biofuture platform

Kickstarting a global, advanced bioeconomy

AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

CEM14 BIOFUTURE UPDATE

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TABLE OF CONTENTS

INTRODUCTION

The **CLEAN ENERGY MINISTERIAL (CEM) BIOFUTURE PLATFORM INITIATIVE** leads global actions to accelerate development, scale-up, and deployment of sustainable bio-based alternatives to fossil-based fuels, chemicals, and materials. It is chaired by the U.S. Department of Energy and coordinated by the International Energy Agency (IEA). It provides a forum for policy dialogue and collaboration among leading countries, organizations, academia, and the private sector. The **BIOFUTURE CAMPAIGN** was developed in the context of the Clean Energy Ministerial (CEM) to enable joint work between Governments and Industry to accelerate deployment of bio- and waste-based products and showcase how they can and will benefit society.

The Biofuture Platform Initiative and its Campaign aim to increase the understanding of, and thereby confidence in, the availability of sustainable bio- and waste-based products to substitute for their fossil equivalents and drive meaningful reductions in greenhouse gas emissions. In addition, to increasing public and private sector commitment to the innovation, investment, and policy needed to fulfill the potential for bio-based fuels, chemicals, and materials to enable the Net Zero future.

OVERVIEW OF PROGRESS

This document reports the progress made by Biofuture Platform Initiative and its Campaign since the CEM13.

The Biofuture Platform Initiative Workstream on Biomass Quantification & Sustainability Governance leads efforts to recruit input from experts. This update features two white papers that describe:

1. Good practices to support expansion of sustainable biomass supplies, and
2. Tools to help mitigate risks for supply chain investments.

The International Energy Agency facilitates the work of the Biofuture Platform Initiative and provides analytical support. This update features two IEA products:

1. An analysis of future feedstock availability for liquid biofuels, and
2. A description of policy lessons learned from countries and regions successfully enabling the production of sustainable biofuels.

The CEM Biofuture Campaign provides a vehicle for Industry engagement. This update features a white paper that summarizes considerable Industry input on barriers to and opportunities for sector growth.

CEM13 BIOFUTURE STATEMENT

During the 13th meeting of the Clean Energy Ministerial held in Pittsburgh, Pennsylvania, USA in September 2023, the Biofuture Platform Initiative released the CEM13 Biofuture Statement that advanced the views of countries participating in and leading the Initiative. Since CEM13 the six components of the CEM13 Biofuture Statement have guided and continue to guide the work of the Initiative and its Campaign. The Statement is presented in its entirety below:

The Clean Energy Ministerial Biofuture Initiative and its Biofuture Campaign affirm that sustainable bio-based fuels, chemicals, and materials are essential to enabling an inclusive clean energy transition and a Net Zero, circular economy.

Specifically, Members recognize that

1. The sustainable production and use of bio-based fuels, chemicals, and materials is key to achieving GHG emissions reductions and offers important co-benefits such as increased energy security and socio-economic development, including job creation across the breadth of the bioeconomy value chain.
2. Promoting an evidence-based approach to quantification of sustainable biomass availability and sustainability governance is essential to optimizing biomass feedstock production and delivering the GHG reduction benefits of using bio-based products, while conserving biodiversity, protecting environment, and increasing social-economic benefits.
3. Engaging diverse stakeholders is necessary to identify and share effective approaches to biomass sustainability governance, and to ensure the credibility of using bio-based products to reduce GHG emissions.
4. Policies intending to scale up the production and use of sustainable bio-based products should support wider climate and environmental targets and be performance-based, technology-agnostic, and developed using the best available science and information.
5. Work is needed to enable the use of transparent and agreed upon carbon accounting methods to inform relevant policies and to optimize the GHG reductions from using bio-based fuels, chemicals, and materials to replace their fossil equivalents.
6. Investments and project implementation should be made in consultation with local communities to identify beneficial social and economic opportunities, and improve environmental quality and climate justice, while minimizing risks.

BIOFUTURE CEM13 STATEMENTS AND CORRESPONDING ACTIONS

CEM13 STATEMENT	BIOFUTURE ACTIONS
The sustainable production and use of bio-based fuels, chemicals, and materials is key to achieving GHG emissions reductions and offers important co-benefits such as increased energy security and socio-economic development, including job creation across the breadth of the bioeconomy value chain.	• Convened a Sustainability Technical Advisory Group (TAG) and met with international Biofuture Leaders to guide and support the work of the CEM Biofuture Platform Initiative. • Developed strategies and resources including case studies to demonstrate the co-benefits from sustainable biomass production and use.
Promoting an **evidence-based approach to quantification of sustainable biomass availability and sustainability governance** is essential to optimizing biomass feedstock production and delivering the GHG reduction benefits of using bio-based products, while conserving biodiversity, protecting environment, and increasing social-economic benefits.	• International Energy Agency prepared a "Feedstock Availability" white paper that was discussed in a series of online and in-person workshops. • Co-hosted online workshops with the Maersk McKinney Møller Center to explore feedstock availability for sustainable marine biofuels. • Promoted evidence-based approach to assess potential effects on land use change (LUC) in collaboration with the IEA Bioenergy Technology Collaboration Program. • Prepared a Biofuture Guidance Document using stakeholder provided case studies and references entitled "Good Practices for Sustainable Biomass".
Engaging diverse stakeholders is necessary to identify and share effective approaches to biomass sustainability governance, and to ensure the credibility of using bio-based products to reduce GHG emissions.	• Conducted a series of Chatham House Rules interviews with 30 diverse stakeholders to better understand concerns and build mutual understanding regarding best practices in sustainable biomass production and use. • The CEM Biofuture Campaign canvassed its industry members for their experiences and lessons learned in sustainable biomass production and use.

Policies intending to scale up the production and use of sustainable bio-based products should support wider climate and environmental targets and be **performance-based, technology-agnostic, and developed using the best available science and information**.	• Prepared a Biofuture Guidance Document using stakeholder inputs entitled "Tools to Manage Biomass Investment Risks". • The IEA prepared a document summarizing "Biofuture Policy Best Practices" and their outcomes in Brazil, India, and the USA. Elements of this document are included in this update.
Work is needed to **enable the use of transparent and agreed upon carbon accounting methods to inform relevant policies** and to optimize the GHG reductions from using bio-based fuels, chemicals, and materials to replace their fossil equivalents.	• NGOs, government representatives, and other stakeholders including members of the CEM Biofuture Campaign provided considerable input on the need for transparent and agreed up carbon accounting. • Input from stakeholders is summarized in this update, and opportunities for collaborative work considered.
Investments and project implementation should be made in **consultation with local communities** to identify beneficial social and economic opportunities, and improve environmental quality and climate justice, while minimizing risks.	• The guidance document entitled "Tools to Manage Biomass Investment Risks" emphasizes "Engaging stakeholders early and continually in project design and implementation" to build trust and support sustainable biomass production aligned with a community's goals for sustainable development.

Good Practices for Sustainable Biomass

Background

The Clean Energy Ministerial (CEM) Biofuture Platform Initiative's (https://biofutureplatform.org/) Workstream on Biomass Quantification and Sustainability Governance (hereafter, Sustainability Workstream) promotes an evidence-based understanding of sustainable biomass production and use. This brief offers a synthesis of recommendations for sustainable biomass production.

Summary

Assessing sustainability is a challenge owing to complex interactions of many variables and nearly infinite possibilities for alternative fates of biomass, coproducts, and displacement or substitution effects associated with materials, fuels, and multiple markets across diverse supply chains. Engaging stakeholders early and continually in project design and implementation can build trust and support for sustainable biomass production and use that are aligned with a community's goals for sustainable development and desired future conditions.

Defining Sustainability

Regulatory frameworks often define "sustainable biomass" based on compliance with an applicable standard. However, documentation of compliance can be a burden for many small producers, and in practice, sustainability depends on place-based conditions including feedstocks, opportunities, and the priorities of affected communities. Thus, criteria for what represents sustainable biomass feedstocks should be developed with local stakeholders.

A risk-based approach is recommended when considering options for production and use of biomass. This means that in each specific case, the costs, benefits, and risks associated with current management should be compared with proposed alternatives to improve net social, economic and environmental benefits to society.

Practices to Accelerate Sustainable Biomass Production & Use

The recommendations below were developed by the Biofuture Platform Initiative with input from a broad group of stakeholders, including a Technical Advisory Group.[1] They are meant to guide governments and project developers as options to build social support for expanding sustainable biomass production and use to help meet climate and other development goals.

1. Ensure that sustainability analyses are transparent and based on clear terms, definitions, and verifiable data.
2. Document real conditions, in specific contexts and at local scales, i.e., specific cases rather than reliance on generalized models, and compare the opportunity costs of practical alternatives including business as usual and any proposed interventions for increasing biomass production.
3. Document compliance with regulatory frameworks that support sustainability to expand market opportunities.

[1] For more information on the Sustainability Workstream and the role and composition of the Technical Advisory Group, see https://biofutureplatform.org/sustainability-workstreams/.

4. Provide public access to timely and transparent reporting and verification systems that build trust with stakeholders.
    a. Cite data from reliable sources that can be verified.
    b. Ensure case studies and briefs provide a balanced analysis of costs, benefits, risks, and opportunities for each proposed use of biomass.
5. Monitor and address priority stakeholder concerns through adjustments in operations and steps to improve transparency and governance.
6. Document risks and net costs and benefits to capture effects on environment, jobs, health, rural development, investments, and other factors that are important to local stakeholders. A multi-disciplinary approach is important to assess impacts because effects of sustainable biomass production and use go beyond reducing net greenhouse gas emissions. For example, effects can include forest and soil regeneration, resilient rural development, and other social, economic, and environmental impacts.
7. Take advantage of independent monitoring resources and data to help track effects of operations (e.g., on soils, forests, water, biodiversity, disadvantaged communities).
8. Monitor and report on the role of biomass participation in energy and material systems in a manner that helps illustrate any linkages with other food, feed, and fiber prices to help document how biomass production responds to market signals and relationships with food security.
9. Align biomass production and use with the principles for a circular economy through efficient integration of food, energy and material provision from sustainably sourced biomass while minimizing waste and losses from the system.
10. Apply a risk-based approach to available options when confronting uncertainties.
11. Capitalize on win-win opportunities. Development of sustainable biomass resources offers an opportunity for sustainable employment in natural resource management while generating multiple ecological services, natural climate solutions, local resilience, and biomass that can be used to meet multiple societal needs for food, feed, chemicals, and energy.
12. Use systematic, contextualized, science-based assessments to illustrate the “pros and cons” of proposed investments relative to other realistic options.
13. Support public policies that are agnostic towards feedstocks and technology and focus instead on performance goals.
14. Provide requirements for sustainable biomass that are clear, practical, and adaptable to local conditions to permit inclusive participation of small land holders in a circular bioeconomy.

TOOLS TO MANAGE BIOMASS INVESTMENT RISKS

Background

The purpose of this update is to share a summary of available tools and policies that can reduce risk and thereby facilitate project development, reduce time to market, decrease the overall cost of capital, or enable better financing terms.

The Clean Energy Ministerial (CEM) Biofuture Platform Initiative, promotes an evidence-based understanding of sustainable biomass availability and best practices for governance. Stakeholders often point out that high risks associated with biomass-related project finance limit investments and the role of sustainable biomass to contribute to a net zero, circular economy. This document provides a synthesis of suggestions received from the Biofuture Sustainability Technical Advisory Group[i] to help reduce three categories of common risks.

Interventions that can help manage and mitigate risks

1. Governments and project developers should support regional planning and cooperation across relevant government offices, industry, investors, civil society, and local economic development organizations, to better link sources of sustainable biomass supply with parties interested in developing bio-based industries and refineries (e.g., to supply specific biorefineries or demand centers at marine and airports). Plans should include strategies to facilitate the flow of capital to specific biomass-related projects.[1]
2. To identify specific policies and investments required to accelerate deployment, project developers should engage local experts and stakeholders to conduct location-based analyses of sustainable biomass supplies.[2] Then apply locally appropriate principles and criteria for acceptable feedstocks as part of due diligence in project planning.[3]
3. Governments and project developers should support the use of existing risk-reduction tools and the development of new tools to support achievement of climate-smart development goals.

Examples of existing risk-reduction tools are described below by type of risk. Examples of specific tools and resources for additional information are provided in end notes.

To manage risks related to land use and food security

- Assess environmental and social risks and use systematic approaches or certification schemes to document how they are mitigated or managed.[4]
- Apply standards and procedures and provide the support required to enable producers to show compliance with defined sustainability criteria and indicators.[5]

To manage risks related to sustainable supply chains

- Identify and promote opportunity zones that reflect feedstock supply opportunities that minimize investor risks.[6]
- Apply tools to assess site-specific supply chain risks for investors, to quantify site-and project-specific risk (supply chain resilience) for the capital market.[7]
- Take advantage of biomass feedstock insurance products to protect investors from excessive fluctuations in feedstock cost and provides guaranteed deliveries to the plant gate.[8]

To manage risks related to technology innovations (green credit risk)

Many options and products now exist for managing new technology risks. Examples include:

- New Energy Risk's portfolio of risk products.[9]
- Munich Re's risk solutions designed for emerging circular economy industries and offering technology insurance for bio-based refineries and manufacturing plants.[10]
- La Capitale Financial Security Insurance was introduced in 2019 by Parhelion to insure against policy risks in California's Low Carbon Fuel Standard (LCFS) market. The policy is underwritten with investment-grade security (Lloyd's).[11]

End Notes

The inclusion or mention of specific products or standards in this document should not be represented as an endorsement. The examples of existing tools and products is not exhaustive. Links are provided to serve as helpful examples of the many tools now available in the marketplace. However, each case may have unique circumstances so consumers should always evaluate options to identify tools that best meet their needs.

[1] Example of establishing bioeconomy development opportunity zones www.bdozone.org

[2] "Biomass Supply and the Sustainable Development Goals - International case studies" IEA Bioenergy 2021 Report (Blair et al) summarizes 37 best practice case studies. And for procedures for stakeholder engagement, see Dale et al. 2019 Engaging stakeholders to assess landscape sustainability.

[3] In addition to the case studies and approaches noted above, another example is engaging stakeholders to integrate bioenergy into landscape design in Iowa.

[4] Many certification schemes and standards are available. Users should identify a standard appropriate for their specific needs and market requirements. Examples of tools recommended by TAG members include those developed by the Food and Agriculture Organization for food security assessments and sustainable agricultural technologies and the principles and criteria developed with stakeholders by the Roundtable for Sustainable Biomaterials. Life-Cycle-Assessment (LCA) approaches are used in most standards to help evaluate specific topics of concern, such as net emissions or Energy Return On Investment (EROI). EROI is used to assess total energy balance of different options and is important when fossil and renewable sources are explicitly analyzed e.g., Murphy et al 2022 https://doi.org/10.3390/su14127098; or fossil EROI in Dale et al. 2013 https://doi.org/10.1016/j.ecolind.2012.10.014.

[5] Examples of standards include, "Evaluating Relative Sustainability" and "Reference Scenarios when Evaluating Sustainability" by ASTM International, and the methodology developed by the Global Bioenergy Partnership.

[6] See this example from Saskatchewan Canada, of a bioeconomy development zone.

[7] For example, see Ratings for Biomass Supply Chain Risk

[8] Many new instruments are becoming available to producers and investors (e.g., biofuel and feedstock supply chain insurance products from various commercial insurers). National policies and programs developed for agriculture are increasingly available such as the Biomass Crop Assistance Program in the US.

[9] For information on products designed to reduce "New Energy Risks" see https://newenergyrisk.com/-, https://paragoninsgroup.com/our-brands/new-energy-risk/ or https://www.transre.com/wp-content/uploads/2021/12/TransRe_New-Energy-Risk.pdf

[10] https://www.munichre.com/en/solutions/for-industry-clients/risk-solutions-circular-economy-industry.html

[11] For more information on La Capitale Financial Security Insurance: https://www.lacapitalefs.com/

FEEDSTOCK AVAILABILITY

Background

On the 7th of March, the International Energy Agency and the Biofuture Campaign co-hosted a workshop on "Avoiding a supply chain crunch for liquid biofuels". The workshop hosted 92 participants from industry, government, and international organizations to understand the nature of a potential feedstock supply crunch for liquid biofuels and seek participant perspectives on two questions:

1. What do the participants consider the most likely pathways to expanding feedstock supply in line with a net zero pathway to 2030?
2. What government, industry and international community action would help expand feedstocks?

Paolo Frankl – Head of the Renewable Energy Division at the IEA, Michael McAdams – President of the Advanced Biofuels Association and Mark Elless – Technology Manager at the Department of Energy opened the workshop opened the conversation while Jeremy Moorhouse – Bioenergy Analyst at the IEA provided the IEA's perspective on the lipids feedstock supply crunch. The conversation then moved into open plenary with one structured intervention from Rohaise Low – Senior Economist at LMC.

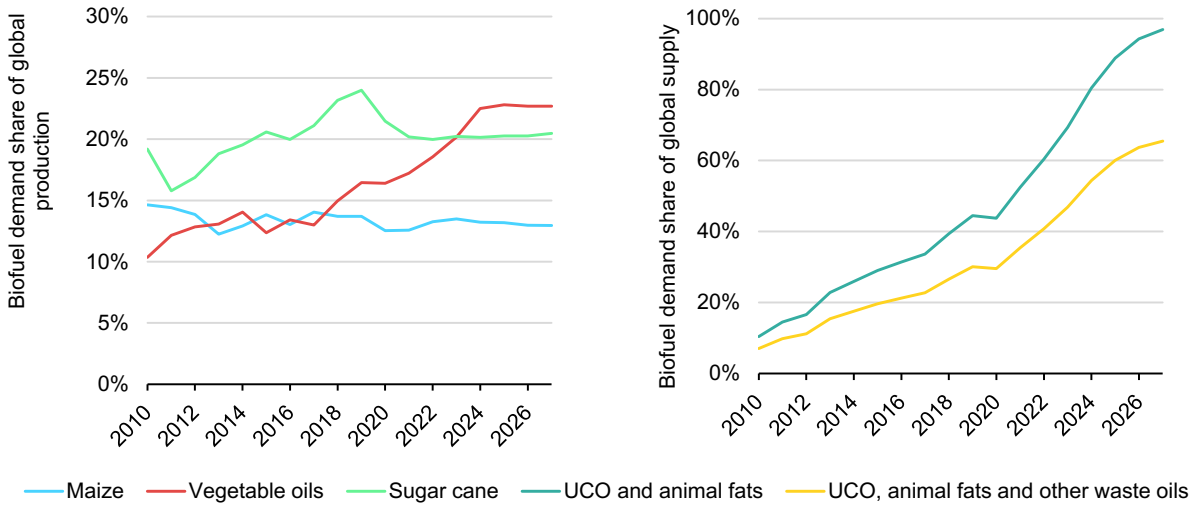
Context

Liquid biofuels are essential to achieving a net zero pathway. In the IEA's Net Zero Emission by 2050 Scenario (NZE) liquid biofuel demand triples by 2030. According to the same analysis, there are sufficient, sustainable feedstocks available to support this growth without expanding crop land or expanding deforestation. Achieving this outcome is premised on intensifying conventional crop production, expanding feedstock production to marginal lands and cover crops, and expanding waste and residue use in fuels.

In 2022 conventional feedstocks, primarily sugar cane, corn, soybean, rapeseed. and palm supported 89% of liquid biofuel production. Waste and residues, primarily used cooking oil and animal fats, supported the remaining 11% of production. By 2027 we expect total liquid biofuel production to expand by 20% to near 5 EJ. Wastes and residues would support more than 30% of this growth. The IEA's net zero emission scenario would see 12 EJ of liquid biofuel production by 2030.

Even at 5 EJ of production there is evidence that biodiesel, renewable diesel, and sustainable aviation fuel (SAF) production could face a feedstock supply crunch over the next five years. Growth of these fuels is driven by renewable diesel and SAF expansion in North America and Europe as well as biodiesel in Brazil, Indonesia and Malaysia. New demand drives up the share of global vegetable oil production directed towards biofuel production by five percentage points by 2027. Over the same time period, biofuel demand could use near all available used cooking oil and animal fat supplies. Ethanol production is less constrained, as global sugar and corn production keep pace with growing ethanol production over the forecast period.

Biofuel demand shares of global crop production (left) and wastes and residues (right), main case, 2010-2027



Notes: UCO = used cooking oil. Biofuel demand by feedstock is calculated based on forecast demand, yield coefficients, project feedstock statements, historical feedstock shares and feedstock policy. Ethanol production using maize produces co-products such as feed, corn oil, CO2 and electricity. Maize, vegetable oil and sugar cane production is based on the OECD-FAO Agricultural Outlook 2022-2031. Collection potential is based on the Clean Skies for Tomorrow Coalition: used cooking oil, avg. 12 million tonnes; animal fats, 13 million tonnes; and other waste oil, 13 million tonnes.

If not addressed this supply crunch risks slowing the pace of liquid biofuel development and making the energy transition more costly for the transport sector, especially for aviation, maritime shipping and long-haul trucking.

Workshop results

The presentations and participant interventions resulted in three broad take aways:

Demand for fats, oils, and greases is expanding: Global biofuel production is expected to increase by 20% by 2027 according to the IEA. Demand for fats, oils and greases is expected to expand quicker, by 40% over the next five years to meet demand for new biodiesel, renewable diesel and SAF production. Biodiesel, renewable diesel and SAF production from existing and future facilities will largely come from vegetable, waste, and residue oils over the next 5-10 years. However, these supplies have limits. Planning for post-2030; therefore, requires broadening supplies, especially in the context of net zero.

Meeting demand requires an all feedstock and all fuels approach: Technologies and processes offer much potential to expand access to existing feedstock supplies, improve GHG performance, increase the efficiency of feedstock use, and expand the base of feedstocks that can be converted to biofuels.

- Intensifying existing agricultural production on the existing landbase: Crop-based feedstocks could be expanded on the existing, cultivated landbase by increasing yields and intercropping, according to several participants.
- Novel oilseed feedstocks: Vegetable oils produced on marginal land or as cover crops could also expand available oil supply.

- Deploying novel technologies that can process new feedstocks: Alcohol-to-jet, cellulosic ethanol, biomass-based Fischer-Tropsch synthesis and biomass-oil co-processing all over avenues to use a broader set of feedstocks.
- Greenhouse gas intensity improvement: Since many policies focus on GHG reductions, any GHG intensity improvement can meet policy objectives with less fuel demand and so less feedstock demand. Carbon capture utilization and storage and biogas offer opportunities for lower GHG intensities.

Policy and market design are essential to encouraging growth: Policy and market design can help set the bounds for investment, support technology development and support the more efficient supply chain development. Measures include:

- **Market response:** Markets will respond to high prices by encouraging more supply and investment in new technologies and processes.
- **Knowledge and market design:** There is a coordination role for governments to understand feedstock availability and connect supply centres with demand centres.
- **Credible, performance-based policies:** Credible, consistent, and long-term policies are necessary to stimulate investment in projects, supply chains and to expand feedstock supply. Policies should be performance based and allow for as many technology pathways as possible.
- **Sustainability:** While credible policies and market design can help expand feedstock availability, policies must also set strict sustainability guardrails to mitigate biodiversity impacts, avoid competition with food and feed production and reduce GHG emissions.

Following activities

The Biofuture Platform incorporated the results of the workshop to support discussion with Biofuture Platform members, the Technical Advisory Group and numerous presentations via the Clean Energy Ministerial, G20 and Biofuture led events.

BIOFUTURE POLICY BEST PRACTICES

Background

India is proposing a Global Biofuel Alliance (GBA) to bring countries together to expand and create new markets for sustainable biofuels. To support and inform this initiative the International Energy Agency (IEA), in collaboration with the Biofuture Platform Initiative summarized policy insights from Brazil, India and the United States in their efforts to expand biofuels production.

Six policy pillars that have supported biofuels growth

Brazil, India, and the United States have all successfully expanded biofuels supply to reduce GHG emissions from the transport sector while supporting energy security and rural development objectives. While each country's approach and challenges are different, there are broad similarities that new markets and existing markets could emulate to help expand biofuls. These six pillars form the foundation of biofuel support:

1. **Develop and maintain a long-term strategy:** Successful biofuel policies rest on a long-term strategy that considers feedstock supply, energy security, food security, investment needs, economic impacts, technical standards and codes, trade policy and coordination with broader government objectives.
2. **Provide the right investment signals:** Clear and long-term policies are essential to attracting investment. These often include a package of mandates, financial incentives, and performance-based greenhouse gas intensity targets.
3. **Continue to innovate:** Greenhouse gas performance policies, financial incentives for new technologies and improved efficiency and feedstock requirements can all drive innovation.
4. **Ensure supplies are secure and affordable:** A thorough understanding of biomass feedstock availability (targets set in context of available supplies), flexible policies (conditions under which policies may be modified) and measures to reduce costs (credit markets, performance-based policies and cost thresholds) are all policy features that can help ensure secure and affordable supplies.
5. **Address sustainability concerns early:** Only sustainable biofuels have a place in the energy transition. Policy design must include clear guidance, measurement, reporting and verification practices. For instance:
    a. **Greenhouse gas emissions:** Life-cycle greenhouse gas thresholds and preferably performance-based targets can be used to ensure greenhouse gas reductions and encourage more efficient plant operation.
    b. **Food security:** A core principle in biofuel policy development is to protect and enhance food security. Annual cost and feedstock assessments, flexible policy design, feedstock guidance and technical flexibility to shift between food and fuel supplies are all options to protect and enhance food security while expanding biofuel production.
6. **Collaborate with the international community:** International forums and bilateral agreements help to share policy lessons, transfer technology, harmonize sustainability requirements and accelerate innovation. These actions in turn can hasten sustainable biofuels deployment and improve trade.

Following activities

The Biofuture Platform Initiative and the IEA have shared and plan to continue to share these policy lessons with G20 member countries, at meetings of the Clean Energy Ministerial, and as the foundation of engagement with the Global Biofuel Alliance as it develops its workplan.

BIOFUTURE CAMPAIGN INPUT AND KEY INDUSTRY RECOMMENDATIONS

Introduction

The Clean Energy Ministerial (CEM) Biofuture Platform Initiative created the Biofuture Campaign to enable and manage productive dialog and joint work between Biofuture Countries and industry leaders that are developing and marketing sustainable, bio-based fuels, chemicals, and materials to replace their fossil equivalents. The Biofuture Campaign is made up of more than 60 leading companies and industry associations.

A primary ambition of the Biofuture Campaign is to provide Clean Energy Ministerial countries with a set of harmonized recommendations with inputs from industry partners that suggest specific actions that countries should take to enable increased production and use of sustainable bio-based fuels, chemicals, and materials. To generate these recommendations the Biofuture Campaign held a series of workshops and online discussions to collect and prioritize Industry inputs.

The response to this call for information was tremendous and will guide and motivate Biofuture Campaign work for the remainder of 2023 and all of 2024. In coordination with Biofuture Campaign members, harmonized industry recommendations will be refined over time in and delivered at high-level international meetings (e.g., COP28) and directly to the relevant CEM country officials. This document provides an overview of workshop inputs and a set of key recommendations.

Key Industry Recommendations

The following recommendations are preliminary. The recommendations were made by industry members of the Biofuture Campaign, but they are neither a consensus industry position nor the recommendations of the CEM Biofuture Platform Initiative countries. In the coming months, efforts will be made to generate consensus and to release joint recommendations from Biofuture Countries and Biofuture Industry Leaders.

- **Across all countries and arable geographies, more should be done to mobilize the full range of sustainable feedstocks available for bioprocessing and biorefining.**
- **International processes, such as the Clean Energy Ministerial, should work with national governments to harmonize the inter-operability of their respective sustainability regulations to enable international trade and high functioning cross-border carbon markets.**
- **National governments should establish policies and regulations that enable sustainable bio-based chemicals, plastics, materials, and hydrogen to substitute for their fossil equivalents.**
- **National governments should improve coordination across the full range of ministries, departments, and agencies with jurisdiction over biomass feedstocks and the regulations of bio-based fuels, chemicals, materials, and hydrogen, including agriculture, climate, energy, environment, finance, forestry, natural resources, petroleum, and transportation.**

Elaborated Industry Recommendations

Mobilize sustainable biomass feedstocks

- As described in the Feedstock Availability section, “meeting demand requires an all feedstocks approach” and “policy and market design are essential to encouraging growth” (see pages 11 - 13). In some countries and regions policies regulating bio-based products either disfavor the use of certain sources of biomass (e.g., crop-based biomass) or do not incorporate certain sources

into existing regulatory frameworks. Regulators should work with industry and adopt a performance-based approach to supporting the use of biomass feedstocks.

- A robust feedstock supply chain is necessary to ensure a productive and efficient bio-based economy. Investments should be made to better grow, harvest, transport, and store the biomass needed to produce the full range of bio-based fuels, chemicals, and materials. Attention should be paid to ensure that feedstock suppliers (e.g., farmers and foresters) share in the economic benefits of a vibrant and sustainable bio-based economy.
- CEM countries should enable the transparent assessment, monitoring, reporting, and verification of their biomass resources and their use. Clarity regarding sustainable biomass resource availability would increase investor confidence in the projects needed to scale-up production of bio-based fuels, chemicals, and materials. Industry is developing technologies for transparent reporting of feedstock sourcing. In addition, countries should consider biomass as a strategic resource, as they do with petroleum and rare earth metals.

Harmonize sustainability regulations and policies, including the carbon intensity of bio-based products

- National governments are putting in place laws and regulations meant to enable their economies towards de-carbonization and de-fossilization. Producers of bio-based fuels, chemicals, and materials face a regulatory environment of ever increase heterogeneity and complexity. This complexity creates barriers to trade and investment.
- Biofuture Campaign members encourage governments to implement performance-based policies, because they (1) incentivize best practices in biomass feedstock production (see pages 7 – 8) and (2) reward continued improvement in operations and product attributes, including reductions in carbon intensity.
- For example, policies should (1) establish sustainability frameworks that treat all biomass resource management and production systems equally to avoid market distortions and (2) provide incentives for more sustainable land and water management and penalties for harmful practices.

Enable bio-based chemicals, materials, and hydrogen to substitute for their fossil equivalents

- Many CEM countries have policies that incentivize the production and use of sustainable biofuels (for example, see pages 14 - 15); however, there is a lack corresponding policies to incentivize production and use of sustainable bio-based chemicals, materials, and hydrogen. This imbalance in policy support makes it difficult scale-up the bio-based chemicals, materials, and hydrogen sector.
- Mobilizing sustainable biomass feedstocks and creating robust biomass supply chains will assist in scaling-up bio-based chemicals, materials, and hydrogen. However, governments, feedstock supply chain partners, producers, and off-takers should be convened to consider the specific feedstocks needs of bio-based chemicals, materials, and hydrogen bio-processing, and how to meet them.
- When preparing performance-based policies for bio-based chemicals, materials, and hydrogen, policymakers and regulators should consider the differences in end-of-life outcomes between biofuels and these bio-based products.

Improve coordination on bio-based products across government ministries, departments, and agencies:

- Using sustainable biomass to produce fuels, chemicals, and materials brings together a broader collection of stakeholders than other clean energy approaches. Energy Ministries often need to coordinate closely with other ministries to properly stimulate and regulate bio-based fuel, chemical, and material production.
- Many CEM governments do not possess a bio-based fuels, chemicals, and materials lead or an inter-agency biofuels coordination group. This lack of coordination slows progress in technology development, investment, and project preparation.
- CEM governments should learn from their peers how to establish high-function biofuels and bio-based product coordination committees, leads, or agencies.

2023 Biofuture Workshops

In-person Biofuture workshops were held in Brussels and Mumbai in May 2023. The first Brussels workshop was held jointly with SHV Energy on 12 May and focused on gaseous fuels & woody biomass. The Mumbai workshop was enabled by the Indian Ministry of Petroleum and Natural Gas (MoPNG) was held on 15 May and focused on the opportunities and needs of the Indian bioeconomy. The second Brussels workshop was held jointly with FuelsEurope and Concawe on 24 May and focused liquid biofuels and bio-based chemicals & materials.

We are extremely grateful for the generous support provided by SHV Energy, MoPNG, and FuelsEurope, as well as the technical support provided by Studio Gear Up. We acknowledge and are grateful for the time, energy, and contributions made by industry leaders whether via online submission or attending the in-person workshops.

Following Actions

Readers of the CEM14 Biofuture Update will note similarities in recommendations regarding best practices expressed by government officials, technical experts, and industry leaders across the secions of this update.

The Biofuture Platform Initiative is encouraged by the potential for an evidence-based consensus and will work to increase mutual understanding among all stakeholders regarding best practices for using biogenic carbon in a Net Zero Circular Economy.

A fuller reporting of the learnings from the May Biofuture Workshops and online contributions from Biofuture Campaign members is being prepared. These long-form treatments of Industry recommendations will be released at future high-level meetings and will be used to facilitate dialogs between industry, international technical agencies, and national governments.