

HORIZON 2020 AND THE BIO-BASED INDUSTRIES JOINT UNDERTAKING  
(BBI JU): OPPORTUNITIES FOR JOBS AND GROWTH IN THE  
MEDITERRANEAN REGION  
Ecomondo, Rimini, Italy - 10 November, 2016

*Round Table: Bioeconomy and bio-based industries in the  
Countries of the Region: barriers, needs and opportunities*

**Electra Papadopoulou**

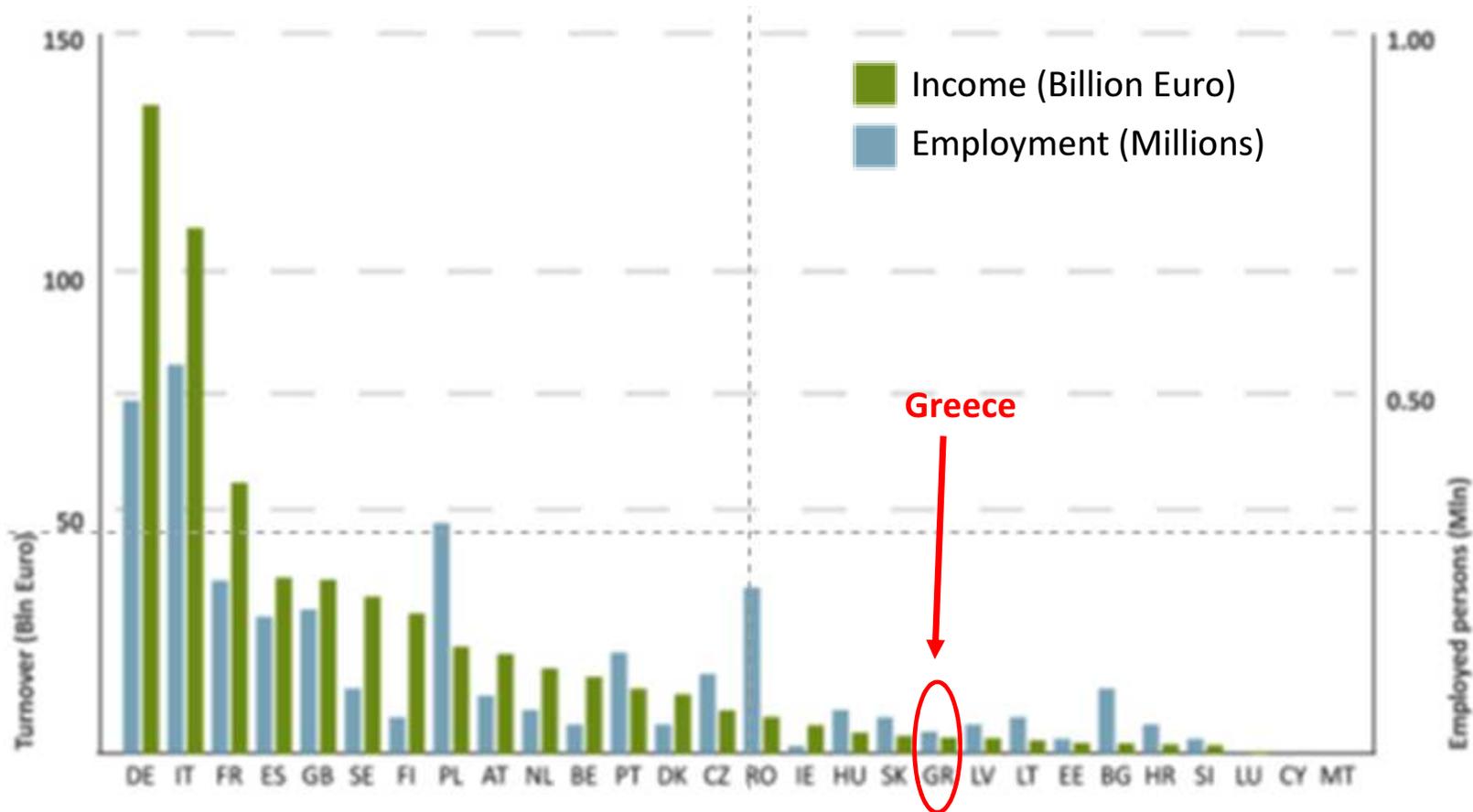
Chimar Hellas S.A.





# Income and employment in Bioeconomy sectors\* in EU, per country

**EU28 - 2013**



*\* Excluding Agriculture, Fisheries, Food, Beverages and Tobacco goods.*

**Current estimations for capacity developments in bio-economy**

TOTAL GDP SHARE:  
**63 BEuro/year** (1/3 GDP)

TOTAL EMPLOYMENT INVOLVED: **875,000**

*Source: BIOTOPOS Network*

*Source: BBI & Nova Institute*

# Bioeconomy

The 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:

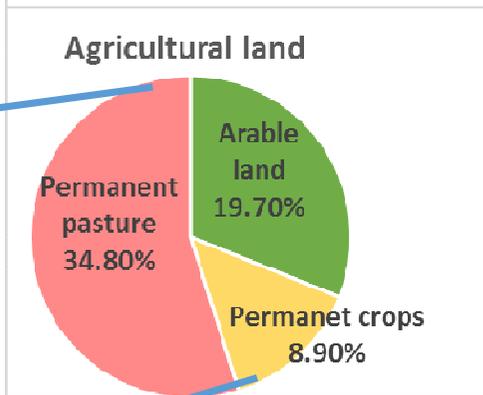
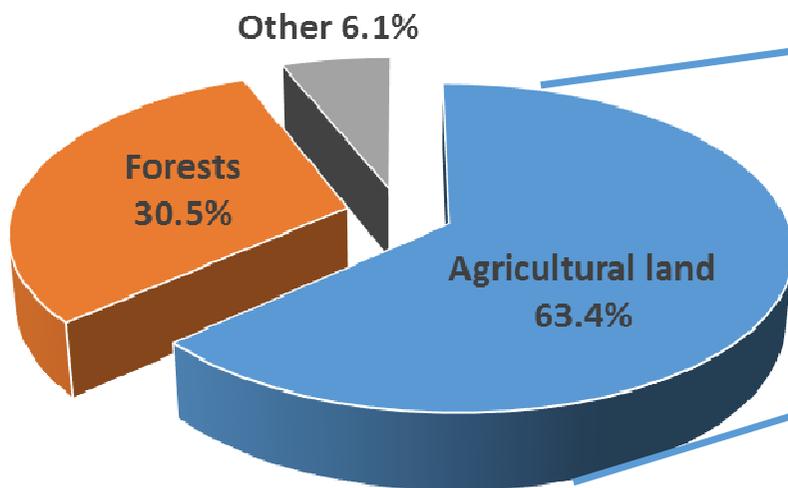
- Food and feed
- materials
- fuels and energy

# Use of land in Greece

The agricultural sector in Greece = about **9.2 million hectares** including pasture *Source: CRES 2013*

Updated on 8 Oct 2016

Greek land use - 2016



- agricultural land: **63.4%**
- arable land 19.7%
- permanent crops 8.9%
- permanent pasture 34.8%
- forest: **30.5%**
- other: 6.1% (2011 est.)

Source:  
<https://www.cia.gov/library/publications/the-world-factbook/fields/2097.html>

# Biomass for Food and Feed Industry

- In 2013 the agricultural sector contributed with **3% to the Gross Domestic Product (GDP)** where **70%** was **agricultural** product and **30%** **animal** product [1].
- The domestic food industry covers more than **1/4 (26%) of all businesses** in Greek manufacturing [2].

## Barriers for development

- Greek farmers are **heavily dependent on EU subsidies**, which constitute about 50% of their income [3].
- the **feed cost** is among the highest in EU [4].
- **Low innovation**

## Opportunities for development

- New food culture – Mediterranean Diet
- Development of novel foods and other new products

### Sources:

1. [http://www.agronews.gr/files/1/PDF/entheta\\_pdf/02\\_13\\_mikres\\_farmes\\_entheto\\_pdf.pdf](http://www.agronews.gr/files/1/PDF/entheta_pdf/02_13_mikres_farmes_entheto_pdf.pdf)
2. IOBE-2016 <http://www.sevipa.gr/blog/iobe-e-biomechania-trophimon-kai-poton-echei-te-megalytere-symbolo-ston-tomea-tes-metapoiases>
3. <http://www.agro24.gr/agrotika/agora/meletes-kladikes/idoy-giati-i-ellada-paramenei-mia-kata-vasi-agrotiki-hora-alla-me>
4. [http://www.gsrt.gr/Financing/Files/ProPeFiles161/%CE%A6%CF%85%CF%84%CE%B9%CE%BA%CE%AE%20%CE%A0%CE%B1%CF%81%CE%B1%CE%B3%CF%89%CE%B3%CE%AE%20\(1\).pdf](http://www.gsrt.gr/Financing/Files/ProPeFiles161/%CE%A6%CF%85%CF%84%CE%B9%CE%BA%CE%AE%20%CE%A0%CE%B1%CF%81%CE%B1%CE%B3%CF%89%CE%B3%CE%AE%20(1).pdf)

# Sources of residual biomass



Agricultural residues



Forestry residues



Livestock residues



Industrial residues



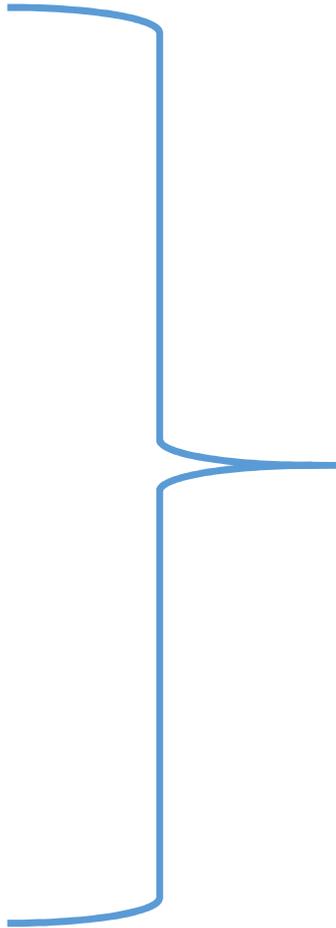
Urban wastes



Energy crops



Used oils



**Materials**

**Fuels and Energy**

# Volumes of wastes

The majority of the wastes are disposed

2011	Production MT	Recovery MT	Disposal MT	Storage MT	Non registered management
Agricultural, Forestry and livestock waste	10,781				10,781
Industrial waste	17,171	1,195	13,825	452	1,573
Total urban waste	5,749	1,068	4,609	22	44
<i>Urban Bio-waste</i>	2,470	175			
Waste oils	56	26		1.6	28

Eurostat **2012:Urban waste:**

Recycling: 16%

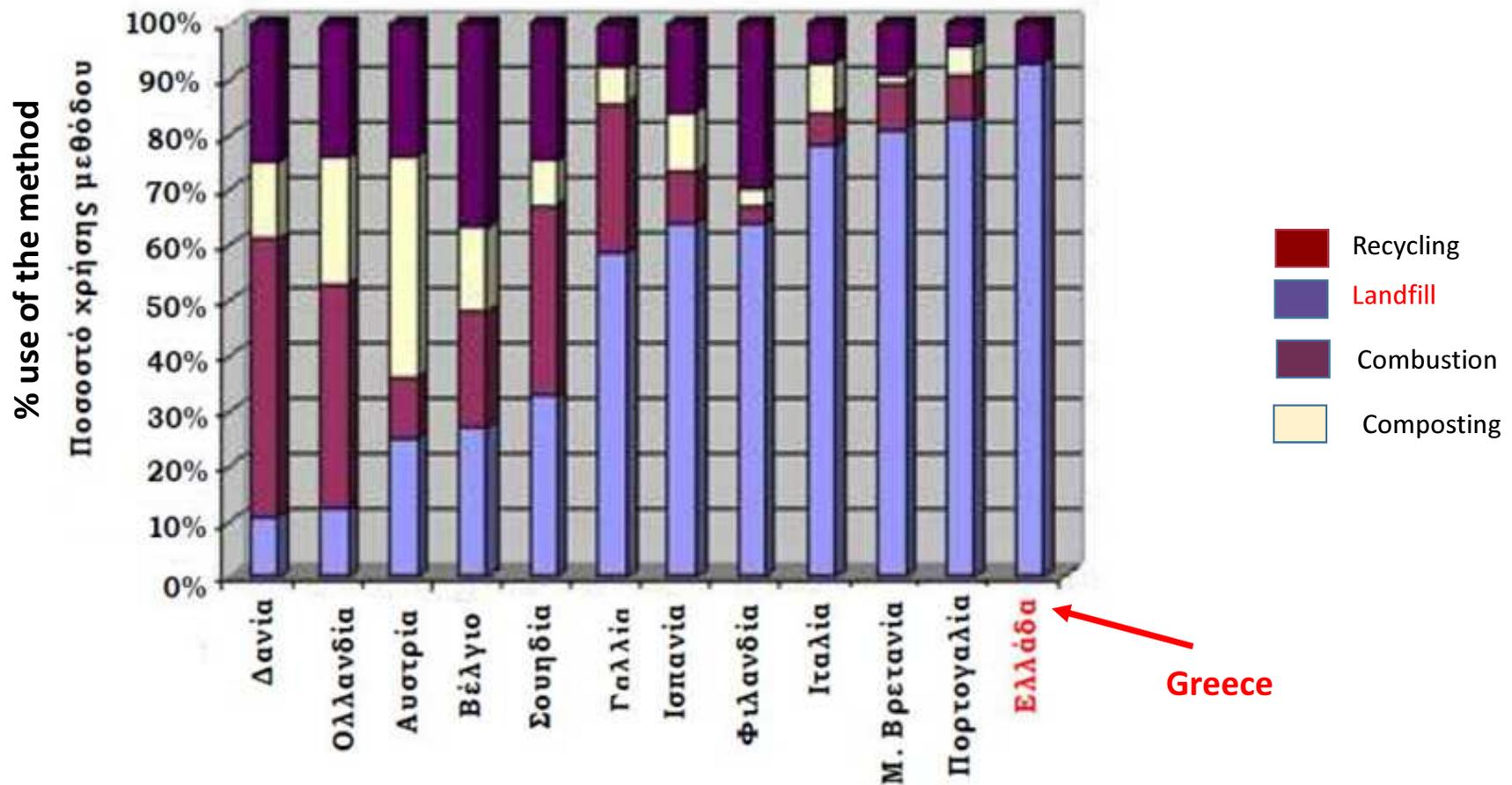
Compost: 2%

**Landfill: 82%**

Source: National Plan for waste management (2015) -  
<http://www.opengov.gr/minenv/wp-content/uploads/downloads/2015/06/paragogikhsanasygkrothsh.pdf>

Source:  
<http://www.tovima.gr/society/article/?aid=580287>

## Management of solid wastes in Europe



Source: <http://ikee.lib.auth.gr/record/136056/files/GRI-2015-13998.pdf>

# Unexploited agro-industrial residues



**Greece: 10.2 PJ unexploited agro-industrial residues (2012)**

Source: EUBIONETIII project partners (2012) - [https://www.researchgate.net/figure/257547972\\_fig8\\_Fig-8-Amounts-of-unexploited-agro-industrial-residues-in-selected-EU-member-countries](https://www.researchgate.net/figure/257547972_fig8_Fig-8-Amounts-of-unexploited-agro-industrial-residues-in-selected-EU-member-countries)

## Biomass for materials



Production of platform chemicals and products through the bio-refinery process.

In Greece bio-refineries for the production of chemicals and products are available basically only in lab/pilot scale. However recently there are some few initiatives for the establishment of commercial units.

# Biomass for materials

## Barriers for development

- Fragmentation of agricultural land in many **small properties** (lot size ~ 4.8 ha against 14,3 in EU -27 and average economic size of farm 9.266,8 € against 25.450,2 € in EU-27) => **lack of reliable transportation network and long-term supply of materials**
- **Low technical training** of farmers (32% have no education)
- **Difficulty in introducing new technologies** because of the age of rural population (60% of farmers over 45y old)
- **Reduction of employment** in the primary sector
- The **family employment** covers 85.5% of total employment in agriculture sector
- **Funding problems** from banks and state because of the economic crisis
- **Lack of control mechanisms** for the implementation of existing environmental legislation and penalties on offenders
- **The lack of public information** on the environmental benefits of energy recovery resulting in strong local resistance to projects
- **Bureaucratic licensing difficulties**
- **Instability of institutional and taxation environment**

Innovation  
aversion

### Sources:

- [https://www.espa.gr/elibrary/pa\\_espa\\_2014\\_2020.pdf](https://www.espa.gr/elibrary/pa_espa_2014_2020.pdf)
- <http://energyexpress.gr/news/se-exelixa-simantika-erga-viomazas-kai-epexergasias-apovlito>
- CRES 2013

# Biomass for materials

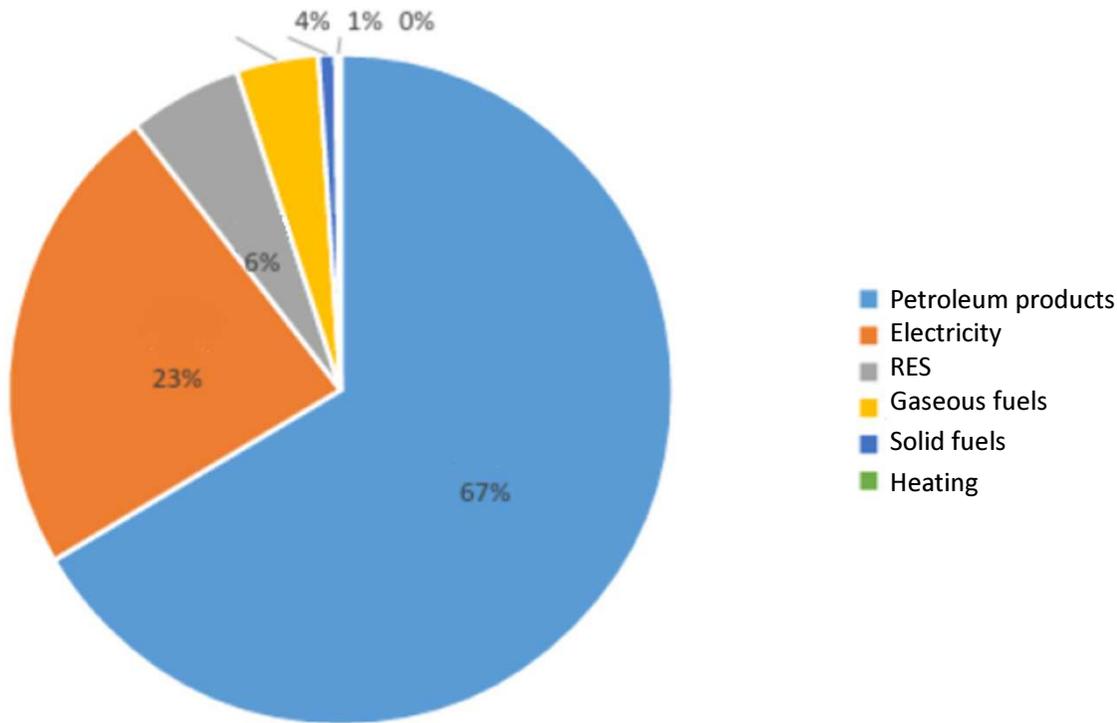
## Opportunities for development

- Currently **only a 3%** of the available biomass is **exploited** (mostly as fuel)
- Exploitation of biomass **allows synergies** with traditional agricultural and livestock activities
- Exploitation of biomass **can be used** for independent renewable electricity **in remote areas**
- There are **reliable and proven technologies**
- There is **favourable legislative framework**
- Greece could **viably exploit** its renewable energy sources, under an environmental friendly and economic viable way

### Sources:

1. <http://www.ecotimes.gr/1520/%CE%B2%CE%B9%CE%BF%CE%BC%CE%AC%CE%B6%CE%B1-%CF%80%CE%B7%CE%B3%CE%AE-%CE%B5%CE%BD%CE%AD%CF%81%CE%B3%CE%B5%CE%B9%CE%B1%CF%82/>
2. [http://www.cres.gr/energy-saving/images/pdf/biomass\\_guide.pdf](http://www.cres.gr/energy-saving/images/pdf/biomass_guide.pdf)

# Energy sector in Greece - 2011



Source: EU, DC Energy A1-June 2011, ESTAT, EC FIN, EEA

## Basic RES and % Total Primary Energy Supply

- biofuels and waste (4.0%)
- hydropower (2.0%),
- solar and wind power (each with less than 1.0%).

Source: National RTDI Strategy for Smart Specialisation 2014-2020

## Use of wood and wood residues (traditional biorefinery)

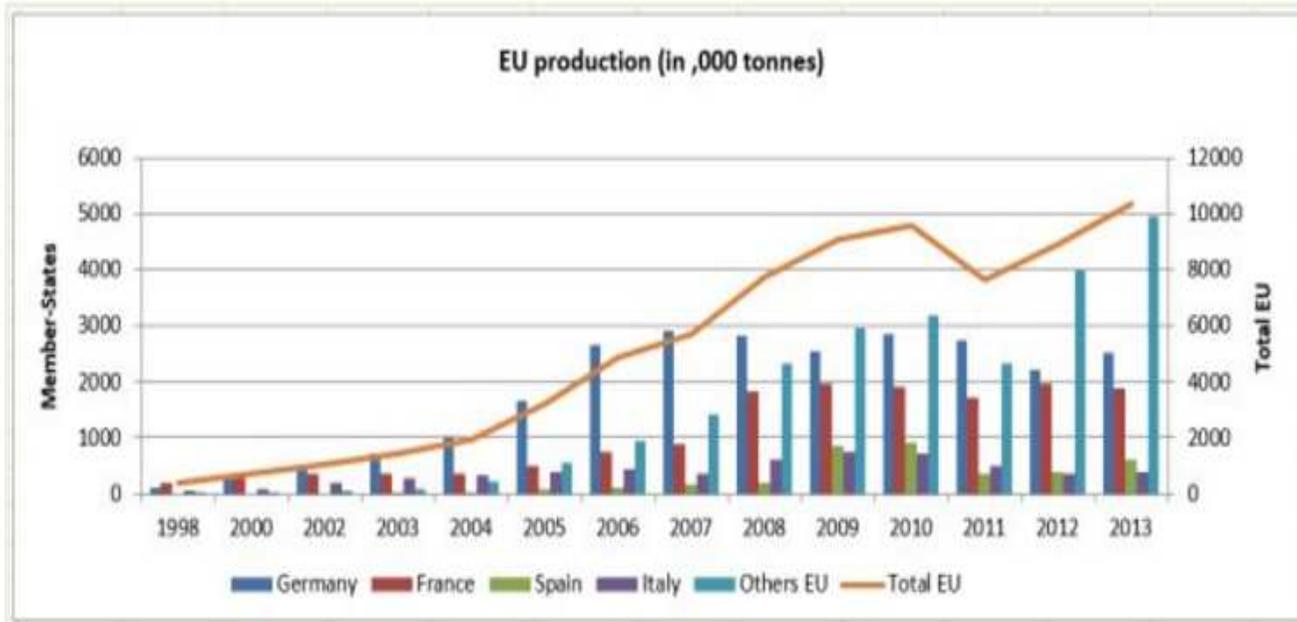
Fuelwood & mill residues: 2 M toe/year

GDP Share: 2 B Euro

Total Employment: 30,000

Source: BIOTOPOS Network

# Bio-diesel industry in Europe



It is increasing rapidly

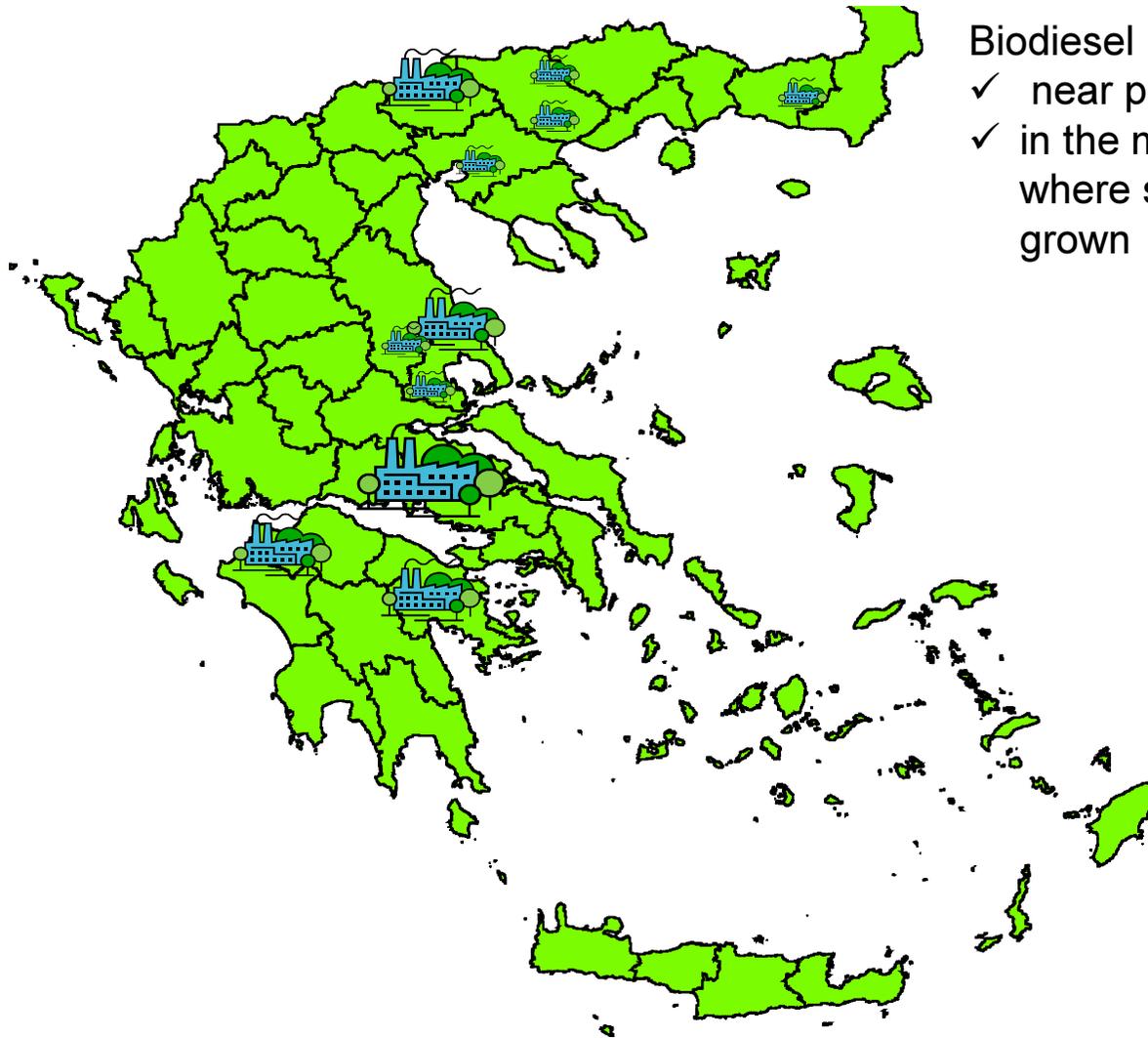
Greece has still low production capacity compared to other EU countries

## Production capacity, 2013-2014

COUNTRY	,000 TONNES	
	2014	2013
Austria	495	239
Belgium	741	565
Bulgaria	378	13
Croatia	55	33
Cyprus	20	1
Czech Republic	502	210
Denmark	250	334
Estonia	35	0
Finland	400	320
France	2445	1885
Germany	4655	2516
Greece	702	220
Hungary	158	150
Ireland	74	24
Italy	1837	387
Latvia	156	61
Lithuania	147	118
Luxemburg	20	0
Malta	5	1
The Netherlands	2505	1248
Poland	1269	648
Portugal	590	314
Romania	407	137
Slovakia	158	105
Slovenia	108	2
Spain	4194	618
Sweden	282	-
UK	505	277
<b>TOTAL</b>	<b>23,093</b>	<b>10,367</b>

Source: European Biodiesel Board <http://www.ebb-eu.org/stats.php>

## Geographic allocation of biodiesel plants in Greece



Biodiesel plants located:

- ✓ near ports
- ✓ in the main agricultural regions of Greece, where sunflower (and some rapeseed) are grown

Source: CRES, 2016

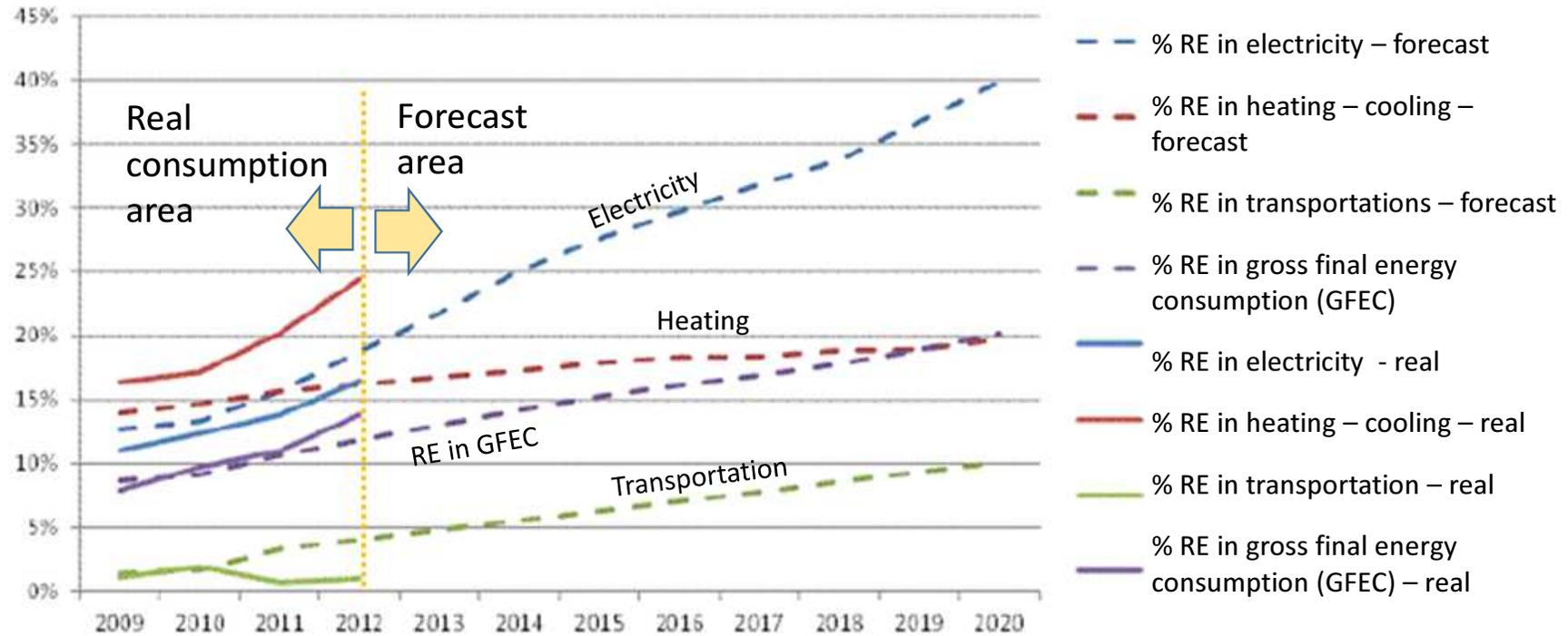
## Biodiesel production in Greece

- ✓ **16 Greek companies** are operating in Greece, producing around **125,000 m<sup>3</sup>** which accounts for the **95% of the biodiesel consumed in the transport sector** of the country.
- ✓ Biodiesel is almost entirely produced **by local feedstock** (70% vegetable oils and the rest from used cooking oils and cotton seed oils)
- ✓ However, **biofuels consumption in Greece is less than 2%**, because **bioethanol is not produced nor imported in Greece**, thus transportation fuels rely only on biodiesel

## Biogas production in Greece

- ✓ Biogas plants of **47.34 MWe capacity** are operating, mostly at solid waste landfills (SWL) and municipal waste water treatment plants (MWTP).
- ✓ Recently, small biogas plants using only agricultural and agri-food wastes start operating.

# Forecast of renewable energy (RE) penetration in the Greek market



# Energy sector in Greece

## Barriers for development

- **High price of raw materials** → which initiates biodiesel imports
- **Unstable and inefficient policy** , which affects the final price of the biofuel.
- **Huge bureaucracy**
- **Environmental licensing**
- **Disorganized and costly supply chain** of raw materials
- Unlike the interest and support at institutional level of RES projects for power generation, contribution of renewable energy to thermal energy and transportation, by the use of biofuels, remains relatively low mainly due to the **lack of appropriate financial mechanisms**
- **Lack of public awareness**
- **Lack of** substantial efforts to create a **framework for the marketability** of 'green' innovations

Sources:

[http://www.opengov.gr/minenv/wp-content/uploads/downloads/2012/04/EnPlan-RoadMap-2050\\_24april2012.pdf](http://www.opengov.gr/minenv/wp-content/uploads/downloads/2012/04/EnPlan-RoadMap-2050_24april2012.pdf)

CRES, 2016

[http://www.opengov.gr/minenv/wp-content/uploads/downloads/2012/04/EnPlan-RoadMap-2050\\_24april2012.pdf](http://www.opengov.gr/minenv/wp-content/uploads/downloads/2012/04/EnPlan-RoadMap-2050_24april2012.pdf)

# Energy sector in Greece

## Opportunities for development

- The exploitation of **agricultural and forestry residues** available in Greece may result in fuel quantities equal to about **3-4 MT petroleum/y**.
- Anaerobic digestion of the whole amount of **agricultural and livestock residues** could result in the production of **13.5 billion m<sup>3</sup>/y biogas**
- Anaerobic treatment of available **wastes could result in 21.9TWh of electricity** which corresponds to **39% of gross electricity consumption amount in Greece**
- The exploitation of **energy crops = 30 - 40% of the petroleum consumed annually in Greece.**
- For the period **2011-2035** the total new investments in power sector is expected to rise to € 28 trillion, corresponding to an average annual investment of approximately € 1,2 trillion.
- The Renewable Energy Sector (RES) achieved increase of 6.8% in 2010 to the value of the range at **€ 242.5 billion**.

**The low participation of renewable and other energy sources reveal high growth potential of the sector in the country through the utilization of untapped energy reserves available. This situation has already attracted a significant number of foreign direct investment**

*Source: National Strategy for Smart Specialisation 2014-2020*

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VERY MUCH