



IEA Bioenergy
Technology Collaboration Programme

Task 42
Biorefining in a circular economy



Country Report Italy

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Technology Collaboration Programme

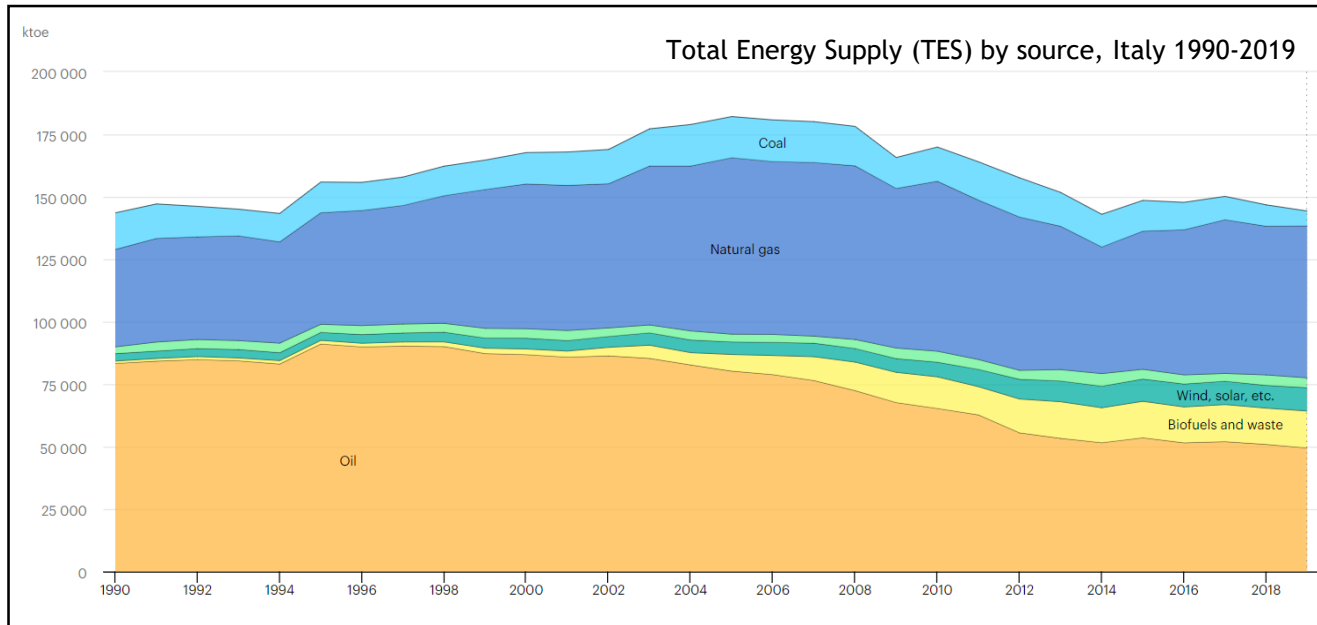
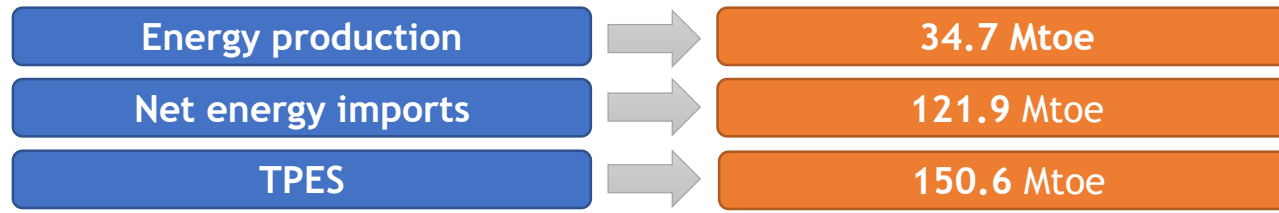
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1. ENERGY SYSTEM OVERVIEW

Supply and Demand (2018)



Share of RES (Energy production)	
Hydro	12,1%
Wind, solar, etc.	26,2%
Biofuels and wastes	34,2%
Total	72,5%

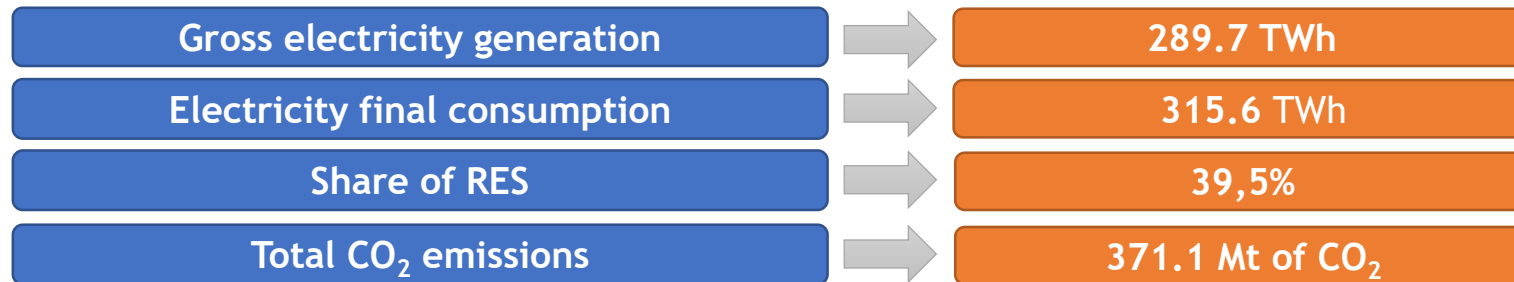
TPES by source (ktoe)	
Oil	50 914
Natural gas	59 513
Coal	8 556
Hydro	4 195
Wind, solar, etc.	9 110
Biofuels and waste	14 514
Total	146 802

Source: GSE Statistical Report 2018
Graph: www.iea.org

The share of overall energy consumption covered by RES in 2018 is 17,8% (for the fifth consecutive year above the 2020 target set for Italy = 17%)

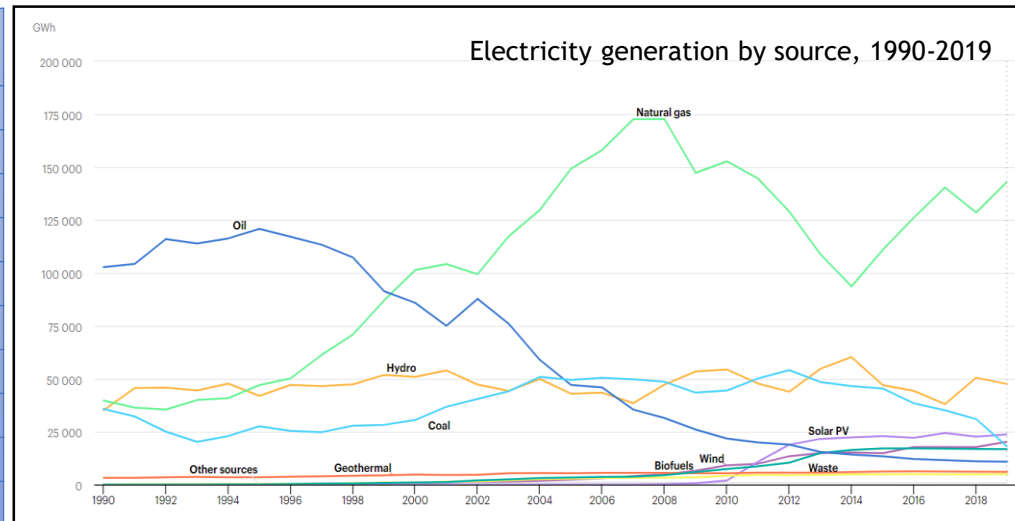
2. ELECTRICITY GENERATION AND CONSUMPTION

Supply and Demand (2018)



Share of RES (Gross RES production)	
Biofuels	28,19%
Geothermal	2,30%
Hydro	19,04%
Solar PV	8,54%
Wind	0,08%

Electricity generation by source, 2018 (GWh)	
Oil	4.000
Natural gas	128.538
Coal	30.956
Geothermal	6.105
Hydro	50.503
Solar PV	22.654
Wind	235
Biofuels	16.782
Waste	4.825
Other sources	601



RES-E penetration in 2018 is 39,5%
 (the significant growth, +10% compared to 2017, is due to the performance of hydroelectric = +35%)

Electricity final consumption (ktoe)	
Industry	9 980
Commercial and other services	8 125
Residential	5 601
Transport	992
Agriculture/Forestry	472
Fishing	31

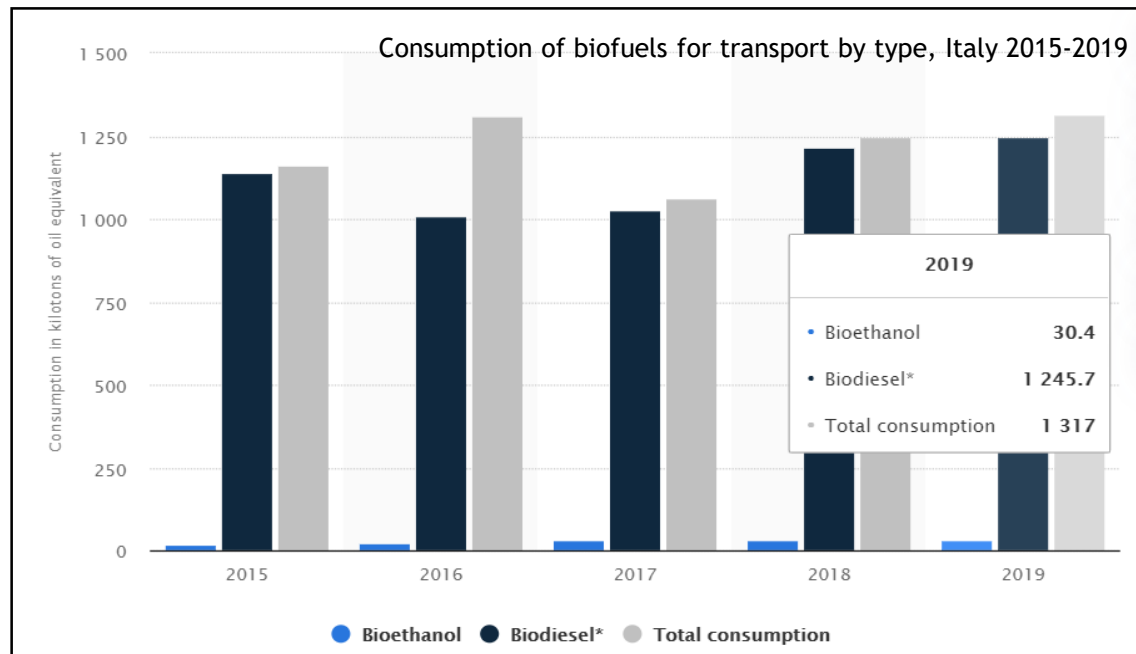
Source: GSE Statistical Report 2018
 Graph: www.iea.org

3. BIOFUELS FOR TRANSPORT (1/2)

Supply and Demand (2018)



- 33% of total biofuels are produced in Italy
- 0,59 Mtoe of double counting biofuels



	2018	2019
Bioethanol	32.6	30,4
Biodiesel	1 217.1	1 245.7
Biogas fuel	0.4	40.9
Total	1 250.1	1 317.0
Total EU 28	3 014.6	3 206.7
Total EU 27	2 617.4	3 761.9

**NEW
BIOGAS-CENTRED
STRATEGY***

RES-T penetration in 2018 is 7,7%
(the share of biofuels consumption in 2018 is 1,4 million tons)

*The Italian National Integrated Energy and Climate Plan (PNIEC) sets out to make biogas fuel the main renewable energy contributor in transport (road and rail) in 2030.

Source: GSE Statistical Report 2018
Graph: www.statista.com

3. BIOFUELS FOR TRANSPORT (2/2)

Double counting and advanced biofuels (2018 vs 2019)

- From 0,59 Mtoe in 2018 to 0,97 Mtoe in 2019 of double counting biofuels

Advanced biofuels (from 64,9 ktoe in 2018 to 403,20 ktoe in 2019)

Biofuels from oils and animal fats (from 519,9 ktoe in 2018 to 571,2 ktoe in 2019)

	Double counting biofuels consumption (toe)	
	2018	2019
Advanced biofuel	64 909	403 193
Used cooking oil and animal fats	519 908	571 241
Total	584 518	974 435
Total EU 28	3 914 941	4 751 239
Total EU 27	2 932 785	3 395 017

- Italian advanced biofuels producer ENI is going to meet demand

HVO biodiesel fuel operation units	Start up year	Installed capacity in 2019
ENI, Gela	2014	420 000 tons/year
ENI, Porto Marghera (Venice)	2019	600 000 tons/year

- 40% of total biofuels are produced in Italy in 2019

Source: EUObserv'ER Biofuels barometer 2020

4. BIOENERGIES PLANTS

Number and power of plants in 2017 and 2018

	2017		2018		var % 2018/2017	
	n°	MW	n°	MW	n°	MW
SOLID BIOMASS	468	1 667.3	475	1 725.4	1,5	3,5
▪ Urban wastes	65	935.8	65	938.8	0,0	0,3
▪ Other biomass	403	731.5	410	786.5	1,7	7,5
BIOGAS	2 117	1 443,9	2 136	1 448,0	0,9	0,3
▪ Wastes	410	411,2	403	405,4	-1,7	-1,4
▪ Muds	78	44,8	79	44,1	1,3	-1,6
▪ Animal dejections	602	235,2	615	238,5	2,2	1,4
▪ Agricultural activities	1 027	752,7	1 039	760,0	1,2	1,0
BIOLIQUIDS	500	1 023,7	497	1 006,9	-0,6	-1,6
▪ Vegetable oils	403	869,4	403	857,3	0,0	-1,4
▪ Other bioliquids	97	154,3	94	149,6	-3,1	-3,1
Bioenergies	2 913	4 135,0	2 924	4 180,4	0,4	1,1

- **835 232 electricity generation plants powered by RES are installed at the end of 2018**
 - mainly photovoltaic systems (98.5% of the total, + 6.2% compared to 2017).
- **Gross efficient power of RES plants installed exceeds 54,300 MW**
 - +2.0% compared to 2017, mainly generated by solar sources (+425 MW) and wind (+499 MW).

Source: GSE Statistical Report 2018

5. BIOECONOMY IN ITALY (1/2)

- 345 billion in production for 2 million employees in 2018 (10,1% of the national GDP)

Key sectors	Value of production (million of €)	Share (%)	Employees (thousand person employed)	Share (%)
Agriculture, forestry and fisheries	60 632	17,6	927	45,2
Food industries, beverages and tobacco	142 419	41,3	464	22,6
Textiles from natural fibers and leather	16 795	4,9	77	3,8
Wood and products of wood	13 595	3,9	103	5,0
Paper and paper products	23 101	6,7	74	3,6
Biobased chemicals and chemical products	4 172	1,2	7,5	0,4
Biobased pharmaceutical products	15 960	4,6	37,4	1,8
Biofuels	143,5	0,0	n.a.	n.a.
Bioenergy	3 298	1,0	2,5	0,1
Bio-based rubber-plastic	1 771	0,5	7,2	0,4
Clothing and footwear	33 186	9,6	201	9,8
Furniture	10 220	3,0	5,4	3,0
Water cycle	12 153	3,5	45,3	2,2
Biodegradable waste management and recovery	7 405	2,1	43,3	2,1
Total Bioeconomy	344 850	100,0	2 049,8	100,0

EMERGING SECTORS

5. BIOECONOMY IN ITALY (2/2)

- Constantly growing trend for some key emerging sectors of the Italian Bioeconomy, both in terms of value of production and employees (*except for Biofuels*)

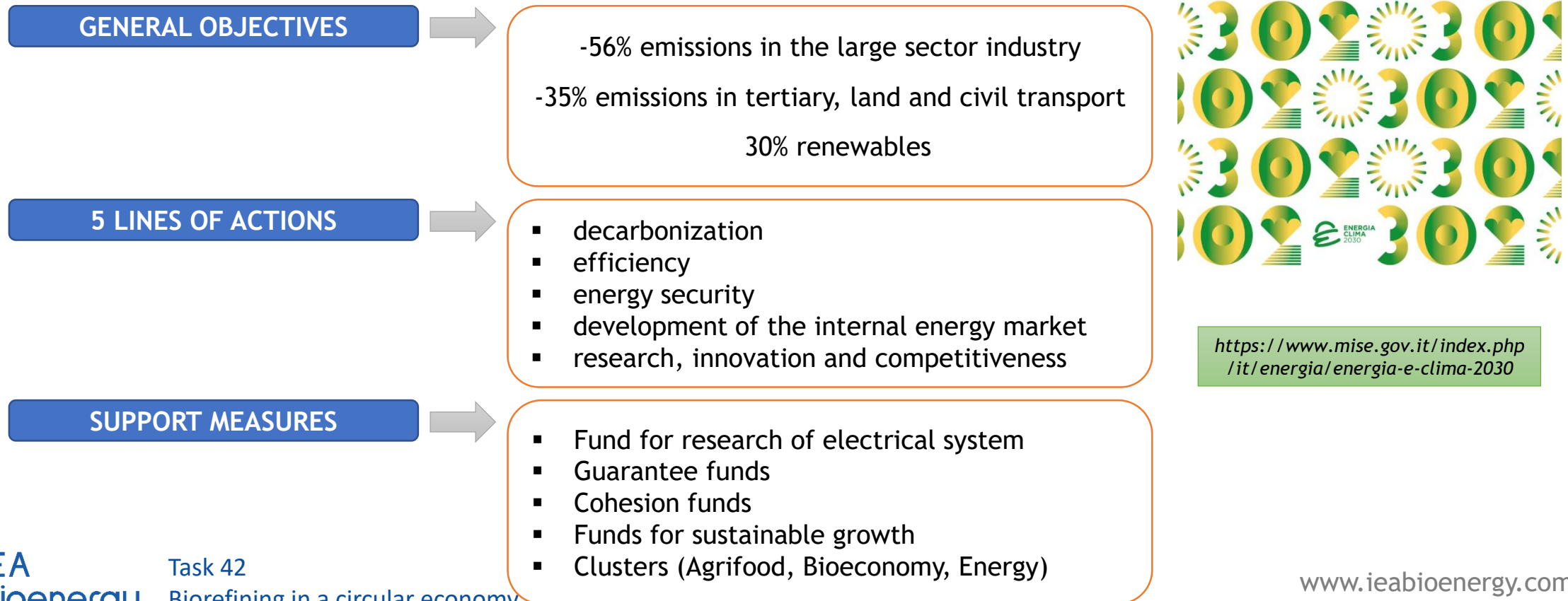
Key sectors	2018	2018	2017	2017
	Production (million of €)	Employees (thousand person employed)	Production (million of €)	Employees (thousand person employed)
Textiles from natural fibers and leather	16 795	77	16 517	76
Biobased chemicals	4 172	7,5	4 056	7,4
Biobased pharmaceutical products	15 960	37,4	15 641	36,6
Biofuels	143,5	n.a.	178,4	n.a.
Bioenergy	3 298	2,5	3 134	2,4
Bio-based rubber-plastic	1 771	7,2	1 743	7,0

Key sectors	Var. % 2017-18	Var. % 2017-18
	Production	Employees
Textiles from natural fibers and leather	1,7	1,0
Biobased chemicals	2,9	1,6
Biobased pharmaceutical products	2,0	2,4
Biofuels	-19,6	n.a.
Bioenergy	5,2	1,1
Bio-based rubber-plastic	1,6	1,8

6. POLICY DOCUMENTS (1/2)

Energy and climate policy

- On January 21, the Ministry of Economic Development has published the text of the **National Integrated Plan for Energy and Climate** which incorporates the innovations contained in the **Green New Deal**.



6. POLICY DOCUMENTS (2/2)

BIT II: Implementation strategies and road map

- On May 14, 2019 the new “BIT Bioeconomy in Italy. A new bioeconomy strategy for a sustainable Italy” is presented in Rome at the Presidency of the Council of Ministers

GENERAL OBJECTIVE

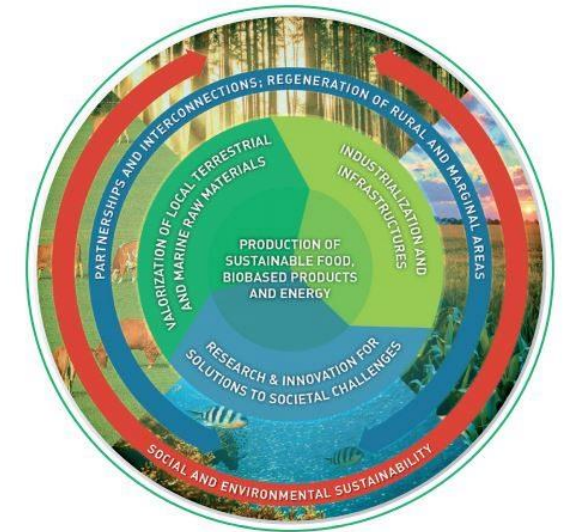
to increase current Italian Bioeconomy turnover (currently about EUR 330 billion/y) and jobs (about 2 M) by 15% by 2030, while increasing the level of circularity in the economy

VISION - ACTION PLAN

- to move ‘*from sectors to systems*’...
- to create ‘*value from local biodiversity and circularity*’...
- to move ‘*from Economy to sustainable Bioeconomy*’...
- to move ‘*from concept to reality*’...
- to promote the ‘*Bioeconomy in the Mediterranean area*’...

SUPPORT MEASURES

- EU level - Horizon Europe
- National level - PON, National Technological Clusters, Smart Specialization Strategy, InnovItalia, Industry 4.0

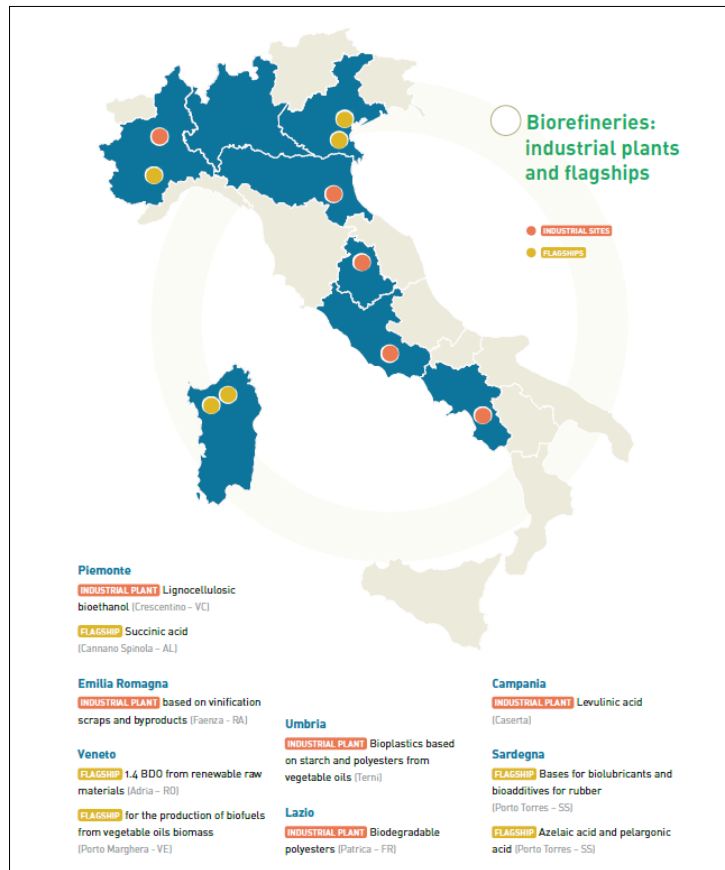


A new bioeconomy strategy for a sustainable Italy

<http://cnbbsv.palazzochigi.it/it/materie-di-competenza/bioeconomia/strategia-italiana/>

7. INDUSTRIAL BIOREFINERY PLANTS (1/2)

5 FLAGSHIP PLANTS: Italy has important projects for the reconversion of industrial sites into biorefineries. Some of these projects have been recognized as flagship initiatives in Europe by the BBI JU.



Mater-Biopolymer (Patrica, FR) INDUSTRIAL

- Products Origo-Bi®
- Capacity 100 ktons/year



Novamont (Terni, TN) INDUSTRIAL

- Products Biolubricants and bioplastics from local crops
- Capacity 20 ktons/year - compounding; 60 ktons/year - polyesters



Biochemtex (Crescentino, VC) DEMO

- Products Bioethanol
- Capacity 40 ktons/year



ENI (Gela, CL) INDUSTRIAL

- Products Hydrotreated vegetable oils (based on Ecofining™ technology)
- Capacity 720 ktons/year max capacity; 600 ktons/year HVO production

7. INDUSTRIAL BIOREFINERY PLANTS (2/2)

5 INDUSTRIAL PLANTS: Italy has 5 important industrial plants.



Mater-Biotech (Bottrighe, RO) FLAGSHIP

- Products 1.4 BDO
- Capacity 30 ktons/year



Reverdia (Cassano Spinola, AL) FLAGSHIP

- Products Succinic acid
- Capacity 10 ktons/year



Matrica (Porto Torres, SS) FLAGSHIP

- Products Biolubricants, Bioadditives, Azelaic acid, Pelargonic acid
- Capacity 350 ktons/year

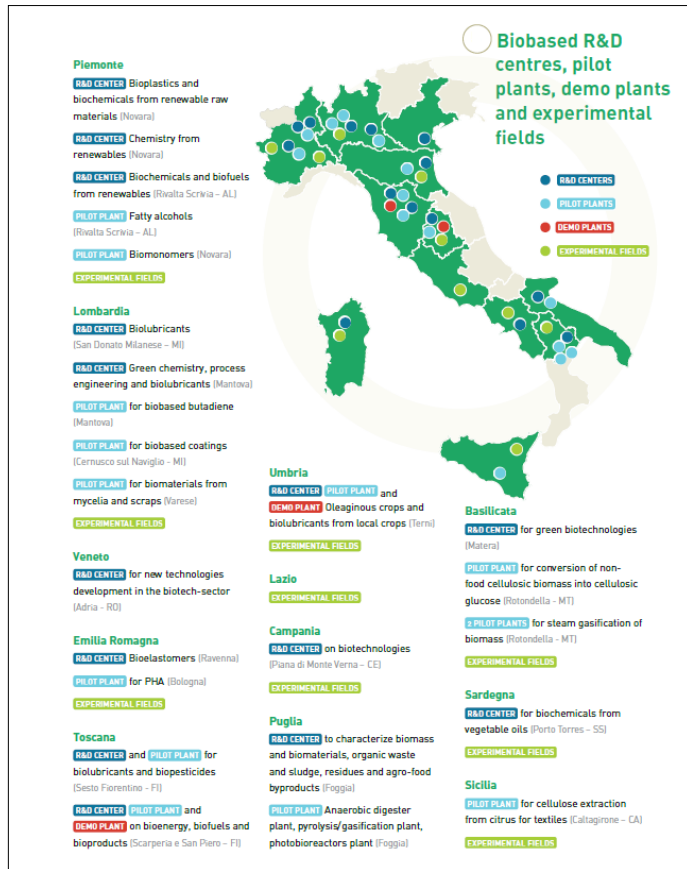


ENI (Porto Marghera, VE) FLAGSHIP

- Products HVO (green-diesel, green-naphtha and green-gpl)
- Capacity 560 ktons/year at 2021 (currently about 360 ktons/year) with a production of about 470 ktons/year of total HVO (currently about 300 ktons/year).

8. R&D, PILOT AND DEMO BIOREFINERY PLANTS

2 DEMO + 13 PILOT PLANTS + 14 R&D CENTRES: Italy has important R&D centres as well as numerous installations on demo- and pilot-scale



ENEA Trisaia Research Centre (Rotondella, MT)

- R&D for biorefineries and green chemistry
- Pilot Plants for the production of second generation sugars from lignocellulosic biomass, for fermentation. Availability of a technological platform including many types of gasyifiers



Pretreatment unit



Gasification plant

9. RESEARCH ACTIVITIES (1/2)

Italian participation in the H2020 program

BBI JU funded projects on BIOREFINERIES

- 30 projects funded by BBI JU
- 3 projects coordinated by Italy



Acronym	Coordinated by	Start date	End date
InDIRECT	Belgium	01/11/2016	31/10/2019
BIOrescue	Spain	01/09/2016	31/08/2019
Zelcor	France	01/10/2016	28/02/2021
FIRST2RUN	Italy	01/07/2015	30/06/2019
BIOSKOH	Slovakia	01/06/2016	31/05/2022
EMBRACED	Italy	01/06/2017	31/05/2022
SWEETWOODS	Estonia	01/06/2018	31/05/2023
PLENITUDE	United Kingdom	01/10/2019	31/03/2025
AgriMax	Spain	01/10/2016	30/09/2021
BioSPRINT	Germany	01/06/2020	31/05/2024
US4GREENCHEM	Germany	01/07/2015	30/06/2019
PEference	Netherlands	01/09/2017	28/02/2025
SpiralG	France	01/05/2018	30/04/2022
SElectiveLi	Germany	01/05/2019	30/04/2022
BeonNAT	Spain	01/07/2020	30/06/2025
GreenSolRes	Germany	01/09/2016	31/08/2021
FUNGUSCHAIN	Netherlands	01/11/2016	30/04/2021
PERCAL	Spain	01/07/2017	31/12/2020
ECOXY	Spain	01/06/2017	30/11/2020
EXCornsEED	Italy	01/06/2018	28/02/2022
VEHICLE	Netherlands	01/05/2019	30/04/2023
GRACE	Germany	01/06/2017	31/05/2022
LigniOx	Finland	01/05/2017	28/02/2022
SMARTBOX	Belgium	01/05/2019	30/04/2023
VALUEMAG	Greece	01/04/2017	31/07/2020
LIBRE	Ireland	01/11/2016	30/04/2021
EUCALIVA	Spain	01/09/2017	31/07/2021

9. RESEARCH ACTIVITIES (2/2)

National Operational Program (PON)



- The **National Operational Program for Research and Innovation** is the instrument with which Italy contributes to the improvement of the quality of **higher education** and to the strengthening of **research, technological development and innovation**, realizing the objectives of the cohesion policy of European Union in favor of its most disadvantaged territorial areas. It is in line with the strategic objectives of the European programs **Horizon 2020** and **Cosme** and in synergy with the **National Strategy of Intelligent Specialization (SNSI)**.
- Total financial endowment = 1,189 million €
- 12 Specialization Areas
- 7 projects funded in the area GREEN CHEMISTRY



C  META

10. FUNDS FOR STRATEGIC INVESTEMENTS (1/2)

latest news

ENEA won a 5 million tender for biorefinery and green chemistry

10 MILLION OF EUROS FOR RESEARCH IN TRISAIA

ENEA won the tender launched by the Basilicata Region as part of the European Regional Development Fund. The total investment, co-financed by the Region and ENEA, of 10 million euros, will make it possible to strengthen the applied research activities launched by the ENEA Bioenergy and Green Chemistry Division. Through the PIBE platform, the goal is to spread new techniques for producing energy from renewable sources and bioproducts, in innovative and particularly important sectors, contributing to the transition process towards a decarbonised and use-based economy sustainable natural resources.



OBJECTIVES



INNOVATIVE BIOLUBRICANTS
GENERATION OF BIOETHANOL
BIOMETHANE AND SYNGAS

10. FUNDS FOR STRATEGIC INVESTEMENTS (2/2)

latest news

ENEA bets on an Italian "Hydrogen Valley" worth 14 million euros

At the gates of Rome, in the ENEA Casaccia Centre, a research center for the development of an Italian hydrogen supply chain

Create the first Italian Hydrogen Valley to develop a national supply chain for the production, transport, storage and use of hydrogen, focusing on research, technologies, infrastructures and innovative services. The project conceived by ENEA was born with an investment of 14 million euros (Mission Innovation funds) to create the first Italian technological incubator for the development of the hydrogen supply chain, in collaboration with universities, research institutes, associations and businesses, with the aim of promoting the energy transition and decarbonisation.



11. ITALIAN BIOTECH INDUSTRY (1/2)

Major players

latest news

ENI and Novamont are always the major players in the Italian Biotech industries landscape

Novamont acquires BioBag

In January 2021, Novamont world leader in the production of bioplastics and in the development of bio-chemicals and bioproducts through the integration of chemistry, environment and agriculture, announces the acquisition of the BioBag Group, a Norwegian company leader in low-impact solutions for waste and packaging.



ENI Versalis starts to produce disinfectant and hand gel

In July 2020, Versalis, ENI Versalis launches a new line for the production of hand disinfectant liquid, marketed under the Invix™ brand, in the plant in Crescentino (Vercelli), in order to meet the growing demand in the face of the current health situation at national level.



11. ITALIAN BIOTECH INDUSTRY (2/2)

Bankrupt

latest news

Crash Bio-On

In January 2020, Italian PHA producer Bio-On declares bankrupt, less than a year after having been valued at over 1 billion dollars.



bio-on



12. MAJOR STAKEHOLDERS (1/2)

Universities and research institutions

Governmental Organizations (GOs)	Non-Governmental Organizations (NGOs)
Presidency of the Council of Ministers	ITABIA
Ministry of Economic Development	Consorzio Italtotec
Ministry of Education, University and Research	Chimica Verde Bionet
Ministry of Agricultural, Food and Forestry Policies	RE-CORD
Ministry of the Environment and Protection of Land and Sea	Consorzio Italiano Biogas e Gassificazione
Committee of the Italian Region	ITP plants for the future
Agency for Territorial Cohesion	Assobioplastiche
Italian Technology Clusters: Green chemistry, Agrifood, Bluegrowth	Federchimica
Research Institutions (RI)	Universities (U)
ENEA (Italian National Agency for New technologies, Energy and Sustainable Economic Development)	University of Aquila (UNIVAQ)
CNR (National Research Council)	University of Bari (UNIBA)
CREA (Council for Agricultural Research and Analysis of Agrarian Economics)	University of Bologna (UNIBO)
Centro Ricerche Produzioni Animali	University of Messina (UNIME)
CRIBE (Centro di Ricerca Interuniversitario sulle Biomasse da Energia)	University of Milano Bicocca (UNIMIB)
ECNP (Centro Europeo per i Polimeri Nanostrutturati)	University of Padova (UNIPD)
	University of Torino (UNITO)
	University of Tuscia (UNITUS)

12. MAJOR STAKEHOLDERS (2/2)

Industries and others

Industries (I)	Other (O)
Fater S.p.A.	Lombardy Green Chemistry Association (LGCA)
ASTER Cons.p.A.	Agroinnova
Biosphere s.r.l.	Environment Park S.p.A.
Biotec Sys s.r.l.	Parco Scientifico e Tecnologico della Sicilia s.c.p.a
Faci S.p.A.	Umbria SPRING - Cluster Umbro Chimica Verde
Spiga Nord S.p.A.	
Ticass s.c.r.l.	
BASF Italia S.p.A.	
GFBiochemicals Italy s.r.l.	
Versalis S.p.A.	
Biochemtex S.p.A.	
Matrica S.p.A.	
Beaulieu Fibres International Terni s.r.l.	
Mater-Biotech S.p.A.	

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