcity of resources** → Only mentioned in a few of the documents
- **Consumption patterns** → Not addressed (except for the documents by Finland and Sweden)
- **Stakeholder interaction** → This is acknowledged in the documents as critical, but needs increased efforts.

2. Two approaches to bioeconomy

Approaches to bioeconomy

2 different (complementary?) approaches that may help to understand the territorial differences in bioeconomy policies:

- the traditional, **technological** approach
- the emerging, **social** approach

The traditional (dominant) approach (modified from Toman, 2012; Pettenella, 2015; Secco *et al.*, 2015)

	Technological approach
Focus on	<ul style="list-style-type: none"> • Technological innovations • Large scale investments • Value chain perspective • Sectoral development • Vertical integration
Input/output diversification	1 or more inputs Diversification in outputs
Market power	Increasing role of business owning/controlling the (new) technologies
Model regions	Northern EU (UK, Scandinavian countries)

Technological approach: example 1, UK

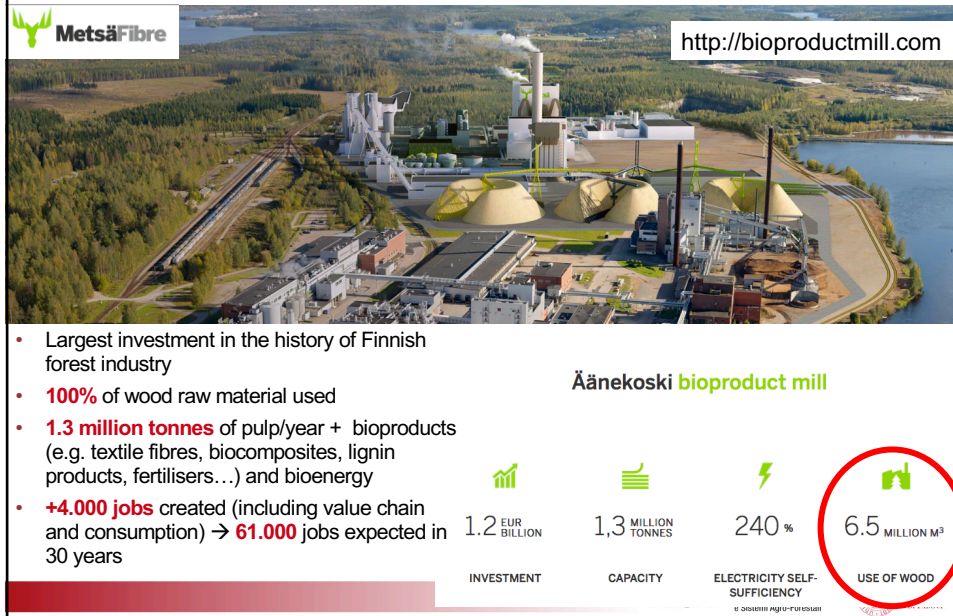


The Tees Renewable Energy Plant (Tees REP) is a proposed 299MW biomass power station that will generate electricity for the equivalent of 600,000 homes, 24 hours a day. The scheme will help to meet the UK's legally binding renewable energy target of 15% of all energy consumed by 2020, accounting for around 1% of the target. It will save about 1.2million tonnes of CO₂ per year by displacing a mix of coal and natural gas from UK generation.

- From 2019
- Area: 14 ha
- Expected consumption of wood biomass: **1.2 M tonnes/year → 299 MW**
- Fuelled by wood **pellets** and **chips, imported by ship primarily from the United States.**

<http://teesside.mgtpower.com/>

Technological approach: example 2, Finland



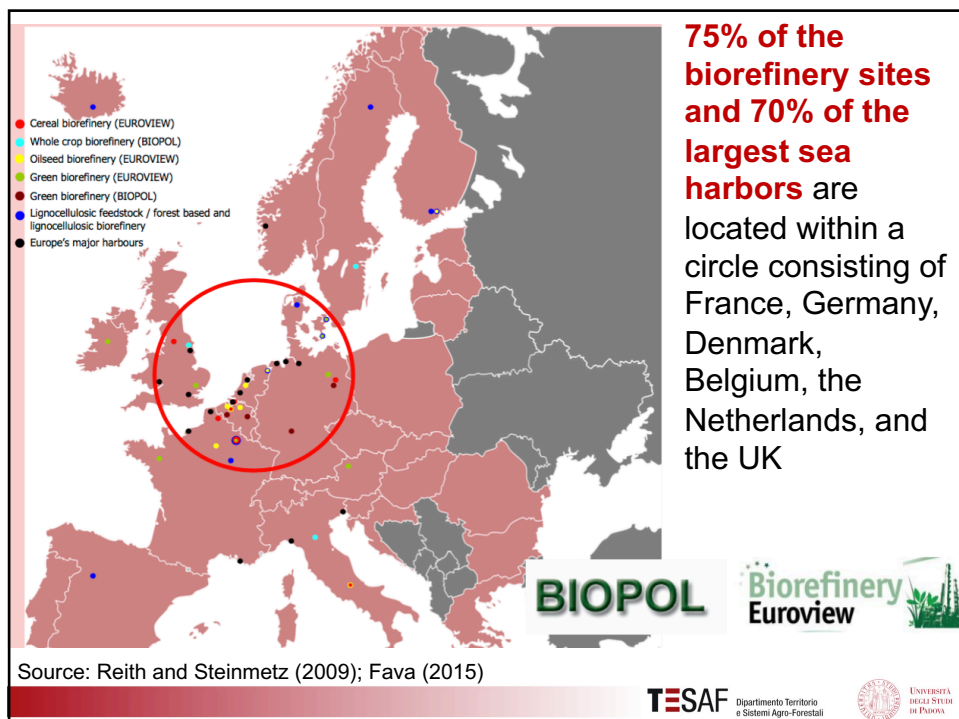
A strong emphasis on biorefinery within the bioeconomy framework

- A **key factor** in the transition to a bio-based economy will be the **development of biorefinery systems** (Scariat *et al.*, 2015)
- Biotechnology and the biorefinery concept are **essential components** of the bioeconomy (McCormick and Kautto, 2013)
- The bioeconomy is integrating traditional agricultural, forest and marine biomass feedstock production systems with a **range of biorefinery options and applications** (SCAR, 2014)
- Biorefineries are increasingly **at the core** of the bioeconomy vision at the EU level and worldwide (World Bioeconomy Summit, 2015)

2 large biorefinery models

(Europabio, 2011, European Commission, 2012, Ceapraz *et al.*, 2016)

- A. Port-biorefinery** → **strongly connected to global flows of raw materials**, key-logistic location (inside/nearby harbors, along channels...), high specialization, threshold effects, and economies of scale
- B. Territorial biorefinery** → **strongly connected to local/surrounding territory** and (in general terms) dependent on a more diverse and more thorough valuation of various biomasses



And... what about the rest of EU?

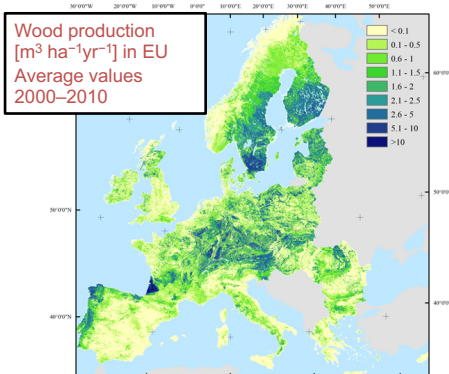
Does this approach really support rural development and general economic growth?



Is it the most appropriate approach for the Southern Europe context?



Source: FAO, 2013



Source: Verkerk *et al.*, 2015

Mediterranean forests in a nutshell

- Highly **fragmented** forestland **estates** (many small private forests)
- Large majority of **SMEs**
- **Difficult forest management conditions** (geomorphological constraints/limits)
- Broad **range of forests/environments**
- **High exposition to risks** (fires, climate change, floods, soil erosion)
- **Production diversification** (constellation of niche markets, NWFP)
- **Limited investments** in technical assistance, innovation and R&D
- **Low financial profitability**, provision of high value **ecosystem services** (water, soil protection, cultural services...)

Average values of the ecosystem services

Average economic **value for biodiversity and recreation services** provided by European forests (benefit transfer approach; TEEB, 2009)

	Mediterranean EU	Northern and Central-Northern EU	Scandinavian EU
	Latitude 45-65	Latitude 65-71	Latitude 35-45
Range US\$ (2000)	356-615	123-182	123-255
Average \$ (2000)	485.5	152.5	189.0
€ (2000)	379,3	119,1	147.7
€ (2008)	467.1	146.7	181.9

Source: TEEB Report; CLIBIO project cit. in ten Brink *et al.* (2009); figures ha/year

The social and political components of the bioeconomy

(Biobased economy) “will also involve achieving smooth and just adjustment in labor markets by ensuring that workers have the means to find opportunity in change. **More generally, the success of a green growth strategy will rest on addressing political obstacles and distributional concerns about the costs of change.**” (OECD 2011, page 20)

“The key aim for a transition to a green economy is to eliminate the trade-offs between economic growth and investment and gains in environmental quality and social inclusiveness... the environmental and social goals of a green economy can also generate increases in income, growth, and enhanced well-being” (UNEP 2011, page 16)

The social approach

(modified from Toman, 2012; Pettenella, 2015; Secco *et al.*, 2015)

	Technological approach	Social approach
Focus on	<ul style="list-style-type: none"> • Technological innovations • Large scale investments • Value chain perspective • Sectoral development • Vertical integration 	<ul style="list-style-type: none"> • Social innovations • Small scale • Networks • Cross-sectoral development • Horizontal integration (= forests and agriculture as the green infrastructures for rural development)
Input/output diversification	1 or more inputs Diversification in outputs	Diversification in the use of inputs High added value products & services
Market power	Increasing role of business owning/controlling the (new) technologies	Role of networks, groups, associations, public-private partnerships...
Model regions	Northern EU (UK, Scandinavian countries)	Southern EU (Mediterranean region)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali



Social Innovation in Mediterranean forests

Example 1: Produtos silvestres do Alentejo (Portugal)



- 7 municipalities
- 16 associations and cooperatives
- 5 research institutes
- 2 national business associations
- 59 individual private promoters

International cooperation/exchange of best practices

...but local knowledge, specialties and typical products, niche markets

Source: www.alentejosilvestre.com

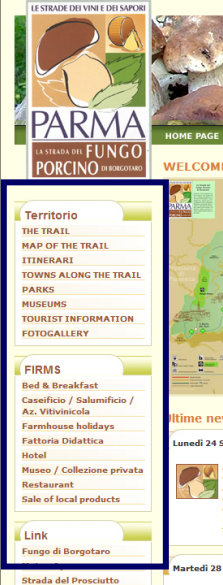


TESAF Dipartimento Territorio e Sistemi Agro-Forestali



Social Innovation in Mediterranean forests


Example 2: Borgotaro network (territorial marketing)



Enterprises: 62

- 15 Agro-tourisms/ Farm businesses
- 12 Hotels/Guest quarters
- 8 B&B/Inns/Hostels
- 9 Cheese, sausage and wine growing and producing factories
- 2 Didactic farms
- 3 Museums/Private collections
- 30 Restaurants/Porterhouses
- 26 Typical products sellers

Imago product:
Boletus mushroom



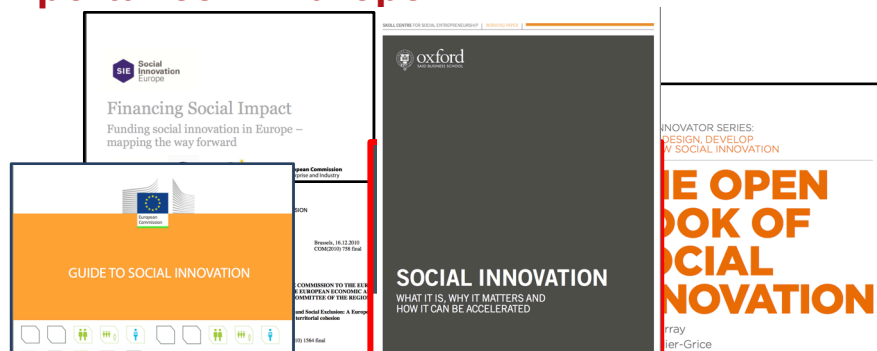
Different (complementary?) strategies

(modified from Toman, 2012; Pettenella, 2015; Secco *et al.*, 2015)

	Technological approach	Social innovation approach
<i>Focus on</i>	Adaptive strategy ("Old wine in new bottles") → conventional wisdom of innovation generation	"Strategies for synergies"
<i>Input/output diversification</i>	Focus on forests, agriculture, fishery as	It not only considers the protection of natural capital, "but it stresses as well the importance of addressing equity
<i>Market power</i>	raw materials providers with biotechnology being	and social inclusion challenges in moving toward a green economy"
<i>Model regions</i>	the engine of the growth	

3. Social innovation and role of science in implementing bioeconomy policy

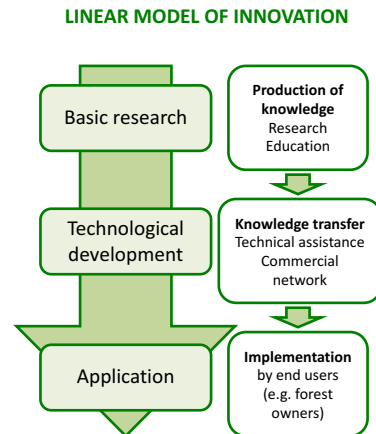
Social innovation as an issue of growing importance in Europe



EU2020 Strategy (smart, sustainable and inclusive) by mobilizing people's creativity → SI as an effective way to develop novel solutions behind technological innovations, to make better use of scarce resources, and to promote an innovative and learning society (BEPA, 2011: 7)

What is the role of scientists and stakeholders in the 2 approaches?

In the **technological innovation approach**, expert knowledge and investment on traditional R&D science-based activities are core components of innovation, while **stakeholders** are likely to be involved as for **consultation needs** (e.g. to increase the acceptance of the establishment of the large investment/industrial plant by the community).



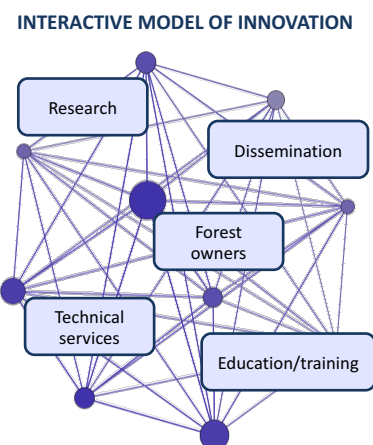
(Source: Illuminati, 2014 – mod.)

TESAF Dipartimento Territorio e Sistemi Agro-Forestali



What is the role of scientists and stakeholders in the 2 approaches?

In the emerging **social innovation approach**, the role of **public-private partnerships, co-management contractual arrangements, civic society-led initiatives** seem able to provide novel solutions to emerging social needs and societal challenges of forest policy (Secco and Pettenella, 2016).



(Source: Illuminati, 2014 – mod.)



see H2020 project SIMRA:
<http://www.simra-h2020.eu/>

TESAF Dipartimento Territorio e Sistemi Agro-Forestali

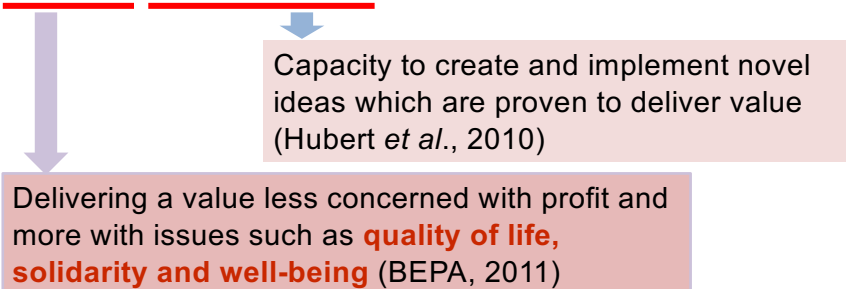


Social innovation: definitions

"[...] lack of a universally accepted definition of social innovation and ambiguity surrounding the term"

(de Bruin 2012: 373)

Social innovation



Social innovation: definitions

- Development and implementation of **new ideas (products, services and models) to meet social needs** and create new social relationships or collaborations (EC, 2013)
- Innovation focusing on social return and transformation → **improvement of human well-being** = improvement of either the quality or the quantity of life (Pol and Ville, 2009); meeting social needs (Caulier-Grice *et al.* 2012; Mulgan 2007; Murray *et al.* 2010); solving a social problem (Phills *et al.*, 2008)
- Social innovation is not the tangible improvement itself rather new intended forms of collaborative action that enables the improvement in the first place → building **coalitions/networks** that leads to some tangible improvement for the actors involved or even beyond (Neumier, 2012)

Some knowledge gaps

- **Empirical evidences of the cause-effect links** between social innovation and economic performance in forestry.
- **Short and long-terms effects of new institutional and policy frameworks/policy reforms** on SI implementation in Mediterranean forests (e.g. EU RDP 2014-2020 art. 35 Cooperation)
- Development of new/refinement of sets of **methods to measure social dimensions in innovative forestry** (e.g. Social Network Analysis)
- Role of networks and Social Capital in **increasing the provision of ecosystem services**
- **Comparison studies** of the effects of different strategies/policies for bioeconomy (e.g. Italy-Australia?)

4. Some final considerations

Conclusions

Bioeconomy is a multifaceted, complex concept that can be understood in multiple ways and shall be addressed with an **appropriate and tailored mix** of:

- Policies
- Tools (taxes, incentives, standards, ...)
- Players/actors
- R&D funding resources

Conclusions

The real innovative aspects of bioeconomy are related to **equity, social inclusiveness, promotion of local knowledge and employment creation**, i.e. to **social innovation**, more than to problems connected to technology innovation (that can be market driven, without much public support).

Conclusions

... the governance of the (bio)economy should stress the needs for **investing adequate resources in research in social innovation**, with a large stakeholders' participation

HOW IS RESEARCH GOING ON?

WE FIND LOTS OF THINGS, EXCEPT MONEY

