BIKE

BIOFUELS PRODUCTION
AT LOW - ILUC RISK
FOR EUROPEAN SUSTAINABLE
BIOECONOMY

D 5.1

ASSESSMENT OF THE FRAMEWORKS AND RECOMMENDATIONS ABOUT ENABLING POLICIES

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Glossary

Acronyms of key public and international institutions can be found in Appendix B.

Acronym	*Name*
AAF	Alternative Aviation Fuel
ABREC	African Biofuel and Renewable Company
ABREF	African Biofuel and Renewable Energy Fund
AKI	Institute of Agricultural Economics (Hungary Ministry of Agriculture)
ANC	Area of Natural or Other Specific Constraints
BDR	Biogas Done Right
BIKE	Biofuels Production At Low ILUC-Risk For European Sustainable Bioeconomy
CA-LCFS	Californian Low Carbon Fuel Standard
CAP	Common Agricultural Policy
CAPEX	Capital Expenditures
CEAP	Circular Economy Action Plan
CHP	Combined Heat and Power
CIB	Consorzio Italiano Biogas E Gassificazione
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CREA	Research Centre for Engineering and Agro-Food Processing
CRES	Center for Renewable Energy Sources and Saving
CS	BIKE Case Study
DLUC	Direct Land Use Change
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guarantee Fund
EIP	European Innovation Partnership
ESCA	Emissions from Soil Carbon (also e_{sca})
ESG	Environmental, Social, Governance
ESIF	European Structural and Investment Funds
EUR	Euro
FAS	US Department of Agriculture Farm Advisory System
FQD	Fuel Quality Directive
FT	Fisher-Tropsch Sythesis
GA	BIKE Grant Agreement
GAEC	Good Agricultural and Environmental Condition
GHG	Greenhouse Gas
HBE	Netherlands Renewable Energy Units (Hernieuwbare Brandstofeenheden)
HEFA	Hydroprocessed Esters and Fatty Acids
HSE	Health, Safedt, and Environmental Requirements
HVO	Hydrogenated Vegetable Oil
IA	European Commission Implementing Act
ICL	Imperial College London
IFI	International Finance Institution
ILUC	Indirect Land Use Change
IPCC	UN Intergovernmental Panel on Climate Change
ISCC	International Sustainability and Carbon Certification
LCA	Life Cycle Analysis

Acronym	*Name*
LIFE Programme	EU L'Instrument Financier pour l'Environnement
LUC	Land Use Change
LUCAS	Land Use/Cover Area frame Survey
LULUCF	Land Use, Land-Use Change, and Forestry
MFF	Multiannual Financial Framework
MJ	Megajoule
MS	EU Member State
NAPINFO	EU Nitrate Action Programme Information System
NCCAP	Kenyan National Climate Change Action Plan
NPK	Nitrogen-phosphorous-potassium
OPEX	Operating Expenses
PFAD	Palm Fatty Acid Distillates
R&D	Research and Development
RCF	Recycled Carbon Fuels
RE	Renewable Energy
RE-CORD	Italian Renewable Energy Consortium for R&D
RED	EU Renewable Energy Directive
REDD+	UNFCCC Reduce Emissions from Deforestation and Forest Degradation in Developing Countries
RFF	EU Recovery and Resilience Facility
RFONBO	Renewable Fuel of Non-Biological Origin
RRF	EU Recovery and Resilience Facility
RSB	Roundtable on Sustainable Biomaterials
RTFO	UK Renewable Transport Fuels Obligation
SAF	Sustainable Aviation Fuel
SAP	CAP Strategic Action Plan
SCM	Standard Cubic Metre
SME	Small and Medium Enterprise
TEN-E	Trans-European Energy Network
WP	BIKE Work Package

Executive Summary

The low ILUC-risk concept is a basis to certify that additional feedstock can be produced from agricultural systems for biofuel use while avoiding broader market impacts, thereby avoiding both indirect land use change and putting pressure on food prices. The concept of low ILUC-risk biofuel production is not new, but the combination of the development of project level certification rules for low ILUC-risk feedstock by the European Commission, the discussion of enhanced renewable energy targets under the Fit for 55 package, and the increased attention on competition between food and fuel as a result of the war in Ukraine has stimulated renewed interest in biofuel production pathways that can deliver emissions reductions without interfering in food markets. There is currently a gap between legislative reality for low ILUC-risk fuels, where the clearest value proposition exists only for low ILUC-risk palm oil, and the conceptual reality, which is that a variety of low ILUC-risk systems can be imagined across a spectrum of feedstocks. The BIKE project seeks to explore the potential for policy action to develop a value proposition for this broader range of low ILUC-risk projects.

Work Package 5 of BIKE involves reviewing the place of low ILUC-risk fuels in the existing EU policy and institutional landscape, identifying policies that can enable the development of low ILUC-risk supply chains, and making recommendations for the development of a supporting framework in the EU. This report, the first deliverable of Work Package 5 (WP5), presents the results of Task 5.1 of the BIKE project, “Stock taking: mapping the legal, institutional and policy frameworks in EU and case studies”.

Policy Landscape

The low ILUC-risk concept was introduced into EU legislation in 2015 when a definition of low ILUC-risk fuels was added to the Renewable Energy Directive; but no measures were introduced at the EU level at that time to actively support the development of low ILUC-risk value chains. In the 2018 recast of the RED, low ILUC-risk fuels were for the first time given a defined regulatory role, providing an exemption from limits placed on the supply of biofuels from feedstocks deemed to be high ILUC-risk. At present, the only feedstock identified as high ILUC-risk is palm oil, and therefore this exemption only offers a value proposition to low ILUC-risk projects in the palm oil industry.

For other feedstocks, low ILUC-risk status can therefore be seen as being in a regulatory no-man’s land. The RED gives a definition that is applicable to other feedstocks, including feedstocks that can be cultivated in Europe, but meeting that definition imparts no direct regulatory advantage under the terms of the RED. Outside of energy policy, low ILUC-risk projects may have many characteristics considered desirable in agriculture, such as enhanced carbon sequestration and utilisation of abandoned land, but low ILUC-risk certification itself receives no explicit recognition.

While the support under the RED is currently constrained, there is space for action at the Member State level that could give low ILUC-risk fuels an advantaged position. Article 26(1) of the RED allows Member States to distinguish between biofuels based on the best available evidence on the associated ILUC emissions. As low ILUC-risk certification is considered in EU law to be a basis to demonstrate that a feedstock is produced without ILUC, this gives Member States considerable leeway to differentiate in national biofuel support policies between certified low ILUC-risk fuels and other food- and feed-based biofuels. This could include exempting low ILUC-risk biofuels from stricter limits on the use of food- and feed-based fuels and providing enhanced support for low ILUC-risk fuels. This type of recognition of low ILUC-risk certification would support engagements in low ILUC-risk projects by parties at all stages of the value chain.

Beyond the RED, low ILUC-risk projects may have a range of characteristics that could make them eligible to be supported in other areas of agricultural policy. For example, the post-2023 CAP states that Europe

will provide support to prevent the abandonment of land facing 'natural or other specific constraints' to farming. This support may be available to low ILUC-risk projects that target unused or abandoned land. The Farm to Fork strategy identifies carbon farming as a priority for regulatory action, and this is reiterated in the Communication on Sustainable Carbon Cycles. Low ILUC-risk projects that are able to demonstrate enhanced soil carbon sequestration, for example by the application of biochar, may be eligible for support within these schemes. The Nitrates Directive empowers Member States to recognise the use of crop rotations, cover crops and perennial crops in their codes of good agricultural practice.

Institutional Landscape

Low ILUC-risk biofuel production systems straddle the thematic areas of energy policy, agricultural policy, climate policy and innovation policy, and therefore there are a number of institutional bodies that could have a stake in supporting low ILUC-risk systems at the EU level. This panoply of EU-level institutions will be reflected by national level institutions at the Member States.

The key institution for the low ILUC-risk concept is the European Commission Directorate General for Energy (DG ENER). DG ENER has primary responsibility within the Commission for developing renewable energy policy, which includes the Renewable Energy Directive. In this role, DG ENER has also been responsible for commissioning external reports on low ILUC-risk certification and low ILUC-risk pilot projects, and for leading the development of the Implementing Regulation on voluntary schemes and low ILUC-risk certification. DG ENER is also the first point of contact for Member States implementing the RED, and is responsible for assessing whether any Member States have taken measures in their renewable energy policy that are inconsistent with the requirements of the RED. Member States considering adding support for low ILUC-risk biofuels under the leeway given in Article 26(1) are therefore likely to be attentive to DG ENER's approval or disapproval of such measures. DG ENER is bound to follow the legislation in place, and therefore currently is understood to perceive low ILUC-risk certification as relevant primarily for high ILUC-risk feedstocks, as that is the main role given in the legislation.

In addition to DG ENER, three further DGs of the Commission are identified as particularly relevant to the consideration of complementary support for low ILUC-risk fuels – DG Agriculture and Rural Development (AGRI), DG Climate Action (CLIMA) and DG Research and Innovation (RTD). Among other relevant responsibilities, DG AGRI is responsible for development of the CAP, DG CLIMA will be responsible for the development of net carbon removals policy, and DG RTD is responsible for supporting innovation through Horizon Europe.

Beyond the EU institutions, the role of certification bodies (such as BIKE partner ISCC) is crucial as the low ILUC-risk certification system relies on certification bodies to develop practical systems to recognise low ILUC-risk production. Certification bodies are constrained by acting within the requirements set by the Commission, but are still responsible for important decisions that could affect project recognition.

Financing Opportunities

The low-ILUC risk concept is a relatively new one and there is little recognition of the low ILUC-risk production concept in existing funding systems, with the Innovation Fund being the only funding opportunity that we are aware of that explicitly recognises low ILUC-risk certification. By definition, many low ILUC-risk production models require additional financing to be deployed – the additionality test is predicated on the fact that low ILUC-risk innovations will not be deployed without investment that must be paid back using a low ILUC-risk premium. Funding for low ILUC-risk biofuels can be potentially acquired via mechanisms for financing biofuel projects, subject to fulfilment of the sustainability criteria therein, but an increased awareness by funders and financial institutions of the benefits and regulatory context

for low ILUC-risk are required to take full advantage of this funding potential. Currently, project-centric funding programmes, such as the Innovation Fund, appear to potentially constitute the most relevant form of support for low ILUC-risk projects.

Reflections from the Case Studies

A core component of the BIKE project is formed by the case studies, which explore four different pathways for producing additional bioenergy through sustainable farming practices. BIKE case studies consider a variety of soil types, crop growing and harvesting periods, providing evidence of the versatility required of the low ILUC-risk concept. Under the scope of the present analysis, BIKE case studies are analysed with respect to the policy and institutional frameworks discussed already. The analysis aims to further pinpoint potential enabling provisions and bottlenecks for projects on the ground, strengthening the basis of the understanding of the specificities of various aspects of the low-ILUC risk concept.

The over-arching EU renewable energy policy frame constitutes the main regulatory driver for the realization of the cases studies. In particular, the RED II's drive for increased renewable energy consumptions and the Green Deal's aspirations for enhanced biodiversity appear as the main EU policies of influence. National legal frameworks appear not yet to have any significant effect on the overall motivation for the initiation of a low ILUC-risk case. Going forward, national frameworks could help to crystallise the value proposition for low ILUC-risk value chains, and will influence the degree of flexibility that a low ILUC-risk case promoter can enjoy in implementation. It is also clear that the alignment of the national frameworks with the conditions in the local market (both in terms of agriculture and energy) is an important parameter influencing the establishment of a viable business case.

Introduction

BIKE Work Package 5

The purpose of BIKE's Work Package 5 is to assess the status of low ILUC-risk production systems in the EU policy and legal framework, cross-referencing the role of low ILUC-risk certification in the Renewable Energy Directive with support for these types of production systems in complementary policies. In the words of the project Grant Agreement (GA):

> *The overall objective of Work Package 5 (WP5) is to evaluate the legal, institutional and political frameworks and understand how these can be tailored to act as enablers in the market uptake of low ILUC risk biofuels, bioliquids and biomass fuels and provide policy recommendations.*

As well as offering a more sustainable basis to supply biofuel feedstock, many low ILUC-risk feedstock production systems also have characteristics that are considered desirable in other areas of agricultural policy. Successfully commercialising low ILUC-risk production systems can help Europe achieve these other policy goals – equally, valorising low ILUC-risk production models within these other policy contexts can accelerate their adoption. The successful development of low ILUC-risk system will depend on how they are treated by the existing policy framework and whether those frameworks can be adjusted, as well as on the institutional bodies empowered to design, interpret, and implement said frameworks. A foundational task for the WP5 group is therefore to understand and highlight the key opportunities and barriers afforded by EU and national policies. It is the BIKE project's intention that:

> *The findings will assist EU with the development of reliable strategical documents and help deliver a dedicated and coherent low ILUC-risk policy through understanding of how interventions that are integrated across the biomass value chain stages can overcome challenges and resolve gaps in a more effective way than isolated sector-specific policies.*

Low ILUC-risk Interpretation

For the purposes of the BIKE project, it is useful to distinguish between three framings of the low ILUC-risk concept, from the broadest conceptual view down to the specific legal framework.

- The sustainable agriculture framing considers how additional agricultural production for biofuels can be delivered as part of a programme of improving the sustainability of European agricultural landscapes. In this broad framing, the focus is on how agricultural options that can support increases in soil carbon sequestration, reduced agricultural input use, and greater agricultural resilience, while delivering additional feedstock that could be used for bioenergy purposes. The BIKE case studies fall within this category, and we are especially interested in this broad framing when we consider potential overlaps between low ILUC risk systems under energy and agricultural policy.
- The additionality framing is focused on the specific question of how additional biofuel feedstock production can be delivered in a way that avoids the displacement of existing agricultural provisioning services, and thereby avoid driving indirect land use change or impacting on markets for commodities for food and other purposes. This framing may include measures to improve feedstock production that are not associated with improvements to broader sustainability, such as delivering increased yields from monoculture crops by increasing the use of agricultural inputs. There is also no conceptual limit on the types of feedstocks that could be produced additionally

using low ILUC-risk production systems in this sense – for example this framing can be applied to cellulosic biofuel feedstocks, even though these are outside of the scope of the specific legal definition of low ILUC-risk biofuels given in the RED. This framing is relevant to the principle stated in the recitals of the RED that, 'Feedstock which has low indirect land-use change impacts when used for biofuels, should be promoted for its contribution to the decarbonisation of the economy'.

- The Renewable Energy Directive (RED) framing is the specific but more limited definition of low ILUC-risk feedstock given by the RED II and associated implementing regulations. The RED II definition is restricted to food and feed crops (i.e., starch rich crops, sugar crops, and oil crops grown as the main crop) produced through increased yields or on areas otherwise not used for crop production. To meet this regulatory definition biofuel feedstocks must be certified by an appropriate scheme. Certified low ILUC-risk biofuel feedstocks are exempted from limits applied by Member States to the supply of biofuels from "high ILUC-risk" feedstocks; this is currently the only regulatory benefit that automatically accrues to biofuels with low ILUC-risk status, and as palm oil is the only feedstock identified as high ILUC-risk it is relevant only to palm oil producers. We use this framing when discussing strictly RED-related provisions, incentives, and discretions granted within the RED II to EU Member States.

The BIKE project seeks to develop the understanding of how the specific legal measures developed in the context of the RED framing of low ILUC-risk might be developed, and might be expanded to encourage the development of value chains that fit into a wider context of overarching EU sustainability and land use objectives – notably as expressed in the EU Green Deal[1].

WP5 Objectives

With the definitional considerations of the previous section in mind, WP5 has three broad objectives:

(i) To understand how the current EU policy landscape would impact the low ILUC-risk feedstock value chain;

(ii) To craft targeted policy recommendations aiming to promote sustainable feedstock production and use in the EU;

(iii) To explore the application of existing and recommended measures to projects on the ground.

The next section outlines the how the work is organised.

Organisation of Tasks

The WP5 research is comprised of the following Tasks[2]:

[1] See also BIKE deliverable D7.1, "Stakeholder engagement and Dissemination Plan", page 6.

[2] Wording has been condensed and paraphrased; the GA is the authoritative source for the scope of each Task.

- Task 5.1: Map the legal, institutional and policy frameworks in the EU and the case studies[3].
    - Task 5.1.1: Review legal and policy frameworks in the EU – specifically, those impacting each stage of the biofuel value chain[4].
    - Task 5.1.2: Review the institutional framework in the EU, identify key stakeholders / decision-makers and characterise their posture towards the low ILUC-risk concept.
    - Task 5.1.3: Analyse how the case studies in BIKE relate to the above policy and institutional frameworks at local / regional level.
- Task 5.2: Identify enabling policies at the EU level.
    - Identify enabling policies across the value chain stages in order to facilitate future uptake of low ILUC-risk biofuels.
- Task 5.3: Develop a supportive framework for the BIKE case studies.
    - Task 5.3.1: Develop a low ILUC-risk framework for the additionality concepts captured by the case studies.
    - Task 5.3.2: Generalise the results of the case study analysis to low ILUC-risk models more broadly, by constructing a Transferability Matrix.

This Report

This report summarises the results of Task 5.1, and constitutes Deliverable D5.1 of the BIKE project. The remainder of this document is aligned to the structure of Task 5.1, and is organised into the following chapters.

Task 5.1.1: Policy Review introduces key pieces of legislation relevant to low ILUC-risk production and the encompassing value chain. The main focus is on EU-level policy, but some national provisions are also considered as example implementations.

Task 5.1.2 (Part 1): Institution Mapping connects these policies to the bodies responsible for drafting, amending, interpreting, and implementing them. The relationships between institutions are considered, as is the alignment of their stated objectives with the intentions of the low ILUC-risk concept.

Task 5.1.2 (Part 2): Access to Finance identifies major funding provisions which may apply to low ILUC-risk stakeholders. EU programmes are considered, along with selected international financial institutions.

Task 5.1.3: Case Studies applies the findings of the preceding chapters to the BIKE case studies, identifying the salient provisions for each and exploring the specific opportunities and barriers accompanying the case study production / business models.

Conclusions summarises the results of Task 5.1, highlighting major points for further consideration by policy-makers and value chain actors. The future work of WP5 is outlined.

Appendices contains additional specific information not contained in the main text, and references to supplementary material contained in other files.

[3] The case studies are the purview of BIKE's Work Package 6, and will be considered later in this report.

[4] Land use, biomass production, conversion, and end use.

Task 5.1.1: Policy Review

Rationale and Scope

Task 5.1.1 is a review of existing EU policies that impact the low ILUC-risk biofuel value chain. It seeks to answer the central question, "how could existing policies support low ILUC-risk production?", primarily at the level of EU policy, though some examples from Member State implementations are also considered. The specific focus on low ILUC-risk biofuels requires a highly targeted investigation, as most policy provisions which are aimed at the biofuels sector as a whole will not create a value proposition for low ILUC-risk certification.

Since 2008, bioenergy developments in the EU have predominantly been driven by the Renewable Energy Directive (RED), which, as the name suggests, is concerned with energy targets. However, agricultural policy (such as the Common Agricultural Policy (CAP)) has immense influence in the bioenergy sector, and the high-level goals of these policies are impacted by bioenergy developments. There is, therefore, an opportunity to promote the framing of biofuels policy in general – and low ILUC-risk policy in particular – from agriculture-related perspectives, and highlight where low ILUC-risk biofuel production can be aligned to wider sustainability goals.

Methods

This section describes the strategy for exploring the policy landscape and identifying features of interest.

Policy Listing

A list of relevant EU-level policy areas – associated with directives/regulations such as the RED, the CAP, etc. – was drawn up (a list of the policies is provided in Appendix A). Using a spreadsheet template, each policy was characterised in terms of type of legislation, major stakeholders involved, the value-chain stages affected, the broad relevance to BIKE, and suggested avenues for investigation. For some directives/regulations several specific measures have been identified as individual policies for the purpose of this review.

Research

Each of these policies was reviewed in detail in order to identify specific provisions that are relevant to the context of low ILUC-risk certification. Limited analysis of national implementations and guidance in selected Member States was also undertaken.

A spreadsheet template facilitated precise and coherent information gathering, covering the text and meaning of each provision, precise references, interpretation of its relevance to the low ILUC-risk system,

and a characterisation of its potential impact. As a result of this exercise, each provision could be assessed in terms of its relevance to BIKE, and assigned to a "relevance category", tabulated below.

Marginal relevance	There is a contextual connection, but nothing linking the policy to low ILUC-risk production
Narrative relevance	Low ILUC-risk production could plausibly fit into the aspirational goals of a particular policy
Value relevance	The policy brings tangible and possibly quantifiable support -- for example funding eligibility
Barrier relevance	The policy may conflict with pursuit of low ILUC-risk production

Review and Feedback

The findings from this process were summarised in order to solicit feedback from selected BIKE partners – both from industry[5] and from a multi-lateral institution[6]. The purpose of this internal consultation was to validate the theoretical conclusions against on-ground experience; the feedback received was valuable for: (i) framing the results; (ii) identifying new policy areas to explore; (iii) discussing barriers to exploiting policy opportunities; (iv) giving insight into the relationship between national regulators and agricultural projects on the ground; and (v) discussing over-arching visions for how the low ILUC-risk concept could fit into a broader sustainability narrative for EU agriculture.[7]

Results

The remainder of the Task 5.1.1 chapter presents the consolidated results from the policy review of BIKE Task 5.1.1. Major EU-level policies are listed, referenced, and rated according to their priority level, in Appendix A. From these policies, specific articles and provisions have been grouped into the thematic numbered sections which follow, relating to some potential opportunity available to low ILUC-risk projects. Within each (numbered) section, a one-line explanation of the thematic heading indicates which kinds of policies were considered for inclusion. This is followed by a sub-section describing the associated EU context, and another on the opportunities afforded by and to the low ILUC-risk concept (with examples where appropriate): this forms the narrative for the section. Specific policy items are then tabulated, with EU-level policies distinguished from national-level policies. Appendix A provides a more detailed characterisation of selected items.

[5] UPM (United Paper Mills), Eni, and CIB (Consorzio Italiano Biogas).

[6] FAO (UN Food and Agriculture Organisation).

[7] Some of this will be addressed in later deliverables.

1. Exemption from the RED II High ILUC-risk Cap

Policy which exempts low ILUC-risk certified material from the diminishing RED II cap on support for high ILUC-risk feedstocks.

Context

The recast of the Renewable Energy Directive (RED II) recognised that, while its predecessor had introduced a set of sustainability criteria for biofuels, it did not adequately manage the issue of ILUC. RED II therefore limited support for the use of crops associated with 'significant expansion of the production area into land with high-carbon stock' at 2019 levels[8]; policy support for these "high ILUC-risk" biofuels must decrease to zero by 2030 at the latest[9].

However, RED II also offered the possibility for biofuels to avoid this cap if they were certified as being low ILUC-risk.

Opportunity

Given that there are restrictive limits on feedstocks with high ILUC-risk, low ILUC-risk certification would be valuable to producers of those feedstocks. The only crop currently meeting the EU criteria to be designated high ILUC-risk is oil palm[10], and therefore only international palm oil producers (and the associated value chain) would benefit from exemption from the high-ILUC cap.

The same analysis also identified soy oil as being strongly associated with conversion of high carbon stock areas; however, at that time it was found to be below the threshold for action[11]; though this could change in subsequent analyses.

Low ILUC-risk certification would offer advantages for industries producing / using these feedstocks, for instance:

- Ability for crop producers to continue supplying the European market.
- Ability for fuel producers (refineries) to continue using the same feedstocks in their refining operations, which avoids potential disruption[12].

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[8] The details of what constitutes land with high carbon stock, including provisions for peatland, wetlands, etc., are laid out in RED II (EU 2018/2001) and in the European Commission's delegated regulation on ILUC-risk (EU 2019/807). The latter also established that "significant expansion" applies if 10% or more of new area for that feedstock is established on such land (during the study period 2008-17).

[9] Member States have the power to set earlier phase-out dates; see Footnote 13.

[10] 45% of palm oil expansion was found to satisfy the criteria, meaning palm oil is comfortably in the high ILUC-risk category.

[11] For soy oil, 8% of new cultivation in the period 2008-17 was onto high-carbon-stock land; hence, soy was found to be close to but below the threshold. A review of the legislation, data and methods, and impact of soy production on deforestation can be found in the report (Malins, 2020).

[12] As an example, a biodiesel plant that is forced to switch from virgin palm oil to a lower-grade feedstock such as animal fats would have to invest in extra pre-treatments steps (to de-contaminate, reduce water content, and esterify free fatty acids which would otherwise pollute the reaction with unwanted by-products), or adopt a different reaction pathway altogether (such as supercritical transesterification). Post-treatment steps to ensure

- Avoidance of higher production costs, in situations where low ILUC-risk certification on existing feedstocks will be less expensive than buying an alternative feedstock.

None of the BIKE case studies consider either palm or soy oil production, and so exemption from the high ILUC-risk penalties is not relevant to them.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 26 Paragraph 2.2 See also Recital 81	From 31 December 2023 until 31 December 2030 at the latest, that limit [on high ILUC-risk feedstocks] shall gradually decrease to 0%.	Limits the use of high ILUC-risk crops, creating an opportunity for certified low ILUC-risk feedstocks to play a role.
RED II	Article 26 Paragraph 2.4	By 1 February 2019, the Commission shall adopt a delegated act in accordance with Article 35 to supplement this Directive by setting out the criteria for certification of low indirect land-use change-risk biofuels	This delegated act has since been adopted, see below.
ILUC-risk Delegated Regulation	Recital 12	Certified low ILUC-risk biofuels, bioliquids or biomass fuels should be exempted from the limit and gradual reduction set for high ILUC-risk biofuels, bioliquids and biomass fuels produced from food and feed crops, provided that they meet the relevant sustainability and greenhouse gas emissions saving criteria laid down in Article 29 of Directive (EU) 2018/2001.	The seminal value proposition for low ILUC-risk certification – namely that it allows biofuels stakeholders to avoid caps intended for high ILUC-risk crops.

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Amendment to the Energy Transport Decree (NL)[13]	Note 2.3.1	palm oil is considered a raw material with a high risk of ILUC and therefore a supplied biofuel from palm oil may not be booked [from 2022], unless the palm oil has a certified low risk of ILUC ... the government will make an effort to designate soybean oil as a high-risk raw material ... [consistent with the Climate Agreement which	Total exclusion of high-ILUC palm (and also soy) is enforced earlier than is required by RED II, meaning that the market for low ILUC-risk certified palm oil-based fuels starts early.

fuel standardisation may also vary. See, for example: (Rutz *et al.*, 2020); Table 10 of (Ramos *et al.*, 2019); (Canakci and Sanli, 2008). Similar considerations apply to a lesser extent when substituting virgin vegetable oils.

[13] We include in this table provisions for NL, DE, and FR, who are eliminating palm/soy from renewable energy targets earlier than the RED II mandate. Similar measures have been taken by other member states; phase-out dates are: AU (palm 2021), BE (palm 2022, soy 2023), DE (palm 2023), DK (palm 2021, soy 2022), FR (palm 2020, soy 2022), IT (palm 2022, soy 2023), NE (palm 2022, soy 2022), PT (palm 2022), SW (palm 2022). There are moves by committees of the European Parliament and Council to adopt a faster EU phase-out date for both palm and soy.

Policy	Section	Excerpt	Relevance
		commits to] not using palm and soybean oil for biofuels	
Decision recommendation and report of the Committee on the Environment, Nature Conservation and Nuclear Safety(German Bundestag Committee on the Environment Nature Conservation and Nuclear Safety, 2021) (DE)	Page 18	The promotion of biofuels from raw materials that show a high risk of indirect land use change is incompatible with Germany's climate protection goals. For this reason, the eligibility will end from the compulsory year 2023.	Total exclusion of high-ILUC palm (and also soy) is enforced earlier than in RED II, meaning that the market for low ILUC-risk certified palm oil-based fuels may start early.
Biomass Sustainability Ordnance[14] (DE)	Section 14 Paragraph 1.8	Proof of sustainability must contain … (f) confirmation of the sum of the [direct] greenhouse gas emissions according to letter c and the mean values of the provisional estimated emissions as a result of indirect land use change in accordance with Annex VIII of Directive (EU) 2018/2001 for liquid biofuels and biomass fuels in grams of carbon dioxide equivalent per megajoule	Requirement to submit fuel carbon intensity values which include the standard ILUC factor specified in RED II; a low ILUC-risk fuel would be exempt from this factor.[15]
Taxe incitative relative à l'incorporation de biocarburants[16] (FR)	Section V Paragraph 46	As of January 1, 2020 … palm oil-based products will no longer be considered as biofuels … to exclude palm oil-based products from renewable energy [targets].	Palm-based biofuel phased out quickly, citing ILUC-risk concerns.
French National Assembly Budget Bill No. 3360 (2020) (FR)	Amendment I-281[17]	Products *based on* soybean oil and palm oil including PFADs are not considered as biofuels.	In France, the proscribed list of feedstocks explicitly applies to their derivatives as well; this is not the case in all countries.

[14] Biomassestrom-Nachhaltigkeitsverordnung – BioSt-NachV: https://www.gesetze-im-internet.de/biost-nachv_2021/BJNR512610021.html.
This is further invoked in the Federal Immission Control Act (Bundes-Immissionsschutzgesetz – BimSchG, section 37a): https://www.gesetze-im-internet.de/bimschg/BJNR007210974.html.

[15] Many member states have similar requirements which, while stopping short of imposing extra costs on biofuels with high ILUC factors, are still relevant for greenhouse gas inventory reporting.

[16] From 2019, https://www.legifrance.gouv.fr/download/pdf/circ?id=44749

[17] https://www.assemblee-nationale.fr/dyn/15/amendements/3360A/AN/281. Italics added to excerpt.

Value Chain Stages

Land use, biomass production, end use.

2. Exemption from RED II Food Crop Caps

Policy which permits low ILUC-risk feedstocks to count differently towards national caps on feedstocks derived from food and feed crops.

Context

The RED II limits the extent to which transport energy demand[18] can be met by biofuels derived from "food and feed crops" . These are defined in Article 2 (40):

> *'food and feed crops' means starch-rich crops, sugar crops or oil crops produced on agricultural land as a main crop excluding residues, waste or ligno-cellulosic material and intermediate crops, such as catch crops and cover crops, provided that the use of such intermediate crops does not trigger demand for additional land*

Food and feed crops are hence defined by their composition and agricultural production cycle, and not by their end-use as food for humans or feed for animals. They must be (a) starch-, sugar-, or oil-rich, and (b) be the 'main' crop. So, for instance, a crop with edible-oil seeds grown in the off-season as an intermediate crop will land outside of the "food and feed" category – *provided* that using it for biofuel does not 'trigger additional demand for land', i.e., does not displace material from existing uses. The text also indicates that all residues, wastes, and ligno-cellulosic material are designated non-food-and-feed, regardless of such displacement effects.

The RED II thus establishes displacement and additionality as key definitional factors for biofuels, in order to control competition between the biofuel sector and other sectors. One motivation for this is that demand for crop feedstocks may result in higher food prices[19]; another motivation is that additional crop demand may lead to unsustainable agricultural intensification and extensification, with commensurate negative environmental impacts such as direct and indirect land use change.

As such, the RED II caps the share of Member States' transport energy which is derived from food- and feed-based biofuels: either at 7%, or at 1 percentage point higher than their 2020 share, whichever is lower[20]. Any consumption above that level is not eligible to count towards the Member State's renewable energy targets, and hence the compliance value of those biofuels is diminished. Member States are empowered to set lower limits on the use of food- and feed-based biofuels if they choose.

Opportunity

There is at present no explicit measure within RED II that gives food- and feed-based biofuels any benefit from low ILUC-risk status. However, within the existing legal provisions low ILUC-risk certification could be given preferential treatment in two ways. First, at the EU level, material which can legitimately claim to be additional because it is harvested from intermediate crops may be exempt from classification as

[18] Specifically, road and rail transport, excluding maritime and air transport. Possible future expansion of the "transport energy" definition is discussed in a later section, "

Recent Policy Proposals".

[19] See Footnote 106.

[20] RED II Article 26 Paragraph 1, quoted in the table below.

food- and feed-based, and hence from the crop cap[21]. For this to work robustly, however, it would be necessary to clarify the meaning of "intermediate crop", which depends on location and historical farming practices; a single definition to cover everything will likely fail to be rigorous enough for achieving sustainability goals.

The second avenue for preferential treatment of low ILUC-risk biofuels would apply to Member States that have adopted a national crop cap lower than the mandated level; in such cases, it may be judged that the supply of food-derived biofuels certified as low ILUC-risk should not be restricted by this lowered national limit[22], or may otherwise grant preferential status to certified low ILUC-risk biofuels when implementing such lower limits.[23]

The possibility of relaxing crop caps may:

- Increase demand for low ILUC-risk certified feedstocks, to replace ineligible non-certified feedstocks.
- Increase the value of low ILUC-risk feedstock because it can count towards national and EU targets from which "conventional" food- and feed-based biofuels are excluded[24].
- Reduce fuel costs if the cost of low ILUC-risk certification is less than the cost difference to the next-best permitted feedstock.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 2 Definition 40	'food and feed crops' means starch-rich crops, sugar crops or oil crops produced on agricultural land as a main crop excluding residues, waste or ligno-cellulosic material and intermediate crops, such as catch crops and cover crops, provided that the use of such intermediate crops does not trigger demand for additional land	Legislation (and national implementations thereof) requires evaluation of indirect land use change effects. Cover crops and intermediate crops, which could be part of an additional low ILUC-risk system, may avoid being classified as food and feed crops, and hence be excluded from the cap on such feedstocks for making biofuels.
RED II	Article 26 Paragraph 1 See also Recital 80	... the share of biofuels … produced from food and feed crops, shall be no more than one percentage point higher than the share of such fuels in the final consumption of energy in the road and rail transport sectors in 2020 in that Member State, with a maximum of 7 % ... Member States may set a lower limit and may distinguish, for the purposes of Article 29(1), between different biofuels, bioliquids and biomass fuels	Member States are empowered to set caps on different types of food- and feed-based biofuels which are lower than those mandated by the directive, if warranted by ILUC considerations.

[21] Such an argument is made, for example, in (Ranta, 2020).

[22] To illustrate: say a Member State has internally decided to impose a 4% cap on food- and feed-based biofuels. Then there is a 3% "window" to the 7% limit set in RED II which certified low ILUC-risk crops may be allowed to fill.

[23] This is discussed in more detail by Malins (2022), https://www.cerulogy.com/2022/considerations-for-addressing-indirect-land-use-change-in-danish-biofuel-regulation/.

[24] Low-ILUC biofuels would then be competing with other non-food biofuels – RFONBOs and RCFs.

Policy	Section	Excerpt	Relevance
		produced from food and feed crops, taking into account best available evidence on indirect land-use change impact. Member States may, for example, set a lower limit for the share of biofuels, bioliquids and biomass fuels produced from oil crops.	

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Amendment to the Energy Transport Decree(Rijksoverheid van Nederland, 2021) (NL)	Note 2.3.4 [See also Environmental Management Act[25] Article 9.7.4.6 Part a[26]]	The "other" category [of renewable energy credits] ... Includes liquid biofuels from crops that do not pose a risk of expanding agricultural land (capture and cover crops) … [for example] crops grown on abandoned and degraded agricultural land.	Low ILUC-risk biofuel may[27] be eligible for renewable energy credits (HBEs) of type "other", and would hence be exempt from the Dutch food cap.

Value Chain Stages

Land use, biomass production, end use.

[25] https://www.internetconsultatie.nl/RED II_besluit_energie_vervoer_kalenderjaren_2022_2030

[26] The excerpt reads:

> *one conventional renewable fuel unit [will be allocated for] … biofuel produced from cereals and other starchy crops, sugars and oil crops and from crops grown on agricultural land as main crop primarily for energy purposes ...*

[27] Depending on their status as main versus intermediate/cover crops; see also Footnote 21.

3. Contribution to RED II Renewable Energy Targets

Policy which would give low ILUC-risk biofuels preferential treatment in contributing to renewable energy targets, as compared with other biofuels.

Context

Renewable energy targets incentivise or disincentivise the use of energy from different sources based on legislated criteria. Targets come in different forms at the Member State level: (i) requirements on the fraction of final transport energy consumption that should come from renewable sources (this is how targets are currently framed in the RED II[28]); (ii) requirements on the share of delivered liquid fuel volumes that must come from renewable sources (this is how targets are currently framed in the UK RTFO); and (iii) requirements on the average GHG intensity of the transport energy supply (this approach is reflected in the proposed revision to RED II (European Commission, 2021b), in the German Treibhausgasminderungsquote[29] and the Californian Low Carbon Fuel Standard (CA-LCFS)[30]).

Beyond differences in the basis upon which obligations are set, targets can furthermore discriminate between different fuels depending on the provenance of their inputs – for example the RED II sets distinct targets for advanced biofuels and for the overall contribution of renewable energy to the transport sector.

There is a distinction to be made between renewable energy targets, and how compliance with those targets is incentivised / non-compliance is penalised. General categories are[31]: (i) Quotas, which are in use in 23 EU countries[32]; these cover a wide range of mechanisms applied at the national level to incentivise the biofuel sector[33], or specific parts of the sector (e.g. through the RED II's "double counting" mechanism for advanced biofuels made from feedstocks listed in Annex IX[34]). (ii) Tax credits, where partial tax or fuel duty exemptions are applied to renewable fuels. Such initiatives are active in 15 EU countries[35]. (iii) Subsidies, where direct payments are available to biofuel suppliers, are available in six countries[36]

[28] More accurately, the RED II requires renewable energy sources to offer a minimum greenhouse gas saving, but provides no incentive to reduce emissions below that threshold.

[29] https://dserver.bundestag.de/btd/19/274/1927435.pdf

[30] https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard

[31] Following (Banja *et al.*, 2019).

[32] Belgium, Bulgaria, Czech Republic, Denmark, Ireland, Greece, Spain, France, Italy, Latvia, Lithuania, Luxembourg, Croatia, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland. Germany had a biofuel quota but replaced it in 2015 with a greenhouse gas reduction quota.

[33] For example, the Netherlands awards renewable energy credits to suppliers of biofuels, which can be traded with fossil fuel suppliers to meet legislated renewable energy obligations for fuel suppliers.

[34] There is some discretion in whether and how to apply this mechanism. Several member states have developed their own lists of feedstocks eligible for double counting.

[35] Belgium, Czech Republic, Denmark, Greece, Latvia, Lithuania, Hungary, the Netherlands, Austria, Portugal, Slovenia, Slovakia, Finland, France, Sweden.

[36] Estonia, Greece, Lithuania, Hungary, Austria and Slovenia.

Opportunity

There is in principle scope to favour biofuels certified as low ILUC-risk over their non-certified counterparts, for instance, through explicit sub-targets, multiple counting of energy contributions, application of bonus carbon intensity factors, or some other mechanism.

The overall effect of prioritising low ILUC-risk fuels in their contribution to targets would be to incentivise adherence to the low ILUC-risk criteria and increase certification applications on the part of producers. Since Member States would likely have some flexibility in exactly how to implement the accounting mechanism, the precise impacts and the transmission of incentives – that is, which stakeholders in the value chain benefit from increased demand – may vary from case to case.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 25 Paragraph 1.2	Member States may exempt, or distinguish between, different fuel suppliers and different energy carriers when setting the obligation on the fuel suppliers, ensuring that the varying degrees of maturity and the cost of different technologies are taken into account.	Empowers Member States to distinguish between low ILUC-risk versus uncertified feedstock. In principle, this allows low ILUC-risk projects to be bound by different accounting rules, market restrictions, and incentive eligibility.
RED II	Article 28 Paragraph 6	The Commission is empowered to adopt delegated acts in accordance with Article 35 to amend the list of feedstocks set out in Parts A and B of Annex IX by adding, but not removing, feedstock. ... Such delegated acts shall be based on ... all of the following: (a) the principles of the circular economy and of the waste hierarchy established in Directive 2008/98/EC; (b) the Union sustainability criteria laid down in Article 29(2) to (7); (c) the need to avoid significant distortive effects on markets for (by-)products, wastes or residues; (d) the potential for delivering substantial greenhouse gas emissions savings compared to fossil fuels based on a life-cycle assessment of emissions; (e) the need to avoid negative impacts on the environment and biodiversity; (f) the need to avoid creating an additional demand for land.	Part (f) offers a possible route for establishing the relevance of low ILUC-risk: it requires that ILUC is taken into consideration when making additions to list of Annex IX feedstocks (see also Recital 37). These feedstocks are eligible for double counting towards energy targets (under the existing RED II). It is possible that cases of low ILUC-risk certified could be added to Annex IX in future revisions.

Value Chain Stages

Conversion[37], end use.

[37] Through RED II's incentivisation of energy efficiencies.

4. Feedstock Regulation under RED II

Policy which specifically promotes production and consumption of sustainable biofuels by imposing feedstock-related requirements under the RED II framework.

Context

Both the EU and Member States regulate the quality and production methods of products used within their borders – this holds for agricultural products as well as industrial ones. The EU and Member States can also require economic operators to declare the origin, characteristics, and volumes of designated input materials; for example, the supply chain traceability of genetically modified crops is stringently monitored[38].

Such provisions foster transparency in value chains, and can be used to ensure safety and legal compliance. These provisions moreover enable political or market-driven preferences for inputs, based on whatever attributes are reported.

Opportunity

In principle, it would be possible for the EU or Member States to extend regulations on biofuel feedstocks – strengthening reporting requirements, or limiting or proscribing the use of feedstocks with certain characteristics. For example, a Member State could choose to mandate that *all* food- and feed-based energy crops have to be low ILUC-risk certified[39], and in this case may also wish to impose a stricter definition of "food and feed" than those contained in the RED II. Or they may wish to exclude certain feedstocks from the RED II's Annex IX unless they are certified as being low ILUC-risk. Or they may introduce additional environmental requirements for feedstocks to satisfy to qualify for RED II targets. These types of provisions would increase – perhaps dramatically – the demand for low ILUC-risk feedstocks and low ILUC-risk certification.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 25 Paragraph 1.2	Member States may exempt, or distinguish between, different fuel suppliers and different energy carriers when setting the obligation on the fuel suppliers, ensuring that the varying degrees of maturity and the cost of different technologies are taken into account.	Empowers Member States to distinguish between low ILUC-risk versus uncertified feedstock. In principle, this allows low ILUC-risk projects to be bound by different accounting rules, market restrictions, and incentive eligibility.
Sustainable Use of Pesticides	Article 15	Harmonised risk indicators as referred to in Annex IV shall be established. However, Member States may continue to use existing national indicators or adopt other appropriate indicators in addition to the harmonised ones.	There are two indicators in the directive with limited relevance to BIKE (total market of pesticides and number of authorisation), but Member States have power to use their own indicators, and

[38] https://food.ec.europa.eu/plants/genetically-modified-organisms/traceability-and-labelling_en

[39] This is not so outlandish considering that, for example, all electricity used to produce RFONBOs must satisfy additionality requirements as the EU level.

Policy	Section	Excerpt	Relevance
			in some contexts, these could explicitly include ILUC.

Value Chain Stages

Biomass production, conversion, end use.

5. ILUC Emissions Factor

Policy which incentivises reductions in emissions, and therefore gives preference to biofuels whose ILUC factor can be eliminated.

Context

Consider a generic scheme which rewards projects whose emissions are reduced compared to a baseline. For example:

- A fuel credit system may reward or penalise fuel suppliers based on the carbon intensity of their fuels (e.g. the CA-LCFS) or the achieved renewable share in their final fuel mix (e.g. the HBE system in the Netherlands).
- A government scheme may make funding for a project contingent on reducing absolute greenhouse gas emissions by some amount.
- A private-sector company sets a target to reduce its greenhouse gas emissions compared to some baseline.
- A country wishes to report low greenhouse gas emissions in its internal record-keeping.

In principle, arrangements such as these would incentivise fuel users to report lower emissions, prompting efforts to reduce their fuel greenhouse gas intensity. In cases where an ILUC factor is included in lifecycle emissions assessments for biofuels, eliminating the factor could make a significant impact on the fuel's attractiveness and competitiveness.

In the specific context of the RED, no Member State currently includes ILUC emissions in its calculations of actual greenhouse gas performance, either in EU-level reporting or in internal book-keeping. Nevertheless, the possibility remains that this could change in time – either at the level of the RED, or at the national level[40].

Opportunity

For biofuels where ILUC is known to be significant, eliminating the ILUC factor from emissions calculations would bring benefits in contexts such as the ones listed above. For example:

- Low ILUC-risk certification would bring increased RED II compliance value for fuel suppliers in Member States if they were to adopt emissions-based incentive mechanisms which include indirect effects.
- There is already a pathway to such ILUC-factor benefits under the international CORSIA framework (see table below).
- Member States who decide to include ILUC emissions in their national reporting would benefit from low ILUC-risk certification, and could capitalise on the narrative advantages of lowering their declared emissions.

[40] At the sub-national level, government departments and private sector entities could theoretically adopt their own accounting methodologies which include ILUC factors, and so the considerations of this section would apply more strongly to them.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Annex VIII Part A	Value of ILUC factor for: Starch crops 12 gCO2eq/MJ Sugar crops 13 gCO2eq/MJ Oil crops 55 gCO2eq/MJ	Indicative ILUC factors which could be waived under some circumstances[41].
Biodiversity Strategy for 2030[42][43]	Section 3.3.3. Measuring and integrating the value of nature	the Commission will develop in 2021 methods, criteria and standards to describe the essential features of biodiversity, its services, values, and sustainable use. These will include measuring the environmental footprint …, including through life-cycle approaches and natural capital accounting.	Externalities accounting, which considers indirect impacts on biodiversity natural capital, could favour low ILUC-risk biomass production[44].
CORSIA Methodology for Calculating Actual Life Cycle Emissions Values[45]	Section 2 Paragraph 2	If the feedstock … does not have "low risk" for land use change, then a default core LCA value and an ILUC value will need to be added …	Establishes a class of fuels which are exempt from the ILUC factor; this is especially important as the CORSIA credit mechanism is sensitive to the carbon intensity of fuels, including the factor, and hence low ILUC-risk certification would immediately generate benefits.
CORSIA Sustainability Criteria for CORSIA Eligible Fuels[46]	Chapter 1 Criterion 2.2	If DLUC greenhouse gas emissions exceed the default induced land use change (ILUC) value, the DLUC value will replace the default ILUC value.[47]	There may be some future scope to waive or reduce feedstock-specific ILUC factors for feedstocks certified to be low ILUC-risk; these would still have to submit to a DLUC evaluation, but in cases where DLUC is lower than ILUC, this represents a benefit for the biofuel.

[41] Within the scope of RED II these ILUC factors have no actual impact, and are included for reference only.

[42] https://www.icao.int/environmental-protection/CORSIA/Documents/ICAO%20document%2007%20-%20Methodology%20for%20Actual%20Life%20Cycle%20Emissions%20-%20March%202021.pdf

[43] COM/2020/380 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380

[44] This approach is further described in "Accounting for natural capital – recognising the contribution of nature to human welfare and well-being", https://ec.europa.eu/newsroom/env/items/661981/en

[45] ICAO's Carbon Offsetting and Reduction for Sustainable International Aviation. This is not an EU policy; nevertheless, we include it because it explicitly introduces the ILUC concept (in the context of alternative aviation fuels made from biogenic feedstocks).

[46] https://www.icao.int/environmental-protection/CORSIA/Documents/ICAO%20document%2005%20-%20Sustainability%20Criteria%20-%20November%202021.pdf

[47] "DLUC" means direct land use change, and "ILUC" in the CORSIA context means *induced* land use change (not indirect); the latter is for all practical purposes the same as "ILUC" in the RED II sense.

Value Chain Stages

Land use, biomass production.

6. Land Conversion Emissions

Policy which ascribes emissions to direct land use change will impact agricultural projects which seek to convert unused land.

Context

EU Member States are required to account for greenhouse gas emissions from land use, land use change, and forestry (LULUCF), and to ensure that these are compensated by removal of carbon dioxide from the atmosphere[48]. The central legislative text is the LULUCF Regulation[49] for the period 2021-2030. This sets general monitoring rules and specific targets for each Member State regarding emissions from forests, croplands, grasslands, wetlands, and their soils[50]. Emissions from bioenergy (heating and power) are counted in the LULUCF sector and not in the bioenergy sector (i.e., RED II sets the emissions to zero).

The carbon intensity of biofuel feedstocks depends on the history of the land they are grown on. For example, conversion of perennial scrub-land to agricultural production will, under LULUCF accounting rules, tend to result in emissions from above-ground and below-ground carbon; conversely, a low ILUC-risk project which rehabilitates degraded or degrading land may sequester carbon in the soil.

Opportunity

In principle, more rigorous accounting for the carbon effects of these conversions will give a more accurate picture of greenhouse gas emissions, and may favour certain types of low ILUC-risk project. In addition to the opportunities outlined in Section 5. ("ILUC Emissions Factor"), we have:

- Feedstocks that are below/above the EU threshold criteria for biofuel carbon intensity may be pushed above/below once the land conversion factors are included; this will open up or close down the market for producers of these feedstocks.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Recital 114	If land with high stocks of carbon in its soil or in its vegetation is converted for the cultivation of raw materials for biofuels, bioliquids and biomass fuels, … the resulting negative greenhouse gas impact can offset the positive greenhouse gas impact of the biofuels, bioliquids or biomass fuels, in some cases by a wide margin. The full carbon effects of such conversion should therefore be taken into	The RED II specifies that any biofuel project, including low ILUC-risk projects, must account for emissions from land use change.

[48] Proposals under the "Fit for 55" policy amendments would replace this "no debit rule" with mandated net negative emissions from the LULUCF sector.

[49] LULUCF Regulation (EU) 2018/841, https://ec.europa.eu/clima/eu-action/forests-and-agriculture/land-use-and-forestry-regulation-2021-2030_en

[50] The LULUCF scope includes emissions from agricultural lands themselves, for instance through the loss of soil organic matter, or clearance of vegetation. Emissions from agricultural activities – for example from livestock and fertilisers – are accounted under the Effort Sharing Regulation (Regulation 2018/842 EU).

Policy	Section	Excerpt	Relevance
		account in calculating the greenhouse gas emissions savings …	
RED II	Annex VI Section B Paragraph 8	The bonus of 29 g CO2eq/MJ shall be attributed if evidence is provided that the land: (a) was not in use for agriculture or any other activity in January 2008; and (b) is severely degraded land, including such land that was formerly in agricultural use. The bonus of 29 g CO2eq/MJ shall apply for a period of up to 20 years from the date of conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured.	Unused land conversions may be eligible for significant carbon intensity credit (if they count as severely degraded[51]).
LULUCF	Article 6 Paragraph 2	By way of derogation from Article 5(3), where land use is converted from cropland, grassland, wetland, settlements or other land to forest land, a Member State may change the categorisation of such land from *land converted to forest land* to *forest land remaining forest land*, 30 years after the date of that conversion, if duly justified based on the IPCC Guidelines.[52]	Abandoned agricultural land that is transitioning to grassland/forest potentially faces lesser restrictions on re-conversion, as compared with *established* grassland/forest; this provision extends the window where we can treat land as "in transition", which may bring benefits in the LUC carbon accounting of low ILUC-risk unused land projects.
FQD	Recital 14	Land should not be converted for the production of biofuels if its carbon stock loss upon conversion could not, within a reasonable period, taking into account the urgency of tackling climate change, be compensated by the greenhouse gas savings resulting from the production of biofuels.	Low ILUC-risk biofuel feedstock can be produced on existing agricultural land (through multi-cropping / yield increase measures), which avoids the issue of carbon stock loss from land conversion. This is consistent with the goals of the policy text, and low ILUC-risk certification can provide evidence that the requirement is satisfied.

Value Chain Stages

Land use.

[51] From RED II Annex VI Section B Paragraph 9:

> *'Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded.*

However, there is a paucity of clear guidance on how the "severely degraded" status of land can be verified in practice, and what constitutes acceptable evidence.

[52] Italics added for clarity – "land converted to forest land" and "forest land remaining forest land" are categories defined in the LULUCF regulations.

7. Unused and Marginal Land

Policy which incentivises or regulates conversion of unproductive land into productive agricultural land.

Context

Land abandonment occurs due to biophysical or socio-economic limitations which impact the quality of soil and water availability, limiting crop profitability and hence the economic attractiveness for farmers. The concept of reclaiming and restoring such land types offers opportunities for landowners and the farming community to bring neglected natural resources back to profitability, diversify their crop portfolio, and improve their annual income.

Incentives would ideally account for local agro-climatic characteristics, and involve farmers and local community in decision-making from the planning and crop selection stage onwards. The new CAP (2023-2028) includes provisions for support to Areas with Natural Constraints (ANCs) through both rural development and income support schemes. This can be directly connected to the low ILUC-risk option for exploitation of unused, abandoned, degraded land and further tailored through the national Strategic Action Plans (SAPs) to steer development for crops and cropping practices suitable to local and regional level in each Member State.

Additionally, through the CAP 'greening measures' farmers receive the green direct payment if they comply with mandatory practices that benefit the environment (soil and biodiversity in particular). This can be linked to additional biomass production through agronomic practices suitable to climate and regional agro-ecology – though implementing successful schemes is not without complexity. Within this context there are good opportunities for crop rotation of additional low ILUC-risk crops with conventional food or feed crops.

Opportunity

The ILUC-risk Delegated Regulation[53], which lays out criteria for high and low ILUC-risk categorisations, establishes that reclaiming unused, abandoned and severely degraded land is an option to promote additional (and hence potentially low ILUC-risk) biomass supply. There are, however, limited initiatives to restore such land types for biomass production, and these are mostly research and demonstration activities. There are also still gaps concerning: (i) consistent classification of land types, as well as (ii) planning, (iii) financing, and (iv) capacity-building and awareness interventions at local level.

Nevertheless, there remains significant opportunity to support low ILUC-risk production systems through measures aimed at reclaiming and rehabilitating land for agriculture.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
New CAP: 2023-27	ANC	Areas facing natural or other specific constraints (ANCs) are those that are more difficult to effectively farm due to specific problems caused by natural conditions. In order to prevent this land from being abandoned, the European Union provides	Directly connected to the low ILUC-risk option for exploitation of unused, abandoned, degraded land.

[53] (European Commission, 2019); Article 2, Definitions 2 and 3.

Policy	Section	Excerpt	Relevance
		support through both rural development and income support schemes.	
New CAP: 2023-28	Greening	Farmers receive the green direct payment if they comply with three mandatory practices that benefit the environment (soil and biodiversity in particular). Crop diversification: a greater variety of crops makes soil and ecosystems more resilient. Farms with more than 10 ha of arable land have to grow at least two crops, while at least three crops are required on farms with more than 30 ha. The main crop may not cover more than 75% of the land. There are exemptions to the rules, depending on the individual situation. For instance, farmers with a large proportion of grassland, which is in itself environmentally beneficial.	Can be linked to additional biomass production through agronomic practices suitable to climate and regional agro-ecology
New CAP: 2023-28	Farm advisory system	The Farm Advisory System (FAS) helps farmers to better understand and meet the EU rules for the environment, public and animal health, animal welfare and good agricultural and environmental condition (GAEC).	Improve farmers' knowledge and awareness on options for additional biomass feedstock production through crop rotation, cover cropping, etc.
Invasive Alien Species Regulation	Chapter IV Article 20	Member States shall carry out appropriate restoration measures to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed by invasive alien species of Union concern	Farmers can play a double role in reclaiming or managing invaded land areas, while simultaneously growing bioenergy crops (which would qualify as low ILUC-risk as the land has been brought into production).
CAP 2013[54]	Preamble 26	any agricultural area of the holding, including areas that were not in good agricultural condition … that is used for an agricultural activity is eligible to benefit from the basic payment.	Support encourages entry of unused land for biomass production since additional bioenergy crops are eligible for basic payment support.
CAP 2013[55]	Title VI Part 94	Member States shall ensure that all agricultural area, including land which is no longer used for production purposes, is maintained in good agricultural and environmental condition. Member States shall define, at national or regional level, minimum standards for beneficiaries for good agricultural and environmental condition of land on the basis of Annex II, taking into account the specific characteristics of the areas concerned, including soil and climatic condition, existing farming systems, land use, crop rotation, farming practices, and farm structures.	A low ILUC-risk bioenergy project on unused land could claim that it is preserving the condition of the land, and therefore that it satisfies this stated requirement.

[54] Regulation (EU) No 1307/2013, http://data.europa.eu/eli/reg/2013/1307/oj

[55] Regulation (EU) No 1306/2013, http://data.europa.eu/eli/reg/2013/1306/oj

Policy	Section	Excerpt	Relevance
Rural Development Funding Regulation[56]	Article 31 Paragraph 1	Additional costs and income foregone shall be calculated in comparison to areas which are not affected by natural or other specific constraints	Encourages entry of low ILUC-risk projects on unused land for biomass production, by taking into account the constraints faced by specific land areas.

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
National Environment Programme 2015-2020 (HU)	Annex 1 Section 4.8	…to preserve biodiversity, reduce economic damage or in order to sanitary prevention, several Hungarian and international regulations and strategies aim to restrain, eliminate and prevent the spread of invasive alien and adventitious species.	This provision intersects with other national and international regulations (such as the EU Biodiversity Directive), and opens the door to funding for managing invasive species. As noted in the table above, this kind of land management can be integrated with converting unused, abandoned or severely degraded agricultural areas for biomass cultivation.
Second River Basin Management Plans (HU)	Section 8.3.2.3	Establishment of buffer zones along watercourses and lakes by grassland or agroforestry methods (coordination with rehabilitation of coastal plant zones, flood protection and maintenance considerations). One of the most important, against diffuse loading protection measure.	In buffer zones[57], near-natural land use is encouraged (e.g by designating a protected forest area, a near-natural area or a restricted agricultural area) to protect surface waters. In principle, these areas can be planted with appropriate cover crops and harvested.

Value Chain Stages

Land use and biomass production.

[56] Regulation (EU) No 1305/2013, http://data.europa.eu/eli/reg/2013/1305/oj

[57] The buffer zone is the water protection plant zone next to the surface waters, the recommended width of which depends on the width of the watercourse and the space available: approx. 10-40 m. (This is distinct from GAEC1's "buffer strips along watercourses", which places restrictions on the storage and application of fertilisers and pesticides along watercourses; here, the mandated width is 5 m for rivers and 20 m for lakes.)

8. Habitats and Pollution

Policy which seeks to enhance biodiversity through the provision of habitats, and mitigation of local pollution.

Context

The EU's overall goals for habitats and pollution are the preservation, protection and improvement of the quality of the environment, including the conservation of natural habitats and of wild fauna and flora. The European Community policy and action programme on the environment (1987 to 1992) makes provision for measures regarding the conservation of nature and natural resources, by promoting the maintenance of biodiversity, taking account of economic, social, cultural requirements at the regional level.

To advance these aims, the EU designates special areas of conservation[58], creating a coherent European ecological network, in which land-use planning and development policies should encourage the management of features of the landscape which are of major importance for wild fauna and flora.

As we have already encountered, many agriculture-focussed policies at EU and national level define or invoke criteria for sustainability. Different levels of overlap and harmonisation between these criteria are observed[59], but at present, the default expectation is that they will not explicitly include ILUC – either because attention to ILUC is a relatively recent phenomenon, or because agriculture and land-use were considered outside the scope of the policy in question. Nevertheless, it is conceivable that the low ILUC-risk concept is consistent with the aims and spirit of a policy that does not make explicit reference to it in its sustainability definitions.

With regard to biodiversity and local pollutants, we highlight the relevant parts of the Biodiversity Strategy and the CAP, the European Regional Development Fund, the Green Deal Farm to Fork Strategy, and Sustainable use of Pesticides.[60]

Opportunity

Both the low ILUC-risk productivity increase pathway, and the unused land conversion pathway are relevant here, as both can increase the vegetation on agricultural land – as cover crops, secondary crops, or through planting on rehabilitated degraded land. During the growing period, these energy crops could provide habitats, may reduce water and chemical runoff, and could potentially reduce the use of

[58] Including those classified now or in the future as special protection areas pursuant to Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds.

[59] With this context in mind, there are three levels of relevance for the low ILUC-risk concept: (i) The low ILUC-risk concept is not relevant; (ii) The low ILUC-risk concept is broadly consistent with the spirit of the policy; (iii) The low ILUC-risk concept satisfies all the sustainability criteria of the policy, but is not explicitly mentioned.

In the case of (i), there is nothing to do. In the case of (ii), we may wish to note the shared goals and move on. In the case of (iii), there may be scope for certified low ILUC-risk material to contribute to the goals of the policy. (In principle, we may seek to go further and explicitly add the low-ILUC concept into the sustainability standards. But that is beyond the scope of this report.)

[60] The Directive on the Conservation of Natural Habitats (Council Directive 92/43/EEC of 21 May 1992), and the Directive on the Conservation of Wild Birds (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009) are less relevant for the study of the production of low ILUC risk bioenergy examined in the project.

pesticides for neighbouring crops (and per unit of total production). Thus, a carefully-planned low ILUC-risk project could provide ecosystem services in addition to the value of produced feedstock.

The following paragraphs introduce relevant policy texts in more detail.

European Regional Development Fund: Funding may be eligible for projects using effective species in agronomically targeted areas in order to reduce greenhouse gas emissions. Diversification and technology changes are effective approaches to increase the carbon benefits.

Farm to Fork Strategy: Developing agroforestry on arable lands and grasslands has potential to increase carbon sequestration in the EU (in both soils and biomass). On arable land, catch crops have a considerable potential too. These solutions can be promoted by the Member States, also by CAP payments. Diversification is an effective approach to decrease pesticide use; but using less pesticides might have a negative impact on yields, resulting in an increased competition for land. Similar comments apply to fertiliser use.

Biodiversity Strategy for 2030: Biomass production on Natura 2000 sites and on sites under national protection schemes will remain possible if farming is compatible with the conservation objectives for the respective habitats and species. Compatible farming techniques could involve the restoration of high-diversity landscape features on agricultural land outside strictly protected areas, or the use of other measures to improve the permeability of the landscape. The share of agricultural land devoted to high-diversity landscape features is low and far from the 10% target, therefore the measure is likely to increase the competition for land; however, there is also some limited opportunity for biomass production (e.g. coppice).

Sustainable use of pesticides:[61] There is no prospect for uniform legislation across the EU, and the regular (five-year) update of the action plans will likely reveal a different pace of development in the member states. In areas where chemical pest control is prohibited, we may yet see viable bioenergy production (since quality requirements are lower than for food crops); for instance, in rust belts / recreational areas close to cities, or in buffer zones surrounding protected areas.

Regulation on the prevention and management of the introduction and spread of invasive alien species:[62] Non-invasive agricultural areas help to maintain and enhance farmland biodiversity, and active management can provide opportunity for ecosystems to resist, regenerate, adapt against the effects of invasive alien species.

Forest Strategy: Protecting biodiversity, fighting desertification and responding to climate change, whilst ensuring that forest ecosystems deliver goods and services. Low ILUC-risk projects based on unused land conversions may find overlap with the aims of this strategy.

Rural Development: Agri-environmental support to low ILUC-risk areas would encourage entry of unused land for biomass production.

A Clean Air Programme for Europe: To meet the cost-effective obligations of 2030 for the four main air pollutants could necessitate climate-positive farming practices which reduce the main air pollutants, e.g. Biomass production for crop rotation seasons.

[61] Directive (2009/128/EC).

[62] Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014.

Cohesion Fund:[63] Incentivising protection of natural areas and biodiversity management.

Hungary's Rural Development Program 2014-2020:[64] With the support of targeted cooperation biodiversity will increase, soil structure and soil nutrient content will improve, and sowing structure will become more diverse.

Hungary's National Plant Protection Action Plan: Flowering crops or crops with flowering weeds can be considered as a significant improvement to degraded areas and can support efforts in changing the pollinator populations' decline trend. Areas close to water are not feasible for crop production relying on pesticides, other approaches are necessary.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Nitrates Directive	Annex II Section B (See also Article 1)	Member States may also include in their code(s) of good agricultural practices the following items: - land use management, including the use of crop rotation systems and the proportion of the land area devoted to permanent crops relative to annual tillage crops; - the maintenance of a minimum quantity of vegetation cover during (rainy) periods that will take up the nitrogen from the soil that could otherwise cause nitrate pollution of water; - the establishment of fertilizer plans on a farm-by-farm basis and the keeping of records on fertilizer use; - the prevention of water pollution from run-off and the downward water movement beyond the reach of crop roots in irrigation systems.	Cover crops (low ILUC-risk) used for bioenergy could benefit from this support.
Fertilising Product Regulation	Recital 1 (See also Annex II, Part II, Category 4: Fresh Crop Digestate)	Harmonised conditions for making fertilisers from such recycled or organic materials available on the entire internal market should be established in order to provide an important incentive for their further use. Promoting increased use of recycled nutrients would further aid the development of the circular economy and allow a more resource-efficient general use of nutrients, while reducing Union dependency on nutrients from third countries.	Support for biological fertilisers may align with some biomass production systems (in the case of by-products), but may also create competing demand for feedstock, channelling it away from the biofuel sector.
Farm to Fork	Section 2.1	The Commission will act to reduce nutrient losses by at least 50% … by applying balanced fertilisation and sustainable	Strategic aspiration, but nevertheless the envisaged sustainable management

[63] Regulation (EU) 2021/1058.

[64] https://www.palyazat.gov.hu/node/56582#

Policy	Section	Excerpt	Relevance
		nutrient management and by managing nitrogen and phosphorus better throughout their lifecycle. The Commission will develop with Member States an integrated nutrient management action plan to address nutrient pollution at source	practices can be integrated with low ILUC-risk biomass production in the case of cover crops on used and unused land.
Sustainable Use of Pesticides	Article 14 (See also ANNEX III Section 1)	Member States shall take all necessary measures to promote low pesticide-input pest management, giving wherever possible priority to non-chemical methods	Crop rotation is central to integrated pest management (described in Annex III[65]), and low ILUC-risk production through cover-cropping can potentially feed into this.
Rural Development Funding Regulation[66]	Article 28 Paragraph 3	Payments cover only those commitments going beyond the relevant mandatory standards ..., and relevant minimum requirements for fertiliser and plant protection products use as well as other relevant mandatory requirements established by national law	Low ILUC-risk certification going beyond the minimum environmental requirements makes production eligible for support under the European Agricultural Fund for Rural Development.
Biodiversity Strategy for 2030	Section 4.2.2: Trade Policy	the Commission will ensure full implementation and enforcement of the biodiversity provisions in all trade agreements […] The Commission will better assess the impact of trade agreements on biodiversity, with follow-up action to strengthen the biodiversity provisions of existing and new agreements if relevant.	Stricter conditions for biomass imported from third countries for energy generation, allowing the EU to enforce biodiversity and environmental protection in its trade agreements and on its trade partners. This may include low ILUC-risk certification.
Biodiversity Strategy for 2030	Section 2.2.2	to bring back at least 10% of agricultural area under high-diversity landscape features. These include, inter alia, buffer strips, rotational or non-rotational fallow land, hedges, non-productive trees, terrace walls, and ponds.	The share of agricultural land devoted to actually high-diversity landscape features is low and far from the 10% target; compliance could be accelerated with low ILUC-risk production methods.
CAP (2013)[67]	Chapter 3 Article 43 Paragraph 2	The agricultural practices beneficial for the climate and the environment shall be the following: (a) crop diversification; (b) maintaining existing permanent grassland; and (c) having ecological focus area on the agricultural area.	New types of (low ILUC-risk) crops grown in rotation with / alongside conventional crops may satisfy these criteria for beneficial agricultural practices, and hence could benefit from this support.

Examples of national-level policy excerpts relevant to this section include:

[65] See also "Eight Principles of Integrated Pest Management", DOI:10.1007/s13593-015-0327-9.

[66] REGULATION (EU) No 1305/2013, http://data.europa.eu/eli/reg/2013/1305/oj.

[67] REGULATION (EU) No 1307/2013.

Policy	Section	Excerpt	Relevance
HU National Biodiversity Conservation Strategy 2015–2020[68] [69] (HU)	Objective 10.1 (See also Objectives 10.4 and 11.5)	Promotion of environment-friendly crop production and protection practices. Integrated crop protection, substitution of chemicals by agro-technological and biological processes.	Incentives for extensification, multi-cropping systems and crop rotation, which are all compatible with low ILUC-risk production.[70]
Second River Basin Management Plans (HU)	Section 8.3.2.1	Alternative treatment methods for treated wastewater is the poplar placement which transfer the treated wastewater to another recipient without endangered the good status of the receiving groundwater or surface water body and useful to grow energy crop.	This would be very specific to woody biomass projects which simultaneously provide low ILUC-risk fuel, e.g. through coppicing, and water filtration. Included as an example for a specific stacked business model.
Fertilising Product Regulation[71] (HU)	General provisions 2.2	Organic fertilizer subject to authorization: industrially processed fertilising products derived from plants or animal by-products, dedicated to nourish plants and to improve soil structure.	An established body of HU law incentivises and regulates domestic use of organic fertiliser; producers pursuing integrated / complementary / alternative production of energy and fertiliser feedstocks may benefit from these incentives.
National Plant Protection Action Plan[72] (HU)	Section 5.3.5	establishment and maintenance of protective vegetation bands at water coasts … in order to prevent contaminations caused by the use of plant protection products.	Establishing non-treated verges as a buffer to water courses offers an opportunity to plant energy crops, which can be harvested once the critical period of high run-off potential has passed.

[68] This provision is based on the framework laid down by CAP. In Hungary, CAP Pillar I support (direct payments) is available in the forms of area-based single payment, greening payment, and voluntary coupled payments. As in other Member States, none of these are 'bioenergy-specific' yet. The area-based single payment in 2020 amounted to around HUF 53.3 thousand (EUR 146) per hectare, the greening payment to 29.3 thousand (EUR 80) per hectare. Soybean producers (assuming that the oil crushed could, theoretically, be used for energy generation) applying for a top-up coupled to production received an additional HUF 75.1 thousand (EUR 206) per hectare. EU law does not permit crop-specific payments, unless they are taken from the (limited) voluntary coupled payment budget.

[69] Decision No 28/2015 (VI.17) of the Hungarian Parliament on the National Strategy to Preserve Biodiversity for the period 2015-2020, https://mkogy.jogtar.hu/jogszabaly?docid=a15h0028.OGY

[70] However, environment-friendly crop production systems can have a negative impact on yields, resulting in increased competition for land, and possibly in increased use of inputs elsewhere.

[71] HU 36/2006. (V. 18.) Ministerial Decree of the Ministry of Agriculture, https://net.jogtar.hu/jogszabaly?docid=A0600036.FVM&celpara=&dbnum=1

[72] https://ec.europa.eu/food/system/files/2019-03/pesticides_sup_nap_hun_en.pdf

Value Chain Stages

Biomass production.

9. Soil Carbon Management

Policy which explicitly encourages soil carbon sequestration in established agricultural lands, through the ongoing application of carbon-negative management practices.

Context

Around 45% of the mineral soils in Europe have low or very low organic carbon content (0-2%) and 45% have a medium content (2-6%)[73]. Croplands generally act as sources of carbon emissions; however, this is sensitive to climate, agro-ecological zone, crops grown, and, crucially, to land management practices. For instance, techniques in cover cropping and residue management have the potential to reduce or even reverse carbon emissions from agricultural soils (Rodrigues *et al.*, 2021); such regenerative agricultural practices fall loosely under the umbrella of "carbon farming".

Agriculture is responsible for about 10% of total EU GHG emissions and needs to contribute to EU emissions reduction goals. Furthermore, soils and forestry can provide sinks to offset hard-to-mitigate sources[74]. This is recognised by the LULUCF legislation (introduced in a previous section, "Land Conversion Emissions"), whose primary goal relating to soils is the retention and accumulation of soil carbon[75]. The European Commission's 2020 Farm to Fork Strategy[76] identified carbon farming as requiring further specific support in order to fulfil its potential in achieving the EU's climate targets. From the Strategy text (emphasis added):

> *An example of a new green business model is carbon sequestration by farmers and foresters. Farming practices that remove CO_2 from the atmosphere contribute to the climate neutrality objective and should be rewarded, either via the common agricultural policy (CAP) or other public or private initiatives (carbon market). A new EU carbon farming initiative [will be proposed and] the Commission will develop a regulatory framework for certifying carbon removals based on robust and transparent carbon accounting to monitor and verify the authenticity of carbon removals.*

This carbon farming initiative, the "Communication on Sustainable Carbon Cycles", was led by DG Climate Action and released in December 2021[77]. It identified the major carbon farming opportunities, including restoring peatlands and wetlands, afforestation, agroforestry, and use of cover crops and conservation tillage to protect and enhance soil[78], and outlined how these measures could be integrated into sustainable business models targeted to land managers on the ground. It also initiated the legal

[73] https://www.eea.europa.eu/data-and-maps/indicators/soil-organic-carbon-1/assessment/

[74] This forms a major rationale for linking the LULUCF and ESR credit "markets".

[75] Refer (Paquel *et al.*, 2017), Section 4.3.

[76] European Commission, 2020, "Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System", COM 2020 381 final.

[77] "Communication on Sustainable Carbon Cycles", 2021, COM(2021) 800, https://ec.europa.eu/clima/eu-action/forests-and-agriculture/sustainable-carbon-cycles/carbon-farming_en

[78] Ibid., Section 2.

framework for standardised monitoring and certifying of carbon farming outcomes, with a proposal to be finalised in 2022 following public and stakeholder consultation[79].

In terms of policy linkage, the communication seeks to 'increase the alignment of CAP to climate and biodiversity objectives', and facilitate the use of relevant funding pathways for Member States' CAP Strategic Plans[80], while simultaneously connecting carbon farming to EU funding programmes such as Horizon and LIFE (see the section "Task 5.1.2 (Part 2): Access to Finance", below for more information on these), with the intention of catalysing private investment.

Opportunity

For biomass farmers, the possibility of complementing the support available for carbon-negative farm management on top of certified low ILUC-risk production could enhance project viability. Indeed, as was discussed in Section 8. ("Habitats and Pollution"), cover cropping is a potential soil restorative that intersects with low ILUC-risk pathways.

In the specific context of the RED II, biofuels projects which implement carbon-farming techniques will be able to reduce the life-cycle emissions of their product, via the e_{sca} term in the total fuel emissions[81]. In the words of the Implementing Regulation on Voluntary Schemes and ILUC-risk[82], acceptable management techniques include:

> *shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop residue management, and the use of organic soil improver (e.g., compost, manure fermentation, digestate, biochar, etc.).*

Under the existing legislation, any emissions reduction conferred by e_{sca} would help those biofuels to meet the greenhouse gas reduction threshold to qualify as renewable. The proposed "Fit for 55" amendment to transition to greenhouse gas-based targets rather than energy share targets)[83], would further strengthen incentives to reduce emissions as far as possible below the threshold.

However, concerns have been raised about the specified method for determining the value of e_{sca} in practical settings. Chiefly, the soil carbon stock baseline and evolution values must be based on laboratory soil assessments at the level of a farm or group of farms (whose fields share agricultural and biophysical characteristics), with samples taken at least every five years. This has been identified as burdening

[79] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13172-Certification-of-carbon-removals-EU-rules_en

[80] The CAP already supports a number of measures consistent with carbon farming techniques, such as protections of wetlands and peatlands (GAEC 2; Article 11 of the new CAP); see (Paquel *et al.*, 2017) Section 4.3, and (European Commission, 2020). The nature of the CAP means that its provisions tend to be oriented towards implementation rather than outcomes when it comes to incentivising soil carbon measures. Furthermore, prior studies have pointed to the need to strengthen CAP incentives for environmental stewardship, in order for it to deliver environmental benefits (European Court of Auditors, 2021).

[81] e_{sca} is defined as the 'emission savings from soil carbon accumulation via improved agricultural management' (RED II, Annex V, Paragraph 1(a)). The units of this quantity are g-CO_2e/MJ/ha, where "MJ" refers to the energy content of produced biofuel, and "ha" refers to the cultivation area; a positive value means net absorption of carbon from the atmosphere into the soil.

[82] Commission Implementing Regulation (EU) 2022/996, Annex V.

[83] See Section "RED Amendment" below.

farmers, especially as fluctuations in measurements will require dense coverage (15 samples per five hectares).

Moreover, there are some high-level tensions between sustainably harvesting material for bioenergy on one hand, and carbon-negative farming on the other. For instance, harvesting crop residues and cover crops that otherwise would have been retained in fields can reduce soil carbon and soil quality. The RED II mandates that all low ILUC-risk crops would have to satisfy the EU's environmental stewardship guidelines[84], but these do not explicitly address soil carbon management practices: for instance, there are no rules on the minimum amounts of cover crop that should be left in the field (Searle and Bitnere, 2017).

The BIKE case studies are exploring this space by blending carbon farming with models of additional biomass production for bioenergy. For example, the castor bean case study[85] seeks to further 'generate knowledge for the development of carbon negative initiatives in Europe'. The *Brassica sp.* case study[86] adopts a "Climate Positive Fuels" model of rotations and land management practices to increase the carbon content of soils, while harvesting biofuel feedstock and animal feed from cover crops.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Annex VI Section B Paragraph 6 See also associated Footnote 1	… emission savings from improved agriculture management, e_{sca}, … shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use.	Possibility to stack low ILUC-risk practices with other soil stewardship measures to add value to low ILUC-risk projects.
LULUCF	Article 5 Paragraph 4	Member States shall include in their accounts for each land accounting category any change in the carbon stock of the carbon pools listed in Section B of Annex I.	Member States obliged to report changes to soil carbon in managed cropland at the national level[87]. This may encourage them to support projects which improve soil characteristics.
Farm to Fork Strategy	Chapter 2 Section 1	Farming practices that remove CO2 from the atmosphere contribute to the climate neutrality objective and should be rewarded, either via the common agricultural policy (CAP) or other public or private initiatives	Developing agroforestry on arable lands and grasslands has the greatest potential to increase carbon sequestration in the EU (in both soils and biomass). On arable land, catch crops have a considerable potential

[84] In the agricultural context, this is done through cross-compliance with the CAP and the Good Agriculture and Environment Conditions standards (Searle and Bitnere, 2017).

[85] Run by Eni in Kenya; https://www.bike-biofuels.eu/case-studies/.

[86] Run by UPM in Uruguay; (BIKE, 2021).

[87] Stipulated in Annex I.B(e).

Policy	Section	Excerpt	Relevance
		(carbon market). A new EU carbon farming initiative under the Climate Pact will promote this new business model, which provides farmers with a new source of income and helps other sectors to decarbonise the food chain. As announced in the Circular Economy Action Plan (CEAP), the Commission will develop a regulatory framework for certifying carbon removals based on robust and transparent carbon accounting to monitor and verify the authenticity of carbon removals.	too. These solutions can be promoted by the Member States, also by CAP payments.
European Commission Communication on Sustainable Carbon Cycles[88]	Section 2.1	… the following are … improved land management practices that result in the increase of carbon sequestration and in most cases in co-benefits for ecosystems and biodiversity: … Agroforestry and other forms of mixed farming combining woody vegetation (trees or shrubs) with crop and/or animal production systems on the same land; Use of catch crops, cover crops, conservation tillage and increasing landscape features: protecting soils, reducing soil loss by erosion and enhancing soil organic carbon on degraded arable land; …	Identified carbon farming practices are consistent with potential low ILUC-risk biomass production models, and will make additional production systems more financially attractive if they are able to generate carbon credits.
Carbon Farming Technical Guidance Handbook[89]	Section 3.3.1	… other factors that should be considered when assessing potential carbon farming schemes … are: permanence of the carbon pool and GHG emission reductions …; additionality [such that] the scheme produces desirable results that would not have happened without it; risk of carbon leakage or displacement of an activity or land	Very close alignment between proposed carbon farming requirements and core considerations relevant to the low ILUC-risk concept: including additionality and displacement which are already part of the low ILUC-risk assessment/concept. Suggests scope for explicit cross-reference in implementation strategies.

[88] "Communication on Sustainable Carbon Cycles", 2021, COM(2021) 800, https://ec.europa.eu/clima/eu-action/forests-and-agriculture/sustainable-carbon-cycles/carbon-farming_en

[89] "Setting up and implementing result-based carbon farming mechanisms in the EU", (COWI, Ecologic Institute and IEEP, 2021). This is not a policy with regulatory weight, but was published by the European Commission and serves as an important and comprehensive guide to the conceptual factors and implementation challenges that will be taken into account in future policy deliberations.

Policy	Section	Excerpt	Relevance
		use that is limited by a scheme to another location, where it leads to increased emissions; uncertainty of the accuracy or reliability in the measurement of results due, for example, to errors, lack of data, modelling assumptions or estimations of future values.	

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Danish Rural District Programme 2014-20[90] (DK)	Section 5.3	There are still no quantitative objectives for the promotion of carbon sequestration in agriculture and forestry in Denmark … however, a number of measures … will promote carbon sequestration, including a subsidy scheme for the promotion of perennial crops, the laying out of additional follow-on [i.e., intermediate catch] crops, a ban on certain types of tillage …	National-level subsidies for conservation and regenerative agriculture could include intermediate energy crops, which can be used for bioenergy purposes.[91]
Danish Rural District Programme 2014-20 (DK)	Section 8.1	At least 5 percent of the agricultural holding's total operating areas must be designated as so-called environmental focus areas … in Denmark [this includes] … follow-on crops, if they are sown in mixtures or as grass cover	Obligations for environmental set-aside land can be fulfilled by certain types of catch crops which may be compatible with bioenergy, provided other environmental criteria are met.

Value Chain Stages

Land use, biomass production.

[90] "Det Danske Landdistriktsprogram 2014-2020"; NaturErhvervstyrelsen, Ministeriet for Fødevarer, Landbrug og Fiskeri (The Danish Business Authority, the Ministry of Food, Agriculture and Fisheries); https://lbst.dk/fileadmin/user_upload/NaturErhverv/Filer/Tvaergaaende/EU-arbejdet/LDP_GODKENDT_101214.pdf

[91] See also "Reviewing the Contribution of the Land Use, Land-use Change and Forestry Sector to the Green Deal -- Workshop IV Report: Carbon Farming in the CAP Strategic Plans", European Commission, 2021; https://ec.europa.eu/clima/system/files/2021-07/20210525_workshop_iv_report_en.pdf; (emphasis added):

> *The 'Targeted nitrogen regulation' scheme was given as an example of maintenance and enhancement of soil organic carbon with a primary objective to reduce leaching of nitrogen to the aquatic environment. This is obtained through establishing catch crops or implementing alternative nitrogen reducing measures (e.g. set-aside or sowing energy crops), for which farmers will be financially compensated. As a result, catch crops will maintain or enhance the level of organic carbon in the cultivated soils for an expected climate impact of 0,5 million tonnes of CO_2 emissions reduction in 2030.*

10. Soil Health and Water Conservation

Policy which supports measures to preserve soil structure/biome/drainage, and conservation of water resources.

Context

Poorly regulated biofuel feedstock production has the potential to degrade and deplete natural resources. Meeting growing demand under the status quo scenario is likely to result in increased land conversion, soil degradation, increased chemical inputs, water pollution through leaching and eutrophication, and conversion of wetlands and water catchment areas for feedstock production.

This holds true also for marginal lands, especially when they are converted to production of inappropriate crops. Economic pressures to increase yields may result in the adoption of unsustainable high-input farming techniques, linked to increased soil erosion and flooding risks.

The nexus between healthy soils, clean water, biodiversity conservation and biofuel production are complex. The biodiversity impact derived from biofuel production is a derivative of sound crop management and selection. Introducing additional cover crops[92] and short crop rotational programs are some of the measures being implemented on existing lands to reduce soil erosion and water pollution, especially when established on marginal or degraded lands.

Opportunity

The soil health benefits of crop diversification and rotation are recognised by the CAP and other schemes, such as the Nitrate Action Programme Information System (NAPINFO). This creates an opportunity for low ILUC-risk feedstock production in marginal lands, and beyond, to capitalise on their integration of such practices. But it also highlights the importance of general sustainability criteria in the low ILUC-risk certification system, as unused or abandoned lands may be vulnerable to increased degradation by poorly conceived or implemented low ILUC-risk projects.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Rural Development Programme	Article 5	[...]c) preventing soil erosion and improving soil management. [...]	Encouraging agricultural practices that protect and improve soil – this would align with many low ILUC-risk production systems.
Farm to Fork Strategy	Subchapter 2.1. Ensuring sustainable food production	The Commission will act to reduce nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility. This will reduce the use of fertilisers by at least 20% by 2030. This will be achieved by implementing and enforcing the relevant environmental and climate legislation in full, by identifying with Member States the	Incentives for extensification, multi-cropping systems and crop rotation. Diversification is an effective approach to decrease nitrogen fertiliser use, and there are good prospects for a low ILUC-risk bioenergy rotation to capitalise on this.

[92] Extra emphasis is placed on additionality here, as definitions of cover cropping may vary; see, e.g., (Malins, 2022).

Policy	Section	Excerpt	Relevance
		nutrient load reductions needed to achieve these goals, applying balanced fertilisation and sustainable nutrient management and by managing nitrogen and phosphorus better throughout their lifecycle. The Commission will develop with Member States an integrated nutrient management action plan to address nutrient pollution at source [...]	
Farm to Fork Strategy	2.2.2 Bringing nature back to agricultural land.	[...] to bring back at least 10% of agricultural area under high-diversity landscape features. These include, inter alia, buffer strips, rotational or non-rotational fallow land, hedges, non-productive trees, terrace walls, and ponds. These helps enhance carbon sequestration, prevent soil erosion and depletion, filter air and water, and support climate adaptation.	Incentives for extensification, multi-cropping systems and crop rotation.
Green Deal: Farm to Fork Strategy	Chapter 5.4.1	Support eligible for ... protein crops	Financially incentivising production of nitrogen fixing protein crops in rotations.
Sustainable Use of Pesticides	Voluntary coupled direct payments related to production in the crop sector	Member States shall ensure that all agricultural area, including land which is no longer used for production purposes, is maintained in good agricultural and environmental condition. Member States shall define, at national or regional level, minimum standards for beneficiaries for good agricultural and environmental condition of land on the basis of Annex II, taking into account the specific characteristics of the areas concerned, including soil and climatic condition, existing farming systems, land use, crop rotation, farming practices, and farm structures.	Incentivising good agricultural and environmental practices to promote healthy soils. Unused land is explicitly mentioned, and Member States have some flexibility in how to apply their criteria. Such ambiguity can go either way, and it's important to ensure that "good agricultural" and "good environmental" condition are not in conflict.
Nitrates Directive	Article 4 Paragraph 1.a	With the aim of providing for all waters a general level of protection against pollution, Member States shall, within a two-year period following the notification of this Directive: (a) establish … codes of good agricultural practice, to be implemented by farmers on a voluntary basis, which should [include (from Annex II B)]: … 7. land use management, including the use of crop rotation systems and the proportion of the land area devoted	Multiple cropping, cover cropping, and short rotational programmes are effective approaches under the voluntary Nitrate Action Programme to decrease nitrogen fertiliser use, protecting soil and water quality; there are good prospects for a low ILUC-risk bioenergy rotation system to capitalise on this.

Policy	Section	Excerpt	Relevance
		to permanent crops relative to annual tillage crops; 8. the maintenance of a minimum quantity of vegetation cover during (rainy) periods that will take up the nitrogen from the soil that could otherwise cause nitrate pollution of water	

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Rural Development Program 2014–2020[93] (HU)	Chapter 8.2.10. M10 – Agri-environment and climate action (Article 28)	The agri-environment payment operation is a voluntary payment scheme in which program participants undertake to carry out additional activities during their management in order to achieve the agri-environment objectives. The condition of the support is the observance of the undertaken activities during the 5-year period of the commitment. ... The standards primarily serve the following environmental and nature protection purposes: ... soil cover, tillage techniques, conservation tillage, nature conservation agriculture ... maintenance of "areas of high nature value" arable and grassland areas (eg mowing techniques, manual labour, stubble abandonment) … conversion of arable land to grassland … Increasing the diversity of the sowing structure … Supporting the conservation of biodiversity in agriculture	The soil cover factor referenced here could be of relevance to low ILUC-risk projects; in which case, this policy item provides a fairly direct support for ecological services. However, there is as ever some tension between producing feedstock and serving environmental goals.

Value Chain Stages

Biomass production.

[93] https://www.palyazat.gov.hu/node/56582#

11. Rural Social Programmes

Policy which seeks to encourage smallholder projects or traditional production methods, which may be suitable for integration with a low ILUC-risk system.

Context

Rural development policy and even the whole CAP actively supports land-use-related measures in rural areas. These measures are mainly targeted towards farmers rather than rural communities, and are elaborated elsewhere in this report. On the other hand, the EU Rural Development Programme provides opportunities for Member States to support the efforts of rural communities in the context of land use through Article 35, via the cooperation measure, and the European Innovation Partnership (EIP) measure. Under Article 35, EIP-Agri[94] supports the goals of rural development by bridging the gap between the innovative solutions created by researchers and the uptake of new technologies by those living and working in rural areas.

Projects funded under these measures have relatively small budgets, and are not necessarily linked to biofuel production, let alone low ILUC production. However, projects can have positive impact on land use – typically through the reclamation of neglected land, support for community gardens/cultivation, afforestation of neglected land, creation of forests, and incentivising climate friendly land use and biomass production.

Opportunity

Two major ways that low ILUC-risk production could benefit from rural support schemes are:

i. If the schemes can be used to reverse land abandonment trends, or reclaim / rehabilitate degraded land.
ii. If the schemes can be used to overcome non-financial barriers which impede development. (For instance, if a rural programme provides education about new farming methods, or facilitates downstream market linkages.)

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Rural Development Programme (2013)[95]	Article 17: Investments in Physical Assets	Support under this measure shall cover tangible and/or intangible investments which: (a) improve the overall performance and sustainability of the agricultural holding; … (c) concern infrastructure related to the development, modernisation or adaptation of agriculture and forestry, including access to farm and forest land, land consolidation and	Infrastructure investments may include new machinery or plants for processing bioenergy crops; this would facilitate bioenergy projects in general, and could be targeted to areas where low ILUC-risk production is possible.

[94] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en#eip

[95] REGULATION (EU) No 1305/2013, http://data.europa.eu/eli/reg/2013/1305/oj
http://data.europa.eu/eli/reg/2013/1305/oj

Policy	Section	Excerpt	Relevance
		improvement, and the supply and saving of energy and water	
Rural Development Programme (2013)	Article 35	Co-operation 1. Support under this measure shall be granted in order to promote forms of co-operation [...] 2. Co-operation under paragraph 1 shall relate to […](g) joint approaches to environmental projects and ongoing environmental practices, including efficient water management, the use of renewable energy and the preservation of agricultural landscapes (h) horizontal and vertical co-operation among supply chain actors in the sustainable provision of biomass for use in food and energy production and industrial processes; [...]	Encouraging cooperation aimed at biomass production and land use – points to opportunities for tackling non-financial barriers.
Rural Development Programme (2013)	Article 35	[...] 1. c. the establishment and operation of operational groups of the EIP for agricultural productivity and sustainability as referred to in Article 56.	For reference: the EIP created here to promote innovative solutions for land use and biomass production, through funding, partnerships, and knowledge transfer between relevant actors including local communities.
EIP Agri Innovative Projects Catalogue 2019[96]	--	--	For reference: examples of supported projects to mainstream bioeconomy and climate-friendly land use in rural areas, encompassing several value-chain stages. This provides a platform to support low ILUC-risk biomass projects[97].

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Climate and Energy Model Regions	--	regional climate protection projects … are co-financed [with] access to a broad network, training, support and funding.	Climate and Energy Model Regions is a programme of the government's Climate and Energy Fund[99]; both support bioenergy projects

[96] https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_innovative_projects_catalogue_2019_en_web.pdf

[97] One relevant EIP-funded example from Spain, focussing on the recovery of abandoned lands, is GORTA: https://ec.europa.eu/eip/agriculture/en/find-connect/projects/gorta-grupo-operativo-de-innovaci%C3%B3n-para-la

[99] https://www.klimafonds.gv.at/

Policy	Section	Excerpt	Relevance
(AU)[98]			potentially relevant to low ILUC-risk production systems[100].

Value Chain Stages

Land use, biomass production.

[98] https://www.klimaundenergiemodellregionen.at/

[100] Examples: https://www.klimafonds.gv.at/projekte/detail/?kf_number=K20SL0U288747 and https://www.klimaundenergiemodellregionen.at/ausgewaehlte-projekte/best-practice-projekte/showbpp/245

12. Food Security

Policy which aims to stabilise EU and global access to and trade in food products, and to diversify and strengthen agricultural production within the bloc.

Context

Food security is a key goal of the EU's Farm to Fork Strategy[101]. Measures adopted or envisaged for this end encompass a wide a range of approaches, including: improving the resilience of supply chains and farmers' access to inputs, promulgating freer trade rules and minimising the effect of global export restrictions, stabilising food prices and managing stockpiles, reducing energy use in the agribusiness sector, and mitigating waste and loss.[102]

Two major themes in domestic food security are preserving the productivity and condition of agricultural land, and reversing trends of land degradation and land abandonment (Carolina *et al.*, 2018; Fayet *et al.*, 2022). Drivers of degradation and abandonment such as overly intensive cropping and chemical use span biophysical and socioeconomic dimensions (Wageningen Environmental Research, 2020); a number of EU research projects[103] seek to gain practical leverage of these dynamics now and into the future. Research topic include, for example:

- Identifying and evaluating promising soil-improving cropping systems and agronomic techniques that increase the profitability and sustainability of agriculture across Europe[104], and
- Diversification through rotation, intercropping, multiple cropping, geared towards improved productivity, delivery of ecosystem services, and resource-efficient and sustainable value chains[105].

Opportunity

Additionality of production is foundational to the low ILUC-risk concept, and both low ILUC-risk pathways – improving crop yields above their baselines, and converting unused or abandoned agricultural land to production – increase agricultural capacity of the target areas. Extra capacity dedicated to bioenergy crops can in theory ultimately transition to food crops, thereby increasing productive capacity in the long term (i.e., on a decadal time-scale), and potentially acting as a buffer to medium-term supply fluctuations (on a seasonal time-scale).

From this perspective, the low ILUC-risk system acts as an incentive to overcome initial barriers to land improvement and production efficiency. This is especially true in areas where the reasons for agricultural underperformance are economic, for example where the bioenergy sector has uncertain market returns (Wageningen Environmental Research, 2020). It is worth noting that certification – and the accompanying benefits – has a fixed duration of ten years, though it is possible that this could be extended for certain

[101] See https://ec.europa.eu/food/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf, Section 2.2.

[102] European Commission COM/2020/381 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381. https://ec.europa.eu/info/strategy/priorities-2019-2024/stronger-europe-world/eu-actions-enhance-global-food-security_en

[103] E.g. MAGIC https://magic-h2020.eu/

[104] Soilcare https://soilcare-project.eu/

[105] DiverImpacts https://www.diverimpacts.net/

projects. At the end of this period, economic operators may transition to other production models, depending on which pathways are available and incentivised at the time.

Recent global events – notably the coronavirus pandemic and the war in Ukraine – have dealt shocks to both energy and food supply; consequently, the role of biofuels in global food security has re-entered the mainstream policy debate[106]. In exceptional circumstances, there is precedent for national governments to adjust fuel blending mandates to divert land and feedstock away from the biofuel sector and towards food and feed uses. This emphasises the argument for the low ILUC-risk concept as a mechanism for delivering additional biofuel production that avoids food market impacts.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Farm to Fork Strategy[107]	Section 2	… ensuring that the food chain, covering food production, transport, distribution, marketing and consumption, has a neutral or positive environmental impact, preserving and restoring the land …	Narrative alignment with the goals of low ILUC-risk production as an opportunity to reclaim unused land while preserving sustainability principles.

Value Chain

Land use; biomass production.

[106] For a primer on the debate and assessment of the evidence, see (Malins, 2017).

[107] See Footnote 102.

13. Reporting Standardisation

Policy which imposes reporting requirements on biogenic material may overlap with the low ILUC-risk certification system, opening the door to harmonisation of standards.

Context

Fuels and biogenic commodities – both within and outside of the bioenergy space – must be registered, accounted, or certified for use in various sectors.

For example, the Fuel Quality Directive requires EU Member States to report the volumes of fuels supplied domestically, as well as the fuels' carbon intensity, to the relevant national agency.

Opportunity

Procedures such as these could be streamlined and integrated together with low ILUC-risk certification, if the latter is recognised as covering the required information and providing easy access to it. Such standardisation – i.e., interchangeability of certain certification elements – could reduce reporting burdens on stakeholders in the low ILUC-risk biofuels space and adjacent sectors, and hence may add value to low ILUC-risk certification.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 30 Paragraph 4 [See also Paragraph 8]	The Commission may decide that voluntary national or international schemes setting standards for the production of biofuels, bioliquids or biomass fuels, or other fuels ... contain accurate information on measures taken for soil, water and air protection, for the restoration of degraded land, for the avoidance of excessive water consumption in areas where water is scarce, and for certification of biofuels, bioliquids and biomass fuels with low indirect land-use change-risk.	High-level Commission vetting lends credibility and value to sustainability assessments – including certification of low ILUC-risk production, which is explicitly mentioned. Furthermore, Commission-led requirements is likely to engender both a degree of uniformity among certification bodies and helpful overlaps between different assessment verticals.
FQD	Article 7.a Paragraph 1[108]	… suppliers shall report annually, to the authority designated by the Member State, … the following information: (a) the total volume of each type of fuel or energy supplied, indicating where purchased and its origin; and (b) life cycle greenhouse gas emissions per unit of energy. Member States shall ensure that reports are subject to verification.	Provisions such as these establish the importance of reporting for fuel characteristics. Overlap of these reporting requirements with information provided by low ILUC-risk certification could be leveraged to reduce the overall reporting burden.

[108] The "Fit for 55" policy proposal would, if adopted in its current form, eliminate this provision.

Policy	Section	Excerpt	Relevance
CORSIA Methodology for Calculating Actual Life Cycle Emissions Values[109]	Section 2 Paragraph 9	The low land use change risk feedstock list includes: (1) feedstocks that do not result in expansion of global agricultural land use for their production; (2) wastes, residues, and by-products (see Section 4); and (3) feedstocks that have yields per surface unit significantly higher than terrestrial crops ...	The CORSIA definition of low LUC-risk encompasses a broader range of feedstock types than RED II (which corresponds to just (1) in the excerpt[110]). On the whole, the CORSIA qualifying criteria are less stringent than RED II[111], so additional material certified as low ILUC-risk is likely to be eligible to generate CORSIA AAF credits[112].

[109] ICAO's Carbon Offsetting and Reduction for Sustainable International Aviation. This is not an EU policy; nevertheless, we include it because it explicitly introduces the ILUC concept (in the context of alternative aviation fuels made from biogenic feedstocks).

[110] The CORSIA framework for assessing additionality of feedstock production is detailed in Section 5 of the referenced document; while it differs in some details from the RED II framework, the overall gist is the same.

[111] One exception is the CORSIA requirement to use five years of historical data, rather than three, to initialise the baseline for productivity-increase projects.

1. [112] As mentioned in the section "Feedstock Regulation under RED II

Policy which specifically promotes production and consumption of sustainable biofuels by imposing feedstock-related requirements under the RED II framework.

Context

Both the EU and Member States regulate the quality and production methods of products used within their borders – this holds for agricultural products as well as industrial ones. The EU and Member States can also require economic operators to declare the origin, characteristics, and volumes of designated input materials; for example, the supply chain traceability of genetically modified crops is stringently monitored.

Such provisions foster transparency in value chains, and can be used to ensure safety and legal compliance. These provisions moreover enable political or market-driven preferences for inputs, based on whatever attributes are reported.

Opportunity

In principle, it would be possible for the EU or Member States to extend regulations on biofuel feedstocks – strengthening reporting requirements, or limiting or proscribing the use of feedstocks with certain characteristics. For example, a Member State could choose to mandate that *all* food- and feed-based energy crops have to be low ILUC-risk certified, and in this case may also wish to impose a stricter definition of "food and feed" than those contained in the RED II. Or they may wish to exclude certain feedstocks from the RED II's Annex IX unless they are certified as being low ILUC-risk. Or they may introduce additional environmental requirements for feedstocks to satisfy to qualify for RED II targets. These types of provisions would increase – perhaps dramatically – the demand for low ILUC-risk feedstocks and low ILUC-risk certification.

Value Chain Stages

Biomass production, conversion, end use.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
RED II	Article 25 Paragraph 1.2	Member States may exempt, or distinguish between, different fuel suppliers and different energy carriers when setting the obligation on the fuel suppliers, ensuring that the varying degrees of maturity and the cost of different technologies are taken into account.	Empowers Member States to distinguish between low ILUC-risk versus uncertified feedstock. In principle, this allows low ILUC-risk projects to be bound by different accounting rules, market restrictions, and incentive eligibility.
Sustainable Use of Pesticides	Article 15	Harmonised risk indicators as referred to in Annex IV shall be established. However, Member States may continue to use existing national indicators or adopt other appropriate indicators in addition to the harmonised ones.	There are two indicators in the directive with limited relevance to BIKE (total market of pesticides and number of authorisation), but Member States have power to use their own indicators, and in some contexts, these could explicitly include ILUC.

Value Chain Stages

Biomass production, conversion, end use.

ILUC Emissions Factor", CORSIA eligibility is especially attractive for low LUC risk fuels because credits are awarded based on their carbon intensity.

14. Information Access

Policy which increases the availability of useful information, or the accessibility of tools which can assist in meeting low ILUC-risk certification requirements.

Context

Agencies at the EU and Member State level publish and maintain databases of information that can be used to inform and develop agricultural projects. These projects may involve farmers, aggregators, biofuel refiners, distributors, and others involved in the biofuel value chain; in this section, we consider information sources that can help such stakeholders to model and plan their projects, and to monitor critical sustainability indicators on an ongoing basis.

Examples of information sources and tools include:

- Agri-environmental data (including soil types, irrigation potential, and weather patterns)
- Land registries (including ownership, permitting, and zoning status)
- Land use classification (including automated classification from satellite images)
- Crop yield data (including geographical and variety-specific information)
- Agricultural extension (including farm management practices)
- Soil carbon data and modelling tools
- Listings of industry players for establishing market linkages

Opportunity

Economic operators seeking to become low ILUC-risk certified – on some or all of their productive area – will be able to use data sources and tools such as these to justify their application and facilitate the application process. For example:

- Regional data on soil carbon trends provides a reference point/benchmark against which to judge potential and claimed improvements.
- Automated land classification avoids the expense of surveying unused land or tracking down distributed administrative records; this facilitates accurate assessment of applications.
- Reliable and accessible crop baselines enable producers to develop better yield projections, and more confidently assess the potential value of low ILUC-risk certification in their specific circumstances.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
LULUCF	Recital 32	To facilitate data collection and methodology improvement, land use should be inventoried and reported using geographical tracking of each land area, corresponding to national and Union data collection systems. The best use should be made of existing Union and Member State programmes and surveys including the Land Use/Cover Area	Centralised and resourced strategy for identifying land usage may be able to identify abandoned and unused land.

Policy	Section	Excerpt	Relevance
		frame Survey ('LUCAS'), the European Earth observation programme Copernicus and the European satellite navigation system Galileo for data collection.	
LULUCF	Article 5 Paragraph 4	Member States shall include in their accounts for each land accounting category any change in the carbon stock of the carbon pools listed in Section B of Annex I.	Member States have to report changes to soil carbon in managed cropland[113]: this information can provide an official reference / baseline for projects seeking to measure improvements to soil carbon sequestration.

Value Chain Stages

Land use, biomass production, conversion, end use.

[113] Stipulated in Annex I.B(e).

15. Sustainable Financing – EU Taxonomy

Context

The EU's new Taxonomy Regulation classifies which economic activities are sustainable[114] according to the objectives of the EU Green Deal, and in this way incentivises companies to meet its sustainability criteria, while directing investment flows towards businesses that perform well– including in the energy sector[115]. It is a financing framework within which both public and private funding decisions are made (see the section "Task 5.1.2 (Part 2): Access to Finance"). The Taxonomy Climate Delegated Act and the Technical Screening Criteria thus constitute a core piece of EU policy which also ties in with other policies: for instance, it has set specific technical screening criteria to meet its European Green Deal objectives, including the 2050 climate-neutrality target.

Opportunity

According to the regulation, the use of agricultural biomass for the manufacture of biofuels, biogas, bioliquids for use in transport should comply with the sustainability criteria laid down in RED II (Article 29), and food-and-feed crops should be not used for the manufacture of biofuels for use in transport[116]. Some of the project types included in BIKE's low ILUC-risk case studies would already be considered sustainable under these rules – for example those based on lignocellulosic feedstocks – provided they meet some of the other criteria such as 65% greenhouse gas savings, and adhering to the forestry standards from the RED II[117].

At present, however, only food-and-feed crops are considered to be the target of established low ILUC-risk policy. There is hence no indication that biofuels made from low ILUC-risk feedstocks would be considered sustainable under the EU Taxonomy rules – unless a specific provision were included in the Technical Screening Criteria to exempt low ILUC-risk material from the food-and-feed prohibition. If this were to be implemented, then investments from businesses traditionally active in 1st-generation biofuels would have a pathway to become eligible for funding.

Policy Text

Policy	Section	Excerpt	Relevance
EU Taxonomy Regulation[118]	Article 10 Paragraph 1	An economic activity shall qualify as contributing substantially to climate change mitigation where that activity contributes substantially to the stabilisation of greenhouse gas concentrations … (h) producing clean and efficient fuels from renewable or carbon-neutral sources; or	Low ILUC-risk related activities could potentially be classified as environmentally sustainable. Projects promoting low ILUC-risk fuels will potentially have

[114] https://ec.europa.eu/info/publications/210421-sustainable-finance-communication_en#taxonomy

[115] At the time of writing, agriculture had not yet been included in the technical screening criteria. See Recital 14 of the Commission Delegated Regulation (EU) 2021/2139, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2139.

[116] Commission Delegated Regulation (EU) 2021/2139 (link above); Annex I, Section 4.13, Paragraph 1.

[117] Commission Delegated Regulation (EU) 2021/2139 (link above); Annex I, Section 4.13, Paragraph 1 & 2.

[118] Regulation (EU) 2020/852 of the European Parliament and of the Council, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852&qid=1643209870481

Policy	Section	Excerpt	Relevance
		(i) enabling any of the activities listed in points (a) to (h) of this paragraph in accordance with Article 16.	better access to finance and increased visibility.
EU Taxonomy Regulation	Article 15 Paragraph 1	An economic activity shall qualify as contributing substantially to the protection and restoration of biodiversity and ecosystems where that activity contributes [to] … (b) sustainable land use and management, including adequate protection of soil biodiversity, land degradation neutrality and the remediation of contaminated sites; (c) sustainable agricultural practices, including those that contribute to enhancing biodiversity or to halting or preventing the degradation of soils and other ecosystems, deforestation and habitat loss; (d) sustainable forest management, including practices and uses of forests and forest land that contribute to enhancing biodiversity or to halting or preventing degradation of ecosystems, deforestation and habitat loss; …	Low ILUC-risk projects are well placed to satisfy these sustainability criteria, and hence become eligible for financial support under the EU Taxonomy.
EU Taxonomy Delegated Regulation	Annex I Section 4.13 Paragraph 1	Food-and feed crops are not used for the manufacture of biofuels for use in transport and for the manufacture of bioliquids.	Low ILUC-risk feedstocks based on food-and-feed crops (which is all of them under the current RED II definitions) may not be classified as sustainable, unless a future change in the law exempts them from this provision.

Value Chain Stages

Biomass production, conversion.

16. Other Narrative Relevance

Policy which raises the profile of issues connected to the low ILUC-risk concept, and which have generally consistent goals.

Context

It is to be expected that the policy space will contain provisions which, though they are connected to and broadly consistent with the aims of the low ILUC-risk concept, do not have a direct discernible impact on the value of the concept to any of its stakeholders.

For example, we may consider the relevance of policies/strategies which reference the negative impacts of land-use change, or stress the need for sustainable transport fuel, but which do not contain any explicit legal provisions for these areas.

Opportunity

We note some illustrative examples below (but make no attempt to be exhaustive). These are not expected to provide any actionable value proposition; they simply build the prominence of issues that low ILUC-risk certification would seek to address, and hence bolster the narrative that low ILUC-risk certification, if implemented successfully, could make a meaningful contribution to high-priority areas.

Policy Text

EU-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
LULUCF	Recital 10	[European] Union's objectives of reducing gross tropical deforestation by at least 50 % by 2020 compared to current levels and to halt global forest cover loss by 2030 at the latest.	Deforestation targets provide context for promoting the low ILUC-risk concept.
Rural Development Programmes	Article 5	[Union priorities for rural development:] … promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy in agriculture, food and forestry sectors, with a focus on the following areas: [...]c) facilitating the supply and use of renewable sources of energy, of by-products, wastes and residues and of other non-food raw material, for the purposes of the bioeconomy	Actions are carried out to promote the production of renewable EU energy sources like biomass.
Rural Development Programmes	Article 35 (Co-operation) Paragraphs 1 and 2	Support under this measure shall be granted in order to promote forms of co-operation [relating to] [...] (g) joint approaches to environmental projects and ongoing environmental practices, including efficient water management, the use of renewable energy and the preservation of agricultural landscapes (h) horizontal and vertical co-operation among supply chain actors in the sustainable provision of biomass for use in food and energy production and industrial processes	This provision implies support for value chain integration, which can be taken up by national legislation.

Policy	Section	Excerpt	Relevance
Cohesion Fund[119]	Section 3.1b	a greener, low-carbon transitioning towards a net zero carbon economy and resilient Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate change mitigation and adaptation, risk prevention and management, and sustainable urban mobility: 1. Promoting energy efficiency and reducing greenhouse gas emissions 2Promoting access to water and sustainable water management; 3.Promoting the transition to a circular and resource efficient economy; 4.Enhancing protection and preservation of nature, biodiversity and green infrastructure, including in urban areas, and reducing all forms of pollution; 5.Promoting sustainable multimodal urban mobility, as part of transition to a net zero carbon economy; 6. Developing smart energy systems, grids and storage outside the Trans-European Energy Network (TEN-E)	General relevance: increased focus on biofuels will bring LUC to the fore and enhance the necessity of low ILUC-risk certification.

Examples of national-level policy excerpts relevant to this section include:

Policy	Section	Excerpt	Relevance
Rural Development Programme (HU)	16.4	Horizontal and vertical cooperation of supply chain actors with the aim of creating and developing short supply chains and local markets	Examples of support given for integrated value chain creation in bioenergy under a national Rural Development Plan

Value Chain Stages

Land use, biomass production, conversion, end use.

[119] REGULATION (EU) 2021/1058, https://eur-lex.europa.eu/eli/reg/2021/1058

Recent Policy Proposals

The European Commission's "Fit for 55" policy package contains proposed amendments to the RED and new policies that would impact the low ILUC-risk value chain. While the proposals must pass through stages of evaluation and potentially amendment before adoption, we may nevertheless take the opportunity to outline the most relevant provisions as they stood in June 2022.

RED Amendment

The proposed changes to the RED come in two broad categories, the first being structural changes to the legal framework, and the second being more detailed modifications to targets and interpretation of provisions.

Structurally, the RED is proposed to shift away from its current energy-based targets (which mandate the share of renewable energy delivered to different sectors) to emissions-based targets (which mandate reductions in greenhouse gas emissions intensities). Accompanying this is the elimination of many "multipliers" which were introduced to stimulate uptake of certain fuels: now, impetus is given to these fuels through sub-targets, discussed below. If Member States follow the lead of the RED and provide support in proportion to reportable GHG reductions this will have the effect of shuffling the incentive hierarchy for different fuels, and creating a financial incentive to deliver emissions reductions through existing supply chains.

One consequence of this new structure is to place greater emphasis on delivering the lowest possible reportable carbon emissions. If low ILUC-risk production models are associated with demonstrable soil carbon sequestration or utilisation of degraded land, this could place them in an advantaged position. Other elements of the regulatory structure – e.g., excluding certain feedstocks and minimum carbon savings threshold – will be retained.

The Fit for 55 amendments also broaden the *scope* of the transport targets: while the existing RED II considers only road and rail transport, the new package encompasses the aviation and maritime sectors as well; these will be discussed in more detail in subsequent sections. The expansion of scope affects the impact and the level of ambition represented by changes to targets.

The second category of changes includes tweaks to specific targets out to 2030; across the board, the level of ambition has increased, starting with raising the overall renewable energy target from 32% to 40%. Within transport, the proposed revision replaces the 14% renewable energy target for 2030 with a 13% greenhouse gas intensity reduction target compared to a liquid fossil fuel baseline. This revised represents increased ambition as delivering a 13% greenhouse gas intensity reduction is likely to require more than 14% renewable energy content (for example, if renewable fuels are rated with a 70% lower carbon intensity than fossil fuels on average, then the existing 14% renewable energy target would be consistent with a 9.8% greenhouse gas target.

New sub-targets for specific types of fuels have been introduced, and existing ones strengthened, to incentivise supply of advanced biofuels[120] and RFONBOs[121]. The advanced biofuels target has increased from 1.75% of 2030 energy supplied to road and rail segments, up to 2.2% of energy supplied to the whole

[120] "Advanced" designates biofuels made from feedstocks in Annex IX Part A of RED II. These are primarily cellulosic materials and wastes for which conversion technology is not deemed mature.

[121] Renewable fuels of non-biological origin; these include green hydrogen and derived liquid fuels. It may also include green hydrogen supplied to conventional oil refineries.

transport sector; also included are interim targets for 2022 and 2025. The new RFONBO target of 2.6% by 2030 is ambitious, but is only tangentially relevant to low ILUC-risk feedstock production; a more in-depth discussion of RFONBOs, as well as RCFs[122] and electricity used for transport, is given in (Searle, 2021).

As for the food and feed cap, the story is a little more complicated. While the number remains the same (7% maximum contribution on an energy basis), this now applies beyond road and rail to the whole transport sector; thus, the absolute potential for RED-compliant food-based fuel has increased somewhat. Similar considerations apply to the 1.7% cap on fuels from waste oils in Annex IX Part B.

ReFuelEU Aviation

This is a completely new proposal for regulation on aviation fuels. It mandates a target for total 'sustainable aviation fuel' (SAF) volume as a percentage of total aviation fuel use, and a sub-target for aviation RFONBO volume. Fuels supplied to aviation will count towards both the ReFuelEU target and towards the RED targets for GHG reductions in the transport sector. Aviation biofuels must be produced from feedstocks listed in Annex IX of the RED, so as it stands no food or feed crops are permitted as feedstocks. This could have relevance to low ILUC-risk production systems if certified feedstocks were to be added to Annex IX.

The only SAF currently produced at commercial scale is HEFA, which is based on lipid feedstocks. Thus, in the context of aviation, low ILUC-risk certification would be most consequential for oilseeds in the near term. No restriction is placed on the use of waste oils under ReFuelEU, and therefore it is likely that there will be a significant shift of available waste oil feedstocks from the road fuel sector and industrial chemicals to the aviation sector.

FuelEU Maritime

The proposed regulation on EU shipping fuels[123] would impose a schedule of greenhouse gas intensity reductions out to 2050. Standard carbon intensities for fossil marine fuels are included as an annex; this is the only differentiating factor – there are no specific sub-targets to further boost the attractiveness of advanced fuels. Nevertheless, predicating the emissions reduction framework on greenhouse gas intensity would be advantageous low ILUC-risk certification in any situation where ILUC factors are given weight or there are narrative advantages to sourcing material with a high level of sustainability.

Similar to the proposed ReFuelEU Aviation regulation, food and feed crops are effectively excluded from counting towards the targets: biofuels from food and feed crops are to be assigned 'the same emission factors as the least favourable fossil fuel pathway for this type of fuel'[124]; this eliminates any compliance contribution that food-based biofuels may have otherwise have made[125] – and this includes low ILUC-risk biofuels which are by definition made from food-and-feed crops. Given that there is no text in FuelEU Maritime that explicitly allows the ILUC-risk status to trump food and feed status, we must conclude that they are excluded.

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[122] Recycled carbon fuels.

[123] Proposal for a Regulation, COM/2021/562, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:562:FIN

[124] Article 9.1(c).

[125] While it is true that biofuels from one fuel class (e.g. bio-methane) may still have an advantage over fossil fuels from another fuel class (e.g. fuel oil), the fact that other more encouraging markets exist for the biofuel means that there is little scope for widespread allocation of food-based biofuels to the maritime sector.

It is unclear whether and in which circumstances cover crops and secondary crops might be made eligible as these are not (necessarily) food and feed crops, but there remains a degree of ambiguity about how the term 'intermediate crops' will be interpreted.

Task 5.1.2 (Part 1): Institution Mapping

Rationale and Scope

The EU's legal and policy framework for biofuels in general and low ILUC-risk biofuels in particular is mediated and implemented by a range of public institutions. In this section, we focus on those institutions whose influence is rooted in policy or regulation, and which have the power to adopt or promulgate strategies that could support (or create barriers to) the low ILUC-risk concept and value chain (as opposed to biofuels more generally). This requires us to consider mostly public and governmental bodies at the EU and national levels, establishing a menu of the most influential institutions interacting with low ILUC-risk biofuel value chains and climate-positive farming.

The scope of the present work is limited to identifying which institutions are most connected to the top-priority policies from the previous chapter, in order to inform the development of enabling recommendations and ensure that these recommendations are targeted and appropriate to the institutions implementing them.

Methods

Even within the narrow scope defined above, institutions play various roles, including writing policy, allocating finance and other incentives, implementing regulation, and administration. For each BIKE-relevant issue or link in the biofuel value chain, we must list the pertinent institutions and define their roles and place in the decision-making hierarchy. Accordingly, relevant institutions were identified and assessed for their low ILUC-risk relevance, decision making powers and alignment with low ILUC-risk goals:

Low ILUC-risk Relevance	Decision-making Powers	Alignment with Low ILUC-risk Goals
•Institution's level and locus of involvement with the low ILUC-risk system •This informs which institutions to prioritise in the analysis	•Types of influence that the institution has to shape / enhance the landscape for other stakeholders •This informs the types of appropriate recommendations	•Potential for promotion of the low ILUC-risk concept, and possible conflicts •Informs which organisations are likely to be sympathetic to reform

Key Decision-making Institutions

The table below presents characterisations of key EU institutions (for brevity, we exclude national-level agencies and ministries). These include institutions that may be approached in the next phase of BIKE's WP5 with targeted recommendations for enabling the low ILUC-risk value chain.

Institution	*Description*
DG Energy (DG ENER)	***Relevance*** DG Energy prepares and manages energy-related legislation for the European Commission, including the Renewable Energy Directive and associated implementing legislation. In this role DG Energy is responsible for the

Institution	*Description*
	introduction of the low ILUC-risk concept, its place in the RED and the development of guidance for low ILUC-risk certification. ***Decision-making power*** DG ENER is the lead DG for the development of the RED. While EU Commission policy proposals are subject to inter-service consultation, DG ENER has primary responsibility for proposing any amendment to the role of low ILUC-risk certification within the frame of the RED. DG ENER has executive responsibility for the Implementing Regulation on voluntary schemes and low ILUC-risk biofuels, which provides a more detailed specification of how the definition of low ILUC-risk in the RED is to be interpreted and operationalised by certification schemes, within the parameters set by the RED. ***Alignment with low ILUC-risk goals*** DG ENER's position on biofuels in general and low ILUC-risk biofuels in particular is primarily determined by the agreed text of the RED. The RED clearly indicates that it is the goal of the EU to "minimise the overall direct and indirect land-use change impacts", and promoting low ILUC-risk certification is consistent with that goal. This said, the primary policy tools that are used to reduce ILUC emissions in the RED are the cap on the use of food- and feed-based fuels, and the promotion of advanced biofuels. Low ILUC-risk certification is presented in the RED primarily as a basis to exempt high ILUC-risk biofuel feedstocks from limitations on support, rather than as a core tool to reduce the ILUC associated with other food- and feed-based biofuels. Considering that the wider promotion of the low ILUC-risk concept promoted by BIKE would require operationalization of the broader conception of the role of low ILUC-risk certification, DG ENER is an important stakeholder to whom BIKE's recommendations could be addressed.
DG Agriculture and Rural Development (DG AGRI)	***Relevance*** DG AGRI leads the development and implementation of European Commission proposals and policy on agriculture and rural development. It has primary responsibility for the CAP, and a voice in the development of the RED through inter-services consultation within the Commission. ***Decision-making power*** DG AGRI is the primary decision-maker for the CAP, which drives EU agricultural support and is hence central in matters of land use and biomass production[126]. ***Alignment with low ILUC-risk goals*** There are obvious tensions between land use for food versus biofuels; however, ongoing efforts to orient the CAP towards environmental services & stewardship may align well with low ILUC-risk production models which promote sustainable practices. Historically, DG AGRI has been supportive of models of biofuel production that offer financial opportunity to farmers. The

[126] It is also a key contributor to the Farm to Fork Strategy, which is initiated and led by DG SANTE.

Institution	*Description*
	further development of low ILUC-risk production models may therefore have appeal as one way to keep farmers engaged with the biofuel economy.
DG Climate Action (DG CLIMA)	***Relevance*** DG CLIMA leads development and implementation of legislation on climate change and greenhouse gas emissions, including from land use (LULUCF). DG CLIMA is also responsible for supporting climate solutions through the Innovation Fund. ***Decision-making power*** DG CLIMA participates in the development of the RED and agricultural policy through inter-services consultation, and sets the eligibility criteria for projects applying to the Innovation Fund. ***Alignment with low ILUC-risk goals*** The Innovation Fund eligibility criteria state that for applicants with projects the bio-economy must commit to using either feedstocks from part A of Annex IX of the RED, or that are low ILUC-risk certified. DG CLIMA is likely to be most aligned when low ILUC-risk biomass production is coupled with soil carbon regeneration and high carbon intensity reductions. However, there may be a tension in DG CLIMA's priorities between agricultural land use and land use choices such as afforestation that deliver greater carbon storage.
DG Research & Innovation (DG RTD)	***Relevance*** Supports research on clean energy through involvement with Horizon Europe (previously Horizon 2020), LIFE and other research funding mechanisms. ***Decision-making power*** DG RTD is able to set the parameters for the award of research funding under managed programmes. There may be scope to target low ILUC-risk agricultural systems as a funding priority in future calls. ***Alignment with low ILUC-risk goals*** The existence of the BIKE project demonstrates the interest of DG RTD in the low ILUC-risk concept. If it can be shown that low ILUC-risk systems present a significant opportunity to meet EU energy, climate and nature goals, additional funding opportunities are likely to be forthcoming.
Certification Bodies (e.g. ISCC and RSB)	***Relevance*** International private-sector certification bodies develop detailed certification criteria for bioenergy feedstock production. These criteria can reflect both policy and the standard's own goals and judgement – for example most sustainability standards have requirements that go beyond the minimum RED legislative requirements. As the low ILUC-risk certification is expected to be implemented through voluntary standards, they are central to the low ILUC-risk system.

Institution	*Description*
	Decision-making power In one sense, the role of certification bodies is more flexible than that of public authorities. The market for low ILUC-risk certification is likely to be driven by the RED, and therefore standards bodies are likely to carefully implement the rules set out by the Commission in the Implementing Regulation. They do, however, have considerable scope to determine how these requirements will be operationalised in practice, and may thus contribute to making low ILUC-risk certification more (or less) appealing to producers. Given that there may be similar but non-identical categories under other legislation (such as CORSIA) standards bodies may also offer similar certifications that are not directly based on the EU Commission rules, which might be of interest to projects that supply low ILUC-risk material in the broad sense but outside the EU legislative framework (such as cellulosic biofuels). ***Alignment with low ILUC-risk goals*** Certification bodies are likely to be interested in low ILUC-risk certification as a commercial opportunity. Standards with their own non-commercial goals (e.g., the RSB) may also be actively interested in trying to ensure the development of effective and robust low ILUC-risk certification (as opposed to racing to develop minimalist interpretations of legal requirements). Indeed, the RSB offers low ILUC-risk certification prior to the development of specifications by the EU Commission.
International Civil Aviation Organisation (ICAO)	***Relevance*** ICAO is responsible for developing and implementing the CORSIA carbon crediting scheme, which includes “low LUC-risk” concept for bio-based SAF. While CORSIA sets a framework for incentives for alternative fuels in aviation, the value proposition for biofuels is likely to be driven more by national/regional action than by CORSIA itself, as the cost of carbon abatement within CORSIA is likely to be relatively low (i.e., compliance with CORSIA will be worth significantly less in €/tCO2e abatement than compliance with RED). ***Decision-making power*** ICAO decisions are made by consensus vote of ICAO member states, and therefore the direct decision-making power of ICAO as an organisation is limited. The development of protocols for CORSIA is led by technical working groups composed of representatives of ICAO member states and observers (such as the airlines, biofuel industry, and environmental community). However, the ICAO process considered as a whole has considerable decision-making power, and is able to determine the rules for identifying low LUC-risk biofuels and for the crediting of the use of those fuels within the CORSIA framework. ***Alignment with low ILUC-risk goals*** ICAO’s sympathy with the low ILUC-risk concept is apparent from its inclusion in CORSIA. While the regulatory provisions are largely clear, there is room for exploration from the perspective of value-chain actors of how the alignments between EU policy and CORSIA rules may afford flexibility to business models

Institution	*Description*
	and affect the value of certification.
European Climate, Infrastructure and Environment Agency (CINEA)	***Relevance*** A major executive player in the management and award of energy-related EU funding programmes including the Innovation Fund, they are ultimately responsible for finalising and applying project assessment protocols and for packaging funding campaigns. ***Decision-making power*** As an executive agency CINEA has a limited role in policy formation or in setting the parameters for funding calls, and may therefore have limited capacity to support (or hinder) low ILUC-risk biofuels. ***Alignment with low ILUC-risk goals*** Several CINEA-administered programmes would overlap with the research, development, and market stages of low ILUC-risk biofuels; recognition of low ILUC-risk in the details of funding criteria would help to integrate the concept into the mainstream, and it is at least theoretically possible that CINEA could cross-pollinate the low ILUC-risk concept beyond the Innovation Fund.

These institutions, and related institutions at the national level, are candidates for outreach and further discussion to understand what could be achieved with through expanded policy or practical guidance, and hence to refine WP5's recommendations.

Relationships and Thematic Clustering

The relationships between EU institutions were mapped at the overall objective higher level to clarify the potential policy objectives alignment and decision-making hierarchy. Such an analysis is needed to establish the points where a policy intervention could have maximum leverage for the wider uptake of the low-ILUC concept within the European framework. In this respect, an assessment of how the output of one institution's policy can be incorporated into the policy framework of another institution can lead to the formulation of a 'policy implementation pathway'.

The graphic below groups the EU's goal-setting / decision-making institutions around broadly stated objectives. The graphic is not only restricted to the key decision-making institutions presented earlier, but concerns a broader set of institutions that can positively influence (or, at least, do not hinder) the implementation of policies related to the BIKE low-ILUC concept. Such mutual alignments could serve as areas for coalition-building and fostering linkages between institutions: ideally at a level which could promote substantive changes to policy formulation or implementation. This will be explored more fully in subsequent publications by WP5 where policy recommendations are proposed.

Increase renewable energy

- DG ENER
- DG CLIMA
- CINEA
- DG MOVE
- Clean Aviation Joint Undertaking
- Clean Hydrogen Joint Undertaking
- EASA

Foster energy security

- DG MOVE
- DG REGIO
- DG JRC
- Clean Hydrogen Joint Undertaking

Limit land use change

- DG ENV
- DG CLIMA

Rehabilitate degraded land

- DG AGRI
- DG ENV
- DG REGIO

Enhance habitats and biodiversity

- DG ENV
- DG AGRI

Reduce water / air pollution

- DG ENV
- DG SANTE
- Clean Aviation Joint Undertaking
- EASA
- ECHA

Improve soil health and carbon

- DG CLIMA
- DG ENV
- DG AGRI
- CINEA
- DG SANTE

Support Rural Communities

- DG ECFIN
- DG GROW
- DG REGIO
- EISMEA
- DG MOVE
- CoR

Innovate in the bio-economy

- CBE JU
- DG RTD
- DG FISMA
- DG JRC
- EIB
- EIT

Stabilise food production and prices

- DG AGRI
- DG SANTE

Supply chain tracking

- EUROSTAT
- DG RTD
- DG MOVE
- DG JRC

Task 5.1.2 (Part 2): Access to Finance

Rationale and Scope

Low ILUC-risk is a relatively new concept introduced by policymakers, and it has yet to gain much traction or practical consequence beyond a limited slice of the biofuel sector. This means that the opportunities (and uncertainties) associated with low ILUC-risk business propositions may be missed or discounted by financial institutions, which set internal rules for approving and allocating funds to bioenergy projects.

Nonetheless, funding for low ILUC-risk biofuels can be potentially acquired via mechanisms addressing the financing of biofuel projects, subject to fulfilment of the sustainability criteria therein.

This chapter briefly introduces some of the major funding pathways that are available for biofuels projects and can be in principle compliant to the sustainability requirements of low ILUC-risk projects. The focus here is on the characteristics and mechanisms of EU and international funding programmes, and the extent to which the administering institutions are (implicitly) aligned with low ILUC-risk concept.

EU Funding Programmes

Context

Investments to innovative technologies contributing to climate change mitigation are needed to reach EU carbon neutrality targets. However, the deployment of innovative technologies which customarily feature high CAPEX and OPEX, and have not been proven under commercial conditions, is naturally perceived as risky for investors. A supportive and stable regulatory framework, including appropriate financing mechanisms and tools, can mitigate and offset part of this risk.

In order to facilitate investments and the use of existing financing mechanisms, the European Council adopted the Economy Recovery Plan and Multiannual Financial Framework (MFF) for 2021-2027, considering energy policy and, more specifically clean green energy as a cornerstone. The funds can be summarised as follows:

Recovery and Resilience Facility (RRF)[127], with an overall budget of EUR 672 billion (grants and loans), of which EUR 250 billion is available for climate-related reforms and investments, targeted towards SMEs. This can be the main vehicle to front-load reforms and investments related to renewable energy from biomass with high GHG savings. Among the eligible areas for funding, the following are mentioned as the potentially most relevant to the low-ILUC concept: Agriculture and forestry, Bio-based Industries, Biotechnology, Energy, Environment & Climate Action. Member States will prepare recovery and resilience plans that set out a coherent package of reforms and public investment projects. RRF provides a significant degree of freedom to the Member States to opt for their priorities and, in principle, funding can be available along the entire value chain of sustainable biofuels.

InvestEU, with 30% contribution to the climate target, will be the key EU instrument to encourage private capital investments in policy areas essential for achieving the European Green Deal objectives, though supporting key intervention areas such as renewable energy from biomass[128].

[127] Regulation (EU) 2021/241 on establishing the Recovery and Resilience Facility.

[128] Commission notice on the InvestEU Programme climate and environmental tracking guidance, C(2021) 3316 final.

The LIFE Programme[129] is the EU's funding instrument for the environment and climate action. In the new LIFE programme (2021-2027) the Commission proposes €5.45 billion; €3.5 billion will go to environmental projects and the remaining €1.9 billion will be allocated to those on climate action. LIFE also considers the following new sub-programmes: nature and biodiversity, circular economy and quality of life, climate change mitigation and adaptation, and clean energy transition. LIFE calls for proposals are run on an annual basis and following the announcement of the specific priorities (and therefore specific evaluation criteria) under each sub-programme.

Connecting Europe Facility[130], with funds of EUR 5.18 billion proposed for energy infrastructure investments will further support cross-border renewable projects.

Cohesion Fund[131] is part of the European Structural and Investment Fund (ESIF)[132]. A 37% contribution to climate objectives supports investments in projects related to energy or transport, as long as they clearly benefit the environment in terms of the use of renewable energy and biomass.

The European agricultural fund for rural development (EAFRD) focuses on resolving the challenges facing the EU's rural areas. Focus areas include facilitating the supply and use of renewable sources of energy.

Just Transition Mechanism[133], with a contribution of EUR 17.5 billion, focusses on the transition towards a climate-neutral Union economy by 2050. Renewable energy is one of the sectors targeted for investment.

EU renewable energy financing mechanism[134] is a new initiative by the Commission that will make the support for renewables more cost-efficient by pooling the resources and allocating them through competitive EU-wide tenders.

European agricultural guarantee fund (EAGF)[135] for income support schemes, with the remainder dedicated to supporting agricultural markets, with an overall posture favouring climate objectives and renewable energy.

The Innovation Fund (IF)[136] will provide financial support for the demonstration of innovative low-carbon technologies and the modernisation of the renewable energy sector. It is one of the world's largest funding programmes for the demonstration of innovative low-carbon technologies. IF funds are raised via the Emissions Trading System (ETS). Supported projects comprise large-scale projects[137], with a capital

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[129] https://cinea.ec.europa.eu/programmes/life_en

[130] https://ec.europa.eu/inea/connecting-europe-facility/cef-energy.

[131] Regulation (EU) 2021/1058 on the European Regional Development Fund and on the Cohesion Fund. For the 2021-2027 period, the Cohesion Fund concerns Bulgaria, Czechia, Estonia, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

[132] https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en.

[133] Proposal for Regulation on establishing the Just Transition Fund, COM (2020) 22 final.

[134] The mechanism stems from article 33 of the Governance Regulation (EU) 2018/1999.

[135] Regulation (EU) 2020/2220 on the support from European Agricultural Fund for Rural Development (EAFRD) and from the European Agricultural Guarantee Fund (EAGF).

[136] https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund_en

[137] https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund/large-scale-calls_en#overview-of-the-second-call-for-large-scale-project-proposals

expenditure above €7.5 million, and small-scale projects[138] with capital expenditure between EUR 2.5 and 7.5 million. The project promoter has to submit a proposal demonstrating compliance with specific criteria relevant to the degree of innovation and the GHG emission savings. In this respect, projects related to sustainable and advanced biofuels can be eligible for funding. Based on the list of projects that are funded or receiving project development assistance, the following are identified as being indicative examples for consideration in the context of the downstream low ILUC-risk value chain:

- BIOZIN (large-scale project): "The BIOZIN project will build and operate the world's first commercial-scale drop-in biofuel production facility in Åmli, Norway. Shell's proprietary IH2 technology will convert forestry waste and offcuts from the sawmill industry alongside other waste into advanced second-generation drop-in biofuels and biochar (byproduct)."
- W4W (small-scale project): "The project aims to be the first global demonstration of an innovative combination of high performance cryocondenser and methane recovery module technology which generates market compliant biomethane from landfill gas containing more than 10% of air, in countries without any feed-in tariffs. the project has the potential to reduce GHG emissions by 97% in comparison to a reference scenario."
- ALGA3HERO (small-scale project): "ALGA3HERO is implementing a disruptive technology to provide low cost and sustainable biofuel and biofertilizer, using municipal and industrial wastewater as raw material, with water reuse as side product."
- Hiisi I BIOCHAR (small-scale project): "The project will build an industry leading biochar production facility in Finland. Biochar is the product of heating lignocellulosic biomass to a high temperature which fixes the carbon into a stable, functional material. This stores carbon that would otherwise be released via decomposition."
- ZERO CARBON GYPSUM (small-scale project): "The scope of the project is to facilitate a transition of an energy-intensive gypsum plasterboard manufacturing site from natural gas use to renewable on-site generated synthesis gas (syngas) using solid waste biomass as a feedstock."
- GreenTissue (small-scale project): "Novel gasification technology able to produce renewable syngas from biomass feedstock that is compliant with the quality requirements for heat generation in industrial processes."

The **Modernisation Fund**[139] is managed by the EIB and is a dedicated funding programme to support 10 lower-income EU Member States in their transition to climate neutrality by helping to modernise their energy systems and improve energy efficiency. The beneficiary Member States are Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia. Member States select the investments they wish to submit for Modernisation Fund support. No direct applications by project proponents can be sent to the EIB or the Commission. The Modernisation Fund will support investments in: (a) Generation and use of energy from renewable sources, (b) Energy efficiency, (c) Energy storage, (d) Modernisation of energy networks, including district heating, pipelines and grids (e) Just transition in carbon-dependent regions: redeployment, re-skilling and upskilling of workers, education, job-seeking initiatives and start-ups.

[138] https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund/small-scale-calls_en

[139] https://ec.europa.eu/clima/eu-action/funding-climate-action/modernisation-fund_en#:~:text=The%20Modernisation%20Fund%20is%20a,systems%20and%20improve%20energy%20efficiency
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Horizon Europe, the ninth European Research and Innovation Framework programme (2021-2027), with a contribution EUR 13.19 billion to climate neutrality of the energy and mobility sectors, aims to contribute to the transition to climate neutrality of the energy and mobility sectors by 2050 at the latest. Potentially provides support to projects promoting low ILUC-risk fuels on a case-by-case basis and at R&D level.

EIP-AGRI (see also discussion in Section "11. Rural Social Programmes"). The European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) was set up in 2012, as one of five innovation partnerships between the European Commission and the EU Member States. It aims to catalyse innovation in EU agriculture and forestry to produce 'more with less', making these sectors more resilient, sustainable and competitive. The EIP-AGRI is one of the main policy tools at EU level to help put the agri-food sector on a more sustainable path. It does so through funding for innovative bottom-up approaches in the Rural Development Programmes, including activities that support soil functionality and promote the sustainability of bio-based value chains; hence, projects related to the low-ILUC concept could be in principle funded.

Opportunity

In conclusion, financing programmes are available to fund innovative projects that will contribute to reforms and investments related to renewable energy from biomass with high GHG savings. For example, Recovery and Resilience Facility, the Innovation Fund and Invest EU are funding programmes that could promote the promotion of low ILUC-risk fuels projects, in principle at all stages along the value chain and can provide opportunities for development of a friendlier environment for support (e.g. through institutional and policy reforms). Other European funding mechanisms, such as the Horizon Europe, are also available to provide support to projects promoting low ILUC-risk fuels on a case-by-case basis and at R&D level. As mentioned above, there are no specific financing instruments for low ILUC-risk feedstock production. Considering the lack of an explicit mandate to include the low ILUC-risk concept in the relevant EU policy frame, this observation comes as no surprise, and further consultation with EU institutions is recommended for enhancing opportunities for low ILUC-risk projects. A key step in this process will be developing appropriate criteria that would reveal the benefits stemming from the implementation of a low ILUC-risk project, and how they align with the objectives of the funding programme in question. Currently, project-centric funding programmes as the Innovation Fund, appear to constitute the most relevant form of support for low-ILUC risk projects, providing that the proposed projects meet the basic criterion for 60% GHG emissions reduction.

Policy Text

EU Funding programs excerpts which may have relevance to the low ILUC-risk value chain include:

Funding program	Section	Excerpt	Relevance
EU Innovation Fund	Article 3	The Innovation Fund shall have the following operational objectives: (a) to support projects demonstrating highly innovative technologies, processes or products, that are sufficiently mature and have a significant potential to reduce greenhouse gas emissions	A potential low ILUC-risk feedstock project that could demonstrate the required emission savings and innovation degree, would be eligible for funding.

Funding program	Section	Excerpt	Relevance
EU Innovation Fund Call for Proposals[140]	Section 8	Please note that all bio-economy projects shall ensure that the used biomass meets the sustainability requirements of the Renewable Energy Directive. The biomass feedstock must either be listed in Part A of Annex IX of the Directive or be certified as low indirect land use change (ILUC)-risk as defined by Commission Delegated Regulation (EU) 2019/807.	Creates a role for feedstock certified as low ILUC-risk in meeting funding eligibility criteria.
Horizon Europe	8. Climate, Energy and Mobility Work Programme	Destination: Sustainable, secure and competitive energy supply – Several individual calls.	A potential low ILUC-risk feedstock project concept could fit in to the specific call requirements and therefore can be funded after its positive evaluation by the Commission.
Rural Development Programme	Article 5	Union priorities for rural development: (4) restoring, preserving and enhancing ecosystems related to agriculture and forestry, with a focus on the following areas: (a) restoring, preserving and enhancing biodiversity, including in Natura 2000 areas, and in areas facing natural or other specific constraints, and high nature value farming, as well as the state of European landscapes; [...] c) preventing soil erosion and improving soil management.	Support granted to farmers or groups of farmers undertaking agri-environment commitments on agricultural land. A low ILUC-risk project could claim consistency with these aims, in terms of biodiversity and soil management on unused lands; this suggests potential for creating a sub-specification for low ILUC-risk projects that deliver on biodiversity and soils.

European Finance Institutions

European Finance Institutions and donor can also play a significant role in supporting the private sector in developing countries by encouraging entrepreneurial initiatives that help developing countries to achieve sustainable agricultural practices and potential use of renewable biomass energy. Within the scope of this report, the case study of European Bank for Reconstruction and Development (EBRD) is examined in terms of its Strategy, goals and eligibility criteria, while examples of programmes and funded projects on biomass exploitation and valorisation for energy uses from the European Investment Bank (EIB) are also briefly discussed. The rationale for solely focusing on the aforementioned institutions is based on the following fact that EBRD and EIB operates in key European, mostly Eastern European, or neighbouring countries with significant agribusiness sectors.

[140] InnovFund-LSC-2021 Call document: V1.0 – 26.10.2021

European Bank for Reconstruction and Development (EBRD):

The EBRD Agribusiness Strategy[141] recognises that there are links between the agribusiness and energy sectors; this may constitute a key step in setting up any putative financing framework for low ILUC-risk feedstock production. The EBRD Energy Strategy 2019-2023[142] promotes biomass conversion to biofuels in countries with a 'significant agricultural sector, land suited to biofuel cultivation, and/or links to regional biofuel supply chains'. EBRD targets financing for private sector projects in the form of loans or equity in specific countries[143]. Smaller projects may be financed through financial intermediaries or through special programmes for smaller direct investments in the less advanced countries.

Eligibility criteria for biofuels funding derive from a number of sources. Annex K of the Energy Sector Strategy and Annex 3 of the Agribusiness Strategy both require projects to account for impacts on biodiversity and on habitats. The EBRD's Environmental and Social Policy[144] establishes more specific requirements which intersect with a number of policy areas; among these requirements are: a) that the project sponsor has an ability to meet EU principles and sustainability criteria, and has sought to certify its operations to such standards where appropriate; b) that the project sponsor has a land management plan in place; and c) that the project sponsor has evaluated feasibility of seeking internationally recognized industry sustainability certification for its operations and supply chain. These criteria coincide with BIKE's key objectives for the certification and market potential of low ILUC-risk biofuel value chains.

European Investment Bank (EIB):

EIB has an ambitious Energy Lending Policy[145] aiming to contribute to the combat against climate change. In this respect, EIB finances individual projects that are consistent with and support EU policies. In this respect, financing of low-carbon energy supply projects is within the scope of EIB. A key criterion for the involvement of EIB to actually play the role of project facilitator is the proof of the profitability of the proposed project. An example of funding for a second-generation biofuels project is the 2019 Nordfuel biorefinery project[146] in Finland. The project will finance (i) the upgrade of the condensing power plant to a combined heat and power (CHP) plant; (ii) a greenfield advanced bioethanol plant Nordfuel biorefinery second generation biofuels; (iii) a greenfield biogas plant; and (iv) ancillary equipment.

[141] https://www.ebrd.com/documents/agribusiness/agribusiness-strategy.pdf

[142] https://www.ebrd.com/power-and-energy/ebrd-energy-sector-strategy.pdf

[143] https://www.ebrd.com/downloads/research/factsheets/guidetofinancing.pdf

[144] https://www.ebrd.com/documents/comms-and-bis/environmental-and-social-policy.pdf

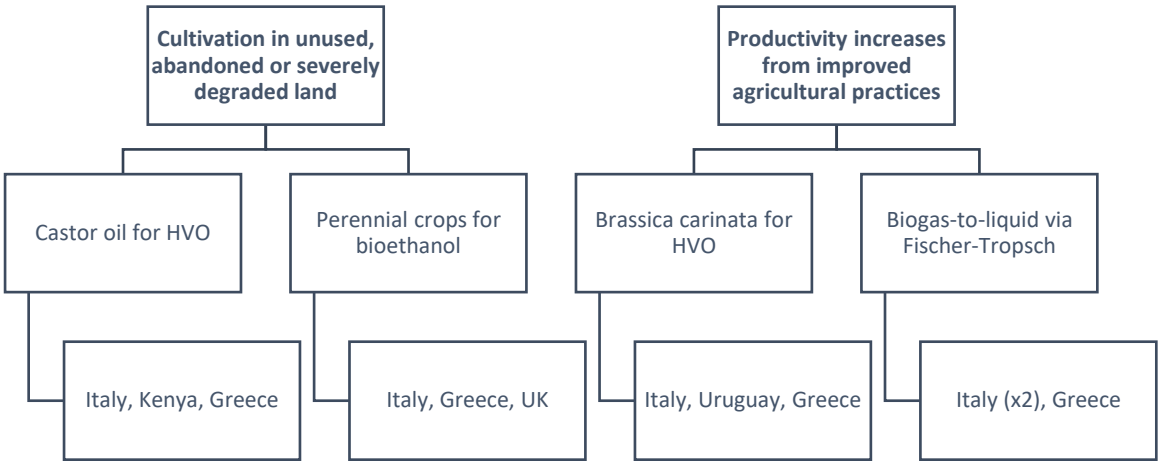
[145] https://www.eib.org/en/publications/eib-energy-lending-policy

[146] https://www.eib.org/en/projects/pipelines/all/20190298

Task 5.1.3: Case Studies

BIKE Work Package 6

BIKE's Work Package 6 (WP6) is responsible for conducting a number of biomass projects in order to develop and showcase good practices for sustainable and additional production. For each of the two low ILUC-risk pathways, two production models are considered, trialled on three plots; this is shown below.



Rationale and Scope

Task 5.1.3, analysed how specific BIKE case studies (see below) relate to the policy and institutional frameworks discussed in the preceding chapters. This serves to further pinpoint potential enabling provisions and bottlenecks for projects on the ground, strengthening the basis for recommendations and essentially facilitating the commencement of the technical work to be performed under Task 5.3.

Methods

The first stage of the analysis consisted of creating and refining a spreadsheet template for gathering standardised information about the case studies. The first part of the template aimed to characterise the projects in detail: including their location, growing season, cultivation techniques, plant varieties used, area and type of land, field parameters for regular monitoring, co-product valorisation, and down-stream linkages.

The second part of the template consisted of questions that tethered the case studies to WP5-related issues. These encompassed policy constraints and support, administrative reporting and registration requirements, on-farm technical hurdles (from piloting new varieties and techniques), logistics, and the availability of finance.

In order to collect the information, discussion with project coordinators and local implementers on the ground was combined with desk research. The tasks were distributed among WP5 members; here we present a summary based on the high-level information collected so far.

The section below presents the BIKE case studies analysed, organized per country – Greece, Uruguay, Italy, and Kenya.

Results

The section below presents key information for each BIKE case study, organized as cases studies per country, based on the available data so far. It is noted that the information logging exercise for the BIKE case studies will be active until the end of the project, and most notably within the activities of Task 5.3.

Castor Bean and Switchgrass in Greece

	Case study on castor bean in central Greece	Case study on switchgrass in central Greece
Key characteristics of case study	**Castor bean for oil for HVO (unused, abandoned or severely degraded lands)** **Location of the study:** Volos **Soil type:** The soil is characterized as clayey. **Crop growing season**: The crop was established on April 24th,2021 and the castor crop was terminated on August 27th. **Harvesting period:** The harvesting performed manually on September 15th, 2021. **Products & coproduct and their use:** 1. Castor oil 2. Castor bean seed cake for biofuel or animal feed 3. Straw that is not recoverable and without added value **Yield:** The average seed yield was 1,241 kg per ha (fresh weight). The straw yield was 590 kg per ha. **What innovation makes this a candidate low ILUC-risk project:** Castor bean produces a non-edible oil suitable for production of HVO that can be produced in low quality soils in relatively dry conditions. Castor bean plantations on unused, abandoned or severely degraded land would therefore potentially be eligible for low ILUC-risk certification.	**Perennial lignocellulosic crops for advanced biofuels (unused, abandoned or severely degraded lands)** **Location of the study:** Aliartos **Soil type:** The soil is characterized as sandy. **Crop growing season:** The crop was established in 1998 and is still ongoing**.** **Harvesting period:** Manually several times when the racemes were ready. **Products & coproduct and their use:** cellulosic ethanol for heat through direct combustion **Yield:** Dry biomass yields 12 t/ha (of 20 years); top yields were recorded in year 2 & 3 **What innovation makes this a candidate low ILUC-risk project:** Perennial switchgrass can be produced on low quality land, delivering a biomass yield while supporting soil recovery and soil carbon enhancement. Switchgrass plantations on unused, abandoned or severely degraded land would therefore potentially be eligible for low ILUC-risk certification.
Operating partner/company name	1. CREA Research Centre for Engineering and Agro-Food Processing, www.crea.gov.it 2. Non-Food/Energy Crops Biomass Department of CRES Center for Renewable Energy Sources and Saving, http://www.cres.gr/	Non-Food/Energy Crops Biomass Department of CRES Center for Renewable Energy Sources and Saving, http://www.cres.gr/

	Case study on castor bean in central Greece	Case study on switchgrass in central Greece
	3. University of Thessaly, Department of Agriculture, Crop Production and Rural Environment, www.agr.uth.gr Landowner (experimental case study): University of Thessaly, Department of Agriculture, Crop Production and Rural Environment	
EU Policies issues	**Specific provision of interest of Regulation (EU) 2018/1999 Governance of the Energy Union and Climate Action (National Energy and Climate Plan)[147]:** Focus will be given in the following period on the transition from current conventional energy uses of biomass to more energy-efficient and cost-effective applications over the entire spectrum of the Greek economy, with emphasis placed on sustainability criteria and sustainable management. **Flagship policies which are being planned currently consist in promoting advanced biofuels and utilizing the production of biomethane by feeding it directly into the natural gas network**. With regard to the promotion of the use of biomass-derived energy, the relevant thematic section on the agricultural sector proposes specific measures for meeting the political priorities concerned.	
National Policies issues	**Specific provision of interest of Greek strategic plan for the new common agricultural policy (SS CAP), the programming period 2023-2027[148]. Specific issues that resulted from national framework high-level analysis:** 1. Regarding the provision for compensation for legal entities and individuals for farming in Areas facing natural or other specific constraints (ANC) areas and mountains area, it is not clear whether the low ILUC-risk projects are eligible. 2. There is provision in the strategic plan for training programs that arise from needs / challenges such as competitiveness, climate change, protection natural resources (water, soil), biodiversity, plant protection (…), however in the absence of explicit recognition of the low ILUC-risk concept it is not clear if associated awareness/information actions will be sufficient for farmers to mobilize for low ILUC-risk projects.	
	Specific provision of interest for Law for categories and land uses (Governmental Gazette 114A/29-06-2018)[149]:	

[147] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018R1999

[148] Greek strategic plan for the new common agricultural policy (SS CAP), the programming period 2023-2027.

[149] http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20180100114

	Case study on castor bean in central Greece	Case study on switchgrass in central Greece
	In agricultural land of high productivity are not allowed other uses except the agricultural exploitation – agricultural activity, in the sense of law 3874/2010 (A '151)[150] as in force, unless they are provided by a special provision of law and are in accordance with the directions of spatial planning. Specific issues that resulted from national policy high level analysis: 1. There is no specific mention for energy crops. It is needed to be clarified whether the energy crops belong to agriculture activities 2. It needs to be clarified whether any restriction is applied for energy crops and high productivity land.	
Technical issues	1.Due to high toxicity of the castor bean seeds, the harvesting machines should be cleaned exhaustively before their next deployment for food/feed crops harvesting 2. Case studies have been developed within an experimental investigation framework and on the basis of special permissions granted for the particular cases; since these are outside of the main relevant regulatory frame, scaling up the production pathways in future will require more robust oversight for compliance from regulators.	
Administrative issues	1. CAP 2023-2027 has been transposed into Greek Strategic Plan that mentions the Areas facing natural or other specific constraints (ANCs), it is not very clear whether low ILUC biofuels are not clearly included. 2. No specific national policies for low ILUC projects yet 3. To be confirmed that the proposed compensatory aid is sufficient for low ILUC projects 4. No specific actions for awareness/information for farmers to mobilize for low ILUC projects	
Funding issues	Among the available funding tools e.g., funding for crops restructuring under RRF mechanism, Invitation for the young farmers, it is not clearly mentioned if low ILUC projects are eligible.	

[150] http://www.et.gr/api/DownloadFeksApi/?fek_pdf=20100100151

Brassica in Uruguay

	Brassica oil in Uruguay
Key characteristics of case study	**Brassica oil crops for HVO (as a cover crop, in rotation systems with conventional crops)** **Location of the study:** UPM is annually cultivating around 15 000 ha in winter season in Uruguay. The specific farms and plots for the pilot will be selected when contracts with farmers for the next season are closed. **Land type:** Agricultural land (usage outside of main season) **Study details:** UPM's purpose was to introduce an additional cover crop for the winter season (May-Nov/Dec) once every three years rotation. The aim is to replace non-productive green cover in the rotation by introducing productive brassica oil crops. This means that more efficient use of existing land is achieved, leading to higher yields per hectare. Simultaneously, there are no market mediated responses triggering demand for additional land, which would lead to land use change. **Plot size:** This info varies on annual basis depending the contract with farmer and land selection that RED II requires **Products:** Oil and meal. Oil is used for HVO, and meal is used as a food/feed. **Yield:** 1,6 tn/ha *Farm yields are calculated taking into account the volume already dry and clean (silo level) and the average meal yield 54% and oil yield around 44%. **What innovation makes this a candidate low ILUC-risk project:** UPM operates in Uruguay already some years. In the Uruguay case the additionality came from the fact that earlier farmers had shorter/different winter rotation. Typically, they used to have barley/wheat/green cover. The first challenge for UPM was to promote the possibility to replace the green cover with productive oil crops. It wasn't straightforward because productive oil-crop farming requires more work from the farmers (fertilizing/harvesting etc.). Also, during the winter season there is increased risk of low yield and other losses are likely due the weather conditions. Therefore, it has been judged that using incentives like the ESCA (i.e. emission savings from soil carbon accumulation via improved agricultural management) element in EU Renewable Energy Directive would be necessary to be able to reduce the financial risk of taking into usage of new cover crop farming in the winter season and be able to convince farmers to make changes to their rotation.
Operating partner/company name	UPM is the first collection point (operator) and typically sign contract the farmers on an annual basis. The farmers are selected with right rotation year (replacing green cover every third year).

	Brassica oil in Uruguay	
EU Policies issues	EU Renewable Energy Directive and GHG Emissions Savings from Soil Carbon Accumulation via Improved Agricultural Management (ESCA) has been important mechanism to start the cover cropping and provide feedstock with good GHG reduction value to the European biofuel market. UPM case study has a main focus to provide EU RED compliant feedstock for European biofuels market. Hence, the requirements in EU RED have been relevant for this project.	
National Policies issues	There is no national relevant legislation for low ILUC-risk projects.	
Technical issues	**During sowing to harvesting phase** Both Brassica oil crops used do not require any very specific operation. The main challenges are related to the weather conditions during the winter season in Uruguay. Sometimes e.g. heavy rains or frost are impacting very negatively to the yield. Second possible difficulty is to adjust the length of the season to be good match with the main crop season (soy/maize). Especially Brassica carinata has a bit longer growing season in comparison than Brassica napus and in some areas it may lead to a shortened season for the main crop whick would impact the main crop yield.	**During conversion phase** No major difficulties, Brassica carinata has some small quality changes compared to Brassica napus which may require some additional purification/processing but those have been quite minor. Basically, from both brassica crops it is possible to produce good HVO and in addition the meal is another valuable product produced mainly for feed production purposes. Sometimes the storage capacity has caused additional burden because due to the small processing differences require carinata and napus to be kept separately.
Administrative issues	Generally, the main challenge is that low-ILUC certification is still undeveloped and there are no clear incentives to apply low-ILUC certification for those operators that are not specifically in a risk of falling into High-risk of ILUC category (i.e. palm oil). From an operator point of view, it is very much needed that new low ILUC risk land operations are better recognized and incentivized by regulations to make them feasible and give a push to the development of positive regenerative land use concepts.	
Funding issues	UPM hasn't utilized any public funding and are not aware of any upcoming funding tool.	

Biogas Done Right (BDR) and Miscanthus in Italy

	Case study on Biogas Done right Model (BDR) in Calabria-Italy	Case study on Miscanthus in Lombardy-Italy
Key characteristics of case study	**BDR model for liquid biofuels for road, aviation and maritime from decentralised and distributed biomethane production through centralized FT or synthesis (in rotation systems with conventional crops)** **Location of the study:** Calabria, Fattoria Della Piana, Candidoni, Calabria **Soil type:** The soil is characterised as clayey. **Plot size:** The farm acquired 103 hectares of abandoned land in 2012 and is still ongoing**.** **Weed control:** Farmers have adopted chemical weed control by applying *Lumax* (Syngenta) on Corn and *Biatlon* on grain). **Fertilisation**: Application of 200m^3/hectare of bio-digestate (composite of energy crops like corn, by-products like olive paste and agricultural wastes like manure) as fertilisers to improve the soil nutrients/quality. **Harvesting period:** Using New Holland Harvester in September silage corn and March grain. **Products & coproduct and their use:** • Corn P2088 (Pioneer), DKC6752 (Dekalb). • Grain Ludwig (Allseeds) **Yield:** Corn average 50 tons/hectare • Grain averages 30 tons/hectare. **What innovation makes this a candidate low ILUC-risk project:** By producing a second biomass crop outside the main growing season the biogas done right model can increase the effective yield per hectare of land.	**Perennial lignocellulosic crops for advanced biofuels (unused, abandoned or severely degraded lands)** **Location of the study:** Lombardy; geographical coordinates: 45°18'49.1"N 8°43'38.8"E; 45°18'03.5"N 8°46'35.1"E **Soil type:** The land used for miscanthus production was not previously used for food production as it was not considered suitable by the farmers. **Harvesting period:** Mechanical using traditional maize harvester and a dumper to produce miscanthus chips. Additionally, it's possible to produce miscanthus bales (round bales or high-density bales) with a baler used for straw. **Products & co-product and their use:** Biomass is the only product (as chips or high-density bales) **Yield:** Fresh biomass production (t/y): 20-25 t/ha • Quality (composition, average moisture): 22% **What innovation makes this a candidate low ILUC-risk project:** Perennial miscanthus can be produced on low quality land, delivering a biomass yield while supporting soil recovery and soil carbon enhancement. Miscanthus plantations on unused, abandoned or severely degraded land would therefore potentially be eligible for low ILUC-risk certification. **Farm Size:** 3 Ha

	Case study on Biogas Done right Model (BDR) in Calabria-Italy	Case study on Miscanthus in Lombardy-Italy
Operating partner/company name	Consorzio Italiano Biogas (CIB)[151]	Planeta Renewables s.r.l.[152] Renewable Energy Consortium for Research and Demonstration[153]
EU Policies issues	RED II Green Deal: Farm to Fork Strategy Green Deal: EU Biodiversity Strategy for 2030 **Specific provision of interest:** Nutrient Management "… reducing nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility. This will result in the reduction of the use of fertilizers by at least 20%"	
National Policies issues	The Legislative Decree No. **199 of 8 November 2021**[154] *implementing Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources* **The specific provision of interest:** 1. The legislative Decree also introduces new rules on incentives for the production of biomethane, through the recognition of an **equal tariff for both transport and other uses**, which will be determined and regulated by an implementing decree of the Minister for Ecological Transition, which must also provide for the cumulation of the tariff with the capital contribution of funds allocated by the NRRP (National Recovery and Resilience Plan[155]) and for coordination until 30 June 2026 with the measures relating to biomethane used in transport provided for by the Ministerial Decree of 2 March 2018.	

[151] https://www.consorziobiogas.it/

[152] https://planetarenewables.com/

[153] http://www.re-cord.org/

[154] https://www.gazzettaufficiale.it/atto/serie_generale/caricaDettaglioAtto/originario?atto.dataPubblicazioneGazzetta=2021-11-30&atto.codiceRedazionale=21G00214&elenco30giorni=false

[155] https://italiadomani.gov.it/en/home.html

	Case study on Biogas Done right Model (BDR) in Calabria-Italy	Case study on Miscanthus in Lombardy-Italy
	2. Legislative Decree 199/2021 contains incentive measures and **a series of measures to simplify authorisation procedures**, including those relating to works functional to the production of biomethane, with reference to infrastructures for connection to the grid and conversions involving non-substantial changes.	
	The Legislative Decree No. **199 of 8 November 2021** Ministerial Decree of 2 March 2018[156]. (Decree for the biomethane production) **The specific provision of interest:** 1. The Decree provides measures for biomethane injected into the natural gas grid without a specific intended use - Guarantees of Origin (art. 4). 2. Biomethane injected into the natural gas grid to be used in the transport sector (art. 5) 3. Advanced biomethane is injected into the natural gas grid with the obligation to connect third parties (art. 6) 4. Advanced biofuels other than biomethane are subject to special provisions (art.7). 5. The total amount of biomethane that can access the provisions of the Decree is 1.1 billion SCM/year.	
Technical issues	There are no particular difficulties. The procedure used in the BDR model is a procedure already tested and used by many CIB farmers in Italy but also in other countries. **The only difficulty is that you have to manage the timing and sowing and harvesting sites well, which obviously are a bit more complex than typical crops and it is important to use more efficient machinery**. However, these difficulties can be easily overcome with adequate planning and pay off widely both in terms of sustainability and yield for the farmer.	The part relating to the conversion into a biofuel suitable for aviation is a theoretical part managed by RE-CORD. This conversion process is therefore only hypothetical for this case study – the produced biomass during the trial period will not be converted to aviation fuel. It is also essential to specify that the conversion part is easily applicable to any case study as biomethane, once introduced into the natural gas network, can be easily transported anywhere and then converted into Biofuel for aviation with the Fischer-Tropsch process wherever methane is taken from the network.
Administrative issues	**Certification** There are no particular problems in our case study. It is abandoned or degraded land and it should not be difficult to obtain recognition	

[156] https://www.mise.gov.it/index.php/it/normativa/decreti-interministeriali/decreto-interministeriale-2-marzo-2018-promozione-dell-uso-del-biometano-nel-settore-dei-trasporti

	Case study on Biogas Done right Model (BDR) in Calabria-Italy	Case study on Miscanthus in Lombardy-Italy
	RED II has been transposed into the Italian National Resilience and Recovery Plan under ***Legislative Decree No. 199 of 8 November 2021***, *implementing Directive (EU) 2018/2001 of December 2018 on the promotion of the use of energy from renewable sources (RED II Decree).* **Circular economy interventions:** Alongside the incentive measures for biomethane production, the new Decree also regulates the recognition of a capital contribution equal to 40%, again from NRRP funds, for the implementation of a series of interventions "**complementary**" to biomethane production. Eligible interventions include the dissemination of agro-ecological practices (minimum tillage, digestate distribution, creation of consortium poles for the management of digestate and effluents), the replacement of obsolete agricultural vehicles with vehicles fuelled exclusively by biomethane and the upgrading of biogas plants for efficiency gains that cannot be converted to biomethane.	
Funding issues	**Available funding** **1. Ministerial Decree of 2 March 2018**. (Decree for the biomethane production: the decree specifies that the sub-target for advanced biofuels must be fulfilled for 75% by biomethane and for 25% by other advanced biofuels. The respective shares will be reviewed every two years. – if the case study would be converted in biomethane, as only biomethane injected into the natural gas grid can access to the support mechanisms). 2. **National Recovery and Resilience Plan (NRRP)** For plants that come into operation by 31 December 2022, it will be possible to opt for either the mechanism provided for in the Decree of 2 March 2018 or the new one provided for in the new Decree. ***Financial risks for biofuel plants (lack of resources, climate conditions etc.)?*** *There is an existing business model to produce biogas and biomethane for injection into the grid, which is already well supported by national policy and therefore is not associated with strong financial risks. The additional processing step of conversion of biomethane in to advanced liquid biofuels relies on technology that is not widely demonstrated at commercial scale, and is therefore subject to the technology risks and investment challenges common to other cellulosic biofuel production projects.*	

Castor Bean in Kenya

	Case study on castor bean – Makueni, Kenya
Key characteristics	**Castor bean for oil for HVO (unused, abandoned or severely degraded lands)**

	Case study on castor bean – Makueni, Kenya
of case study	**Location of the study: Makueni Kenya** **Soil type:** The soil is characterised as clayey. **Crop growing season**: Rainy seasons (October-November & March-April) **Harvesting period:** The first harvest period is scheduled for June 2022 and is projected to be recurring every two months. **Products & co-product and use:** 1. **Castor seeds** for oil production 2. Residual cake. The residual castor cake will be used as soil enricher (NPK 5-1-1) upon verification of Health, Safety and Environmental (HSE) requirements. The cake is approximately 50% in mass of the oilseeds, with a residual oil content of 5-7%. **Yield:** projected seed yield of 1500-2500 kg/ha with oil yield amounting to 40%-50%. The oil quality is projected to be 85% ricinoleic, 5,4% linoleic, 3,2% oleic, and other fatty acids, whereas the cake is: 50% C, 7% H, 5% N, 32% O, 7% ash. **What innovation makes this a candidate low ILUC-risk project:** Eni considers the Castor production as an option to restore and put into use large areas of arid and semi-arid land that are currently not able to deliver an agricultural crop.
Operating partner/company name	Eni is the implementing partner in collaboration with the Ministry of Agriculture.
EU Policies issue	The EU Renewable Energy Directive creates the market for HVO, and the identification of palm oil as high ILUC-risk has encouraged the development of alternative feedstock supply chains.
National Policies issues	There is no relevant legislation for low-ILUC projects but only general national plans and strategies on biofuel and forest degradation as outlined: • Kenyan Energy Act 2019[157]:Promoting the use of renewable energies • Kenyan Bioenergy Strategy (2020-2027)[158]: Case study of working model

[157] http://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/2019/EnergyAct__No.1of2019.PDF

[158] https://repository.kippra.or.ke/bitstream/handle/123456789/3017/Bioenergy-strategy%202020-2027.pdf?sequence=1&isAllowed=y; this is the inaugural bioenergy strategy for Kenya, whose aim is to set forth guidelines, approaches and identification of strategic interventions that promote the development and sustainable utilisation of bioenergy resources between 2020-2027. Under biodiesel feedstocks, castor and croton are among the identified sustainable non-food agri-feedstocks which are also drought tolerant.

	Case study on castor bean – Makueni, Kenya
	• National Energy Policy (2018)[159]: 3.5 BIOFUELS (3.5.4) • National Climate Change Action Plan (NCCAP)2-18-2022[160]: Reduce Deforestation and Forest Degradation
Technical issues	Not yet documented, as the first evaluation will be done at the end of June.
Administrative issues	Kenya has transposed the REDD+ to its National Climate Change Action Plan: Reduce Deforestation and Forest Degradation, but there are no specific provisions for low ILUC-risk.
Funding issues	Currently there are no mechanisms available to explicitly support low-ILUC project. However, specific provision might be possible to be considered with the REDD+ programme in Kenya (determination of the exact nature of the incentive would require further analysis)

[159] https://kplc.co.ke/img/full/BL4PdOqKtxFT_National%20Energy%20Policy%20October%20%202018.pdf

[160] http://www.environment.go.ke/wp-content/uploads/2020/03/NCCAP-2018-2022-v2.pdf

Conclusions

Policy Environment

In one form or another, the low ILUC-risk concept is over a decade old now. The definition first entered the RED in 2015; since 2018 low ILUC-risk certification has had a defined role in the RED II, elaborated in the Delegated Regulation for ILUC-risk feedstock (2019); and the Implementing Regulation on voluntary schemes and low ILUC-risk certification (2021) lays out a basis for the inclusion of low ILUC-risk certification modules by existing biofuel sustainability standards. Despite this evolution of the policy environment supporting the shift from concept to implementation, low ILUC-risk biofuel is, arguably, not yet a mature concept. Practical certification requirements still need to be finalised (this is addressed under BIKE's WP1) and the economic value proposition of low ILUC-risk certification remains unclear. Indeed, work on low ILUC-risk pilot projects for DG ENER[161] has identified the lack of a clear value signal as a barrier to demonstrating additionality. More than either of these issues, a tension remains between the broad vision for low ILUC-risk certification that was envisaged by its progenitors and the narrowly prescribed role for low ILUC-risk biofuels as a way to avoid high ILUC-risk classification in the RED framework. The BIKE project sees the opportunity for more sustainable low ILUC-risk systems as much broader and more important than simply being a way to identify responsible palm oil production systems. Given this dissonance between the wide vision for low ILUC-risk and its narrowly prescribed role in current policy, questions remain as to the scalability of low ILUC-risk production, and hence its long-term relevance as a policy instrument.

The goal of the BIKE policy analysis exercise (Task 5.1.1) was to examine where support for low ILUC-risk production pathways can be found not only explicitly but also implicitly in the existing legislation ecosystem. That required consideration of which policy instruments might provide support for *the sort of agricultural innovation* that could achieve low ILUC-risk certification. The answer to this question is necessarily somewhat hypothetical, as alignment between the low ILUC-risk concept and policy goals in other EU legislation is not exact; nevertheless, it is possible to identify some promising complementarity and opportunity in the EU policy space.

The most promising regulatory window in the short term is the provision in the RED II itself, which gives Member States agency to regulate biofuels differently on the basis of their estimated ILUC emissions. This freedom has already been used by some Member States to curtail the use of soy oil as a biofuel feedstock[162], and accelerate the curtailment of palm oil[163]. There is an opportunity, therefore, for low ILUC-risk certification to not only exempt genuinely sustainable feedstock from restrictions such as these, but also to benefit from positive policy support from governments who believe it could contribute to their broader environmental agenda.

Besides this, low ILUC-risk production intersects with a number of policy goals and themes outside of the energy sector. For example, introducing fast-growing cover crops during fallow periods of the crop rotation can produce additional biomass for energy, while also (potentially) bringing side-benefits for biodiversity, soil health, fertiliser runoff, pesticide use, and local jobs; all of these are covered by different

[161] https://iluc.guidehouse.com/

[162] Although at the time of writing we are not aware of any official statement from the Commission on these measures.

[163] See Footnote 13.

parts of EU law. Indeed, the CAP introduces incentives for farmers to adopt increasingly conservation-oriented land management practices such as crop rotations and catch crops, which interlock with other legislation such as the Nitrates Directive and Farm to Fork Strategy to create an enabling environment for sustainable cropping systems. These are likely to encompass production models of the kind that would be employed by low ILUC-risk projects, though the link between these and financial support will have to be integrated more explicitly into the CAP and other policy texts in order to boost confidence in the low ILUC-risk business case.

Similarly, bringing genuinely unused or unproductive land online for agricultural activity aligns well with policy goals for rehabilitating degraded soils and for invigorating rural economies with diversified activities. As the primary funding instrument for the agricultural sector, the CAP once again has a large role to play: particularly through its support of agricultural measures in "areas with natural and special constraints", which will need to be streamlined against the RED II's unused and abandoned land definitions in order to create a coherent enabling framework for low ILUC-risk. Investment in land couples with rural development programmes which seek to provide infrastructure and overcome other economic barriers in rural areas. In the context of the bioenergy sector, this could include extension services, transport infrastructure, the facilitating of downstream market linkages, and promoting agricultural livelihoods more generally. Since such measures are typically applied at the national or sub-national level, there is room to tailor them to local conditions and production models to create a favourable business narrative, and such opportunities will have to be explored in more depth.

Finally, recent EU initiatives under the Farm to Fork Strategy and elsewhere have promoted avenues for greenhouse gas abatement and draw-down through soil management in the farming sector. These intersect with the existing RED II carbon intensity bonus for biofuels grown on land with demonstrated increases in soil carbon stocks. Sustainability-oriented farming and land preparation techniques such as crop rotations and carbon enrichment can create a number of overlapping benefits at the farm level, and are natural allies to low ILUC-risk production pathways. The low ILUC-risk concept could be explicitly recognised in carbon removal strategies at both the EU and the Member State level.

While this report has focussed more on the existing provisions which may cultivate and promote low ILUC-risk value chains, within the policy landscape there are naturally potential conflicts between different sectors for the finite resources of land, water, labour, money, and administrative capacity. For instance, there is the tension between agriculture (whether for food, fibres, or bioenergy) and other land use sectors such as forestry and protected natural areas; or between the use of agricultural inputs and water for irrigation with a need to minimise environmental pollution and conserve resources. The current policy framework around low ILUC-risk feedstock – i.e., the RED II Article 29 and the Delegated Regulation on ILUC risk – applies important ecological and sustainability safeguards to forestall some of the major issues. However, it is fair to expect that expanded or intensified agricultural production, even under the banner of the low ILUC-risk concept, will have a variety of impacts on resource allocation and the natural world. The adoption of a coherent approach to land use which maximises environmental and social benefits must therefore be a matter of ongoing evaluation and refinement.

Institutional Environment

Review and analysis of the policy framework has revealed the fact that the low ILUC-risk concept touches upon several policy instruments, whose primary focus can lie on different policy areas. This situation can result in practical difficulties when the implementation of a new dedicated to the low ILUC-risk concept policy comes at stake. Within this work package, and following the policy analysis previously presented, the respective institutional framework has been also studied with respect to assessing institutional

challenges in promoting the low ILUC-risk concept given existing institution posture and possible conflicts with their other goals.

RED has been identified as the main legislative document affecting the BIKE low ILUC-risk concept and DG ENER has primary responsibility for proposing any amendment to the role of low ILUC-risk certification within the frame of the RED. Further, and considering that the low-ILUC risk concept touches upon issues relevant to the entire biofuels value chain, there is a need for harmonization of scattered policy items under the responsibilities of various institutions. As the low ILUC-risk concept is very closely related to land use and soil health and management issues, DG AGRI can also have a vital role. DG CLIMA is also likely to be most aligned when low ILUC-risk biomass production is coupled with soil carbon regeneration and high carbon intensity reductions.

Other European institutions can also contribute the proportion of the low-ILUC risks concept with the first action being explicit consideration of the concept in their policy objectives. It is finally important to develop mutual alignments between institutions to foster linkages at a level which could promote substantive changes to policy formulation or implementation.

Access to Finance

Analysis of the current EU framework with respect to available funding for projects pertinent to the advanced biofuels area, and therefore to the low-ILUC risk concept, suggests that funding is, in general, available either (a) to finance profitable business cases in the private sector, or (b) to support relevant policies and programmes (such as for instance, the development of the needed regulatory framework) in the public sector.

Focusing on the former, which is closely related to the BIKE project concept, the currently available financing tools and instruments allow for financing of an advanced biofuel plant that already considers the supply of a low ILUC-risk feedstock, where the promoter has already internalized the parts related to sustainable feedstock supply, and there are no tools focusing on low ILUC-risk. As far as potential public programmes are concerned, it can be expected that the promotion of awareness for benefits of low ILUC-risk projects, including crop yield increases, soil health, reinforcement of farmers revenues, etc., could indeed support the wider exploitation of the low ILUC-risk concept.

Overall, and considering the specificities of low ILUC-risk projects, that can essentially touch on both the agriculture and energy sectors, it can be argued that an explicit reference of the low ILUC-risk concept in either the existing or new, dedicated, financing instruments is needed to boost funding of low-ILUC risk projects along the entire value chain.

Case Studies

The BIKE case studies have been analysed, on the basis of the up-to-date available information, with respect to the policy and institutional frameworks discussed already. The analysis aimed to further pinpoint potential enabling provisions and bottlenecks for projects on the ground, strengthening the basis for recommendations and essentially facilitating the commencement of the technical work to be performed under Task 5.3.

The analysis reveals that the over-arching EU renewable energy policy frame constitutes the main regulatory driver for the realization of the cases studies. In particular, the RED II as the main driver for the consumption of renewable fuels in transport, and the Green Deal as the basis for expanded aspirations for enhanced biodiversity appear as the main EU policies that are considered most relevant by the case study developers. There is no evidence that the other more tangentially relevant policies identified here

have been given any strong consideration by the case study developers, which supports the conclusion that at present there is no clear understanding among value chain participants about how the broader constellation of environment and energy policies may support a low ILUC-risk business model. At present, national legal frameworks appear to add little to the overall motivation for the initiation of a low ILUC-risk case, which remains predicated on the EU-level opportunity. This is consistent with the understanding that no EU Member State has yet taken advantage of the flexibility of the RED to develop a stronger support system for low ILUC-risk fuels.

Going forward, national frameworks could help to crystallise the value proposition for low ILUC-risk value chains by adding explicit incentives for non-palm-oil feedstock systems, and will influence the degree of flexibility that a low ILUC-risk case promoter can enjoy in implementation. It is also clear that the alignment of the national frameworks with the particular conditions in the local market (for example in terms of the types of the local capacity for feedstock processing, the low ILUC-risk crops that could be viable in local conditions, the local availability of unused land and any local permitting requirements) is an important parameter influencing the establishment of a viable business case.

Finally, there are no targeted funding mechanisms for low ILUC-risk cases. This leads to a situation where several case studies are related to academic projects for which it is naturally difficult to establish a clear picture of their potential marketability.

Next Steps

Building on the findings of this report for BIKE's Task 5.1, WP5 will now begin to explore the following areas.

Enabling Policies

This work will feed directly into the activities of Task 5.2 and 5.3, both of which will require continued analysis of the EU policy framework and potential levers therein. The outcome of both Tasks will be more specific identification and characterisation of enabling policies for the low ILUC-risk biofuel value chain. Task 5.2 will adopt a "top-down" approach, following up on the high-level policy findings presented here, and engaging the other BIKE WPs for further input and discussion on overlapping policy issues to pinpoint (and where possible to quantify) impacts along the value chain. Results and conclusions emerging from other Work Packages will be fed into the analysis. Task 5.3, on the other hand, will adopt a "bottom-up" approach, seeking to generalise findings from the BIKE Case Studies and other sources, and use them to test and validate the conclusions of Task 5.2. In combination, these two work-streams will allow the development of WP5's policy recommendations for appropriate promotion of the low ILUC-risk concept, and facilitating market uptake of sustainable low ILUC-risk biofuels.

Transferability Matrix

The “Transferability Matrix”, central to Task 5.3, will be an opportunity to generalise results from BIKE’s case studies to low-ILUC risk biomass projects more broadly. The primary characteristics of each case study – such as, crop/feedstock types and cultivation practices, additionality pathways and yield projections, harvesting techniques, agro-ecological zone, land type, co-products, and logistical arrangements – can be presented in a way to emphasise potential overlaps, pointing at the same time to common principles towards the development of a low-ILUC concept supporting framework.

Institutional Engagement

The conclusions so far will be wrapped-up as preliminary policy recommendations and will be circulated to targeted officials at the key institutions identified in this report as part of a strategy to initiate dialogue on the topic. The focus will be on EU-level bodies as the primary agenda-setting actors, but selected national decision-makers might also be considered so as to allow from a more practical and at the ground point of view. This engagement will have a number of aims, including: sensitising the institution to the possible relevance of low ILUC-risk to their purview; gauging the level of enthusiasm and alignment with the overall objectives of the low ILUC-risk concept; highlighting practical areas of disagreement or conflict with existing systems; and assessing opportunities for inter-institution collaboration.

Recommendations

On the basis of the present work and anticipated further research, WP5 will endeavour to issue recommendations for creating an enabling environment for legitimate low ILUC-risk projects. Recommendations will be primarily targeted to: (i) opportunities for value-chain stakeholders to interpret and leverage existing policy; (ii) opportunities for decision-makers to officially clarify and expand existing policy with novel provisions; and (iii) opportunities for institutions to harmonise their programmes and policy formulations, by recognising and incorporating the low ILUC-risk concept.

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(Most references are included as footnotes in the main text.)

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Appendices

Appendix A. Major EU Policies

The following table lists and references the major EU policies reviewed in BIKE Task 5.1.1. As indicated, not all policies were found to be relevant to the low ILUC-risk concept or value chain.

Policy	#	Type	Reference	Relevance
RED II	1	Directive	(European Parliament and European Council, 2018a)	High
ILUC Delegated Act	2	Regulation	(European Commission, 2019)	High
CAP 2013	3	Regulation	[164]	High
LULUCF	4	Regulation	(European Parliament and European Council, 2018b)	Medium
Natura 2000	5	Strategy	[165]	Low
Forest Strategy	6	Strategy proposal	[166]	Low
Fuels Quality Directive	7	Directive	(European Commission, 2016)	Low
REDD+	8	Directive	[167]	Low
Rural Development Programme	9	Programme	[168]	Medium
EIP Agri	10	Programme	[169]	Medium
Habitats Directive	11	Directive	[170]	Medium
Birds Directive	12	Directive	[171]	Low
Soil Thematic Strategy	13	Strategy	[172]	High

[164] Regulation (EU) No 1307/2013, http://data.europa.eu/eli/reg/2013/1307/oj

[165] https://ec.europa.eu/environment/nature/natura2000/index_en.htm

[166] https://eur-lex.europa.eu/resource.html?uri=cellar:21b27c38-21fb-11e3-8d1c-01aa75ed71a1.0022.01/DOC_1&format=PDF

[167] https://ec.europa.eu/clima/eu-action/forests-and-agriculture/combatting-tropical-deforestation-redd-initiative_en

[168] REGULATION (EU) No 1305/2013, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1305

[169] https://ec.europa.eu/eip/agriculture/en

[170] Council Directive 92/43/EEC https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

[171] Directive 2009/147/EC https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

[172] https://ec.europa.eu/environment/soil/three_en.htm

Policy	#	Type	Reference	Relevance
Nitrates Directive	14	Directive	[173]	High
EU Taxonomy	15	Standards	[174] [175]	High
Cohesion Fund	16	Programme	[176]	Medium
Recovery and Resilience Facility	17	Programme	[177]	Low
InvestEU	18	Fund	[178]	Medium
Connecting Europe Facility	19	Fund	[179]	Low
EAFRD & EAGF	20	Fund	[180]	High
Just Transition Mechanism	21	Fund	[181]	Medium
Renewable Energy Financing Mechanism	22	Fund	[182]	Low
Innovation Fund	23	Fund	[183]	Low
Modernisation Fund	24	Fund	[184]	Medium
Horizon Europe	25	Fund	(European Commission, 2021a)	High
Regional Development Funding Regulation	26	Regulation	[185]	Medium

[173] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1561542776070&uri=CELEX:01991L0676-20081211

[174] Regulation (EU) 2020/852 of the European Parliament and of the Council, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852&qid=1643209870481

[175] Commission Delegated Regulation (EU) 2021/2139, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2139

[176] REGULATION (EU) 2021/1058, https://eur-lex.europa.eu/eli/reg/2021/1058

[177] Regulation (EU) 2021/241 on establishing the Recovery and Resilience Facility.

[178] https://europa.eu/investeu/home_en

[179] https://ec.europa.eu/inea/connecting-europe-facility/cef-energy

[180] Regulation (EU) 2020/2220 on the support from European Agricultural Fund for Rural Development (EAFRD) and from the European Agricultural Guarantee Fund (EAGF).

[181] Proposal for Regulation on establishing the Just Transition Fund, COM (2020) 22 final.

[182] See https://ec.europa.eu/info/news/eu-renewable-energy-financing-mechanism-opening-way-private-investment-2021-jan-11_en and links therein.

[183] https://eufundingoverview.be/funding/innovation-fund.

[184] https://modernisationfund.eu/documents/

[185] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1058

Policy	#	Type	Reference	Relevance
Farm to Fork	27	Strategy	[186]	High
Sustainably Produced Biomass for Energy Applications	28	Standard	[187]	Low
Biodiversity Strategy	29	Strategy	[188]	Medium
Invasive Alien Species	30	Regulation	[189]	Medium
Sustainable Use of Pesticides	31	Directive	[190]	Medium
Fertilising Products Regulation	32	Regulation	[191]	Low
Clean Air Programme	33	Regulation	[192]	Low
Water Framework Directive	34	Directive	[193]	Low
Circular Economy Package	35	Strategy	[194]	Low
Energy Efficiency Directive	36	Directive	[195]	Low
Emission Trading System	37	Directive	[196]	Low
RED II Amendment	38	Proposed directive	(European Commission, 2021b)	High
ReFuelEU Aviation	39	Proposed regulation	[197]	High

[186] "Farm to Fork Strategy for a Fair, Healthy and Environmentally-Friendly Food System", EU COM (2020) 381 final. https://ec.europa.eu/info/sites/default/files/communication-annex-farm-fork-green-deal_en.pdf

[187] See https://www.etipbioenergy.eu/industry/standards for further references.

[188] COM/2020/380 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380

[189] Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1143&from=EN

[190] Directive (2009/128/EC), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0128-20190725

[191] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1009&from=EN

[192] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52013DC0918

[193] https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF

[194] https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

[195] Directive 2012/27/EU https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012L0027&qid=1638284643527

[196] Consolidated text at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02003L0087-20210101&qid=1643212576851

[197] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0552&qid=1643212295486

Policy	#	Type	Reference	Relevance
FuelEU Maritime	40	Proposed regulation	[198]	High
CORSIA	41	Non-EU binding scheme	[199]	Medium

[198] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0562

[199] https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Eligible-Fuels.aspx

Appendix B. Major EU and International Institutions

The table in this Appendix lists the main EU-level institutions which have some connection to the low ILUC-risk biofuel value chain. Selected international organisations are also included. Each institution is assigned a priority rating depending the relevance and impact of their scope of influence.

Institution	Institution Type	Reference	Priority
CBE JU (Circular Bio-based Europe Joint Undertaking)	EU Funding Body	[200]	Medium
CINEA (European Climate, Infrastructure and Environment Executive Agency)	EU Executive Agency	[201]	Medium
Clean Aviation Joint Undertaking (Clean Aviation Joint Undertaking)	EU Funding Body	[202]	Low
Clean Hydrogen Joint Undertaking (Clean Hydrogen Joint Undertaking)	EU Funding Body	[203]	Low
CoR (European Committee of the Regions)	EU Advisory Body	[204]	High
CPVO (Community Plant Variety Office)	EU Executive Agency	[205]	Low
DG AGRI (Directorate General for Agriculture and Rural Development)	EU Directorate General	[206]	High
DG CLIMA (DG Climate Action)	EU Directorate General	[207]	Medium
DG ECFIN (DG Economic and Financial Affairs)	EU Directorate General	[208]	Low
DG ENER (DG Energy)	EU Directorate General	[209]	High
DG ENV (DG Environment)	EU Directorate General	[210]	High
DG FISMA (DG Financial Stability, Financial Services and Capital Markets Union)	EU Directorate General	[211]	Low

[200] https://www.cbe.europa.eu

[201] https://cinea.ec.europa.eu/index_en

[202] https://www.clean-aviation.eu/

[203] https://www.clean-hydrogen.europa.eu/index_en

[204] https://cor.europa.eu/en

[205] https://cpvo.europa.eu/en

[206] https://ec.europa.eu/info/departments/agriculture-and-rural-development_en

[207] https://ec.europa.eu/clima/index_en

[208] https://ec.europa.eu/info/departments/economic-and-financial-affairs_en

[209] https://ec.europa.eu/info/departments/energy_en

[210] https://ec.europa.eu/environment/index_en

[211] https://ec.europa.eu/newsroom/fisma/items/738336/en

DG GROW (DG Internal Market, Industry, Entrepreneurship and SMEs)	EU Directorate General	[212]	Low
DG JRC (DG Joint Research Centre)	EU Directorate General	[213]	Low
DG MOVE (DG Mobility and Transport)	EU Directorate General	[214]	Low
DG REGIO (DG Regional and Urban Policy)	EU Directorate General	[215]	Medium
DG RTD (DG Research & Innovation)	EU Directorate General	[216]	High
EASA (European Aviation Safety Agency)	EU Executive Agency	[217]	Medium
EBRD (European Bank for Reconstruction and Development)	International Finance Institution	--	Low
ECA (European Court of Auditors)	EU Executive Agency	[218]	Low
ECHA (European Chemicals Agency)	EU Executive Agency	[219]	Medium
EEA (European Environment Agency)	EU Advisory Body	[220]	Low
EESC (European Economic and Social Committee)	EU Advisory Body	[221]	Low
EFSA (European Food Safety Authority)	EU Executive Agency	[222]	Low
EIB (European Investment Bank)	EU Funding Body	[223]	Low
EISMEA (European Innovation Council and Small and Medium-sized Enterprises Executive Agency)	EU Executive Agency	[224]	Low

[212] https://ec.europa.eu/info/departments/internal-market-industry-entrepreneurship-and-smes_en

[213] https://ec.europa.eu/info/departments/joint-research-centre_en

[214] https://ec.europa.eu/info/departments/mobility-and-transport_en

[215] https://ec.europa.eu/info/departments/regional-and-urban-policy_en

[216] https://ec.europa.eu/info/departments/research-and-innovation_en

[217] http://easa.europa.eu/

[218] http://www.eca.europa.eu/en

[219] https://echa.europa.eu/en/home

[220] http://www.eea.europa.eu/

[221] https://www.eesc.europa.eu/

[222] https://www.efsa.europa.eu/

[223] https://www.eib.org/en/index.htm

[224] https://ec.europa.eu/info/departments/small-and-medium-sized-enterprises_en

EIT InnoEnergy (European Institute of Innovation and Technology)	EU Funding Body	[225]	Medium
EIT (European Institute of Innovation and Technology)	EU Advisory Body	[226]	Low
ESA (European Space Agency)	EU Executive Agency	[227]	Low
EU Rail (Europe's Rail Joint Undertaking)	EU Advisory Body	[228]	Medium
European Commission (European Commission)	EU Governance	[229]	Low
European Council	EU Governance	[230]	Low
European Innovation Council	EU Advisory Body	[231]	Low
European Parliament	EU Governance	[232]	Low
EUROSTAT (DG European Statistics)	EU Directorate General	[233]	Low
ICAO (International Civil Aviation Organization)	International Agency	[234]	High
ISCC (International Sustainability & Carbon Certification)	International Certification Body	[235]	Medium
REA (European Research Executive Agency)	EU Executive Agency	[236]	Low
RSB (Roundtable for Sustainable Biomaterials)	International Certification Body	[237]	Medium

[225] https://www.innoenergy.com/for-innovators/innoenergy-thematic-fields/?page=1&thematicField=1668#data_container_anchor

[226] http://eit.europa.eu/

[227] https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Europe_s_Copernicus_programme

[228] https://shift2rail.org/about-europes-rail/

[229] https://ec.europa.eu/info/index_en

[230] https://www.consilium.europa.eu/en/european-council/

[231] https://eic.ec.europa.eu/index_en

[232] https://www.europarl.europa.eu/about-parliament/en

[233] https://ec.europa.eu/info/departments/eurostat-european-statistics_en

[234] https://www.icao.int/about-icao/Pages/default.aspx

[235] https://www.iscc-system.org/

[236] https://ec.europa.eu/info/departments/european-research-executive-agency_en

[237] https://rsb.org/