

The Rapid Development of Bioeconomy Policies in the EU and other Regions of the World

Le développement rapide des politiques de la bioéconomie dans l'Union européenne et d'autres régions du monde

Die rasante Entwicklung der Bioökonomie Richtlinien in der EU und anderen Regionen der Welt

Robert M'barek and Justus Wesseler

The year 2022 was a turning point in many respects. The unprovoked Russian invasion of Ukraine exacerbated increasing cost inflation for energy, food and other goods, which was challenging for producers, consumers and governments while revisiting concerns about food security even in richer countries.

Furthermore, the post-Covid-19 pandemic in most parts of the world confirmed new consumer tendencies and behaviours. This also illustrated the strategic importance and resilience of the food and other bioeconomy systems. New genetic technologies such as MRA and CRISP-Cas9, and a new push for digitalisation and artificial intelligence (AI) have come to the fore, further supporting development of the bioeconomy (Smith *et al.*, 2021). A sustainable and circular bioeconomy is now seen as a central element in the transition to a climate-neutral economy preserving the biosphere (Gomez San Juan *et al.*, 2022). As the central building block, the food system and its transformation are essential to further developing the bioeconomy (European Commission *et al.*, 2022).

Recent years have witnessed several important developments for the bioeconomy across the world. The European Commission published its bioeconomy progress report in 2022, confirming the overall direction of its

strategy and reiterating the importance of a sustainable development of biobased products, supported via industrial policies.

“ La bioéconomie constitue un élément important de la transformation mondiale vers un système économique plus durable. ”

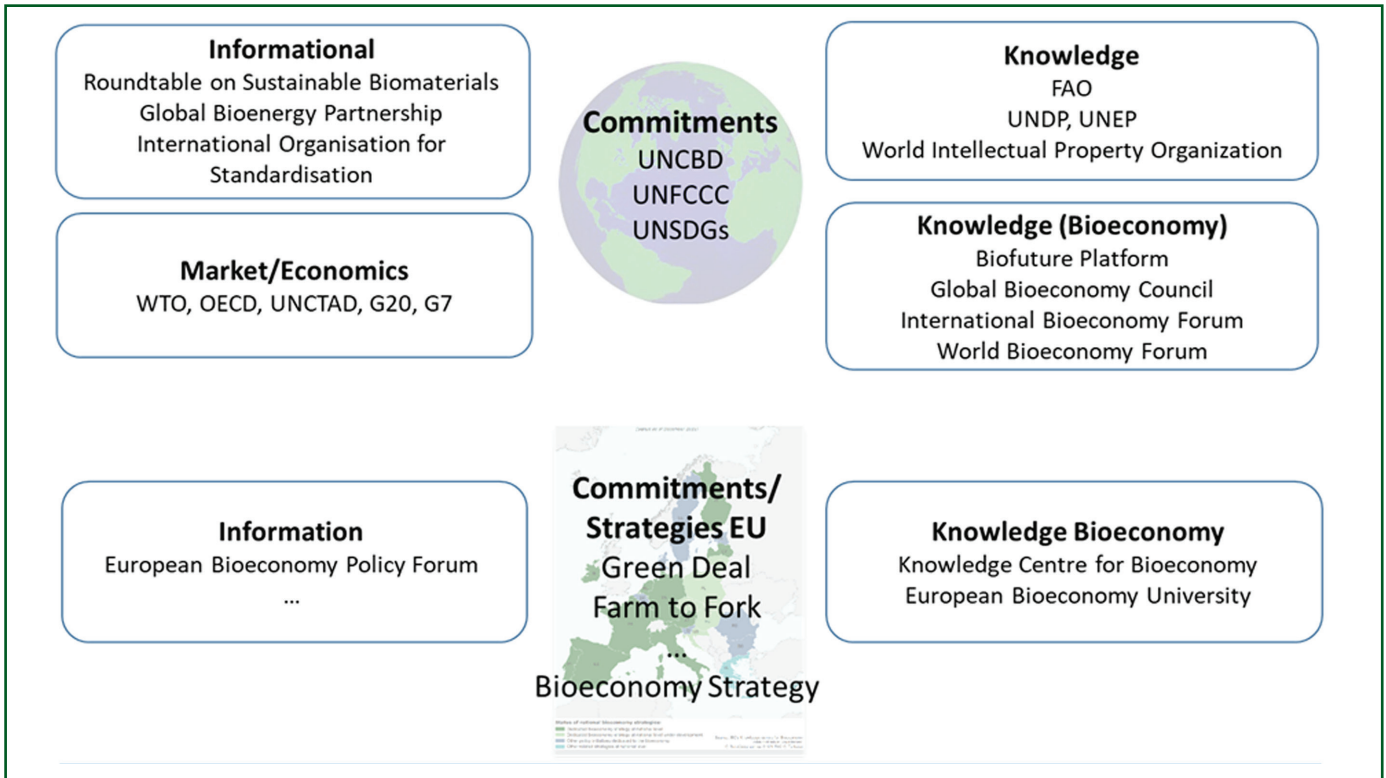
The United States passed its Innovation and Competition Act in 2021, which included the Bioeconomy Research and Development Act of 2021 with implementation in 2022 and published 'bold goals for U.S. biotechnology and biomanufacturing' in 2023; China has published a research strategy with biotechnology and a wide range of applications at its core; South America started the Latin American Bioeconomy Network; and in Eastern Africa the BioInnovate initiative is aimed at stimulating the bioeconomy in the region. Both globally and regionally multidimensional bodies either relatedly or specifically support the bioeconomy through different pathways.

In general, the bioeconomy can be understood as the conversion of natural resources into food, feed, fuels, fibres and further products (4+1 Fs). Some policy strategies have a stronger focus on bio-based products, other than food, feed and fuel; others focus more strongly on the pharmaceutical sector such as the US, or on the biofuel sector such as Brazil. Germany has also stressed the importance of using biological knowledge such as biomimicry for further developing the bioeconomy. There are no clear definitional boundaries of the bioeconomy and countries and regions have identified strategies according to their needs and priorities.

This article mainly focuses on the European Union – for which we provide an overview of strategies followed, but also referencing other regions. This includes describing how the bioeconomy has been defined and the focus of the strategies on specific sectors or policies. In addition to countries and regions, international organisations have also developed policy strategies (see Figure 1).

The overall agenda for the bioeconomy is set by the main global (UN) commitments concerning the Sustainable Development goals (UNSDGs), climate change (UNFCCC), and biodiversity (UNCBD).

Figure 1: International and European institutions relevant for the governance of bioeconomy pathways



Source: Authors, based on https://www.researchgate.net/figure/International-institutions-relevant-for-the-governance-of-bioeconomy-pathways_tbl1_348034994

Several UN organisations provide knowledge and analyses on the bioeconomy. In particular, the FAO plays a leading role in developing guidelines for monitoring (Bogdanski *et al.*, 2021). Other, more economy-oriented organisations such as UNCTAD, OECD, G20 and G7 provide either information and/or supportive policy analysis and recommendations for developing the bioeconomy.

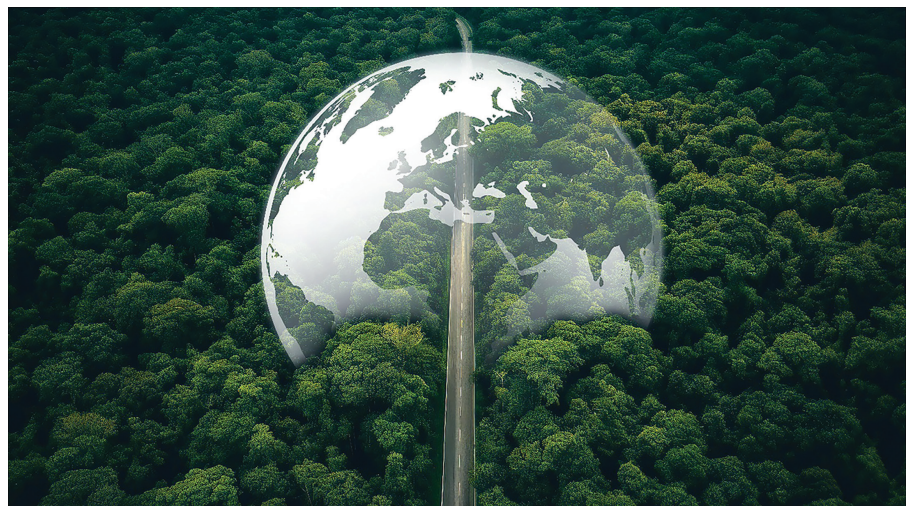
“ Die Bioökonomie ist ein wichtiger Baustein im globalen Wandel hin zu einem nachhaltigeren Wirtschaftssystem. ”

Specific bioeconomy-oriented, global fora have also been established to promote and discuss the different facets of the bioeconomy concept, spearheaded by the International Advisory Council on Global Bioeconomy (Lang, 2022).

Other organisations or partnerships advance information exchange on a more technical and expert level, including the Roundtable of Sustainable Biomaterials (SCS Global, 2023) or the International Consortium on Applied Bioeconomy Research (ICABR) (Wessler *et al.*, 2010).

The bioeconomy in **Africa** is characterised by the high share of agriculture in economic and employment terms, where biomass use for food and energy is still the

major use of biological resources. The potential of the bioeconomy as a catalyser for advancing towards many SDGs is therefore seen as enormous in Africa. However, only a small number of countries have a dedicated bioeconomy strategy (for example South Africa) or feature the bioeconomy within other policy initiatives such as the aforementioned BioInnovate initiative for East-Africa. Considering that the bioeconomy is the conversion of biological resources, it is of immense economic importance



The bioeconomy and its related policies have shown a rapid development in the EU and other regions of the world.

for Africa. The agriculture and food sector has a high growth potential as indicated by the differences in yield per hectare within Africa and between Africa and, for example, Europe (Virgin and Morris, 2016).

In **North America**, the US recently gave a new push for the bioeconomy with ‘bold goals for U.S. biotechnology and biomanufacturing’, published in 2023. The goals and solutions for climate change, food and agriculture innovation, supply chain resilience and human health, provide a real vision for the bioeconomy in the United States. In 2022 President Biden had already signed an Executive Order creating a National Biotechnology and Biomanufacturing Initiative, while the bioeconomy received further support with the Inflation Reduction Act that included a number of government initiatives (Figure 2).

Canada published its *Canada’s Bioeconomy Strategy: Leveraging our Strengths for a Sustainable Future* in 2019. The strategy builds strongly on the forestry sector and its supply of biomass. The bioeconomy strategy of Mexico has a strong focus on biodiversity.

The agricultural and forestry potential in **South America** is enormous, as is its importance for global climate and biodiversity. A bioeconomy strategy has a long tradition, with Brazil building on increasing the value of



Many of the bioeconomy strategies around the world reference the strategy of the European Union with its strong focus on biomass and its conversion and the related implications for sustainability.

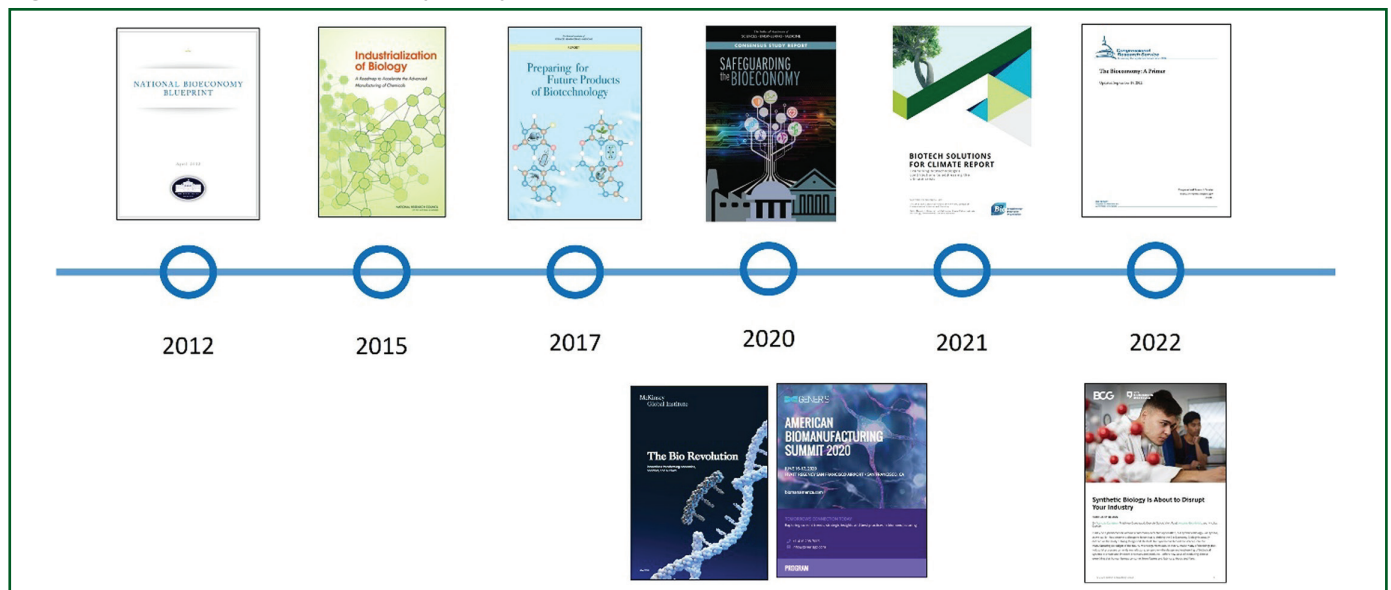
sugar cane in switching between sugar exports and its use for bioethanol replacing fossil fuels. Several countries have dedicated strategies and regulatory pathways supporting the bioeconomy (Trigo et al., 2023). The Inter-American Institute for Cooperation on Agriculture (IICA) has built a virtual bioeconomy platform facilitating access to key technologies with a strong support from the private sector serving the whole region.

In **Asia**, China has a very ambitious bioeconomy strategy and prioritised growth of its bioeconomy in its recent 5-year plan, aimed at dominating the 21st-century bioeconomy. The market

value of publicly listed biopharmaceutical innovators from China increased approximately 127-fold across several major stock exchanges between 2016 to 2021, valued in 2021 at about 380 billion USD. Biotechnology companies accounted for more than 47 per cent of that valuation (Forbes, 2022). India also has a biotechnology sector-oriented bioeconomy strategy and developed a roadmap with the objective of reaching a 150 billion USD bio-based economy by 2025 with a focus on low-carbon biobased products.

The bioeconomy strategies of **Australia** and **New Zealand** are aimed more towards the conversion

Figure 2: Timeline of US Bioeconomy Policy



Source: Maxon (2022).



Hemp – an important plant for a sustainable bioeconomy © Justus Wesseler.

of biomass into 4F+1F (food, feed, fuels, fibres and further products). In Australia the bioeconomy was very much linked with bioenergy in the beginning but has broadened since then. New Zealand has a strong focus on food and bioenergy.

In the **European Union** the bioeconomy is described as encompassing ‘all sectors and

associated services and investments that produce, use, process, distribute or consume biological resources, including ecosystem services’ (EC, 2022).

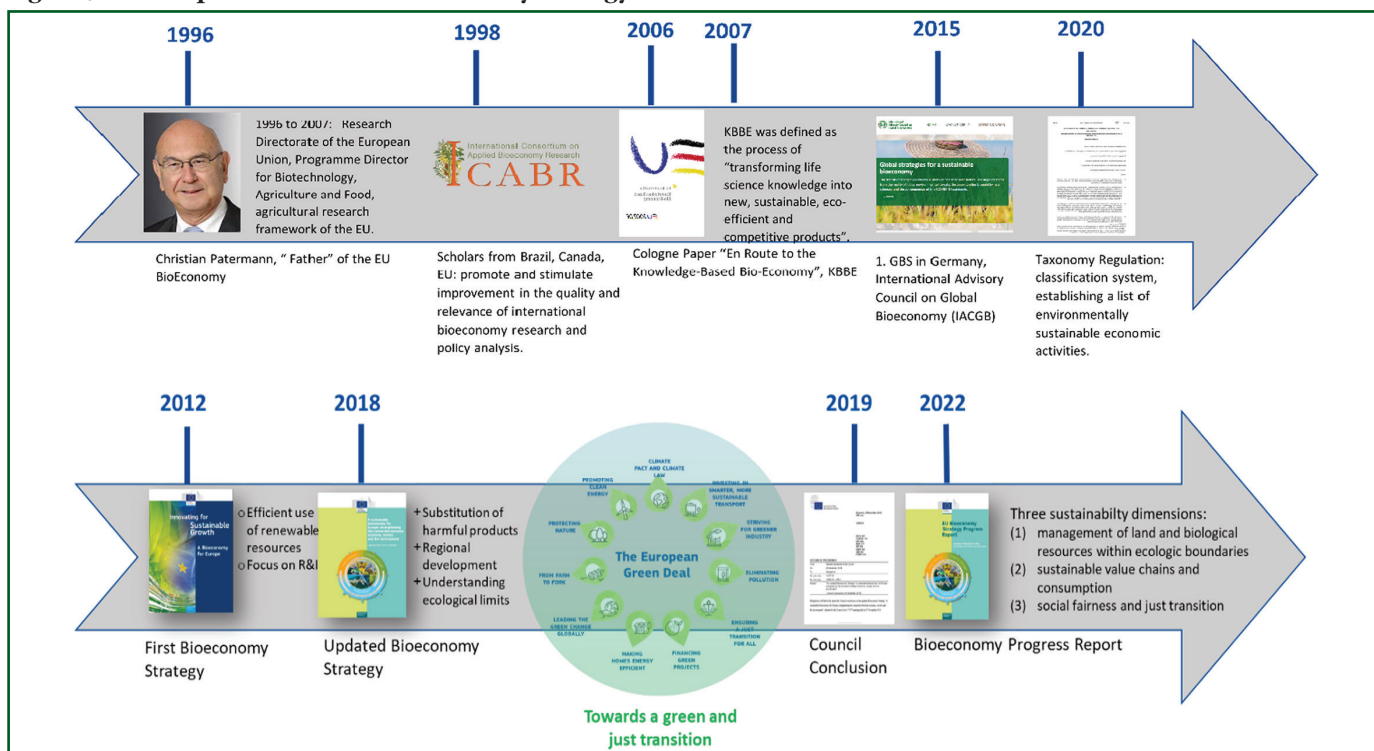
The bioeconomy strategy of the EU, as well as one of its Member States, Germany, is linked with Christian Paterman, who is considered by many the ‘Father’ of the EU bioeconomy. As the Programme

Director for Biotechnology, Agriculture and Food in 1990 he started to develop initial ideas about a policy strategy for the bioeconomy which resulted in the Cologne Paper *En Route to the Knowledge-Based Bio-Economy* and the publication of the EU Bioeconomy Strategy in 2012 that stressed the importance of human capital and an enabling policy environment. In 1998 the International Consortium on Applied Bioeconomy Research was founded. Many of the topics of the consortium were inspired by developments in the EU in leveraging it to an international level debate (EFB, 2022).

A decade after the first Bioeconomy Strategy was published (EC, 2012), the bioeconomy is seen as ‘a natural enabler and result of the European Green Deal transformation’ (EC, 2022). Figure 3 describes the different steps since 2012, with the concepts of bioeconomy and bioeconomy policy having evolved as described in the most recent Bioeconomy Progress report (EC, 2022).

The EC (2022) report confirms that good progress has been made on the key actions to achieve the main objectives of the Bioeconomy

Figure 3: Development of the EU BioEconomy Strategy



Source: EC (2022), p. 5; Wesseler (2012).

Strategy. However, it also underlines the challenges and trade-offs, in particular regarding the increased demands for materials and bioenergy, continued pressure on land with its consequences on climate and biodiversity, the need for transformation and re-skilling of Europe's work force, and the need to consider consumption patterns. Much debate has emerged around the establishment of a list of environmentally sustainable economic activities under the taxonomy regulation (EU, 2020). Establishing such a list faces a number of problems as the trade-offs of economic activities are extremely difficult to quantify with the currently available level of information (Sturm *et al.*, 2022). However, the price system provides important information as it allows the conversion of different product qualities in comparable measure across products, when measurement in physical units reaches its limit (Wesseler and Drabik, 2016).

“ The bioeconomy is an important building block for the global transformation towards a more sustainable economic system. ”

In October 2022, a high-level bioeconomy conference brought together policymakers and experts to discuss findings of the EU Bioeconomy Strategy Progress and how to better manage trade-offs (EU Bioeconomy Conference, 2022).

In April 2023 the EU's AGRIFISH council (EU-27 Member States at Ministerial level) published conclusions on the opportunities provided by the bioeconomy in the light of current challenges, with a focus on rural areas (see <https://www.consilium.europa.eu/en/meetings/agrifish/2023/04/25/>).

Several strategies within the Green Deal have a direct link to the

bioeconomy. A summary can be found in the EC Progress report (EC, 2022) and, which includes more recent initiatives, in the JRC report on trends in the EU bioeconomy (Mubareka *et al.*, 2023). The industrial dimension of the bioeconomy can be found in the recently published Green Deal Industrial plan (EC, 2023a), and a discussion document on transition pathways for the EU chemical sector (EC, 2023b).

The bioeconomy strategy is closely related to Research and Innovation in Europe and receives an important stimulus through the EU's funding programme *Horizon Europe*. Of particular relevance is Cluster 6 which provides opportunities to enhance and balance environmental, social & economic goals to set human economic activities on a path towards sustainability.

As a follow up to the Bio-based Industry Joint Undertaking, the Circular Bio-based Europe Joint Undertaking (<https://www.cbe.europa.eu/>), with about 2 billion € of funding, is set to give an additional push to innovation and sustainable industrial development.

The status of national and regional bioeconomy policies in the EU-27 is already well documented (see for instance Haarich *et al.*, 2022; Kardung *et al.*, 2020; Mubareka *et al.*, 2023). Beginning in 2023, 10 Member States have a dedicated bioeconomy strategy at national level in force and at least 6 Member States are in the process of developing their respective dedicated national strategies. According to Haarich (2022), 7 Member States are involved in other macro-regional or sub-national policy initiatives dedicated to the bioeconomy. In this context, the BIOEAST macro-regional initiative should be mentioned, which involves all Central and Eastern European countries. To complete the picture, 4 Member States have bioeconomy related strategies. This listing, illustrated in Figure 4, shows the overall advanced implementation of bioeconomy strategies at national level.

While a sustainable bioeconomy needs global and national governance, it is implemented mainly at the regional and local levels, where the biomass is produced and to a large extent processed. As shown in Lasarte *et al.* (2022), Europe's regions are characterised by a very heterogeneous bioeconomy structure and therefore require targeted strategies. Recently, Haarich *et al.* (2022) published a detailed overview of regional strategies. About 194 regions in the EU-27 (NUTS 1, NUTS 2 or NUTS 3 level) have, or are working towards, a strategic framework related to the bioeconomy. Fully dedicated bioeconomy strategies can be currently found in 28 regions. An impressive number of 62 regions have strategic frameworks with a strong bioeconomy focus. However, the authors (Haarich *et al.*, 2022) also identified about 94 regions which have strategies with only minimum bioeconomy content.

Key messages for the EU

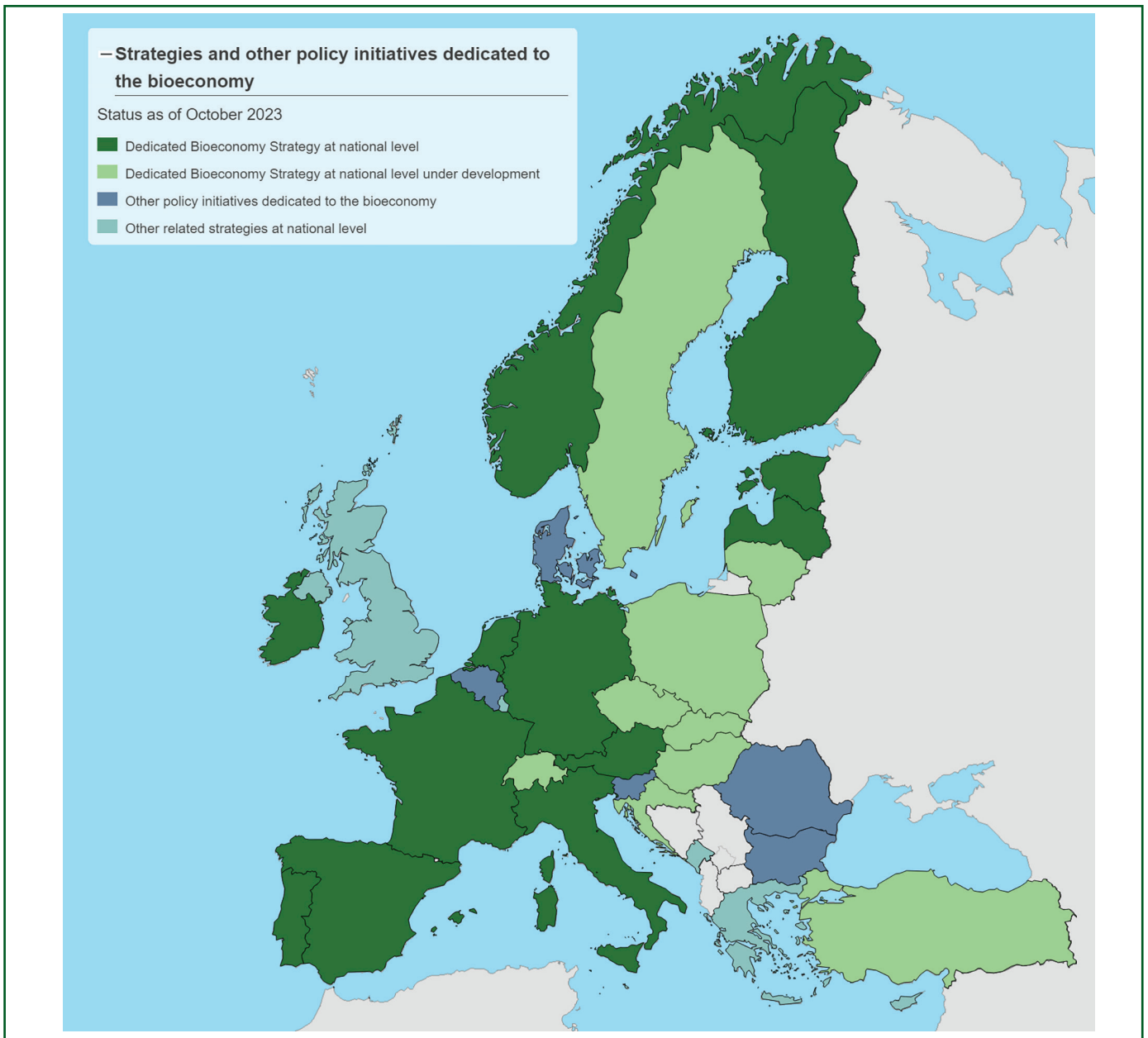
Frans Timmermans, European Vice President: *'A truly circular and sustainable bioeconomy is a critical tool to support the objectives of the green transition. We need to make sure that we reach our objectives in a fair and balanced way'*.

Mairead McGuinness, European Commissioner for Financial Stability, Financial Services and the Capital Markets Union: *'The bioeconomy enables a green and socially fair transition by developing sustainable business models and by promoting sustainable trade and social fairness in Europe and beyond, adding value to the regional economies'*.

(High-level Bioeconomy conference, October 2022)

Many of the bioeconomy strategies around the world reference the strategy of the European Union with its strong focus on biomass and its

Figure 4: National bioeconomy strategies in the EU-27 and neighbouring countries



Source: European Commission, Knowledge Centre for Bioeconomy, 2023 (November 2023). See https://knowledge4policy.ec.europa.eu/visualisation/bioeconomy-different-countries_en

conversion and the related implications for sustainability. Australia, Canada and New Zealand and many of the countries in Latin America follow the EU strategy, but other countries have a much stronger technology focus such as China, India and the United States. Nevertheless, the UK has withdrawn its 2018 bioeconomy strategy and replaced it with its 2021 Innovation Strategy and somewhat related UK Biological Security Strategy. The bioeconomy seems to play a less relevant role now in UK innovation policies. One of the re-emerging issues is the need to measure and monitor the contribution of the

bioeconomy to economic development. Biorefineries, for example, have the potential to contribute positively to regional economic growth (Zhu, 2022), which will not only depend on regional or national policies, but also on how they interact. The recent Inflation Reduction Act (IRA) in the US has raised concerns in the EU about its implication of industry shifting to the US. However, as a large part of the bioeconomy strongly depends on local resources, the allocation of biorefineries might be relatively less affected by the IRA, although the resulting products are often traded on international

markets. Trade policies can thus have a strong impact on the development of the bioeconomy. However, in this broad context, harmonisation of standards and the data supporting standard setting still remains a challenge as other elements to provide a facilitating policy environment.

Acknowledgements

This work was supported by the BioMonitor project, which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 773297.

Further Reading

- Bogdanski, A., Giuntoli, J., Mubareka, S., Gomez San Juan, M., Robert, N. and Tani A. (2021). *Guidance Note on Monitoring the Sustainability of the Bioeconomy at a Country or Macro-Regional Level*, FAO and European Commission's Joint Research Centre, Rome. Available online at: <https://www.fao.org/documents/card/en/c/cb7437en>
- Bracco, S., Tani, A., Çalıcıoğlu, Ö., Gomez San Juan, M. and Bogdanski, A. (2019). *Indicators to Monitor and Evaluate the Sustainability of Bioeconomy*. Overview and a Proposed Way Forward. Rome, FAO.
- European Commission (2012). *EU bioeconomy strategy 2012, COM/2012/060 final*. Brussels: European Commission.
- European Commission (2022b). *EU bioeconomy strategy progress report, COM(2022) 283 final*. Brussels: European Commission.
- EU Bioeconomy Conference (2022). *Proceeds of the EU Bioeconomy conference*, 6–7 October, Brussels, Belgium. Available online at: <https://eu-bioeconomy-conference-2022.b2match.io/>
- European Commission (2023a). *A green deal industrial plan for the net-zero age, COM(2023) 62 final*. Brussels: European Commission.
- European Commission (2023b). *Transition pathway for the EU chemical sector*. Brussels: European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.
- European Parliament (2020). *Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance)*. Luxembourg: European Parliament. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852>
- Gomez San Juan, M., Harnett, S. and Albinelli, I. (2022). *Sustainable and Circular Bioeconomy in the Climate Agenda: Opportunities to Transform Agrifood Systems*. Rome, FAO.
- Haarich, S. and Kirchmayr-Novak, S. (2022). *Bioeconomy strategy development in EU regions*, Sanchez Lopez, J., Borzacchiello, M.T. and Avraamides, M. editor(s), Luxembourg: Publications Office of the European Union.
- *EFB Bioeconomy Journal* (2022). Special Issue on Christian Patermann and The Bioeconomy: A Testimony on his 80th Anniversary: Important next steps for speeding up and unlocking the full potential of a circular biobased economy. *The EFB Bioeconomy Journal*, 2(1): 100037.
- Lang, C. (2022). Bioeconomy – from the Cologne paper to concepts for a global strategy. *EFB Bioeconomy Journal*, 2: 100038.
- Lasarte Lopez, J., Ronzon, T., Van Leeuwen, M., Rossi Cervi, W. and M'barek, R. (2022). *Estimating employment and value added in the bioeconomy of EU regions, EUR 31058 EN*, Luxembourg: Publications Office of the European Union.
- Lier, M., Aarne, M., Kärkkäinen, L., Korhonen, K.T., Yli-Viikari, A. and Packalen, T. (2018). Synthesis on bioeconomy monitoring systems in the EU Member States – indicators for monitoring the progress of bioeconomy. *Natural Resources and Bioeconomy Studies*, 38/2018.
- Mubareka, S., Giuntoli, J., Sanchez Lopez, J., Lasarte Lopez, J., M'barek, R., Ronzon, T., Renner, A. and Avraamides, M. (2023). *Trends in the EU bioeconomy, EUR 31434 EN*, Luxembourg: Publications Office of the European Union.
- SCS Global (2023). *Roundtable on Sustainable Biomaterials*. Emeryville, CA: SCS Global. Available online at: <https://www.scsGLOBALservices.com/services/roundtable-on-sustainable-biomaterials-rsb>. Last accessed: 6 September 2023.
- Smith, V., Wesseler, J.H.H. and Zilberman, D. (2021). New plant breeding technologies: an assessment of the political economy of the regulatory environment and implications for sustainability. *Sustainability*, 13(7): 3687.
- Sturm, V., Banse, M. and Salamon, P. (2022). The role of feed-grade amino acids in the bioeconomy: Contribution from production activities and use in animal feed. *Cleaner Environmental Systems*, 4: 100073.
- The White House Office of Science and Technology Policy (2023). *Bold Goals for U.S. Biotechnology and Biomanufacturing, Harnessing Research and Development to Further Societal Goals*, Washington, DC: OSTP. Available online at: <https://www.whitehouse.gov/wp-content/uploads/2023/03/Bold-Goals-for-U.S.-Biotechnology-and-Biomanufacturing-Harnessing-Research-and-Development-To-Further-Societal-Goals-FINAL.pdf>
- Trigo, E., Chavarria, H., Pray, C., Smyth, S.J., Torroba, A., Wesseler, J., Zilberman, D. and Martinez, J.F. (2023). The bioeconomy and food systems transformation, in: J. von Braun, K. Afsana, L. O. Fresco and M. H. A. Hassan (eds.) *Science and Innovations for Food Systems Transformation*. Springer, Cham, pp. 849–868.
- Virgin, I. and E.J. Morris (eds.) (2016) *Creating Sustainable Bioeconomies. The Bioscience Revolution in Europe and Africa*. Routledge.
- Webb, P., Sonnino, R., Fraser, E., et al. (2022a). *Everyone at the table: Transforming food systems by connecting science, policy and society*. Luxembourg: Publications Office of the European Union.
- Wesseler, J. and Drabik, D. (2016). Prices matter: Analysis of food and energy competition relative to land resources in the European Union. *NJAS - Wageningen Journal of Life Sciences*, 77: 19–24.
- Wesseler, J., Smyth, S. and Scatasta, S. (eds.) (2010). Special Issue of AgBioForum, contribution of the ICABR 2009 conference to the Emerging Bioeconomy. *AgBioForum*, 13(2).
- Zhu, Benz Xinqi (2022). Bioeconomy and EU regional development. *Presentation at BioMonitor Meeting with Stakeholders Workshop, 5 October 2022*, Brussels, Belgium.

Robert M'barek, European Commission, Joint Research Centre, Spain.

Email: robert.m'barek@ec.europa.eu

Justus Wesseler, Agricultural Economics and Rural Policy Group, Wageningen University and Research, The Netherlands.

Email: justus.wesseler@wur.nl


Summary

The Rapid Development of Bioeconomy Policies in the EU and other Regions of the World

 In the European Union, the bioeconomy is very broadly defined, encompassing all sectors and associated services and investments that produce, use, process, distribute or consume biological resources, including ecosystem services. It is seen as a natural enabler and result of the transformation proposed by Europe's sustainable growth strategy, the Green Deal. EU Member States and regions also have strategies to further target the implementation of the bioeconomy. The bioeconomy and its related policies have shown a rapid development in the EU and other regions of the world. In challenging times, the sustainable and circular bioeconomy is a central element in supporting the transition to an economy that is climate-neutral, while preserving the biosphere. From the global agenda of United Nation's Sustainable Development Goals (SDGs), climate change and biodiversity, several other international organisations, global fora, and private initiatives, all provide knowledge, analyses and perspectives for the bioeconomy. Africa's bioeconomy has a huge potential as a catalyser for advancing towards many SDGs. In North America, the US has recently defined bold goals for biotechnology and biomanufacturing. South American countries foster their enormous agricultural and forestry potential in supporting the bioeconomy, while playing a key role for global climate and biodiversity.


The bioeconomy in its different designs is thus an important building block for the global transformation towards a more sustainable economic system.

Le développement rapide des politiques de la bioéconomie dans l'Union européenne et d'autres régions du monde

 Dans l'Union européenne (UE), la bioéconomie est définie de manière très large pour comprendre tous les secteurs ainsi que les services et investissements associés produisant, utilisant, traitant, distribuant ou consommant des ressources biologiques, y compris les services écosystémiques. Elle est considérée comme un catalyseur naturel et le résultat de la transformation proposée par la stratégie européenne de croissance durable, le Pacte vert. Les États membres et les régions de l'UE disposent également de stratégies visant à mieux cibler la mise en œuvre de la bioéconomie. La bioéconomie et les politiques afférentes ont connu un développement rapide dans l'UE et dans d'autres régions du monde. En ces temps difficiles, la bioéconomie durable et circulaire est un élément central pour soutenir la transition vers une économie neutre pour le climat, tout en préservant la biosphère. Depuis l'agenda mondial des objectifs de développement durable (ODD) des Nations Unies, concernant par exemple le changement climatique et la biodiversité, plusieurs autres organisations internationales, forums mondiaux et initiatives privées, fournissent tous des connaissances, des analyses et des perspectives pour la bioéconomie. La bioéconomie africaine a un énorme potentiel en tant que catalyseur pour progresser vers de nombreux ODD. En Amérique du Nord, les États-Unis ont récemment défini des objectifs audacieux en matière de biotechnologie et de biofabrication. Les pays d'Amérique du Sud exploitent leur énorme potentiel agricole et forestier pour soutenir la bioéconomie, tout en jouant un rôle clé pour le climat mondial et la biodiversité.

La bioéconomie, dans ses différentes conceptions, constitue donc un élément important de la transformation mondiale vers un système économique plus durable.

Die rasante Entwicklung der Bioökonomie Richtlinien in der EU und anderen Regionen der Welt

 In der Europäischen Union ist der Begriff Bioökonomie sehr weit gefasst und beinhaltet alle Sektoren und damit verbundenen Dienstleistungen und Investitionen, die biologische Ressourcen, einschließlich Ökosystemleistungen, erzeugen, nutzen, verarbeiten, verteilen oder verbrauchen. Sie wird als natürlicher Wegbereiter und als Ergebnis des Wandels gesehen, den die europäische Strategie für nachhaltiges Wachstum, der Green Deal, vorschlägt. Die EU-Mitgliedstaaten und -Regionen haben ebenfalls Strategien, um die Umsetzung der Bioökonomie voranzutreiben. Die Bioökonomie und die damit verbundenen politischen Maßnahmen haben sich in der EU und in anderen Regionen der Welt schnell entwickelt. In schwierigen Zeiten ist die nachhaltige und kreislauforientierte Bioökonomie ein zentrales Element, um den Übergang zu einer klimaneutralen Wirtschaft zu unterstützen und gleichzeitig die Biosphäre zu erhalten. Von den Sustainable Development Goals (SDGs) der Vereinten Nationen, über den Klimawandel und die biologische Vielfalt, aber auch andere internationale Organisationen, globale Foren und private Initiativen - sie liefern alle Wissen, Analysen und Perspektiven für die Bioökonomie. Die afrikanische Bioökonomie hat ein enormes Potenzial als Katalysator für die Verwirklichung vieler SDGs zu sorgen. In Nordamerika haben die USA vor kurzem ehrgeizige Ziele für die Biotechnologie und die Bioproduktion festgelegt. Die südamerikanischen Länder fördern ihr enormes land- und forstwirtschaftliches Potenzial zur Unterstützung der Bioökonomie und spielen gleichzeitig eine Schlüsselrolle für das globale Klima und die biologische Vielfalt.

Die Bioökonomie in ihren verschiedenen Ausprägungen ist somit ein wichtiger Baustein für den globalen Wandel hin zu einem nachhaltigeren Wirtschaftssystem.

summary