European Commission

The European Commission's Knowledge Centre for Bioeconomy

Brief on jobs and growth of the bioeconomy 2009-2015[1]

Key messages

1. In 2015, the bioeconomy generated 4.2% of the gross domestic product (GDP) of the EU[2] and employed 8.2% of the labour force (see section 1).
2. Concomitant growth in value added and reduction in number of people employed resulted in apparent labour productivity gains over the period 2009–2015 (see section 2).
3. Each bioeconomy sector follows its own dynamics, which can also differ from one EU Member State to another (see section 3).

1. How much turnover, value added and employment does the EU bioeconomy generate?

The most recent estimates are based on 2015 data.

In 2015, the bioeconomy created a turnover of EUR 2.3 trillion in the EU. Half of this was generated by the food, beverages and tobacco industry, 17% by agriculture (Figure 1).

In 2015, the bioeconomy created EUR 621 billion of value added in the EU. More than 37% came from the food, beverages and tobacco industry, and 28% from agriculture. The value added generated by the bioeconomy represented 4.2% of the EU's GDP.

In 2015, the bioeconomy employed 18 million people in the EU. Three quarters worked in agriculture (51%) or in the food, beverages and tobacco industry (25%). They made up 8.2% of the total EU labour force.

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[1] This brief is based on Ronzon and M'Barek (2018), Data portal of agro-economics Modelling – DataM: Bioeconomics dataset (Ronzon et al., 2018) and Jobs and wealth in the EU bioeconomy dashboard (version 08/05/2018). The methodology applied is further detailed in Ronzon et al., 2017 and Piotrowski et al., 2018.

[2] EU stands for "European Union". It is also referred to as EU-28 as it comprises 28 Member States at the date of publication: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE) and United Kingdom (UK).

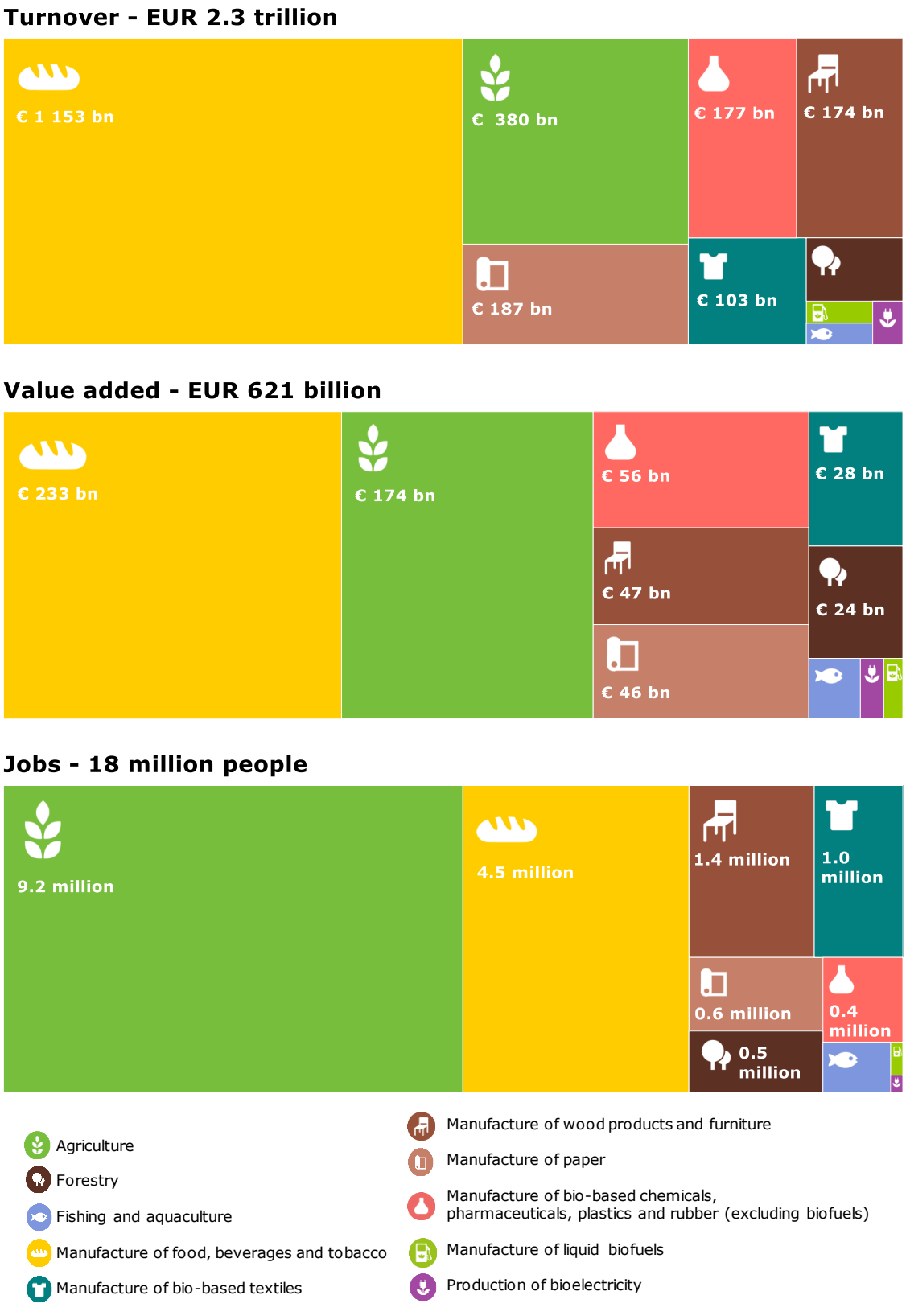

Figure 1. Turnover (billion EUR), value added (billion EUR) and employment (million people) in the bio-based sectors of the EU-28 in 2015[3].

[3] Some specific bio-based sectors are not covered in this brief, e.g. the production of bio-heat and the management of organic waste (*see "Knowledge gaps", page 7*).

2. How did value added and employment in the bioeconomy evolve over the period 2009-2015?

The bioeconomy contracted in 2009 due to the economic downturn, but it recovered quickly and has since continued its trend of steady growth. Value added increased by approximately EUR 96 billion between 2009 and 2015 (Figure 2), with more than 60% being generated by the agriculture and the food, beverages and tobacco sectors. Within this timeframe, the bio-based electricity[4] sector showed the greatest growth[5], followed by the forestry sector (see Figure 2, right).

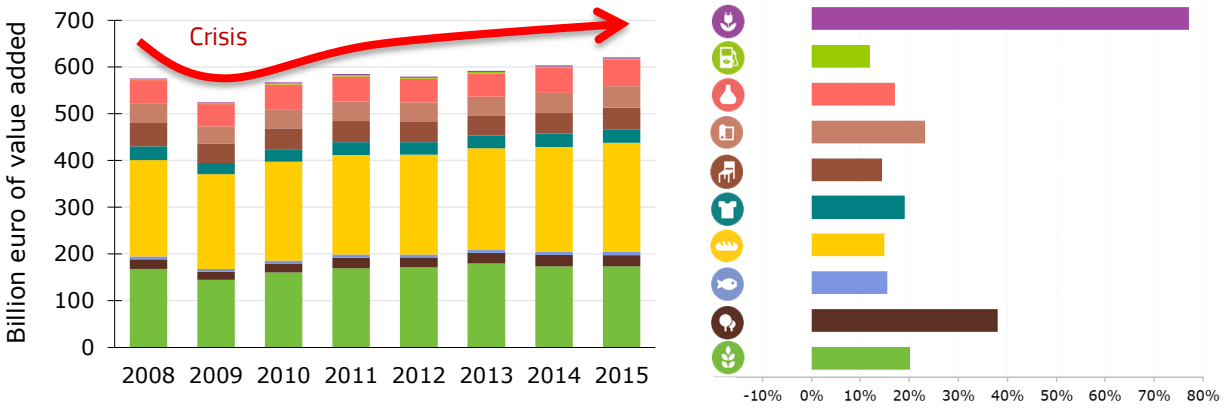

Figure 2. Evolution (left) and sectoral variation (%) (right) of value added in the EU-28 during the period 2009-2015 in the bio-based sectors.

An ongoing restructuring of the agriculture sector[6] led to a reduction in the number of people employed in this sector by 1.4 million (-13.3%) between 2009 and 2015 (Figure 3). This is the main driver of the decrease in overall employment in the EU bioeconomy, where the number of people employed fell by 1.7 million between 2009 and 2015.

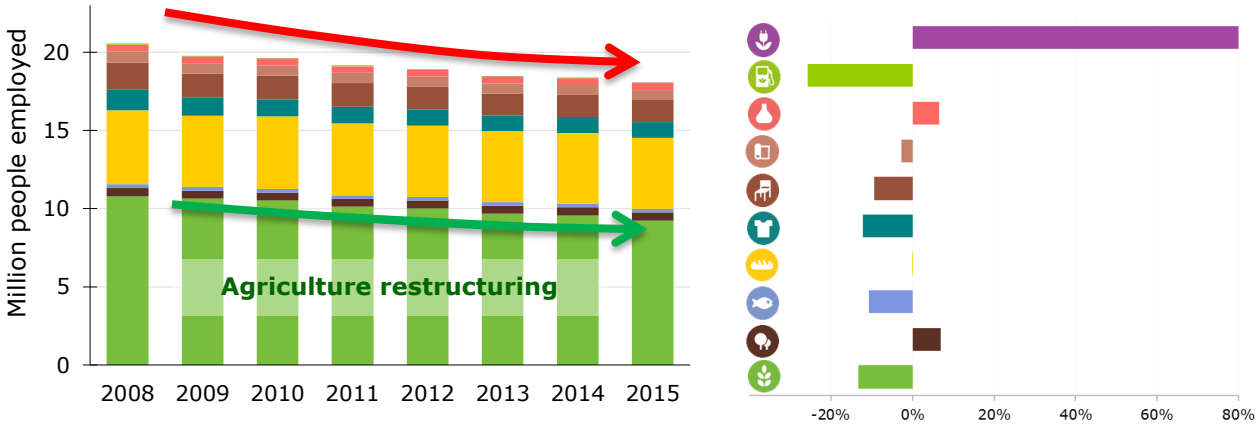

Figure 3. Evolution (left) and sectoral variation (%) (right) of employment in the bio-based sectors in the EU-28 during the period 2009-2015.

The labour force during this period also declined significantly in other "traditional" sectors (see Figure 3), such as the manufacture of wood products and wooden furniture (-145 000 people, -9.4%), the

[4] Bio-based electricity includes the operation of generation facilities that produce electric energy from biomass, and excludes the production of electricity through incineration of organic waste (Eurostat, 2008). Following official reporting statistics, only the enterprises with Combined Heat and Power (CHP) plants where the share of the value added in the production of electricity is higher than in the production of heat are included in this brief.

[5] Data for the production of bio-based electricity have to be treated with caution due to scarce reporting by EU Member States. In 2015, the number of people employed and the value added generated in the production of electricity was not reported, or was classified as confidential or with low reliability, for eight of the 28 Member States (Eurostat, 2018; which serves as a basis for the calculation of the production of bio-electricity).

[6] The restructuring refers to certain qualitative changes in the pattern of land holdings and size distribution of farms.

manufacture of bio-based textiles (-139 000 people, -12.2%) and the fishing and aquaculture[7] sectors (-27 000 people, -10.7%). On the other hand, employment increased in the bio-based chemicals, pharmaceuticals, plastics and rubber (excl. biofuels) (27 000 people, 6.6%), forestry (35 000 people, 6.9%) and bio-based electricity[5] (6 000 people, 79.9%) sectors.

Labour productivity gains were achieved in all bioeconomy sectors over the 2009-2015 period, except for the bioelectricity sector[5] (Figure 4), in which employment grew to a greater extent (80%) than the value added (77%).

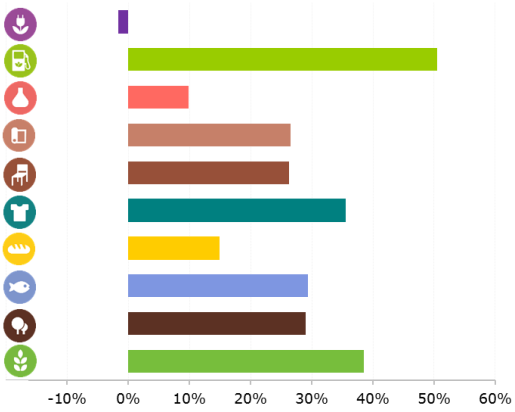

Figure 4. Labour productivity growth in the bio-based sectors between 2009 and 2015 in the EU-28.

3. How do the socio-economic indicators of the EU bioeconomy vary between sectors and Member States?

The EU bioeconomy is made up of sectors that vary greatly in terms of their capacity to employ people and generate economic growth, but also in their production costs. Sectors with a high proportion of inputs (or high costs of bought-in goods and services) have a greater impact on the turnover of the EU bioeconomy than on the value added. As an example, the manufacture of food, beverages and tobacco contributes far more to the EU bioeconomy's turnover (51%) than to its added value (38%), in contrast to agriculture (17% turnover vs. 28% value added). Figure 5 shows the value added (first bar) and turnover (second bar) per sector.

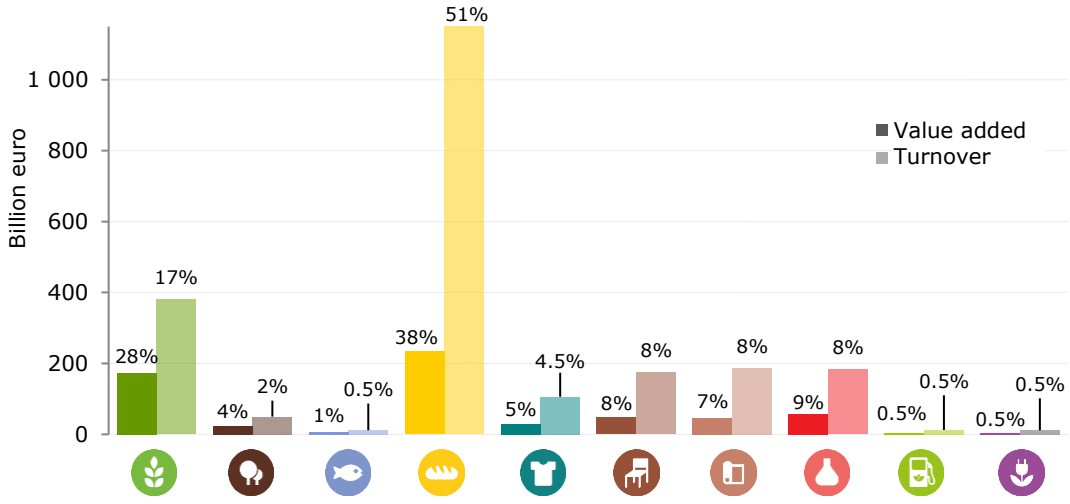

Figure 5. Value added and turnover per sector in the EU-28 in 2015 (% of total Bioeconomy in the EU-28).

[7] Fishing and aquaculture covers activities in both marine and freshwaters, which include the gathering of other marine organisms and materials such as natural pearls, sponges, coral and algae, as well as the growth of edible seaweeds such as laver (Eurostat, 2008).

There are significant differences in the labour productivity levels reached in 2015, both by sector and by Member State (Figure 6).

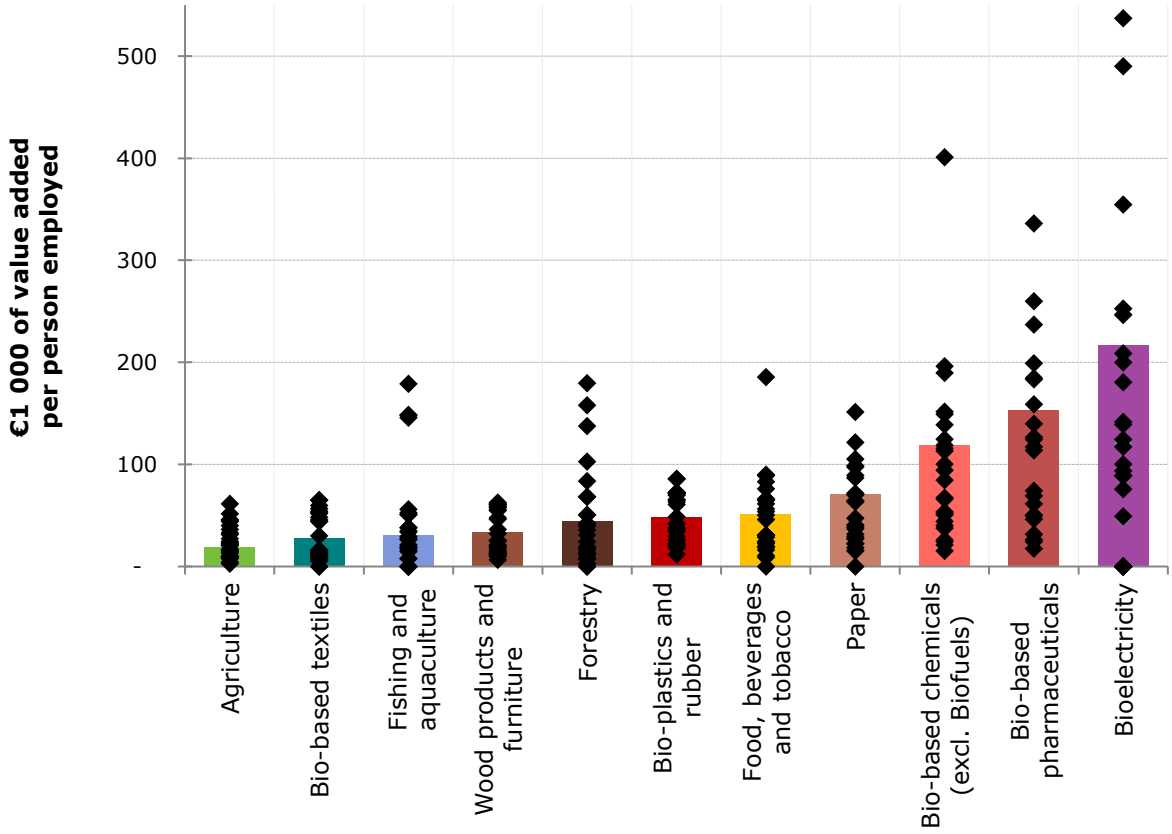

Figure 6. Apparent labour productivity[8] in the EU-28 bioeconomy in 2015 by sector. Bars show the EU-28 apparent labour productivity; points show the Member States' apparent labour productivity[9].

By analysing the concentration of national labour markets in the bioeconomy (using location quotient[10] as a proxy for the employment situation), and the apparent labour productivity of the bioeconomy, four distinct groups of Member States (MS) can be identified as follows (see Figure 7):

- Group 1.1: MS whose national labour markets are strongly specialised in the bioeconomy sectors but have a low level of apparent labour productivity. In this group, the bioeconomy is geared towards biomass-producing sectors and the food, beverages and tobacco manufacturing sector, while other manufacturing sectors with low levels of apparent labour productivity can play a significant role, depending on their historical sectoral specialisation or biomass endowment. This is reflected in the bioeconomy research and innovation (R&I) priorities in the food and beverages sector (in all MS of this group), as well as in the agriculture and forest-based bioeconomy (EL, HR, LT, LV, PL, PT, RO) and the blue economy (BG, EL, PL, PT, RO) for the timeframe 2014-2020 (Spatial foresight et al., 2017).
- Group 1.2: MS with a medium specialisation of national labour markets in the bioeconomy sectors and a medium-low level of apparent labour productivity. In this group, the agriculture and the food, beverages and tobacco manufacturing sectors are the main sources of bioeconomy jobs and value added, but other biomass-producing sectors are also relevant due to resource availability (e.g.

[8] Apparent labour productivity is an indicator of the economic growth potential, calculated as the value added at factor costs divided by the number of people employed.

[9] Apparent labour productivity in Ireland for the manufacture of bio-based pharmaceuticals reached EUR 784 000 per person employed, and is beyond the scale of this figure.

[10] In this context, location quotient (LQ) is the share of those employed in a Member State that are working in the bioeconomy (or one of its sectors), divided by the equivalent employment share in the EU as a whole. LQ helps quantify how "concentrated" the bioeconomy is in a Member State compared to the EU as a whole.

fishing in MT and forestry in EE, SK and CZ). R&I programmes in these MS already attempt to further develop the bio-based manufacturing sectors and the bio-based industries in general, since many MS within this group include the biochemical (CZ, EE, SI, SK), biopharmaceutical (CY, CZ, SI, SK) and biorefinery (MT, SI) sectors in their 2014-2020 R&I priorities and plans (Spatial foresight et al., 2017).

- Group 2.1: MS with a low-to-medium specialisation of national labour markets in the bioeconomy and medium-high level of apparent labour productivity. Generally, these MS show high sectoral diversification and productivity, suggesting a high level of maturity of the bioeconomy manufacturing sectors. This is also supported by the fact that most MS within this group (DE, FI, FR, IT, ES) have developed dedicated bioeconomy strategies at the national level (BKC, 2018) and have focused their R&I priorities on the biochemical (AT, DE, ES, FI, FR, IT), biopharmaceutical (AT, DE, ES, FI, FR, LU) and biorefinery sectors (AT, DE, ES, FI, FR, IT) (Spatial foresight et al., 2017).
- Group 2.2: MS with a low level of bioeconomy specialisation in their national labour markets and high level of apparent labour productivity of the bioeconomy sectors. High labour-productive sectors are generally supported by the presence of Regional Specialisation Strategies (Research and Innovation Strategies for Smart Specialisation - RIS3) and related R&I programmes, e.g. four MS (BE, NL, SE, UK) have 2014-2020 RIS3 that are focused on bio-based chemicals, and five MS (BE, IE, NL, SE, UK) focus on bio-based pharmaceuticals (Spatial foresight et al., 2017). For example, the UK[11], NL[12] and SE[13] have developed bioeconomy-related strategies that specifically address these fields (BKC, 2018).

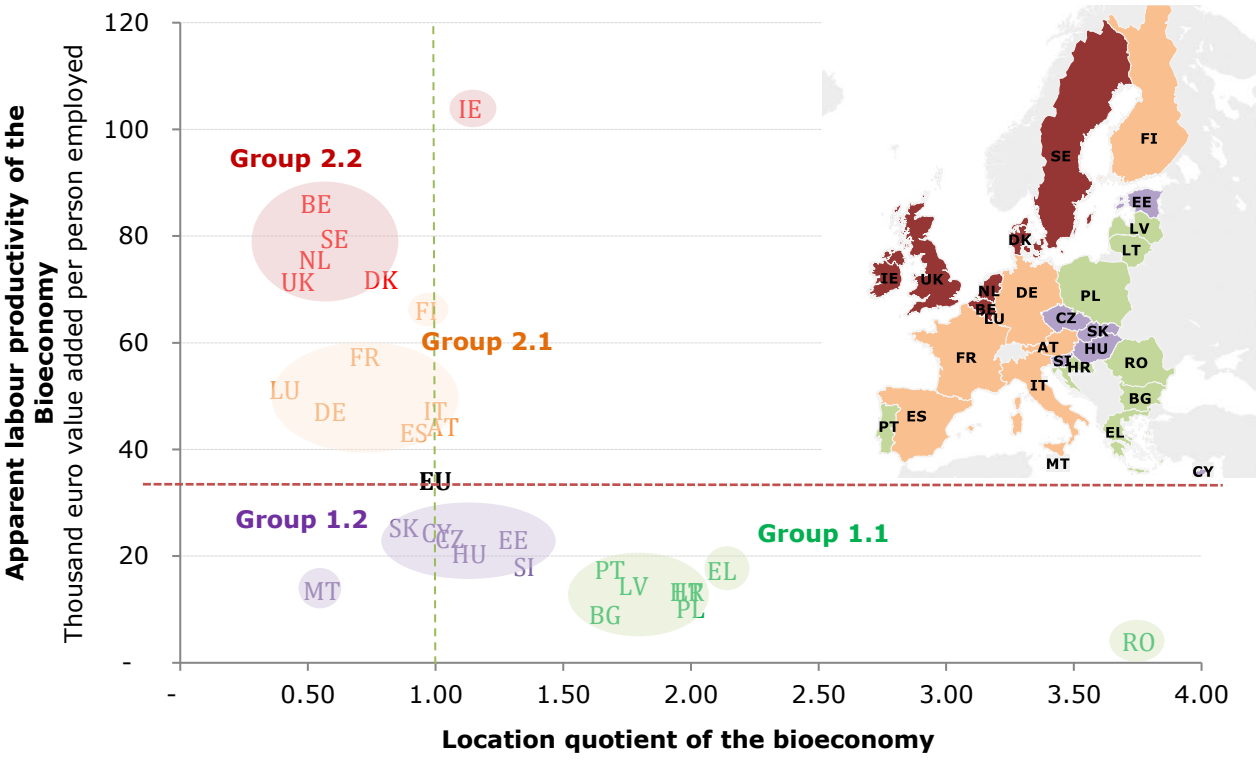

Figure 7. Clustering of EU-28 Member States based on the apparent labour productivity and employment concentration in the different sectors. Average EU-28 values are shown as dashed lines.

[11] UK Synthetic Biology Strategic Plan 2016 — Biodesign for the Bioeconomy (https://connect.innovateuk.org/documents/2826135/31405930/BioDesign+for+the+Bioeconomy+2016+DIGITAL+updated+21_03_2016.pdf/d0409f15-bad3-4f55-be03-430bc7ab4e7e).
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Knowledge gaps

1. In the absence of official statistics on all sectors of the bioeconomy, this document is partly based on estimates following the nova-Institute's methodology. The methodology is detailed in Ronzon et al. (2017), Ronzon & M'Barek (2018), and Piotrowski et al. (2018). Although these estimates give valuable information on the relative weight of each bioeconomy sector and on main trends, absolute numbers are subject to uncertainties and should therefore be used with caution.
2. Data for 2015 are not available for certain sectors (e.g. aquaculture, liquid biofuels and bio-based electricity) and countries (e.g. Malta, Cyprus and Luxembourg). As a result, their estimates are subject to a higher degree of uncertainty and may be underestimated.
3. Certain 'hybrid' sectors (i.e. activities that make use of biomass and other types of feedstock) are not covered in this brief due to the lack of statistics for the economic indicators assessed and/or estimates of the bio-based shares. This is the case for bio-heat generation (including district heating, domestic heating, and certain Combined Heat and Power plants) and the management of organic waste. The jobs and growth generated in the management of their feedstock are, however, included in the primary sectors (e.g. agriculture, forestry). Similarly, statistics on the production of algae through freshwater aquaculture (i.e. bioreactors) are not reported. New research (e.g. the BioMonitor project funded under the EU's Horizon 2020 programme) aims to fill some of those gaps.
4. The estimates presented in this brief may be subject to correction in the future as more data become available.

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