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INVESTMENTS GAPS TO ACHIEVE SUSTAINABLE TARGETS IN THE BIOECONOMY

European Investment Bank

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European Investment Bank
98-100, boulevard Konrad Adenauer
L-2950 Luxembourg

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EXECUTIVE SUMMARY

- The bioeconomy generates €967 billion annually for the European Union, representing 8.6% of its gross domestic product (GDP) and supporting 16.9% of all EU jobs. It is a cornerstone of Europe's economic strength, driving innovation and global competitiveness. The bioeconomy also plays a central role in the European Green Deal and the United Nations Sustainable Development Goals (SDGs), offering sustainable solutions for food security, climate adaptation, biodiversity conservation and the shift to a low-carbon economy.
- The European Union needs an additional €350 billion in annual investment across all sectors to meet its sustainability goals. However, the specific investment needs of the bioeconomy have not been fully quantified until now. This report estimates both the total investment required for the European bioeconomy and the current investment gap.
- The report estimates that the EU bioeconomy faces an annual investment gap of €121.8 billion. Globally, the gap exceeds $777 billion per year.
- The analysis identifies nine key subsectors. In the European Union, agriculture accounts for the largest share of the investment gap (€62.3 billion per year), followed by resource protection (€18.7 billion), irrigation for agriculture (€11.5 billion), bioenergy (€8.7 billion to €9.4 billion), agrifood industries (€5.5 billion), fisheries and aquaculture (€3.3 billion to €10.4 billion), forestry (€4.2 billion), bio-based industries (€2.07 billion to €3.35 billion) and research, development and innovation in agriculture (€1 billion).
- The European Investment Bank (EIB) is already helping to close this gap, investing €7.1 billion in the bioeconomy each year. To close the remaining gap, increased public investment and innovative financing tools – such as green bonds, programme loans, venture capital and risk-sharing instruments – are essential. These tools are particularly important for bioeconomy sectors that have difficulty accessing traditional finance.
- This report provides a roadmap for targeted investment in the bioeconomy. With strong partnerships between public institutions, private investors and EU Member States, the bioeconomy can attract the transformative investments needed to build a sustainable, competitive and climate-resilient Europe.

1 INTRODUCTION

The bioeconomy strengthens Europe's competitiveness by creating jobs and driving innovation. Each year it generates as much as €563 billion to €967 billion in added value – equal to 5% to 8.6% of EU GDP – and provides employment for 10.2% to 16.9% of the EU workforce. The bioeconomy is central to the European Green Deal's main goals: ensuring food security and nutrition, managing natural resources sustainably, reducing dependence on fossil fuels, and mitigating and adapting to climate change. These priorities align with the United Nations 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals, where the bioeconomy also plays a key role.

The European Union needs to invest an extra €350 billion a year to meet its sustainability targets,[1] but how much of this should go to the bioeconomy has never been clearly defined. This report helps fill that gap by estimating the extra investment the bioeconomy needs to achieve the Green Deal targets and the Sustainable Development Goals.

This report uses the latest data to estimate investment needs in nine bioeconomy subsectors: agriculture; irrigation; forestry; agrifood industries; research, development and innovation; bioenergy; bio-based industries; fisheries and aquaculture; and resource protection. It highlights the role of the European Investment Bank (EIB) in addressing these gaps and shows how innovative financing can support the green transition. Case studies illustrate EIB-backed solutions and outline strategies to mobilise capital to ensure the European Union meets its sustainable development goals and builds long-term economic resilience.

The bioeconomy: Using biological resources for a sustainable economy

The **bioeconomy** is defined by the European Union as **"the part of the economy that uses renewable biological resources from land and sea – such as crops, forestry, fish, animals, microorganisms, and algae – to produce food, materials, and energy."**[1]

Essentially, the bioeconomy includes all sectors that use biological assets to produce food, materials and energy. It spans industries such as **agriculture**, **forestry**, **fisheries**, **aquaculture**, **biotechnology**, **food**, **bio-based materials and bioenergy.**

The European Union's **Bioeconomy Strategy**[2] promotes **sustainability**, **resource efficiency** and **innovation**. It aims to **reduce dependence on fossil fuels**, **mitigate climate change** and **support circular models** by managing natural resources responsibly and turning waste into valuable products.

It also supports the European Union's broader goals of **economic growth**, **job creation**, **environmental protection** and **climate resilience**.

[1] European Commission. (2021). A global Green Deal: Op-ed article by Ursula von der Leyen, President of the European Commission, and Werner Hoyer, President of the European Investment Bank. https://ec.europa.eu/commission/presscorner/detail/en/ac_21_1322

[2] An update of the EU Bioeconomy Strategy and Action Plan is scheduled for 2025.

2 INVESTMENT GAPS AND FINANCING SOLUTIONS IN THE BIOECONOMY: DEFINITIONS

2.1 Investment needs in the bioeconomy

The bioeconomy is a complex sector, encompassing activities ranging from renewable energy production (biomass and biogas) to sustainable land management, ecological restoration and circular food systems. To achieve the objectives of the European Green Deal and contribute to the Sustainable Development Goals,[3] significant investment is needed in various sectors.

- **Greenhouse gas emissions:**

Investments in areas such as **renewable energy production** (biomass, bioenergy and biogas), energy and resource efficiency, and the development of **bio-based materials** (bioplastics, biocomposites, wood and fibre-based products) help reduce greenhouse gas emissions. These activities contribute to SDG 13 (climate action) and SDG 15 (life on land). They align with key European Green Deal initiatives, such as the European Climate Law, which sets binding emission reduction targets, and REPowerEU, which focuses on reducing dependence on fossil fuels and transitioning to renewable energy sources.

- **Renewable energy production:**

Investments in renewable energies, including **biomass energy, biomethane and biofuels**, support the European Union's transition to a clean, sustainable energy system. These investments are in line with SDG 7 (affordable and clean energy) and SDG 13 (climate action), as well as the EU Renewable Energy Directive and **REPowerEU**. These components aim to accelerate the uptake of renewable energies and strengthen energy security within the European Union.

- **Sustainable agricultural and forestry practices:**

Investments in sustainable land management, agroforestry and regenerative agricultural practices promote **carbon sequestration and biodiversity restoration**. These initiatives are essential to achieving SDG 13 (climate action), SDG 15 (life on land) and SDG 2 (zero hunger). They also contribute to the Farm to Fork Strategy, which promotes sustainable food systems, and to the EU Forest Strategy for 2030, which aims to improve forest health, biodiversity and carbon storage. In addition, the ongoing strategic dialogue on the future of EU agriculture will provide important frameworks for the future of agriculture, further aligning with these objectives. The Common Agricultural Policy (CAP) also plays a critical role in supporting these efforts by encouraging practices that enhance environmental sustainability, promote biodiversity and contribute to climate change mitigation within EU farming systems.

- **Biodiversity and ecosystem restoration:**

Nature-based solutions for ecosystem restoration, as well as sustainable forest management, help preserve terrestrial and aquatic ecosystems, thus contributing to SDG 14 (life below water) and SDG 5 (life on land). These efforts are aligned with the EU Biodiversity Strategy for 2030, which outlines actions to protect biodiversity, and the Water Framework Directive, which aims to protect water bodies and ecosystem health across Europe.

[3] A detailed presentation of how the bioeconomy helps to achieve the Sustainable Development Goals and the Green Deal targets is presented in Annexes 1 and 2.

- **Sustainable and circular food systems:**

The transition to sustainable and circular food systems is vital for food security (SDG 2: zero hunger) and responsible consumption (SDG 12: responsible consumption and production). This includes investment in innovation, sustainable food production, circular economy practices and waste recycling technologies. These activities contribute to the **Farm to Fork Strategy**, which aims to make food systems fair, healthy and environmentally friendly, and align with the Circular Economy Action Plan, which promotes resource efficiency and waste reduction in food production. Additionally, the European Union is preparing a new **Circular Economy Act**, which is expected to further strengthen and expand these efforts, including in the area of food production and waste management.

- **Water management and restoration of aquatic ecosystems:**

Sustainable water use helps restore aquatic ecosystems and support SDG 6 (clean water and sanitation) and SDG 14 (life below water). These initiatives are aligned with the **Water Framework Directive**, which aims to protect water bodies across the European Union, and the **EU Biodiversity Strategy for 2030**, which includes actions to protect and restore aquatic ecosystems. Additionally, **sustainable agricultural water management** plays a key role in both conserving water resources and reducing pollution, thereby contributing to the resilience of aquatic ecosystems.

Despite their obvious environmental and economic benefits, many of these projects find it difficult to obtain adequate financing, often due to perceived risks, limited profitability, long payback periods and the need for large initial investments. The **notion of investment gap** is often used to measure the resulting shortfall of investment. It refers to the difference between the level of investment required to achieve a development objective and the level of investment made or available. This concept is different from the **credit gap**, which refers to the lack of access to credit for individuals, companies or governments, particularly when financing is needed to develop projects but is not available due to factors such as unfavourable market conditions, stringent collateral requirements or perceived risks. The **financing gap** is a third concept that encompasses, but is not limited to, the credit gap, since it corresponds to the difference between the funds required for a specific project or activity and the financial resources available. Financing can come from a variety of sources, including loans, equity, grants or capital investment.

2.2 The role of international financial institutions in bioeconomy investment

International financial institutions play an important role in filling the investment gap for the bioeconomy, offering a wide range of financing instruments tailored to this sector.

The **EIB has been one of the main lenders to the bioeconomy, contributing some €7 billion[4] a year** to co-finance projects in the fields of agriculture and the bioeconomy. A significant proportion of the financing (65% to 70%) goes to small and medium-sized companies via **intermediated financial products**, principally loans provided by the EIB to local banks that are used to provide advantageous financing for specific policy objectives.

In addition to direct financing, the EIB provides financing to the bioeconomy through other EU financial instruments, such as the **Cohesion Fund,** the **European Agricultural Fund for Rural Development (EAFRD)**, as well as **Horizon Europe** and **InnovFin**, which provide funding for innovative, research-led projects in the bioeconomy. These instruments are key to advancing the green transition by encouraging sustainable practices and facilitating investment in bio-based solutions.

[4] Based on the average between 2017 and 2024, both within and beyond the European Union. Operations outside the European Union represent around 20% of the total financing volume.

Financing for the bioeconomy is also developing through **green bonds and sustainable investment funds**. Annual issuance of green bonds reached €627 billion worldwide in 2024,[5] a significant proportion of which was allocated to bioeconomy initiatives. **Venture capital and private equity** investment also play an important role in financing early-stage bioeconomy technologies, such as biotech, bio-based industry, bioenergy and circular economy startups. Global venture capital investment in the bioeconomy sectors was estimated at some €80 billion in 2023,[6] mainly supporting innovative companies in fields such as biotechnology.

Globally, climate change financing mechanisms such as the **Green Climate Fund (GCF)** provide additional resources for projects focused on reducing greenhouse gas emissions in developing countries, helping to support bioeconomy activities aimed at global sustainability.

Despite significant efforts by the EIB and other international financial institutions to support the transition to a sustainable bioeconomy, bioeconomy investments are often considered too risky or not profitable enough in the short term to attract sufficient private financing. Additionally, the sector tends to have a lower appetite for credit leverage, meaning that even when financing options are available, the willingness to take on debt or use financial instruments that increase exposure is limited. As a result, a **persistent gap between the resources available and the funding required** compromises the European Union's ability to achieve the green transition on schedule. Closing this investment gap will require innovative strategies, more support for high-risk projects and greater mobilisation of public and private finance, both at European and global level. Section 3 reviews prior work aimed at estimating this gap. Section 4 brings together insights from existing studies and proposes original methodologies for estimating the gap, breaking it down by bioeconomy subsectors.

3 REVIEW OF RECENT ANALYSES ON THE BIOECONOMY INVESTMENT GAP

EIB reports on barriers to investment

In its 2022/2023 Investment Report, the EIB used two main empirical approaches to measure the challenges facing investment in Europe:[7] a macroeconomic approach and a company-level approach. The latter, based on the EIB Group Survey on Investment and Investment Finance (EIBIS), provides a finer-grained view of sectoral challenges, although it does not specifically isolate the bioeconomy. The EIB survey revealed that many companies in the bioeconomy sector have difficulty accessing private finance, particularly those in the initial and intermediate stages of their development, for example when it comes to moving from pilot to demonstration projects, or from demonstration to industrial-scale operations.

In a more targeted study, the EIB assessed the financing conditions for bio-based industries based on a sample of 85 projects, 27 of which were bio-based industry-related.[8] The study revealed that 77% of respondents (33 out of 43 projects) reported difficulties in obtaining private financing. Notably, this problem was more pronounced for projects requiring substantial initial investment, where high levels of equity, particularly from private sources, were required to reduce perceived risks and attract funding. Although the report did not quantify the

5 Labeled-Bond-Quarterly-Newsletter-Issue-No-10.pdf

6 Buntz, B. (2024). Analyzing the biotech funding landscape in 2023: U.S. still out front. Drug Discovery & Development. https://www.drugdiscoverytrends.com/biotech-funding-landscape-2023/

7 European Investment Bank. (2023). *Investment Report 2022/2023: Resilience and renewal in Europe*. European Investment Bank. https://doi.org/10.2867/307689

8 Leoussis, J. & Brzezicka, P. (2017). *Study on access-to-finance conditions for investments in bio-based industries and the blue economy*. European Investment Bank. https://www.eib.org/attachments/pj/access_to_finance_study_on_bioeconomy_en.pdf

exact extent of the funding gap, it did point out that the structure of financing, in particular the equity/debt ratio, was a key factor in determining whether projects could access the necessary capital.

Perspectives from the European Commission and the Joint Research Centre

As part of its work on the REPowerEU action plan, the European Commission[9] has estimated the investment needed to reduce Russian fossil fuel dependence and switch to clean energy by 2027. This report uses sophisticated modelling techniques (such as the price-induced market equilibrium system (PRIMES) energy model) to estimate financing needs and investment gaps in the energy sector. Although not directly applicable to the bioeconomy because biomass energy sources are not distinguished, the methods employed in this report illustrate the importance of modelling and estimating the scale of investment required for large-scale transitions, such as those needed in the bioeconomy. The difficulty of securing financing for high-risk projects with long-term payback periods is a common thread between the energy transition and bioeconomy sectors.

Global perspectives on financing the Sustainable Development Goals

The World Bank Group's International Finance Corporation (IFC) has estimated the amount of financing needed to achieve the Sustainable Development Goals globally, with a particular focus on climate change mitigation.[10] It forecasts a global annual financing requirement of $850 billion for climate-related investments. This study highlights the complexity of meeting the financing needs of the Sustainable Development Goals, which depend on factors such as infrastructure investment, tax revenue mobilisation, cross-border flows and the efficiency of capital spending. These factors are all relevant to the bioeconomy, where long-term investment in infrastructure and innovation is essential and a prerequisite for further investment needs. Nonetheless, achieving the Sustainable Development Goals includes sectors other than the bioeconomy, and it is difficult to isolate the gap related to bioeconomy sectors in the report.

In another report, the World Bank assessed the financing needed to achieve SDG 6 (clean water and sanitation) using a cost model to estimate the resources needed to provide universal water and sanitation services.[11] This study, while specific to SDG 6, highlights the importance of understanding both initial investment costs and ongoing operational expenses when estimating investment needs for large-scale infrastructure projects, such as those found in bioeconomy sectors like sustainable agriculture, irrigation or bioenergy.

Investment needs and obstacles in bio-based industries

A recurring theme in these studies is the difficulty of financing high-risk, early-stage bioeconomy projects, particularly those based on unproven technologies or innovative business models. Barriers include high capital expenditure, uncertain returns and long payback periods, making such projects unattractive to traditional private investors. Public sector funding – often provided by development banks or multilateral institutions such as the EIB – is essential for bridging these gaps, especially when moving from pilot projects to industrial-scale operations. This support is particularly important for overcoming high upfront investment costs in underdeveloped markets or in situations involving significant technological risk.

The Biomonitor and *SDG Trends Investment Monitor*[12] also provide useful information on the evolving financial landscape for sustainable sectors, noting that despite growing interest in green investment, significant gaps

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9 European Commission. (2022). *Implementing the REPower EU action plan: Investment needs, hydrogen accelerator and achieving the bio-methane targets.* Commission Staff Working Document SWD(2022) 230 final. European Commission. eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230

10 Doumbia, D., & Lauridsen, M. L. (2019). Closing the SDG financing gap: Trends and data. Washington, DC: International Finance Corporation. https://doi.org/10.1596/32654

11 Hutton, G., & Varughese, M. (2016). The costs of meeting the 2030 Sustainable Development Goal targets on drinking water, sanitation, and hygiene. World Bank. http://hdl.handle.net/10986/23681

12 United Nations Conference on Trade and Development. (2020). SDG Investment Trends Monitor: International SDG investment flows to developing economies down by one third due to COVID-19. SDG Investment Trends Monitor: International SDG investment flows to developing economies down by one third due to COVID-19 | FBSD

remain in the financing of bioeconomy subsectors such as sustainable agriculture, bioenergy and bio-based industries.

This short literature review shows that, although the issue of investment gaps in the bioeconomy has been approached from a variety of angles, no previous study has sought to quantify them in a systematic way, distinguishing between bioeconomy subsectors and on a European and global scale. This is what we propose to do in the following section.

4 CALCULATING THE INVESTMENT GAP TO ACHIEVE SUSTAINABLE TARGETS IN THE BIOECONOMY

In this section, we present the results of our calculations, which have enabled us to estimate investment gaps for the bioeconomy in Europe and in the rest of the world.

The investment gap of the bioeconomy subsectors identified was estimated using a unique methodology based on interviews, the EIB's own calculations and academic literature. An overview of the methodology adopted for each subsector is provided in the following subsections, while detailed explanations are provided in Annexes 3-7. Summary figures are shown in Table 1.

By default, gross fixed capital formation has been used as an indirect indicator of current investment in the sectors for which data are available. Used in macroeconomics, gross fixed capital formation measures fixed assets by ascertaining the total value of acquisitions minus disposals during the accounting period, taking into account certain additions to the value of assets. When gross fixed capital formation data were not available, current investment was estimated using our own calculations and assumptions based on existing economic literature. The investment gap was calculated by subtracting current investment from the estimated investment needed.

Table 1: Annual investment gaps in bioeconomy subsectors

Bioeconomy subsectors	European Union		Countries beyond the European Union		EIB investments (€ bn/year)
	Current investments (€ bn/year)	Investment/ financing gap (€ bn/year)	Geographic area	Investment/ financing gap ($ bn/year)	
Forestry	3.9	4.2	Global	270 (of which 54 for adaptation)	0.32
Agriculture	63.4	62.3 (of which 4 for sustainable soil management)	Developing countries	300	2.5
Irrigation	2.3	11.5	Beyond the European Union	64.1	0.1
Research, development and innovation in agriculture	3.5	1	Developing countries	10.5	0.3
Agrifood industries	Lack of data	5.5	N/A	Included in agriculture	3.2
Bio-based industries	Lack of data	2.07-3.35	N/A	Lack of data	0.3

Bioenergy	0.87	8.7-9.4	-	Lack of data	0.16
Fisheries and aquaculture	1.8-2	3.3 - 10.4	Global	25-50	0.05
Protection of resources	16.3	18.7	Global	95	0.22
Total bioeconomy	91.2	121.8	-	777.1	7.1

4.1 Forestry: An investment gap of more than €4.2 billion in the European Union and $270 billion globally

Forestry activities refer only to primary production and related activities (afforestation, reforestation and improved forest management). Investment in forest-based industries is not included here as it is captured in the estimates for the bioenergy subsector and for bio-based industries.

European Union

Gross fixed capital formation data provided by Eurostat were used to estimate current forestry investment in the European Union.[13] The most recent data are for 2020 and are available only for 17 of the 27 EU countries.[14] **Therefore, the consolidated figure of €3.9 billion is likely a significant underestimate of current investments at the EU level.**

To calculate the investment gap, we considered the only two quantified targets present in the Green Deal: (1) achieving the Fit for 55 package and (2) the 3 billion trees campaign.

We calculated the investment gap for the two quantified targets at around €4.2 billion.[15] However, this investment gap only accounts for forestry activities related to climate change mitigation through carbon sequestration. It does not include the additional investment required to produce sustainable wood and non-wood forest products, which are also critical for the bioeconomy. Furthermore, the investment gap for the wood energy industry is not included in this calculation but is partially accounted for in the **bioenergy section** of this report. The investment needed for the **protection of biodiversity** and **forest conservation** (for example, the preservation of protected areas) is also not considered under forestry but is considered under the protection of resources subsector.

World

The international community has set ambitious targets for forest landscape restoration, including achieving land degradation neutrality by 2030 (SDG 15.3), restoring 150 million hectares by 2020 as part of the Bonn Challenge, and restoring 350 million hectares by 2030 as part of the New York Declaration on Forests.

Currently, around $200 billion is invested annually in nature and forest-based solutions, with public funds accounting for 82% and private funds for just 18%.

The United Nations Environment Programme (UNEP) estimates that the current level of investment in nature-based solutions, such as reforestation, needs to triple by 2030 to reach global climate and biodiversity targets, which translates into an extra $542 billion of investment per year. The investment gap for forests alone

[13] Eurostat. (2023a). Economic aggregates of forestry (for_eco_cp) [dataset]. https://ec.europa.eu/eurostat/databrowser/view/FOR_ECO_CP__custom_7748916/default/table

[14] The Eurostat database includes 31 countries; however, four of these countries (Bosnia and Herzegovina, Norway, Switzerland and the United Kingdom) were not included in the gross fixed capital formation calculation as they do not belong to the European Union. Six countries (Belgium, Estonia, Hungary, Ireland, Latvia and Malta) lacked data for the whole timeframe considered in the database (2012-2021). Lastly, four countries (Denmark, Greece, Lithuania and the Netherlands) lacked data for 2020.

[15] A detailed breakdown of the estimation can be found in Annex 3.

(afforestation, reforestation and mangrove restoration) is estimated to be **$270 billion per year**.[16] For **adaptation purposes only**, the financing needs at global scale for the forestry sector is estimated to be **$54 billion per year.**[17]

4.2 Agriculture and agrifood sectors: An investment gap of €67.8 billion in the European Union and $300 billion in developing countries

European Union

The European Union's sustainable agriculture targets are wide-reaching and diverse. Some of them are contained in the EU Biodiversity Strategy, others in the Farm to Fork Strategy. Some EU countries have also established emission reduction targets that are specific to the sector. Ireland, for instance, passed a national Climate Act, which aims to reduce agricultural emissions by 25%. As there is no such target for the European Union, we use the literature to calculate the investment gap in agriculture.

Data from Eurostat[18] were used to estimate the current investment for agriculture in the European Union, and the figure amounts to €63.4 billion in 2021. fi-compass[19] estimates that the financing gap for the EU agriculture sector (excluding Luxembourg, Cyprus and Malta) in 2022 was €62.3 billion, representing a 33% increase since 2017.[20] This report focuses on the investment gap in agriculture to meet the targets of the Green Deal, which is a slightly different scope from that used by fi-compass, but we consider the figures from the fi-compass study to be the most accurate and up-to-date proxy for our estimate.

As regards agrifood industries, fi-compass estimated **the financing gap at €5.5 billion[21] in 2022** for the 24 EU countries it covered.

In 2024, the EIB commissioned Trinomics, Wageningen University and Finance for Impact to conduct a study identifying and assessing gaps and investment opportunities related to sustainable soil management through 2050. Their methodology estimates that supporting the transition to sustainable soil management in agriculture will require closing a total investment gap of €100 billion by 2050 – equivalent to an **annual investment gap of approximately €4 billion specifically for sustainable soil management**. Sustainable soil management practices are already included in the fi-compass study, so this amount is not added to the investment gap identified by fi-compass.

Developing countries

The United Nations Conference on Trade and Development (UNCTAD) has estimated investment gaps in key Sustainable Development Goal sectors in developing countries.[22] UNCTAD finds that the investment gap in

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16 United Nations Environment Programme. (2023). *State of finance for nature: The big nature turnaround – Repurposing $7 trillion to combat nature loss*. United Nations Environment Programme. https://www.unep.org/resources/state-finance-nature-2023

17 United Nations Environment Programme. (2023). Adaptation finance gap update 2023. In Adaptation gap report 2023: Underfinanced. Underprepared. Inadequate investment and planning on climate adaptation leaves world exposed. United Nations Environment Programme. https://unfccc.int/sites/default/files/resource/Finance_Gap_Update.pdf

18 Eurostat. (2023b). Economic accounts for agriculture – values at current prices (aact_eaa01) [dataset]. https://doi.org/10.2908/aact_eaa01

19 fi-compass (2023). *Survey on financial needs and access to finance of EU agricultural enterprises*. https://www.fi-compass.eu/library/market-analysis/survey-financial-needs-and-access-finance-eu-agricultural-enterprises

20 fi-compass uses the following method to calculate the financing gap for agriculture: Financing gap = Number of farms * percentage of farms that are both financially viable and have unmet demand * average loan size.

21 Industries active in the manufacture of food products and beverages.

22 United Nations Conference on Trade and Development. (2023a). SDG Investment Trends Monitor: SDG investment is growing, but too slowly: The investment gap is now $4 trillion, up from $2.5 in 2015. https://unctad.org/system/files/official-document/diaemisc2023d6_en.pdf

agrifood industries and agriculture – namely "agriculture and agrifood systems, food processing, agricultural research, and rural infrastructure" – to be **$300 billion per year** in developing countries.

4.3 Irrigation: An investment gap of €11.5 billion per year in the European Union and $77.8 billion in the rest of the world

European Union

Water scarcity, exacerbated by climate change, is placing significant pressure on water resources in the European Union. Agriculture is a major consumer, accounting for 40% of water use, with irrigation covering 6% of EU farmland and contributing to 24% of water withdrawals in the European Union. Although UN SDG Indicator 6.4.1 aims to increase water use efficiency across all sectors, it does not set a specific target. The European Union does not have a target either. Nevertheless, modernising, digitalising and renovating irrigation infrastructure is essential for climate change resilience and to ensure that irrigation services can continue.

We estimate **the European Union needs to invest approximately €11.5 billion per year to modernise and renovate its irrigation systems.** This amount considers the need to shift from less efficient methods (such as surface irrigation) to more efficient systems (such as localised irrigation), alongside infrastructure upgrades.[23]

Rest of the world

The rest of the world also needs to invest significantly to modernise and expand irrigation infrastructure. Although there are no hard targets, the UN Food and Agriculture Organization provides guidance on achievable efficiency improvements. Based on our calculations,[24] the total investment still required to **modernise, renovate and expand** irrigation systems in the rest of the world outside the European Union is **$64.1 billion[25] per year**.

This gap is primarily driven by the need for infrastructure renovation, which is estimated at **€81.6 billion**. Modernisation and expansion efforts also represent a large share of the funding requirement, accounting for **€4.2 billion** and **€20.8 billion,** respectively.

4.4 Research, development and innovation in bio-based industries: An investment gap of around €1 billion in the European Union and $10.5 billion in developing countries

European Union

Sustainable agriculture requires new technologies to reduce the use of chemical inputs, while improving yields and preserving the environment and biodiversity. This requires investment in precision agriculture (using technologies to optimise the use of resources), biotechnology and genomic agriculture (creating drought-resistant cereals, for example), organic farming and agroecological systems, and reducing energy consumption in agriculture, etc. Such investments are necessary to enable farmers to remain competitive and cope with climate change, while at the same time trying to meet the growing demand for food due to population growth. We estimate **the current investment gap for these activities at around €1 billion per year in the European Union.[26]**

[23] A detailed breakdown of the estimation can be found in Annex 4.
[24] A detailed breakdown of the estimation can be found in Annex 5.
[25] 1 EUR = 1.04 USD.
[26] A detailed breakdown of the estimation can be found in Annex 6.

Developing countries

Rosegrant et al. (2022)[27] estimate the annual investment gap in agricultural research and innovation in the Global South. As a target, they use SDG 2 (zero hunger) as well as reducing greenhouse gas emissions for the agricultural sector in line with the Paris Agreement emissions target to limit temperature rises to 1.5 degrees Celsius. The authors define ending hunger as ensuring that less than 5% of the population is at risk of hunger by 2030. To achieve this target, they estimate that an additional $4 billion a year needs be invested in agricultural research and development. That figure rises to $6.5 billion per year above the baseline. Hence, they estimate the total agricultural research investment gap in the global south to be **$10.5 billion per year**. They obtain these results by using a number of different modelling techniques that consider economic, technological, environmental and climate options.

4.5 Innovative bio-based industries: An investment gap of around €2.07 billion to €3.35 billion in the European Union

European Union

The bioeconomy sectors with significant scale-up potential, particularly bio-based materials and chemicals, bio-based food and feed ingredients, and bio-based soil nutrients and enhancers, are at the forefront of the transition to a more sustainable economy. However, these sectors face substantial investment gaps that hinder their growth and prevent them from reaching their full potential.

The first transition point for these industries is the scale-up from pilot to demonstration phase, where an estimated €470 million to €750 million in annual funding is required to bridge this gap. This phase is critical for demonstrating the commercial viability of innovative bio-based technologies and processes, but the perceived financial risks and uncertainties often deter private investment.

The second transition point involves scaling from demonstration to industrial-level production, a leap that demands more substantial financial support. To bridge this phase, an additional €1.6 billion to €2.6 billion per year is needed. This level of funding is necessary to build and scale industrial facilities capable of producing bio-based products at the volume and cost required for market competitiveness.

In total, the funding gap for these key bioeconomy sectors in the European Union is estimated at **€2.07 billion to €3.35 billion per year**. Bridging this gap will require a concerted effort from both public and private sectors to mobilise the necessary capital, reduce perceived risks and enable the large-scale deployment of sustainable bio-based technologies.[28]

4.6 Bioenergy: An investment gap of €8.7 billion to €9.4 billion per year in the European Union

European Union

The bioenergy sector, which includes biogas, biomethane and biofuels, is key for the European Union's strategy to reduce its reliance on natural gas and enhance energy independence (Fit for 55 and REPowerEU action plan). However, to meet its ambitious bioenergy targets, substantial investment is required.

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[27] Rosegrant, M. W., Sulser, T. B., & Wiebe, K. (2022). Global investment gap in agricultural research and innovation to meet Sustainable Development Goals for hunger and Paris Agreement climate change mitigation. *Frontiers in Sustainable Food Systems*, 6. https://www.frontiersin.org/articles/10.3389/fsufs.2022.965767

[28] As compiled in the EIB report "Scaling up Europe's bio-based industries" prepared by the InvestEU Advisory Hub for the European Commission's Directorate-General for Research and Innovation.

The production of biomethane, in particular, needs to increase significantly by 2030. In addition, the European Union's broader goals for energy independence involve expanding the use of bioenergy for power generation and sustainable biomethane, which also requires substantial financial commitments. As a result, the investment gap in the bioenergy sector is estimated to be **€78 billion to €85 billion** between 2022 and 2030, or about **€8.7 billion to €9.4 billion per year.**[29]

Rest of the world

Current global investment in gaseous and liquid bioenergy reached $11 billion in 2023[30] and investment in solid biomass energy averaged $7.3 billion between 2013 and 2022.[31] UNCTAD[32] reports that annual investment of **$2.2 trillion** is needed in developing countries to fulfil the Sustainable Development Goals related to affordable and clean energy (SDG 7) and climate action (SDG 13). This estimate, however, relates to renewable sources, energy efficiency, electrification, hydrogen, carbon capture and storage, bioenergy, nuclear energy and non-nuclear energy (natural gas, oil and coal) rather than bioenergy sources specifically.

4.7 Fisheries and aquaculture: An investment gap of €3.3 billion to €10.4 billion per year in the European Union and $25 billion to $50 billion in the rest of the world

European Union

The European Union lacks a specific target for the sector and data are scarce. Therefore, we relied on existing literature and expert opinions to calculate the investment gap in the fisheries and aquaculture sector. The European Commission published a report that provides estimates on financing gaps in the blue economy.[33] According to the report, €147 billion per year globally is needed to achieve Sustainable Development Goal 14 (life below water) by 2030, of which only €21 billion is currently being invested, creating an annual gap of €126 billion.

A study funded by the European Commission[34] identified the financing gap for EU small and medium businesses involved in the blue economy to range from €60 billion to €70 billion.[35] The financing gap is defined as the difference between the financing that small and medium firms would like to obtain and the financing that they would have obtained in a better environment.

It is difficult to reconcile these different sources, but a reasonable estimate of the funding gap for sustainable fisheries and aquaculture in the European Union is between **€3.3 billion to €10.4 billion**. This estimate is based on the two European Commission reports mentioned above and on the judgement of EIB sector experts

[29] A detailed breakdown of the calculations can be found in Annex 7.

[30] International Energy Agency. (n.d.). *Biofuels*. IEA. https://www.iea.org/energy-system/low-emission-fuels/biofuels

[31] International Renewable Energy Agency. (n.d.). *Bioenergy and biofuels*. IRENA. https://www.irena.org/Energy-Transition/Technology/Bioenergy-and-biofuels

[32] United Nations Conference on Trade and Development. (2023b). *World Investment Report 2023: Investing in sustainable energy for all*. United Nations. https://doi.org/10.18356/9789210027847

[33] European Commission Directorate-General for Maritime Affairs and Fisheries, & PricewaterhouseCoopers (2023). *BlueInvest investor report: An ocean of opportunities*. European Commission.

[34] van Aalst, P., Adams, M., Paterson-Jones, G., Poulsen, M., Pucher, J., Jeffrey, P., Belicka, D., Lonsdale, J., Kisielewicz, J., Głowacki, K., & Barreto, R. (2018). *Study to support investment for the sustainable development of the Blue Economy* (Service Request No EASME/EMFF/2017/038; D13 – Investment Platform Recommendation). European Commission – Executive Agency for Small and Medium-sized Enterprises (EASME).

[35] All types of financing (investment and working capital) are included in the calculations as well as all stages of firms' development (from startups to established firms). This is different from the gap between the European Union's actual R&D spending (about 2% of GDP) and the target R&D spending (3% of GDP by 2020), which the EIB (2016) calculated to be €130 billion per year.

concerning the weight of the tourism, aquaculture and fisheries sectors in what is defined as the "blue economy."

For the 2021 to 2027 period, the European Union has set a target to allocate approximately €6.1 billion to support fisheries and aquaculture, marine conservation, infrastructure upgrades, innovation and sustainable processing.[36] Private and regional co-funding likely match or exceed this, bringing total EU-level investment (public and private/regional) to an annual average of around **€1.8 billion to €2 billion**.

World

For climate adaptation purposes only, a new analysis commissioned by the Food and Agriculture Organization of the United Nations (FAO) assesses the finance gap for fisheries and aquaculture to be $4.8 billion a year for all developing countries.[37] Another publication from the Coalition for Fair Fisheries Arrangements[38] states that transitioning to sustainable marine fisheries requires additional funding of between $23 billion and $47 billion annually until 2030, while Planet Tracker estimates that a $55 billion investment in regenerative aquaculture by 2050 (or an annual $2.2 billion investment) is needed to address biodiversity risks and close the seafood supply gap.

Reconciling these data, we estimate the global financing gap for fisheries and aquaculture to be between **$25 billion and $50 billion per year**.

The Organisation for Economic Co-operation and Development (OECD) reports that government support for fisheries between 2020 and 2022 totalled about $10.7 billion annually.[39]

4.8 Protection of resources: An investment gap of €18 billion in the European Union and $95 billion in the rest of the world

European Union

According to Eurostat,[40] spending on environmental protection by various EU members ranged from 0.2% to 1.5% of GDP in 2021, with an average of 0.8% of GDP in the Member States (€119 billion).

Eurostat data on spending for each of the subsectors covered by environmental protection were for protection of biodiversity and landscapes. We estimate current spending to be €16.3 billion per year.

The European Commission commissioned a study on Biodiversity Financing and Tracking,[41] which estimated that around €48.15 billion is needed annually from 2021 to 2030, including current expenditures, to deliver all the objectives of the Biodiversity Strategy. This corresponds to **€18.7 billion per year.**

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[36] European Commission. (n.d.). *European Maritime, Fisheries and Aquaculture Fund (EMFAF)*. EU Funding & Tenders Portal. https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/emfaf

[37] FAO. (2024). *The fisheries and aquaculture adaptation finance gap*. FAO. https://openknowledge.fao.org/server/api/core/bitstreams/029d32c7-c1f0-4804-a5ba-3c6a55ad7d36/content

[38] Standing, A. (2024). *Why the $700 billion funding gap for biodiversity is dangerous nonsense: Implications for the oceans and small-scale fisheries*. Coalition for Fair Fisheries Arrangements. Why the $700 billion funding gap for biodiversity is dangerous nonsense: Implications for the oceans and small-scale fisheries — Coalition for Fair Fisheries Arrangements

[39] OECD. (2025). *OECD review of fisheries 2025*. Paris: OECD Publishing. https://www.oecd.org/en/publications/2025/02/oecd-review-of-fisheries-2025_d308ff48.html

[40] Eurostat. (2025). *Investments in environmental protection*. Statistics Explained. European Commission. Investments in environmental protection - Statistics Explained

[41] Nesbit, M., Whiteoak, K., et al. (2022). *Biodiversity financing and tracking: Final report*. Institute for European Environmental Policy and Trinomics. https://op.europa.eu/en/publication-detail/-/publication/793eb6ec-dbd6-11ec-a534-01aa75ed71a1/language-en

Rest of the world

The report of the United Nations Environment Programme on the State of Finance for Nature[42] estimates **the investment gap for protecting resources at approximately $95 billion per year until 2030**. The protection of resources mentioned in this report includes avoided grassland conversion, avoided peatland conversion, avoided deforestation, protected areas, avoided seagrass conversion and avoided mangrove conversion. It does not include measures for the restoration of peatlands, saltmarshes and seagrass, which would require an additional **$135 billion** per year until 2030.The United Nations Convention to Combat Desertification (UNCCD) has assessed the financial needs for land restoration, breaking them down by groups of sectors. For the restoration of forests and natural ecosystems, it is estimated that the total financing needs would be $1.204 trillion between 2014 and 2030, or around **$86 billion** per year.[43] This is similar to the amount estimated by UNEP, although there are some differences in scope. While the UNCCD estimate includes avoided deforestation and forest restoration, it excludes seagrass beds, peatlands and saltmarshes. Overall, it is reasonable to conclude that the UNEP estimate provides a solid approximation of the investment gap in resource protection.

5 FILLING THE INVESTMENT GAPS IN PRACTICE: THE ROLE OF THE EIB IN OVERCOMING BARRIERS TO INVESTMENT IN THE BIOECONOMY

The investment gaps identified in Section 4 of this report are considerable and highlight the urgent need for targeted investment strategies. Nevertheless, each of the sectors of the bioeconomy faces unique and often interconnected investment barriers that can hinder the flow of capital necessary for their development. The following section outlines the role of the EIB in overcoming these investment barriers and presents some insights on the way forward.

5.1 Barriers related to regulation require better coordination and harmonisation

Investment barriers in bioeconomy sectors are heavily influenced by **complex and fragmented regulations**, which often intersect across different policy domains such as environmental protection, energy production, food and biomass production, both at EU and international levels. For instance, policies related to the Common Agricultural Policy (CAP) can conflict with environmental standards, leading to regulatory confusion and investment hesitation, while forest management often faces conflicting objectives between carbon sequestration, biodiversity conservation and wood harvesting. Irrigation systems often face regulatory issues related to water rights, inconsistent water management policies and climate-induced water scarcity. Countries with weaker water governance structures thus face additional investment barriers.

In many parts of the world outside the European Union, **complex land tenure systems**, **lack of enforcement of property rights, and inconsistent agricultural policies** often create substantial investment risks. Furthermore, mismatched regulations across regional and national borders complicate trade in food and fibre-based goods.

[42] United Nations Environment Programme. (2023). *State of finance for nature: The big nature turnaround – Repurposing $7 trillion to combat nature loss*. United Nations Environment Programme. State of Finance for Nature 2023 | UNEP - UN Environment Programme

[43] UNCCD Global Mechanism. (2024). *Investing in land's future: Financial needs assessment for UNCCD*. United Nations Convention to Combat Desertification. 58587 UNCCD_Financial needs assesments-WEB2.pdf

Fisheries also face regulatory challenges related to illegal, unreported and unregulated fishing, as well as inconsistent enforcement of marine conservation laws. Regulatory frameworks for biodiversity and ecosystem conservation outside the European Union often lack robustness or enforcement capacity, leading to inefficiencies in land management and poor investor confidence.

While regulatory fragmentation is a significant barrier, it could be addressed through **better coordination** between the different players and harmonisation of the procedures. The implementation of **centralised platforms or agencies** for **coordinating sustainability policies** across the different sectors could also help to reduce regulatory uncertainty and improve market access.

EIB in action: EIB supports regulatory improvements to boost Moldova's forestry sector

Moldova's forestry sector has faced regulatory fragmentation and a lack of transparency in forest resource management, along with endemic corruption in some regions. These issues have led to illegal logging – often facilitated by corruption networks – and, more broadly, to inefficient management of public forests.

The EIB project is structured as sector-based lending to support a sector-wide Forestry Development Programme, which includes measures to restructure and modernise the forestry sector in Moldova. The innovative aspect of this approach is to use an initial phase of financing to address regulatory inconsistencies and improve the governance framework of Moldova's forestry sector. This includes restructuring forestry agencies, conducting a national forest inventory, and strengthening institutional and technical capacities, such as knowledge, equipment, infrastructure and traceability systems. The goal is to establish a clear vision for the sector's future development and align it with international best practices in sustainable forest management.

In the second, later phase of funding, the focus will be on deploying forest expansion and landscape restoration work to improve forest health and growth and strengthen the resilience of forest landscapes and ecosystems to climate change. This two-stage approach is a way of effectively and sustainably reducing the barriers to investment associated with regulatory issues in order to make forest investment more efficient and sustainable.

To find out more: MOLDOVA FOREST DEVELOPMENT PROGRAMME

5.2 Fostering cooperatives and regional cooperation among small and medium-sized bioeconomy companies to reduce investment barriers related to market size and structure

Landholdings in the European Union are often **fragmented**, with small family-owned farms or forest properties dominating in many regions. This fragmentation increases transaction costs, discourages investment in modern practices and makes it difficult to implement large-scale innovations, since each small entity faces **unique local challenges in terms of market access, supply chains and product differentiation**. Lack of infrastructure, inadequate supply chains and fragmented markets **increase transaction costs**. In emerging markets, fragmented land tenure systems and a lack of market integration increase risks for investors.

Fostering **cooperatives** and **regional cooperation** among small and medium-sized enterprises (SMEs) involved in the bioeconomy would allow such companies to pool resources, share risks and benefit from economies of scale.

EIB in action: Support for the sustainable development of Andalusia's rural economy

Fragmentation of the agricultural landscape and connectivity of agricultural and forest ecosystems are important issues within EU countries. The EIB is supporting the Spanish Autonomous Community of Andalusia (Comunidad Autónoma de Andalucía) with the implementation of selected and mainly small-scale investment programmes, co-financed by the European Agricultural Fund for Rural Development (EAFRD) under the Common Agricultural Policy Strategic Plan for Spain.

The project involves the modernisation of 1 405 farms, climate-related investments on 961 farms, and natural resource-related investments on a further 708 farms. It also targets 3 000 hectares of forest for ecosystem enhancements and improved protection against weather hazards and fire. The rural population is expected to benefit from enhanced local development through local action groups (LEADER projects).

By supporting the region's financial contribution to these programmes, the project should help accelerate their implementation, thus **boosting the long-term competitiveness, job security and overall sustainability of Andalusia's agricultural sector and wider rural economy**. Improving basic services for the population and ancillary services for economic sectors can strengthen social cohesion, encourage economic activity and help to slow negative demographic trends, the fragmentation of properties and the abandonment of rural areas.

To find out more: EAFRD CO-FINANCING ANDALUCIA 2023-27

5.3 Investment barriers from public sector constraints can be reduced by aligning budgets with climate and sustainability goals and increasing funding for research and innovation that benefits society

Bioeconomy activities generate **positive environmental and climate externalities**. In this respect, they are like public goods requiring public intervention to achieve socially desirable levels of investment. However, **public sector promoters sometimes face budget or capacity constraints that are obstacles to investment**. This is even more the case outside the European Union, as many developing countries have limited budgets for agricultural research, infrastructure and climate change adaptation.

In addition, public budgets are increasingly focused on **climate change adaptation and crisis management** (such as addressing droughts or pest invasions), leaving little room for other necessary investments. Public sector budgets and institutional capacities are struggling to keep up with increasingly complex environmental, climate and commercial developments. **Both public and private R&D** funding for new techniques and supply chain infrastructure is essential to **unlock the commercial and social potential of sustainable value chains** in the bioeconomy, which benefit society as a whole. But the problem is not limited to research funding, as moving innovation from the lab to the factory floor requires a costly increase in production capacity that new market entrants do not have the capacity to fund.

EIB in action: R&D support for Groupe Florimond Desprez's climate-resilient crops

The Groupe Florimond Desprez (GFD) project focuses on financing research, development and innovation activities in Europe, with the goal of creating, developing, registering and commercialising new field crop seed varieties.

The project is structured to enhance the company's long-term competitiveness in the seed sector and improve farmers' resilience to climate change through the creation of high-performance crop varieties.

With EIB financing, GFD will accelerate its research, development and innovation efforts, leading to substantial positive externalities in key areas such as environmental protection, food security and climate resilience in agricultural land management. The research, development and innovation programme is specifically designed for climate change adaptation, which should help to reduce the environmental footprint of agricultural activities while ensuring that new crop varieties can thrive in changing climate conditions.

This project not only addresses significant investment needs in agricultural innovation, but also directly helps to reduce the investment gap in research, development and innovation for sustainable farming practices in Europe. It exemplifies how tailored financial support can drive long-term sustainability and strengthen the agricultural sector's capacity to adapt to climate change.

To find out more: FLORIMOND DESPREZ CLIMATE RESILIENT SEEDS

EIB in action: Reforesting Côte d'Ivoire

Côte d'Ivoire lost 81% of its forests between 1960 and 2015. This dramatic deforestation is due to a number of factors, including the civil war (2002-2007), the Ivorian crisis (2010-2011) and the rapid expansion of cocoa plantations combined with unsustainable agricultural practices. Today, **government intervention is needed to halt this trend and initiate reforestation in the country**, but a lack of public funding is holding back investment.

The EIB is helping to address the problem with an ambitious project **to finance forest restoration and agroforestry practices in state-owned and community-managed forests**. The project will generate direct financial benefits through timber and fuelwood sales, while bringing indirect benefits such as soil fixation, carbon sequestration and improved local livelihoods through agroforestry practices that diversify income sources.

By supporting this project, the European Investment Bank is addressing the market failures that have historically undervalued forest products and services, leading to uncontrolled deforestation.

To find out more: PROGRAMME DE RESTAURATION DURABLE DES FORETS

5.4 Investment barriers related to access to financing can be tackled with targeted financial products

Estimating the expected benefits of certain investments in the bioeconomy and their degree of risk is difficult for certain types of investors (for example, small businesses and startups) and certain types of investment (such as in the field of innovation) when there is a lack of information. This is often the case in the bioeconomy as **information about natural resources is often lacking or difficult to access.** This makes it hard to make informed decisions in value chains and acts as an obstacle to financing. In addition, financing the bioeconomy can be complicated by the **long time horizons** involved in many bioeconomy products. For example, forestry initiatives

can take from five to 20 years to generate positive cash flows and typically produce only modest returns. Furthermore, in some sectors, such as irrigation, investors find it difficult to structure transactions due to **high upfront costs**.

Barriers to financing can be alleviated with **more targeted financial products**, such as green bonds, impact investing and microfinance specifically designed for bioeconomy sectors. Such products often have longer maturities and can be blended with private financing.

EIB in action: A €3 billion customised programme loan for agriculture and the bioeconomy

At the end of 2024, the EIB Group committed to providing €3 billion over three years to a landmark financing initiative for European **agriculture, forestry** and **fisheries**. The initiative aims to unlock €8.4 billion in long-term investments in the bioeconomy sector, with a special focus on **young farmers, gender equality** and **green investments**.

This financing package is the EIB's biggest to date for European agriculture and will target small and medium-sized enterprises and mid-caps. The EIB will also provide financing tailored to support **young** or **new farmers**, who often face greater challenges in accessing financing. The programme will also target **female farmers**, aiming to address gender imbalances in the agricultural sector, while also driving forward the European Union's **sustainability goals** through investments in **green projects**.

To make loans more accessible, the financing package will be complemented by **EU and national budget subsidies**, ensuring favourable loan terms for recipients.

The **EIB's strategic approach** also includes exploring forms of strengthening agricultural insurance and **de-risking schemes** to protect farmers and their investments against extreme weather events such as **floods** and **droughts**. These efforts are part of a broader focus on climate change adaptation, helping farmers better prepare for and respond to the increasing risks associated with a changing climate.

This EIB Group financing package is a crucial step towards **closing the financing gap** in the agricultural and bioeconomy sectors. It will foster long-term **climate adaptation** and ensure that the agricultural sector can thrive while maintaining its essential role in **food security, environmental protection** and **economic development** across Europe.

To find out more: €3 billion of EIB Group financing announced for farmers and bioeconomy

6 CONCLUSION

This report highlights the extent to which investment in key sectors of the bioeconomy is falling short in Europe and around the world. We estimate the annual shortfall – the investment gap – to be as high as €121.8 billion in the European Union and $777.1 billion worldwide, underling the urgent need for decisive action to achieve the European Green Deal and the Sustainable Development Goals by 2050. As considerable as these estimates are, they are also clearly underestimates, as certain subsectors of the bioeconomy, notably the wood and pulp industries and the numerous innovative niche bio-based industries, and certain geographies, could not be covered in this report due to a lack of data or academic studies.

While the EIB has played a key role in bridging these gaps – and will continue to do so – much remains to be done. By analysing the specific investment needs of each subsector of the bioeconomy, as well as efforts to quantify and understand the nature of the barriers to investment, this report helps to direct financial resources more effectively where they are needed most.

Above all, this report highlights the need to mobilise more investment in the bioeconomy and the need to use public capital to support private investment. The European Investment Bank is committed to the task, but more concerted action is needed in Europe and around the world. Collaboration between financial institutions, governments and the private sector will be essential to channel the necessary capital into the bioeconomy in the right forms, stimulate the green transition and ensure long-term sustainability. Filling this investment gap will also require innovative financial solutions, such as green bonds, programme loans, venture capital and risk mitigation tools, as many bioeconomy projects are considered high risk and difficult to finance with traditional loans.

Despite the scale of the investment gap, it is not insurmountable. This report contributes to the roadmap on how best to fill them by highlighting the most urgent needs and identifying the barriers to investment. Armed with this knowledge, the EIB and other financial institutions can focus their efforts on the most critical areas, ensuring that resources are deployed efficiently and strategically. By harnessing innovative financial mechanisms and fostering collaboration between the public and private sectors, we can not only achieve the European Union's climate and sustainable development goals, but also build a more resilient, secure and sustainable future for all.

Annex 1: Contribution of bioeconomy sectors to Sustainable Development Goals

The **Sustainable Development Goals (SDGs)**, adopted by all United Nations Member States in 2015, set out a shared blueprint for peace and prosperity for people and the planet, now and into the future. The 17 goals address global challenges, including poverty, inequality, climate change, environmental degradation, peace and justice, with the overarching aim to **leave no one behind**.

The Sustainable Development Goals are deeply interconnected, and the transition to a sustainable **bioeconomy** plays a pivotal role in achieving several of these goals. By harnessing the potential of **renewable biological resources** to create **bio-based products**, such as biofuels, biodegradable materials and sustainable food sources, the bioeconomy supports a circular economy, reduces dependence on fossil fuels and fosters sustainable growth.

Key Sustainable Development Goals closely linked to the bioeconomy include:

1. **SDG 2: Zero Hunger** – by promoting sustainable agricultural practices, strengthening food security and reducing food waste.
2. SDG 6 (Clean Water and Sanitation), particularly Target 6.4 – by enhancing water use efficiency in agriculture.
3. **SDG 7: Affordable and Clean Energy** – bioenergy, including biofuels and biogas, offers renewable alternatives to fossil fuels, helping to reduce carbon emissions.
4. **SDG 9: Industry, Innovation and Infrastructure** – a thriving bioeconomy drives innovation in green technologies, sustainable manufacturing and resource-efficient industries.
5. **SDG 12: Responsible Consumption and Production** – the bioeconomy contributes to more sustainable production cycles by using renewable biological resources, thus reducing waste.
6. **SDG 13: Climate Action** – by promoting carbon sequestration in forests, soils and bio-based materials, and reducing dependence on materials with high greenhouse gas emissions, the bioeconomy can make a significant contribution to mitigating climate change.
7. **SDG 14: Life Below Water** – involves sustainable aquaculture.
8. **SDG 15: Life on Land** – is linked to sustainable land management and reforestation efforts in the bioeconomy.

Annex 2: Green Deal and bioeconomy

The European Green Deal aims to make Europe the first **climate-neutral continent by 2050**, by promoting a sustainable, circular, low-carbon economy. The bioeconomy plays a crucial role in achieving several elements of the Green Deal across all its sectors. The following table presents some examples (non-exhaustive list) of principles, products and/or activities in the different subsectors of the bioeconomy that are promoted by the Green Deal through various directives, strategies or policies.

	Green Deal elements					
	Farm to Fork	Common Agricultural Policy (CAP)	Biodiversity Strategy for 2030	REPowerEU	Water Framework Directive	Bioeconomy Strategy
Agriculture	Organic farming; reduced pesticide use; sustainable soil practices; fair share of the value added in the value chain.	Soil conservation and carbon sequestration practices; biodiversity enhancement.	Biodiversity preservation through sustainable farming; habitat protection.	N/A	Agricultural runoff reduction; protection of water quality.	Innovations in sustainable agriculture and in bio-based products.
Irrigation	Water-efficient techniques to produce food.	Efficient water use; pollution reduction.	Protection of aquatic ecosystems with smart water management.	N/A	Water waste reduction; freshwater ecosystems protection.	Sustainable use of water in agriculture.
Forestry	Sustainable solutions for food packaging (pulp and wood-based packaging).	Reforestation; sustainable forestry.	Biodiversity-friendly forestry practices. The Forest Strategy for 2030 builds on the Biodiversity Strategy.	Forest-based bioenergy that reduces fossil fuel reliance.	N/A	Promotion of the forest-based bioeconomy, such as biofuels and forest products.

Agrifood industries	Waste reduction; promotion of sustainable food options.	Waste reduction; promotion of sustainable food options.	Reduction of environmental footprint of food systems.	N/A	N/A	Circular food systems; waste reduction.
Bioenergy	Biomass and biofuels to decarbonise food systems.	Sustainable bioenergy and bio-based products.	Sustainable bioenergy from sustainably managed land (forests and agriculture).	Biomass, biofuels and biogas to decarbonise the energy sector.	Sustainable water use in bioenergy production.	Renewable energy from sustainable biological raw materials.
Fisheries and aquaculture	Sustainable seafood sourcing; responsible aquaculture.	Sustainable aquaculture and fishing practices.	Conservation of marine biodiversity through sustainable fishing practices.	N/A	N/A	Promotion of resource-efficient and sustainable aquaculture.
Resource protection	Sustainable food and water management to protect resources.	Sustainable food and water management to protect resources.	Enhanced biodiversity through soil conservation and ecosystem restoration.	N/A	Sustainable water management across Europe.	Use of biological resources for sustainability and circularity.

Annex 3: Detailed calculations for the European Union's investment gap in forestry

Forests account for over 45% of the European Union's total land area, covering approximately 180 million hectares. Forests play a critical role in mitigating climate change by sequestering and storing carbon. EU forests absorb nearly **155 million tonnes** of CO_2 annually, accounting for **10%** of total EU greenhouse gas emissions each year. The **Fit for 55** package sets a target of **310 million tonnes** of additional CO_2 equivalent sequestration per year by 2030 through efforts to restore nature, including forests. In 2021, the carbon sink from land use, land-use change and forestry was **230 million tonnes** of CO_2 equivalent. The additional sequestration needed is **80 million tonnes of CO_2 equivalent per year** across all sectors, with forests expected to contribute **around 40 million tonnes of CO_2 equivalent** annually.

Afforestation measures are expected to contribute **two-thirds** (approximately **26.7 $MtCO_2e$**) of the sequestration target while **improved forest management** (for example, sustainable forestry practices and reduced deforestation) is expected to contribute **one-third** (approximately **13.3 $MtCO_2e$**).

Marginal mitigation costs:[44]

- The **marginal cost** for **afforestation** in Europe is higher compared to other regions due to direct planting costs and opportunity costs of land use. The cost is estimated at **€150 per tonne of CO_2**.
- The cost for **improved forest management** is estimated at **€10 per tonne of CO_2**. This cost includes direct investments in forest management activities (planting, maintenance, monitoring, etc.) but excludes the opportunity costs of land use.

Investment gap calculation:

- **Investment for afforestation:**
  - The required sequestration from afforestation measures is **26.7 million tonnes of CO_2 equivalent**. The total investment required is calculated as:
    - **26.7 $MtCO_2$ x €150/tonne CO_2 = €4.0 billion annually**
- **Investment for improved forest management:**
  - The required sequestration from improved forest management is **13.3 million tonnes of CO_2 equivalent**. The total investment required is calculated as:
    - **13.3 $MtCO_2$ x €10/tonne CO_2 = €133 million annually**

Therefore, the total annual investment required to meet the European Union's carbon sequestration targets for forests is estimated to be **€4.1 billion annually** (including both afforestation and improved forest management).

As regards the 3 billion trees objective, by January 2025, only around 24 million additional trees had been planted across Europe,[45] giving a current deficit of around 2.8 billion trees, or around 560 million trees to be planted per year. The cost of achieving the 3 billion additional trees target has been estimated at €6.4 billion between 2021 and 2030, or **€641 million per year.**[46]

In all, the annual investment gap for the two quantified targets is estimated to be around €4.2 billion.

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[44] European Commission. (2021). Impact assessment report accompanying the document Proposal for a Regulation of the European Parliament and the Council amending Regulations (EU) 2018/841 and (EU) 2018/1999. Commission Staff Working Document SWD(2021) 609 final. European Commission. eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021SC0609

[45] European Environment Agency. (2025). MapMyTree [data visualisation]. Retrieved 23 January 2025 from https://mapmytree.eea.europa.eu/

[46] Nesbit, M., Whiteoak, K. et al. (2022). *Biodiversity financing and tracking: Final report*. Institute for European Environmental Policy and Trinomics. https://data.europa.eu/doi/10.2779/950856

Annex 4: Methodology for estimating the European Union's irrigation investment gap

Assessing the investment needed for irrigation is complex due to the poor availability of data and because of the lack of a unified and consistent database on irrigation or water used in agriculture. For this reason, we have relied mainly on our own calculations to estimate the investment gap in irrigation. Irrigation depends on two broad types of infrastructure: water infrastructure provided by a country or region and irrigation used on individual farms. Farms typically use three irrigation techniques:

- Localised (or drop, micro or drip) irrigation, which consists of watering plants drop by drop. It is considered the most water-efficient technique.
- Sprinkler irrigation, which simulates rainfall by spraying water into the air through sprinklers.
- Surface (or furrow) irrigation, in which water is channelled along a field either using gravity or by flooding the area (flood irrigation).

This study assumes that the modernisation and renovation of existing infrastructure in the European Union would be sufficient to ensure a more efficient use of water and can therefore be considered as the target for irrigation.

Table 1: Irrigation in the European Union, by different techniques

Irrigation technique	Current area equipped for irrigation (ha)	Current percentage (%)	Target percentage (%)	Area to be converted from surface irrigation (ha)	Target area (ha)
Localised	3 747 250	26.61	37.83	1 580 792	5 328 042
Sprinkler	6 556 550	46.56	52.17	790 396	7 346 946
Surface	3 779 520	26.84	10	2 371 188	1 408 332
Total	14 083 320	100			-

Our estimate assumes that the area covered by public irrigation infrastructure is equivalent to the area equipped for agricultural irrigation (around 14.08 million hectares), and that half of public infrastructure needs to be modernised.

The target date for modernising agricultural irrigation structures is 2035 (approximately ten years), while that for public water infrastructure is 2040 (approximately 15 years). The dates differ because modernising public infrastructure generally takes longer. Table 2 summarises the areas to be modernised and the costs involved.

Table 2: Investment needed to modernise irrigation in the European Union, by technique and type of infrastructure

Irrigation infrastructure	Area to be modernised (ha)	Modernisation cost (€/ha)	Duration (years)	Modernisation investment needs (€/year)
From surface to localised	1 580 792	3 804	10	601.3 million
From surface to sprinkler	790 396	2 500	10	197.6 million
Total farm				798.9 million
Upstream	7 041 660	15 000	15	7 billion
Total EU modernisation	-	-	-	7.8 billion

Thus, the total investment needed to modernise EU irrigation is around €7.8 billion per year. To assess the impact of this investment, we have estimated the current efficiency of EU irrigation and the expected efficiency if modernisation is funded based on the conditions assumed in this study. They are shown in Table 3.

Table 3: Estimated improvement in the efficiency of EU irrigation

Irrigation technique	Efficiency	Current irrigated area (ha)	Future irrigated area (ha)
Localised irrigation	81%	3 747 250	5 328 042
Sprinkler irrigation	68%	6 556 550	7 346 946
Surface irrigation	39%	3 779 520	1 408 332
Upstream irrigation	75%	14 083 320	14 083 320
Total current efficiency	69%	-	-
Total efficiency after modernisation	73%	-	-

In addition to the modernisation of irrigation systems, the OECD stresses the need to renovate existing irrigation infrastructure. The OECD highlights that investments in irrigation alone are not sufficient if most of the existing assets have already surpassed their expected lifespan.[47] The renovation needed amounts to €3.2 billion per year for private farm infrastructure and €2.8 billion per year for public infrastructure. Thus, the total investment needed to renovate all irrigation systems in Europe is **€6 billion per year**.

Table 4 summarises the results of Tables 2 and 3, showing that EU irrigation needs investment of approximately **€13.8 billion per year**.

Table 4: Total investment needed for EU irrigation

Intervention	Investment needs (€/year)
Modernisation (public and private farm infrastructure)	7.8 billion
Renovation (public and private farm infrastructure)	6 billion
Expansion	N/A
Total	13.8 billion

The investment gap is calculated by deducting current investments from these investment requirements. Current investments amount to $2.5 billion.[48] **Consequently, the investment gap for EU irrigation amounts to €11.5 billion per year.**

Annex 5: Methodology for estimating the investment gap for irrigation in the rest of the world

The calculations performed to estimate the investment gap for irrigation outside the European Union follow the same logic as those carried out for the European Union. Asset life and renovation costs for the various irrigation techniques are the same as those used in the European Union. Data on irrigated area were extracted from FAO's AQUASTAT dissemination system database. More specifically, global data on "area equipped for total irrigation control: localised irrigation," "area equipped for total irrigation control: sprinkler irrigation" and "area equipped for total irrigation control: surface irrigation" in 2020 were extracted from the database. The EU Member States (EU-27) were then removed from the dataset.

Investment requirements for the expansion of the irrigated area outside the European Union were estimated based on national historical data (from 2000 to 2020) on the area equipped for irrigation for each irrigation technique (localised, sprinkler and surface). The data were extracted from the FAO AQUASTAT dissemination system database. Data for the EU Member States (EU-27) were removed in order to obtain data for outside the European Union only. Next, the projected expansion of irrigation outside the European Union by 2020-2030 was calculated, taking into account the growth rate of irrigated area for each technique.

[47] OECD. (2022). Financing a water secure future. *OECD studies on water*. OECD Publishing. https://doi.org/10.1787/a2ecb261-en

[48] Calculated by extrapolating information from OECD. (2022). Financing a water secure future. *OECD studies on water*. OECD Publishing. https://doi.org/10.1787/a2ecb261-en

Estimates for modernisation come from Rosegrant et al. (2017).[49]

Table 1: Investment needs in the irrigation sector outside the European Union, by intervention

Intervention	Investment needs (€/year)
Modernisation	4.2 billion
Renovation	81.6 billion
Expansion	20.8 billion
Total	106.6 billion

Total public irrigation investments in 54 countries examined by the OECD[50] amounted to around €31.6 billion in 2019. However, total irrigation includes payments to encourage irrigation (around 82% of the total) and the development of irrigation systems on farms (18% of the total). As this study is only considering investment needs (capital expenditure) and not operational expenditure, the above-mentioned 18% was considered, amounting to €5.69 billion. In addition, upstream water infrastructure was identified in the reference given, amounting to around €3.72 billion. Therefore, the total current irrigation investments in the 54 surveyed countries correspond to around €9.4 billion.

For private irrigation investments, a calculation of private investments and official development assistance per hectare was performed in Chapter 4.2.1. The investments per hectare are multiplied by the number of hectares outside the European Union, resulting in current private investments in irrigation outside the European Union of €23.9 billion. Therefore, total current investments outside the European Union amount to €35.7 billion.

Finally, the investment gap for the irrigation sector outside the European Union is estimated by subtracting the current investments (both public and private) from the total investment needs, amounting to €61.5 billion.

Annex 6: Methodology for estimating the European Union's investment gap for research, development and innovation

According to Eurostat,[51] EU public funding for agricultural research and development has increased 25% since 2016, reaching €3.3 billion in 2021. The €3.3 billion of investment correspond to government budget allocations for R&D, which reflect the priority given by national governments to financing R&D in the bioeconomy. Nevertheless, it is difficult to estimate total investment needs, and hence investment gaps, from national research, development and innovation budgets. Some third-party sources have, however, estimated this financing gap:

- The Horizon Europe programme (the European Union's research funding programme for the period 2021-2027) defines certain objectives related to sustainable agriculture. It is estimated that around €1 billion to €2 billion a year extra may be needed to support research related to climate-smart agriculture, the reduction of agricultural emissions, and the sustainable management of natural resources (water, soil, etc.).

[49] Rosegrant, M. W., Sulser, T. B., Mason-D'Croz, D., Cenacchi, N., Nin-Pratt, A., Dunston, S., Zhu, T., Ringler, C., Wiebe, K., Robinson, S., Willenbockel, D., Xie, H., Kwon, H-Y., Johnson, T., Thomas, T. S., Wimmer, F., Schaldach, R., Nelson, G. C., & Willaarts, B. (2017). *Quantitative foresight modeling to inform the CGIAR research portfolio*. Project report for USAID. International Food Policy Research Institute (IFPRI). https://hdl.handle.net/10568/148186

[50] OECD. (2022). Financing a water secure future. *OECD studies on water*. OECD Publishing. https://doi.org/10.1787/a2ecb261-en

[51] Eurostat. (2023c). *Sustainable development in the European Union – Monitoring report on progress towards the SDGs in an EU context:* 2023 edition. Eurostat. https://doi.org/10.2785/403194

- A study on the costs of adapting agriculture to climate change[52] suggests that an additional €500 million to €1 billion a year until 2050 should be invested in R&D in Europe to develop technologies to reduce methane emissions, improve input efficiency and promote greener farming practices.

It is difficult to compare these different sources, as the scope of the activities they involve differs. Nevertheless, **it is reasonable to estimate that the current investment deficit is around €1 billion per year.**

Annex 7: Methodology for estimating the European Union's investment gap for bioenergy

Bioenergy includes biogas, biomethane and biodiesel, which can be extracted from wood, plants and agricultural waste. Eurostat does not provide gross fixed capital formation data for the bioenergy sector, so various sources are used to assess current investment in bioenergy and the bioenergy investment gap.

REPowerEU states that **biomethane production is set to increase to 35 billion m^3 by 2030**. In addition, another one of REPowerEU's main objectives is the European Union's energy independence, quantifiable by **a reduction in natural gas demand of 310 billion m^3**. We use these two quantified objectives to estimate the investment gap.

Regarding the first objective, the European Biogas Association estimates that, to supply **35 billion m^3** of biomethane by 2030, a total of €83 billion of investment is required, or around **€9.2 billion per year.**[53] These amounts are, respectively, around €48 billion to build 4 000 medium-sized units[54] and €35 billion to build 1 000 large-scale facilities.[55] Only 3 billion m^3 of biomethane will have been produced by 2022. Thus, to reach the target of 35 billion m^3, a further 32 billion m^3 are needed by 2030.

Regarding the second objective, the European Commission's REPowerEU action plan outlines several possible measures to achieve the 310 billion m^3 target and the corresponding investment requirements.[56] Two of these potential measures are relevant to the bioenergy subsector of the bioeconomy: biomass in power generation and sustainable biomethane. The first represents 1 billion m^3 in 2030, with investment needs estimated at €2 billion between 2022 and 2030 (**around €222 million per year**). The second is a sustainable biomethane production target for 2030 of around 17 billion m^3, with investment requirements of €37 billion between 2022 and 2030 (around €4.1 billion per year). This adds to the existing 18 billion m^3 target of the Fit for 55 plan for 2030. Applying the European Commission's unit cost (37/17 = €2.18 of investment per m^3 of sustainable biomethane) to the objective estimated by the European Biogas Association (35 billion m^3, the same as REPowerEU and Fit for 55), the investment requirements for 35 billion m^3 correspond to €76 billion, **or €8.4 billion per year,** roughly in the same order of magnitude as the European Biogas Association's estimates. This estimate, combined with the investment needs of biomass in power generation, can be used as the lower band of the confidence interval measuring the investment gap in bioenergy. On the other hand, the upper band is made up of the European Biogas Association's estimate (€83 billion) coupled again with biomass needs for electricity generation.

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52 Baldos, U. L. C., Fuglie, K. O., & Hertel, T. W. (2019). The research cost of adapting agriculture to climate change: A global analysis to 2050. *Agricultural Economics, 51*(2), 207-220. The research cost of adapting agriculture to climate change: A global analysis to 2050 - Baldos - 2020 - Agricultural Economics - Wiley Online Library

53 European Biogas Association. (2022). *Breaking free of the energy dependency trap: Delivering 35 bcm of biomethane by 2030.* https://www.europeanbiogas.eu/breaking-free-of-the-energy-dependency-trap-delivering-35-bcm-of-biomethane-by-2030/

54 According to the European Biogas Association, capital expenditure for the installation of a medium-sized biomethane plant based on anaerobic digestion amounts to €12 million, with a production capacity of 4 million m^3 per year at a cost of €80/MWh.

55 According to the European Biogas Association, capital expenditure for the installation of a large-scale anaerobic digestion biomethane plant amounts to €35 million, with a production capacity of 16 million m^3 per year at a cost of €55/MWh.

56 European Commission. (2022). *Implementing the REPower EU action plan: Investment needs, hydrogen accelerator and achieving the bio-methane targets.* Commission Staff Working Document SWD(2022) 230 final. European Commission. eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230

As a result, the shortfall in the bioenergy sector is €78 billion to €85 billion from 2022 to 2030, or **€8.7 billion to €9.4 billion per year**.

To estimate current investment in biomethane, this study uses a simple proportion. Since €83 billion of investment is needed to supply an additional 32 billion m^3 by 2030, current investment in biomethane corresponds to the production of 3 billion m^3, which in proportion represents around €7.8 billion, or around €0.87 billion per year (since the €83 billion of investment needed is quantified for a nine-year period).

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