

INTESA  **SANPAOLO**



FEDERCHIMICA
ASSOBIOTEC

Associazione nazionale per lo sviluppo
delle biotecnologie

The 4th Bioeconomy Report

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Direzione Studi e Ricerche

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Agenda

1 The report: a brief overview of its history and scope

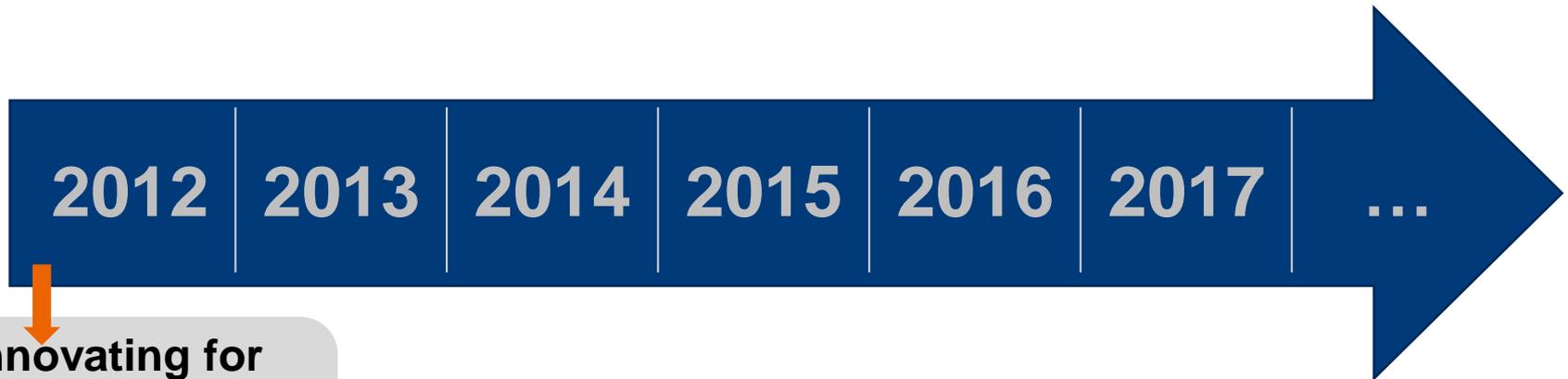
2 Measuring the bioeconomy: 2016 updated estimates

3 The first analysis of Italian start-ups in the bioeconomy

4 The bioeconomy of water: sewage sludge

5 The bioeconomy of water: blue-bioeconomy

The report: measuring the bioeconomy



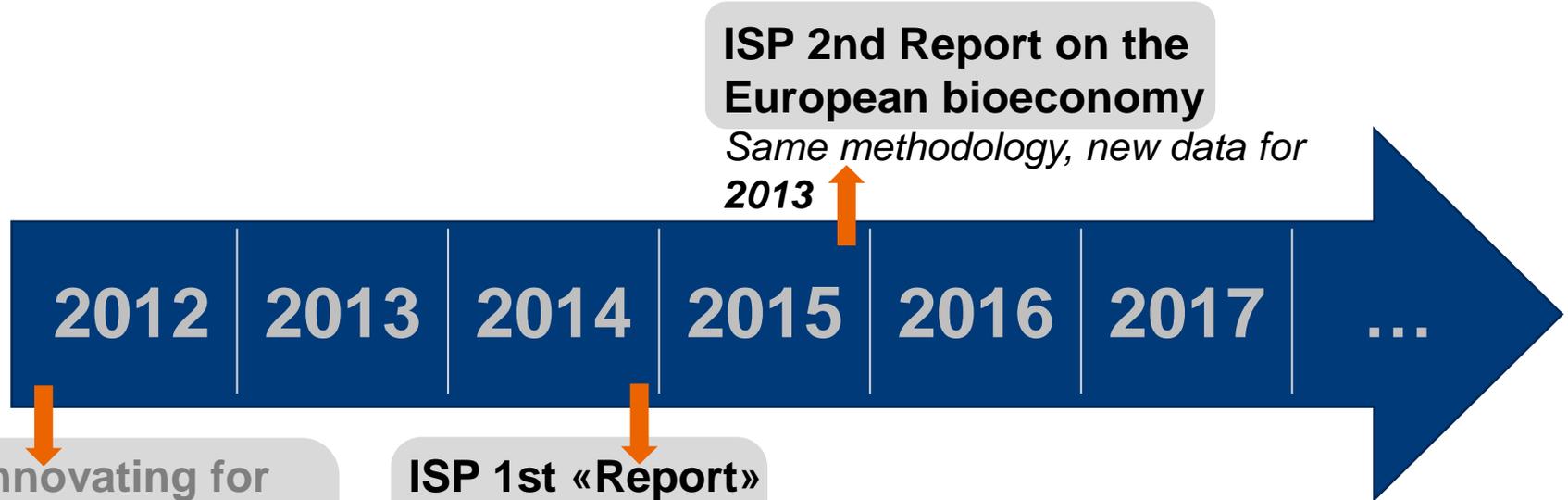
EU Innovating for Sustainable Growth: A Bioeconomy for Europe

The bioeconomy encompasses the sustainable production of renewable biological resources and their conversion and that of waste streams into food, feed and bio-based products such as bioplastics, biofuels and bioenergy [...] It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries¹

Designing a policy for the bioeconomy relies also on our capability to measure this phenomenon.

1) European Commission (2012) *Innovating for Sustainable Growth: A Bioeconomy for Europe*; 11 final)

The report: measuring the bioeconomy

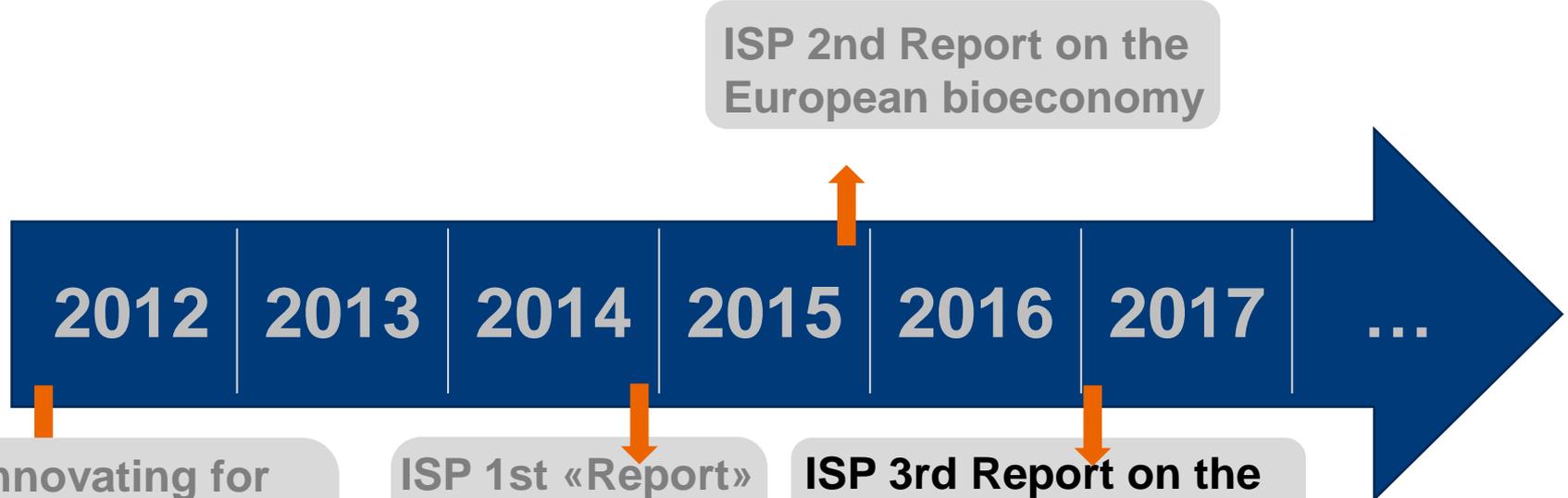


EU Innovating for Sustainable Growth: A Bioeconomy for Europe

ISP 1st «Report» on the European bioeconomy

- Provide a **country based quantification of the bioeconomy**
- Build an approach based on **official statistics**, that can be applied to **all EU countries** and regularly **updated**
- Agriculture, forestry, fisheries, food, wood, paper and pulp
- Biochemicals measured as a share of chemical production thanks to the PRODCOM classification. To be interpreted as a **«potential» for biochemicals production**
- Data on production, employment and trade for 2011

The report: measuring the bioeconomy



2012

2013

2014

2015

2016

2017

...

EU Innovating for Sustainable Growth: A Bioeconomy for Europe

ISP 1st «Report» on the European bioeconomy

ISP 3rd Report on the European bioeconomy

ISP 2nd Report on the European bioeconomy

A **new methodology** is adopted:

- production of **textiles** from natural fibers (PRODCOM) and leather, biotech **pharma** (Assobiotec market data), biofuels (PRODCOM), **bioenergy** (estimates on energy production by source) and **renewable waste** added to the estimation;
- **bio-based chemicals quantified** with PRODCOM data and I/O tables¹;
- Data for 2014.

1) The methodology was developed with CREA, Assobiotec, Cluster Spring and the collaboration of Federchimica, SMI and Farindustria

The 4th Report on the Bioeconomy in Europe

- **Estimates** have been **updated to 2016**, with the same methodology adopted in the third Report; Water cycle added to the estimates;
- Focus on **innovation** with a new classification of the start-ups operating in the bioeconomy in Italy;
- Focus on **water**:
 - Water as an **input** for standard bioeconomic industries (agriculture, food, paper etc...) & a precious **output**, if depurated, in terms of sewage sludge, an important source of biomass, energy and bio-based products;
 - Water as a **source of food and biomass** (fish, fish discards, seaweeds and other aquatic organisms).



2018

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The Bioeconomy in Italy: 260 euro billions in 2016

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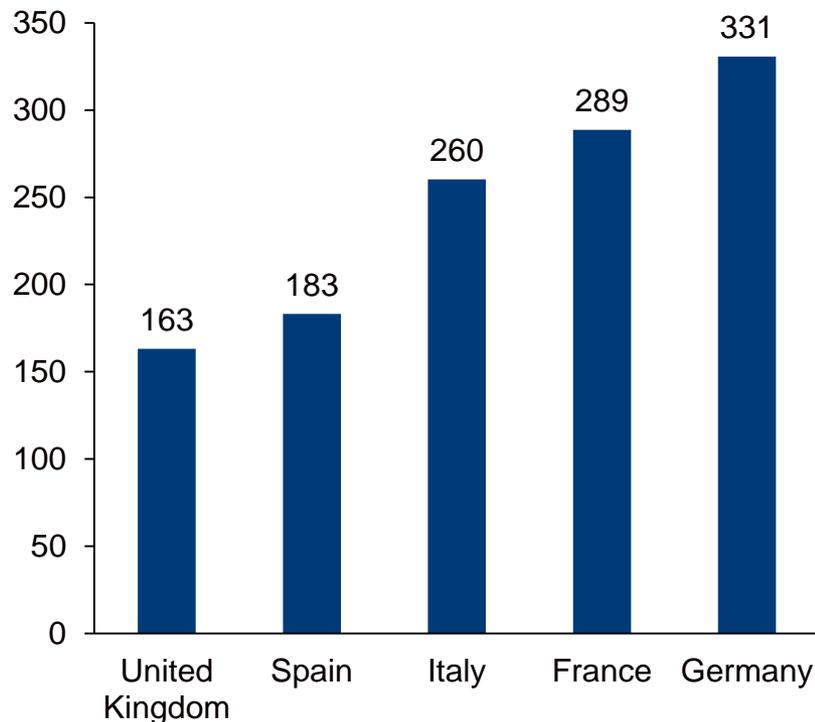
Bioeconomy in Italy (production, euro billions)

	2015	2016	Composition 2016 %
Agriculture, forestry and fishing, of which:	58 232	56 003	21.5
Agriculture	54 946		
Forestry and logging	1 491		
Fishing and aquaculture	1 795		
Food products, beverages and tobacco products	130 281	132 801	51.0
Textiles from natural fibers and leather	16 873	17 153	6.6
Wood	12 713	13 156	5.1
Paper	22 361	23 098	8.9
Bio-based chemical products	2 900	3 037	1.2
Bio-based pharmaceutical products	4 830	5 107	2.0
Biofuel	316	350	0.1
Bioenergy	2 174	2 237	0.9
Total production of bio-based products	250 680	252 942	
% of bio-based products on total production	25.9%	26.3%	
Management and recovery of biodegradable waste	7 049	7 366	2.8
Bioeconomy total	257 729	260 308	100
Bioeconomy in % of total economy	8.2%	8.3%	
Water cycle	9 745	10 026	
Bioeconomy and water cycle	267 474	270 334	
Bioeconomy and water cycle in % of total economy	8.5%	8.6%	

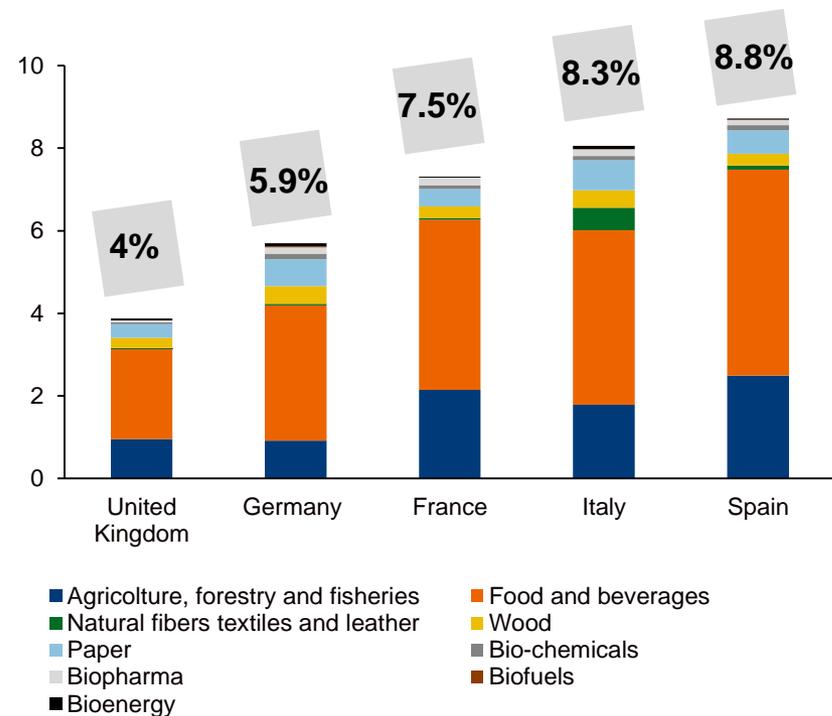
Source: Intesa Sanpaolo on various sources

The bioeconomy in Europe

The bioeconomy in Europe¹
(euro billions, 2016)



The importance of bioeconomy in Europe²
(%, 2016)



Source: Intesa Sanpaolo on Eurostat

1) Net of water cycle

2) The % weight of the bioeconomy on the total production of goods is computed on the bioeconomy value net of the waste component

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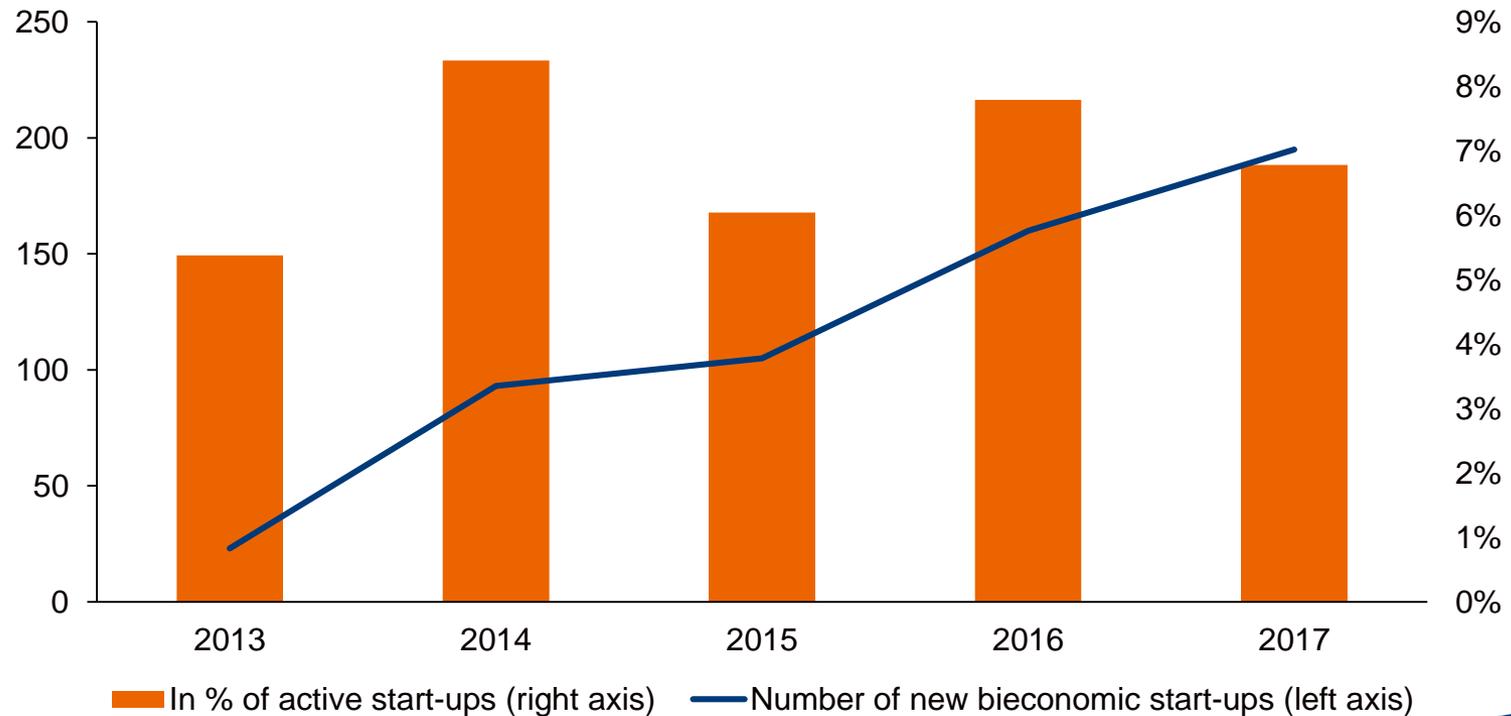
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Start-ups in the bioeconomy

576 innovative start-ups operate in bioeconomic industries. They account for **7%** of the total number of registered innovative start-ups

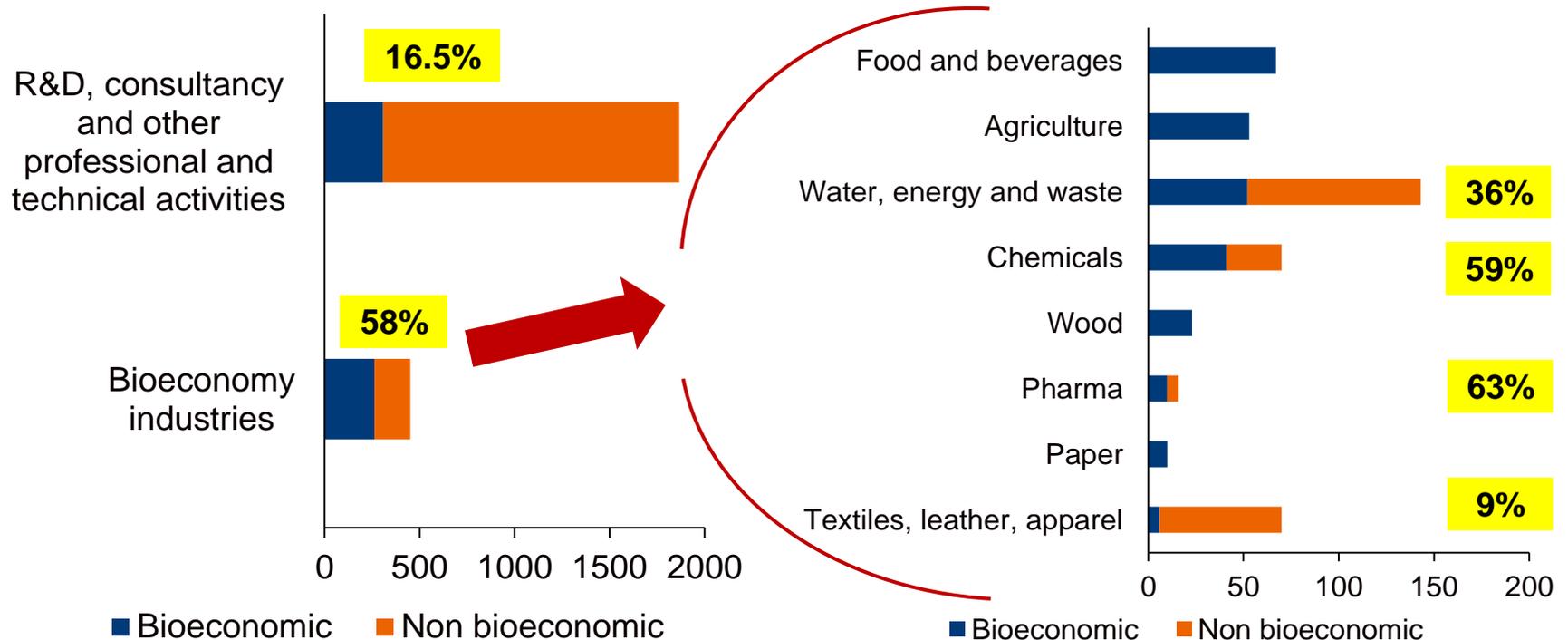
Bioeconomic start-ups by year of registration



Source: Intesa Sanpaolo on InfoCamere data

16.5% of innovative start-ups in the R&D industry are bioeconomic

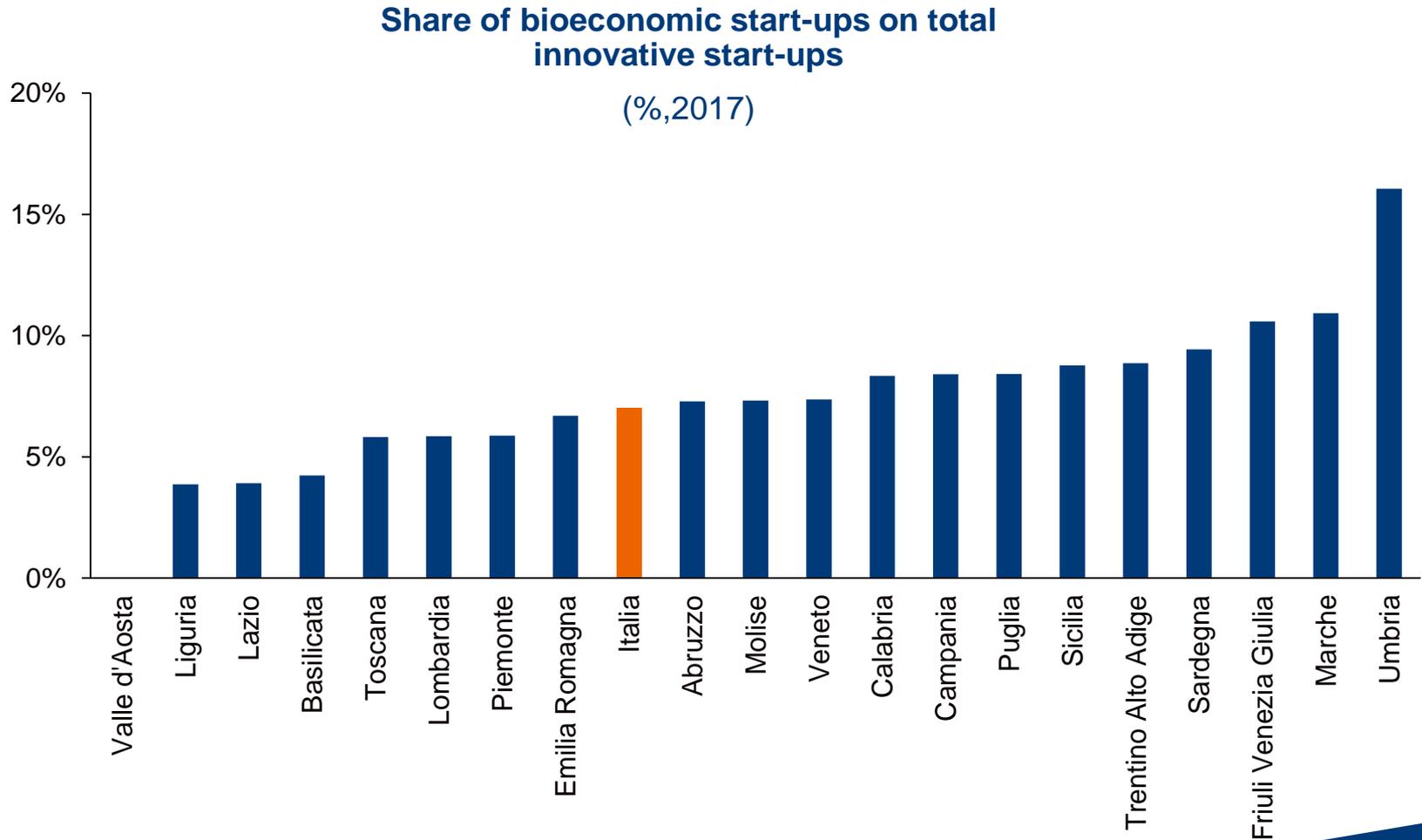
Start-ups in the bioeconomy by industry (2017)



Source: Intesa Sanpaolo on InfoCamere data

Percentage of start-ups in the bioeconomy (manually classified according to the criteria followed in the report).

Innovative start-ups are specialized in the bioeconomy in Southern Italy



Source: Intesa Sanpaolo on InfoCamere data

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Why water (1)?

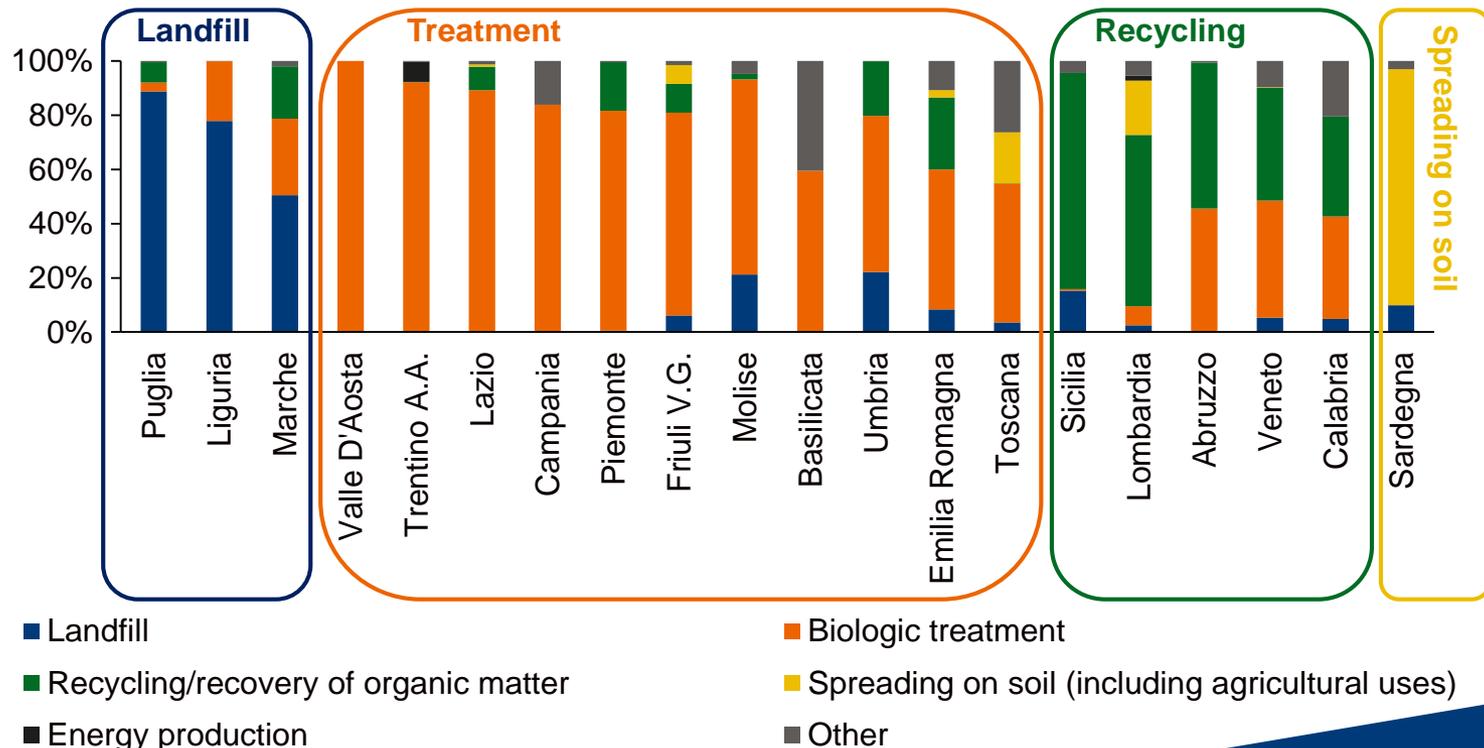
- Water is essential for life and as such is one of the most important inputs in the bioeconomy
- The way we manage the water cycle has a great impact on **efficiency and sustainability** on many levels. We decided in this report to focus on water depuration and on the production of sewage sludge that follows as it is a relevant step in the management of water cycle
- **Waste water treatment** is crucial for the healthiness of the bodies of water
- Depending on how it is managed, **sewage sludge**, an output of the treatment, can be a further threat to sustainability or a valuable source of **biomass**: from it we can extract compost, energy (biogas and biomethane), single nutrients (e.g. phosphorus) and biocompatible materials (bioplastics)

How to manage sewage sludge?

There are different ways to manage sludge, depending on the presence of adequate **treatment plants**, **regulatory context**, the prevailing **type** and **quality of sewage** (industrial, civil), and the **costs** associated to the treatment and the disposal of sludge.

The management of sludge from urban sewage per Italian region

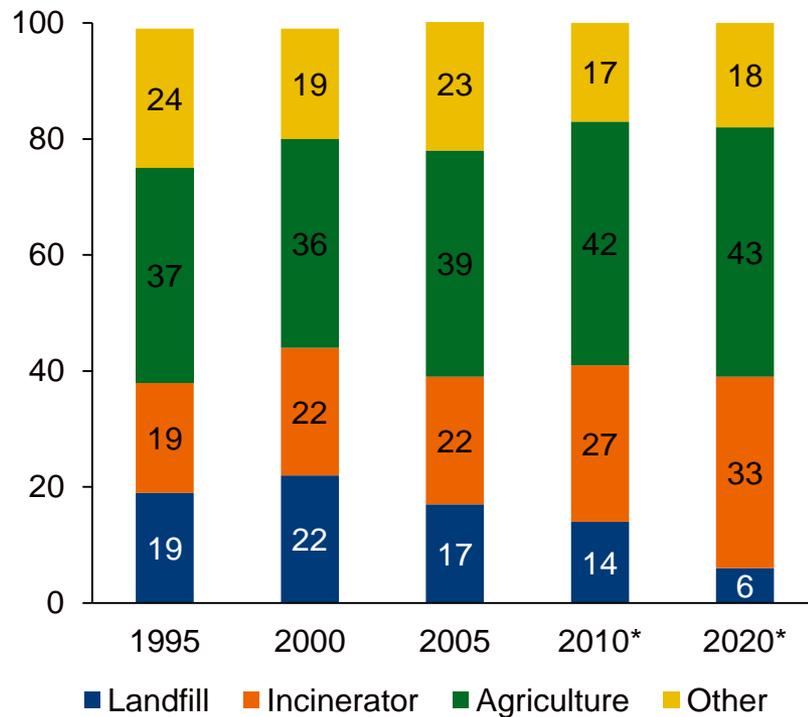
(%, 2015)



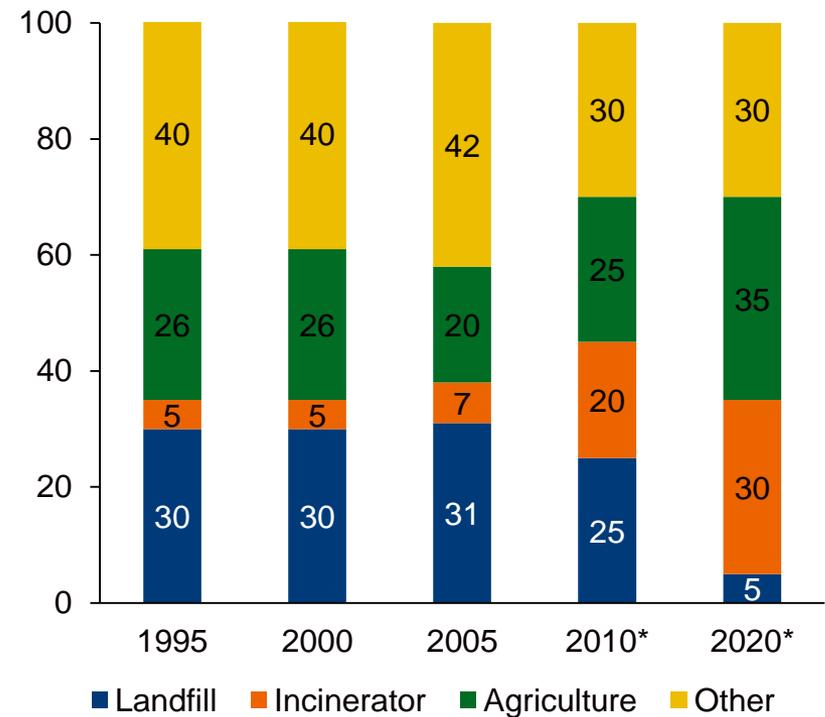
Source: Intesa Sanpaolo on ISPRA data

The European and Italian situation

% of sewage sludge by type of disposal in Europe (EU 27)



% of sewage sludge by type of disposal in Italy



(*) estimates

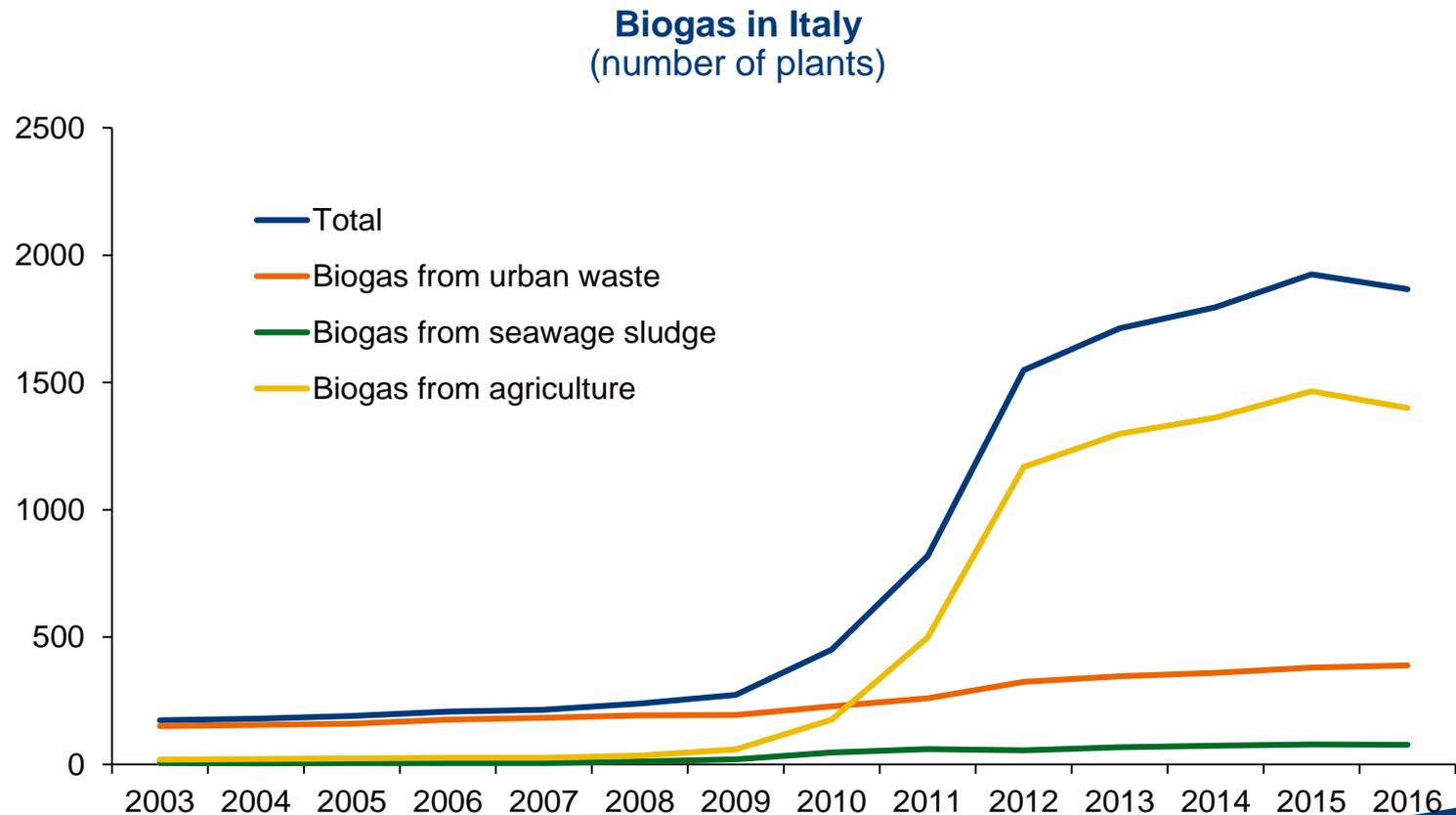
Source: European Commission (2010), Environmental, economic and social impacts of the use of sewage sludge on land, Part III

The role of regulation

- **The disposal of sewage sludge by landfilling must become marginal**, with sludge reused whenever it is deemed appropriate.
- **Spreading on soil is going to become more difficult**, due to regulatory constraints and the scarce availability of suitable land.
- **Waste-to-energy plants are problematic in terms of social acceptance.**
- In the future **recycling and recovery are to be at the top of the hierarchy in sludge management.**
- The **incentives** approved with the decree «Promoting the use of biomethane in transportation» (2nd of March 2018) **are going to add momentum to the treatment of sludge to recover biogas and biomethane.**

Biogas e biomethane

Italy is the **fourth country in the world** for the production of biogas, following Germany, China and the United States.



Source: Intesa Sanpaolo on Terna

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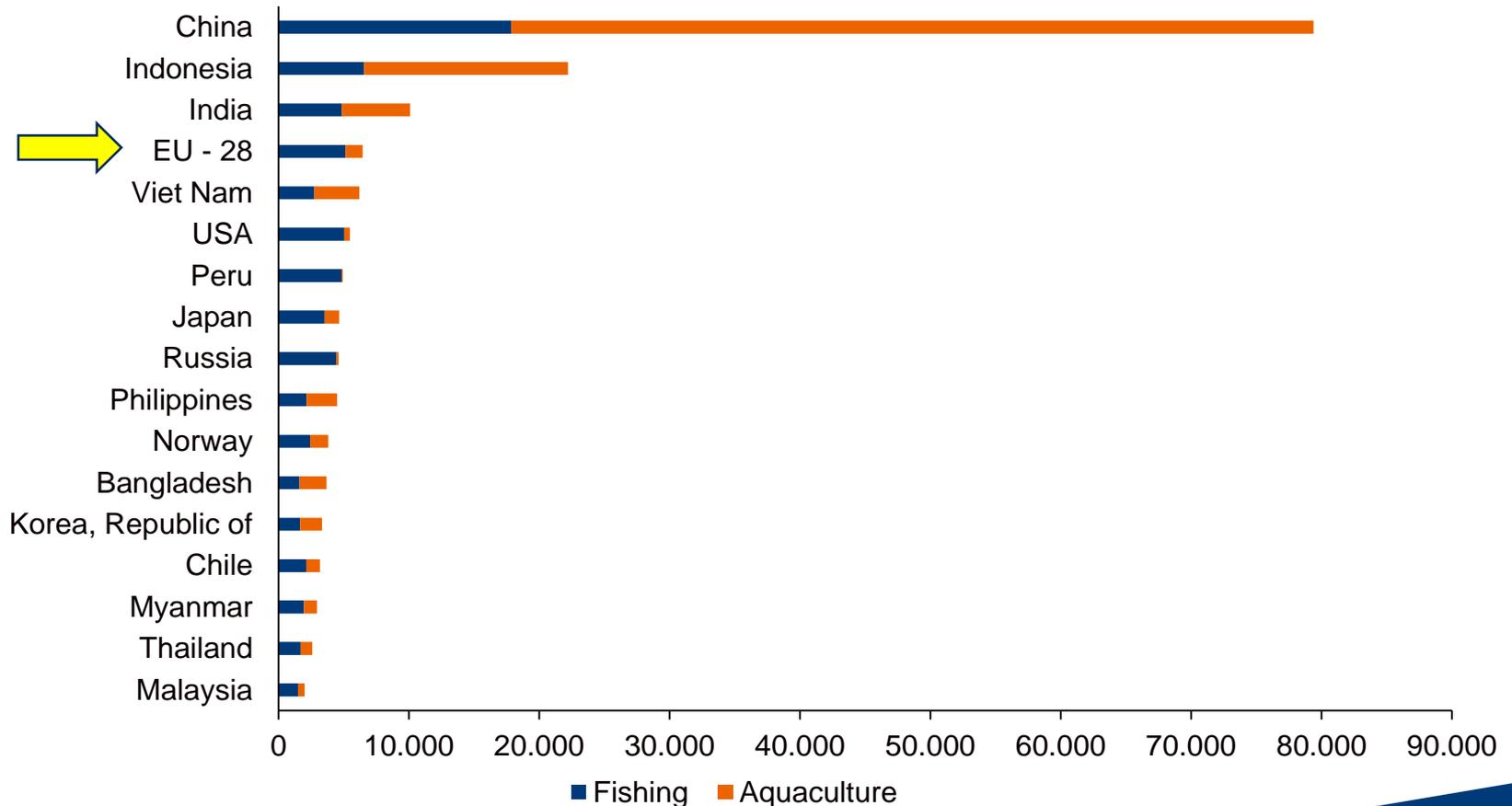
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Why water (2)?

- **Fish and other seafood provide 17% of the human intake of animal proteins** and almost 7% with respect to total proteins. Being a complete source of protein and other vital nutrients such as long fatty acids, vitamins and minerals, fish and other seafood play a relevant role in ensuring food-security.
- The future availability of increasing quantities of seafood depends critically on our capability of preserving the sustainability of its production (water depuration and the adequate treatment of sludge are far from irrelevant in this regard)
- Marine bio-resources are not limited to food. Less traditional avenues for the sustainable use of these resources encompass the use of **seaweed** as an important source of **biomass** and **marine biotechnology**, both activities with a high growth potential.

Europe: a small share in the production...

World production of fisheries and aquaculture
(2015, thousands of tonnes, live weight)

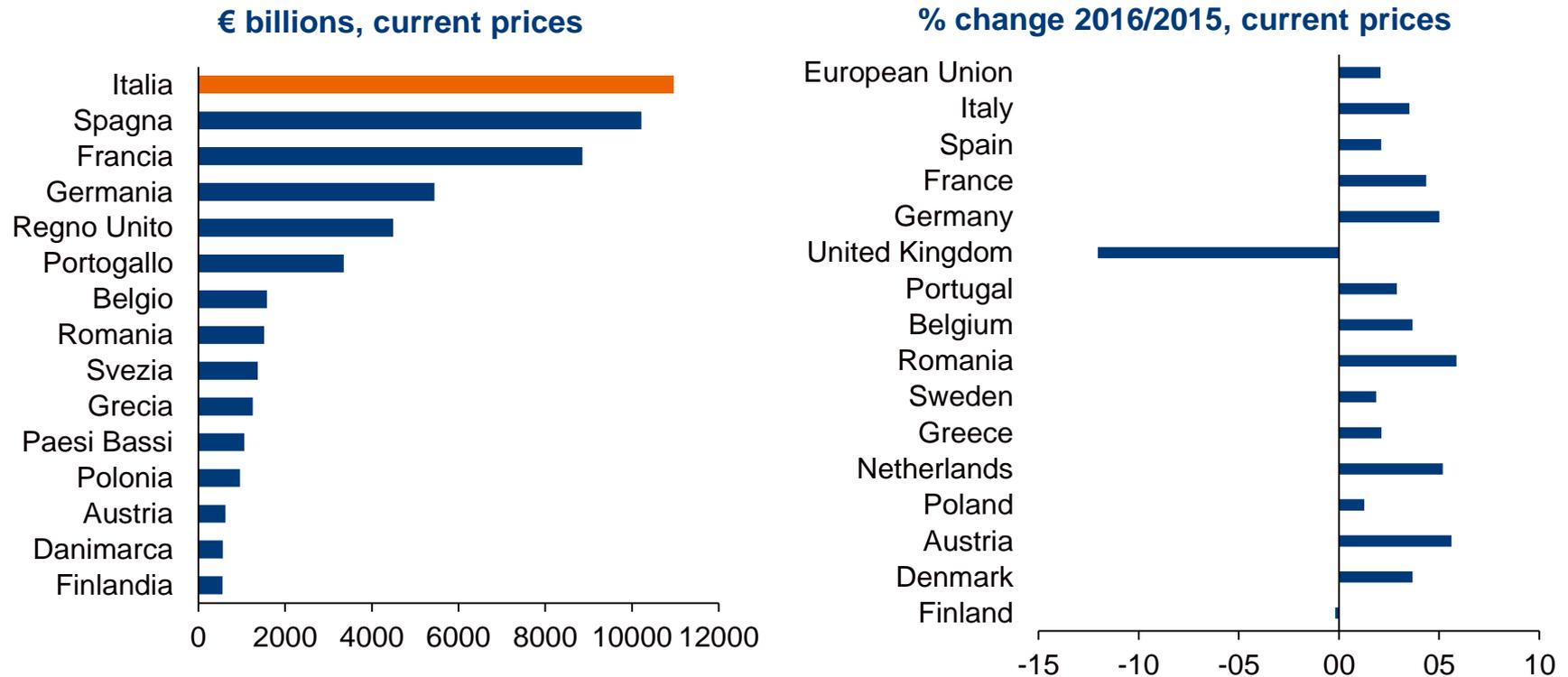


Source: Intesa Sanpaolo on EUMOFA data

... a much higher share in the consumption

European families spent **55 billions of euros in sea products in 2016** and the trade balance shows increasingly growing deficits. Italy is the first European country in terms of expenditure in fish and seafood, with a large deficit in the trade balance.

Annual consumption of fish and aquaculture products

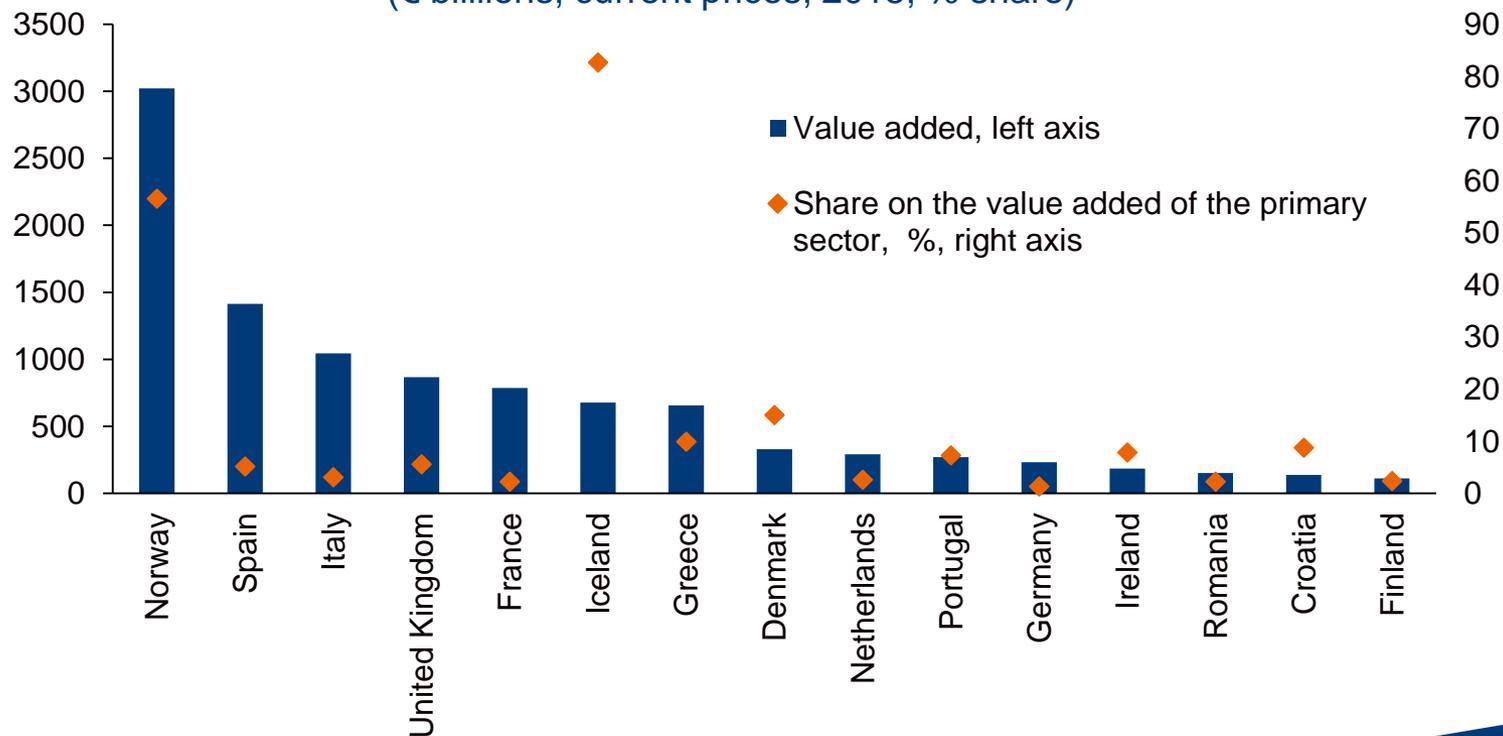


Source: Intesa Sanpaolo on Eurostat

Italy is the third country in Europe in terms of value added in fisheries and aquaculture

With a value added of more than **1 € billion** in fisheries and aquaculture (2015), Italy is second only to Spain in the EU. About **30 000 people** are **employed** in the industry.

Value added in fisheries and aquaculture and its share on total value added of the primary sector in Europe
(€ billions, current prices, 2015; % share)

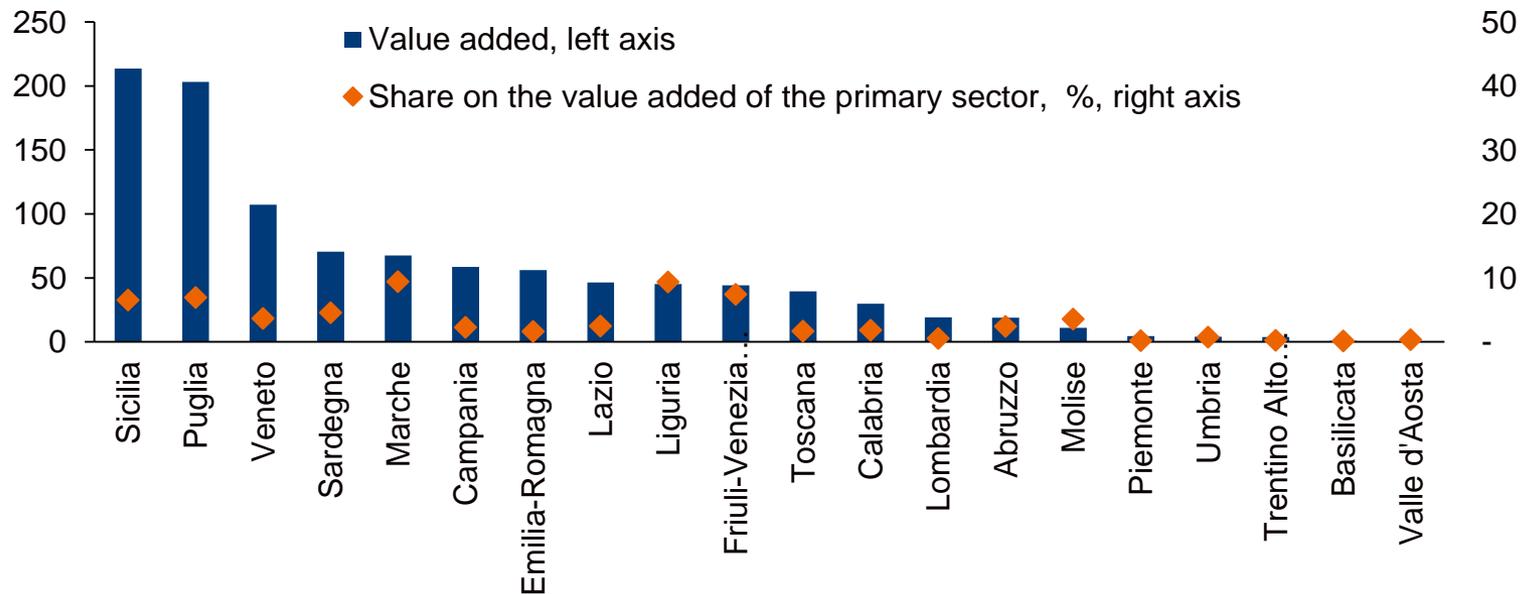


Source: Intesa Sanpaolo on Eurostat

“Mezzogiorno” plays a relevant role in Italian fisheries and aquaculture

40% of the value added in fisheries and aquaculture is created in Sicilia and Puglia. A further 10% in Veneto.

Value added in fisheries and aquaculture and its share on total value added of the primary sector in Italy
(€ billions, current prices, 2015; % share)



Source: Intesa Sanpaolo on Eurostat

The role of the regulator in balancing growing needs with sustainability: EU policies...

■ Common Fisheries Policy

- TAC (total allowable catches) shares and multi-annual plans
- Fishing effort controls and technical measures (fishing capacity, mesh size, minimum landing and conservation size, closed areas and seasons, design and use of gear, ...)
- Fighting against illegal fisheries
- Landing obligation → reducing wasteful discards, creating great potential for biomass

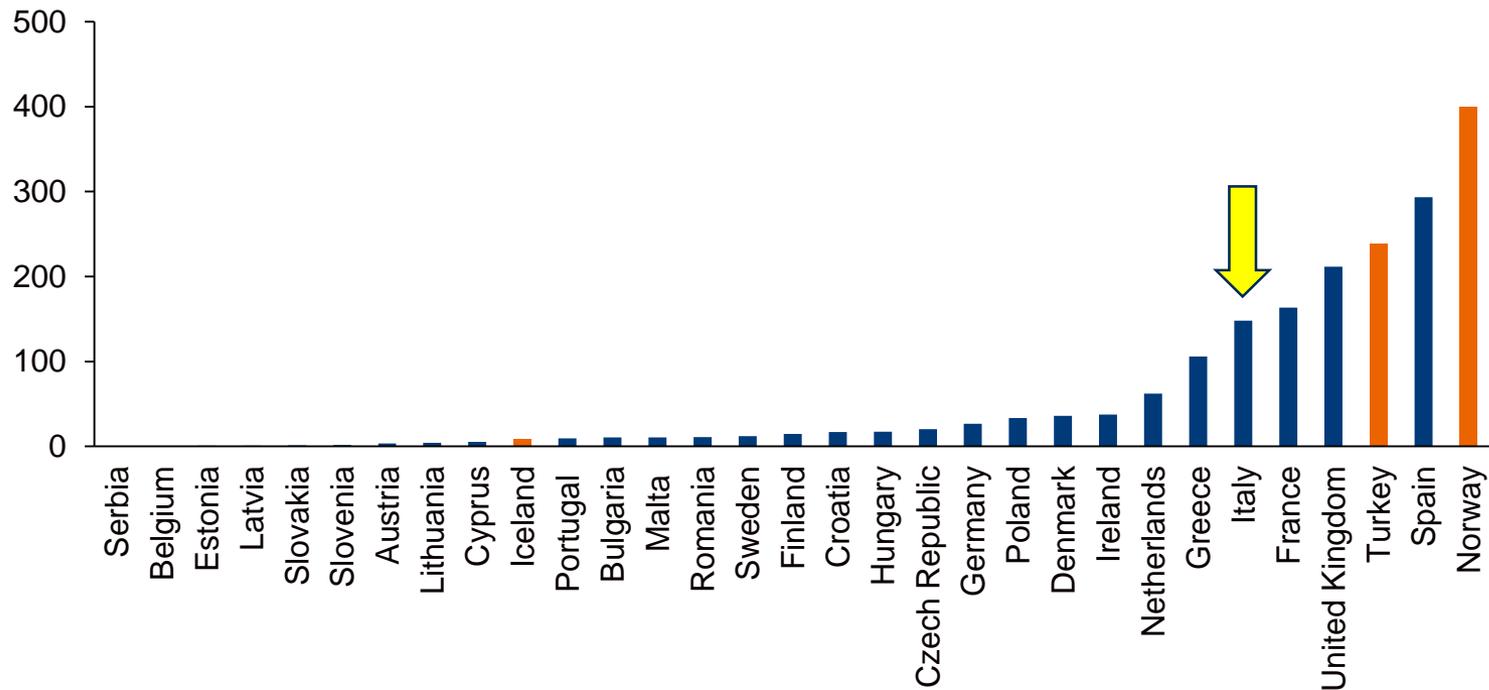
■ Blue Growth Strategy (EU 2020)

- Focus on sectors that have a high potential for growth (aquaculture and marine biotechnology)

... a sustainable development for aquaculture ...

Fish and seafood consumption is going to rely increasingly on aquaculture → a plan for sustainable development is needed, especially in terms of feeding requirements, which rely still heavily on nutrients extracted from wild catches (e.g. long-chain fatty acids)

Total production of aquaculture
(thousands of tonnes, 2015)



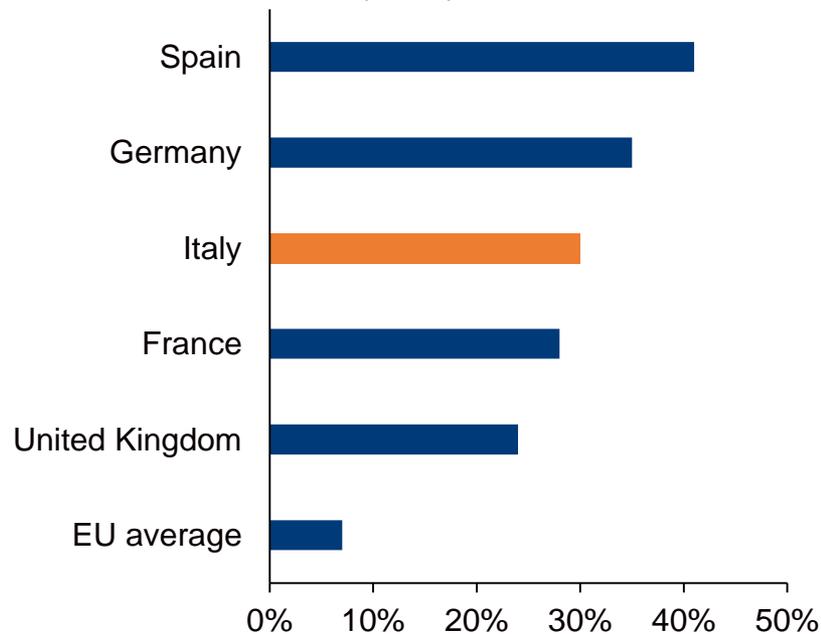
Extra-EU countries in orange. (a) Norway is out of scale for readability (the true value is 1,381,000 tonnes).

Source: Intesa Sanpaolo on Eurostat

... and for marine biotechnologies

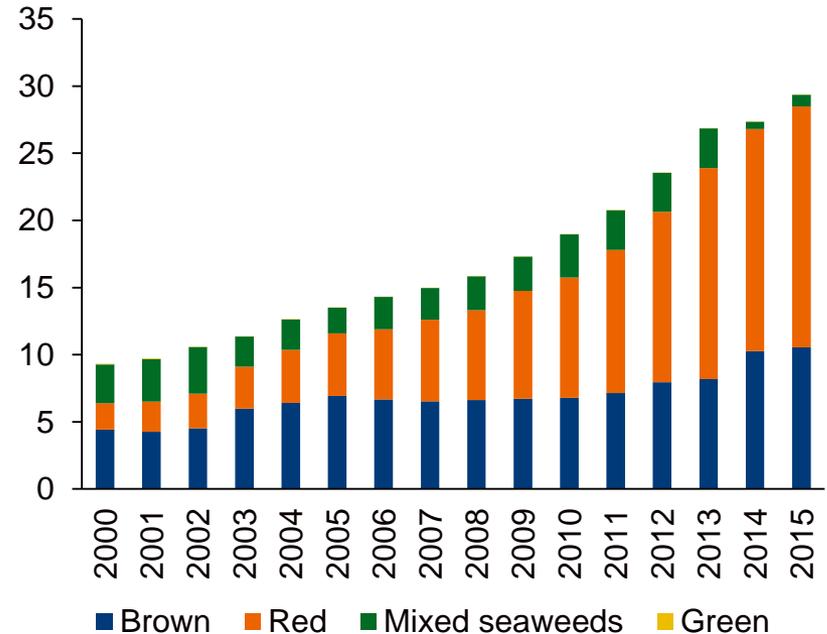
The effort for sustainability will depend strongly on the research in **marine biotechnologies**, which will improve the exploitation of marine resources, especially with respect to the **by-products of fish and seafood** (whose availability is going to grow thanks to the landing obligation policy), **seaweeds** and **marine bacteria**.

% share of marine biomass in the industrial processes in Europe (2014)



Source: Intesa Sanpaolo on Hodgson et alii (2016)

World production of seaweeds (billions of tonnes)



Source: Intesa Sanpaolo on FAO