AgroBioHeat

Promoting the penetration of agrobiomass in European rural areas

Grant Agreement No 818369

D5.1: National and European framework conditions

Part 1: European framework conditions - Spain

Lead Beneficiary: B.E.
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Abbreviations

Abbreviation	Explanation
CAP	Common Agricultural Policy
ECA	European Court of Auditors
EEA	European Environment Agency
EFA	Ecological Focus Areas
EU	European Union
GAEC	Good Agricultural and Environmental Conditions
GHG	Greenhouse Gases
GLOBIOM	Global Biosphere Management Model: developed by IIASA (International Institute for Applied Systems Analysis) to analyse to the competition for land use between agriculture, forestry, and bioenergy
GPP	Green Public Procurement
JRC	Joint Research Centre
LIFE	1. The EU's main funding instrument for environment and climate action 2. One of the long term strategy options considered in the European Commission scenarios for 2050
MCP	Medium Combustion Plant
NECP	National Energy and Climate Plan
OGC	Organic Gaseous Compounds
PM	Particle Matter, e.g. Dust
PRIMES	Price-Induced Market Equilibrium System: a model for the simulation of the European energy system and markets, developed by Energy-Economy-Environment Modelling Laboratory E^3MLab of the National Technical University of Athens
RED II	Renewable Energy Directive recast
SRC / SRF	Short Rotation Coppice / Short Rotation Forestry
WHO	World Health Organization

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Executive Summary

Bioenergy is currently the main source of renewable energy in the European Union, in particular for the heating and cooling sector. The increased climate ambition for 2030 and 2050 and the National Energy and Climate Plans submitted by the Member States can hint how the policy mix is going to evolve, considering the energy efficiency measures.

This report, together with the accompanying reports on national framework conditions and the European-wide survey on social perceptions on agrobiomass heating, aims to identify the current conditions for the development of agricultural biomass from an integral policy perspective. This is, including the supply side, demand side and broad policy considerations in the fields of energy, climate and environment.

The potential of agricultural biomass for heat generation is high. While the mobilisation of residues has improved in some observed countries, in most it remains low in comparison with the available volumes. This is mostly due to mobilisation costs and in a lesser extend to competing uses, in particular animal farming and soil maintenance.

In relation with lignocellulosic energy crops, at the moment, they correspond to a small part (< 1 %) of the Utilized Agricultural Land in Europe. However, all investigated policy scenarios achieving carbon neutrality by 2050 foresee an increase in their surface to the expense of other land uses, especially first-generation biofuels. In the future Common Agricultural Policy, considering the reinforced role of national governments for the preparation of their National Strategic Plans, there is room for intervention supporting short rotation coppice and miscanthus. Implementation actions at national level, such as eco-schemes, will be critical for this.

The European Union is moving fast in the direction of improved air quality and has already adopted policy measures to that effect. The Medium Combustion Plant Directive regulates emissions from combustion plants with a thermal input between 1 and 50 MW and does include limits for facilities utilizing agrobiomass. For smaller scale systems, the current Ecodesign Regulation sets specifics efficiency and emission limits of solid fuel boilers up to 500 kW but at the moment excludes non-woody biomass fuels. The inclusion of non-woody (e.g. agrobiomass) biomass boilers in the Ecodesign Regulation and its expansion up to 1,000 kW would impact the industry, shaping the sector development and the scale of upcoming projects. The AgroBioHeat project aims to provide a realistic and science-based approach to this exercise, considering the European Commission agenda for circular and bio-based economy.

Carbon removals and circularity are other key features of the industry and are part of the European Commission agenda. The economic recovery from the COVID-19 crisis will also bring other opportunities for a sector with the potential to support rural economy, mainly through the EU Next Generation Fund, the renovation wave and the Common Agricultural Policy's rural development fund.

Introduction

The present document constitutes the Part 1 of Deliverable 5.1 "European and National framework conditions" of the AgroBioHeat project, prepared in the framework of Task 5.1 "Monitoring of current national and European framework conditions".

Part 1 of D5.1 focuses on the overall framework conditions on the EU policy landscape that have a direct or indirect impact on fostering agrobiomass supply, mobilization and end-use. Both policies already in place as well as proposals based on the current legislative agenda are covered, since the latter will be critical to support the use of agricultural biomass in the near future. The main measures / strategies are detailed in their own separate chapters, as follows:

- The Common Agricultural Policy
- Biodiversity Strategy
- The Renewable Energy Directive
- The Ecodesign Regulation and the Medium Combustion Plant Directive
- The Air Quality targets
- The Recovery Plan and Renovation Wave
- The National Energy and Climate Plans
- The Climate Law
- The Circular Economy Action Plant

Part 2 of D5.1 presents the results of a European-wide, public perception survey on agrobiomass heating implemented in spring 2020; more than 3,500 individuals have participated in the online survey, providing useful insights on – among others - perceived barriers and drivers for the development of agrobiomass heating.

Parts 3 to 9 of D5.1 focus on the national framework conditions of the following project countries: Croatia, Denmark, France, Greece, Romania, Spain, Ukraine. These reports, available as separate documents focus on the following country conditions and policy aspects, especially as concerns agrobiomass and its current or potential use for heating:

- Agrobiomass availability, covering all potential sources: agricultural residues (from annual and permanent crops), agro-industrial residues and energy crops.
- Rural Development and accompanying measures targeting agrobiomass and its management.
- Logistics and other market considerations affecting biomass mobilization.
- Air quality measures, including any national emission limits on agrobiomass boilers.
- Tax measures applicable to the use of (agro)biomass, in comparison to other energy products.
- Other support measures targeting promotion of renewable energy in the heating sector.
- Measures targeting buildings efficiency / renovation.
- Policy coherence, e.g. how is agrobiomass treated in key policy documents (e.g. waste/residue definition, NECPs, bioeconomy strategies, CAP strategic plans).

The compilation of the European national framework conditions together with the public perception survey will serve as a basis for upcoming project activities: drafting of national (D5.2) and EU (D5.4)

Strategic Plans that will be presented and discussed in national and European policy and advocacy workshops and engagement actions. Specifically for the review of the Ecodesign Regulation, a proposal for informed emission limits for agrobiomass boilers will be drafted (D5.5) based on project results from lab-scale and field measurements at operating facilities as well as feedback from equipment manufacturers, researchers and other stakeholders.

1. Agrobiomass availability

1.1. Agricultural residues

Agricultural residues can be defined as primary or secondary depending on their origin. Primary residues are solid vegetal residues left in the field after harvest or pruning operations. Secondary residues (olive stones, nut shells, etc.) are the portion discarded / separated during the processing phase. Although they consist in a promising feedstock for bioenergy use and, in general, for EU bioeconomy, they are currently underutilised mainly because of logistical constraints and lack of incentives. They positively contribute to rural development, representing a possible income for farmers, and if used as bioenergy feedstock they contribute to climate change mitigation strategies. The following table presents a non-exhaustive list of primary and secondary agrobiomass feedstocks along with technical requirements for harvesting, benefits of mobilisation and seasonality.[1]

Residues from agricultural activities are widely available and have traditional low mobilisation rates. Type of residues, geographical distribution and level of mobilisation, and uses varies across Europe. Detailed information can be found in the Parts 3 to 9 of this report, containing National Framework conditions of the following project partner countries: Croatia, Denmark, France, Greece, Romania, Spain and Ukraine.

- Cereal is the main crop in terms of surface in Denmark, Croatia, Romania and Ukraine. However, there are different levels of utilisation and use for the straw with Denmark with most of the residues dedicated for fodder for pig farming and, Croatia and Romania and Ukraine having a big potential.
- In the Mediterranean basin, vineyards and olive crops are widespread in France, Spain and Greece. While vineyard pruning is widely available but underutilised in France, the mobilisation of olive cake and stone is improving. The potential is relevant in Spain with more than 2,000 ktons. Vineyards extension due to climate change are increasing the availability in countries like Germany.
- Maize is present in Croatia, Romania and Ukraine with sunflower also in the latter two, especially relevant in Ukraine.
- Soft fruits and seed are widely available through Europe for energy utilisation, with Poland having more than 500 ktons available, followed by Italy, Spain, Hungary and Romania.
- Flax and hemp seeds are particularly well mobilised for agrobiomass in France.

1.2.Dedicated energy crops

Dedicated energy crops (grassy and woody) such as miscanthus, poplar, willow, are plants grown specifically for their energetic value (for heating and cooling, and electricity purposes). Adaptable to a wide range of climate and soils conditions, they can successfully be grown on lands not ecologically suited for conventional farming practices, while delivering several ecosystem services. Ligno-cellulosic crops have

[1] https://bioenergyeurope.org/index.php?option=com_content&view=article&id=204

normally a higher GHG efficiency than rotational arable crops because of their lower input requirements, and a much higher energy yield per hectare potential. When grown on marginal lands, they do not compete with rotational arable crops and acceptable yields can still be reached[2]. They have very low fertilizer requirements and short carbon cycles, provide ecosystem services and contribute to climate change mitigation. These attractive characteristics cause dedicated energy crops to be seen a source of bioenergy with significant potential for growth.

However, current land use in the EU for the production of dedicated energy crops is still marginal (Estimation of 125,179 ha of lignocellulosic crops) and the EU statistics on this topic are incomplete. Bioenergy Europe has therefore developed its own data collection, displayed in table 3. The figures in the table 3 are either specified in the National Renewable Action Plan Progress Reports (2015-2016) or are estimated results from Bioenergy Europe's enquiry or alternatively Eurostat. This collection has been updated for this report. It should be noted that this table is focusing mainly on lignocellulosic crops, oil, sugar and starch crops grown for energy purposes are not included even though sometimes the division is not clearly stated in the sources (Eurostat). Eurostat was used only for energy crops n.e.c (not elsewhere classified) defined as follows:

"Crops exclusively used for renewable energy production not elsewhere classified and grown on arable land: miscanthus (Miscanthus giganteus), reed canary grass (Phalaris arundinacea), etc. These crops can vary depending on the country. With the change of agricultural policy, it is expected that new plants used exclusively for energy production will be taken into production. Areas of crops which are not used exclusively for renewable energy production (e.g. rape, green maize) are recorded under the respective headings (e.g. 'rape and turnip rape' in the case of rape used as an energy crop). As short rotation coppices do not belong to UAA, they are excluded."

Table 2. Energy crops (Source: Bioenergy Europe).

Feedstock		Harvesting Requirements	Benefits	Seasonality
Short-Rotation Coppice	Poplar Willow Eucalyptus lucust	Machines needed to harvest efficiently (e.g. modified forage harvester)	Relatively fast growing; reduce soil erosion; can increase soil carbon and soil fertility in poor soils	All year round, though harvest for deciduous trees is done in winter
Perennial crops	Miscanthus Switchgrass Reed canary grass Cynara Cardunculus Other Grasses	Existing machinery (maize harvester, baler)	Can be grown on degraded land, can mitigate soil erosion, can increase soil carbon and soil fertility in poor soil	Harvest during autumn and winter. Grass can be harvested during summer and dried with the sun.

Additionally, please note that figures are not always available, hence this table does not strictly reflect the field reality and is probably still underestimating the area dedicated to energy crops. Indeed, when just a

[2] https://bioenergyeurope.org/index.php?option=com_content&view=article&id=204

part of the culture is dedicated for energy usage - when the crops are not registered as "dedicated" energy crops when it is plantations with several final uses (e.g. Eucalyptus in Spain) - statistics are even more complicated to get. This division issue is also related to policy decisions regarding financial supports. To allow the EU to benefit from the promise of dedicated energy crops, political incentives should be applied to encourage more widespread plantation of energy crops, like short rotation coppice and miscanthus.

Table 3. Surfaces cultivated with lignocellulosic energy crops (Source: Bioenergy Europe 2020).

Country	Short Rotation Coppice (SRC)				Grassy energy crops			Total	Year	Sources
	Poplar	Willow	Other SRC	Total	Miscanthus	Other	Total			
EU28	**20,691**	**19,378**	**1,020**	**68,287**	**24,620**	**12,097**	**53,494**	**125,179**	-	
AT	977	244		**1,221**	1,078	52	**1,130**	**2,351**	2016	NREAP, Eurostat
BE		68	97	**165**	105	85	**190**	**355**	2012	NREAP
BG						3,286	**3,286**	**3,286**	2016	NREAP
CY								**0**	2016	NREAP
CZ	2,869			**2,869**	200	190	**390**	**3,259**	2016	NREAP, BEECO and Eurostat
DE				**6,600**	4,600	4,600	**9,200**	**15,800**	2016	NREAP, Eurostat
DK				**8,896**			**66**	**8,962**	2016	NREAP
EE	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**	**n.a.**		
EL							**11,010**	**11,010**	2016	Eurostat
ES							**38**	**38**	2018	CEDER
FI				**26**			**5,452**	**5,478**	2016	NREAP
FR				**220**	6,403		**6,403**	**6,623**	2019	ADEME, France miscanthus
HR					500		**500**	**500**	2016	NREAP
HU	3,352	505	247	**4,104**	1,000		**1,000**	**5,104**	2016	NREAP, BEECO
IE		1,100		**1,100**	700	410	**1,110**	**2,210**	2016	Teagasc
IT					1,000		**1,000**	**1,000**	2016	BEECO
LT				**4,063**			**0**	**4,063**	2016	NREAP
LU				**0**			**211**	**211**	2016	NREAP
LV	221	442	3	**666**		253	**253**	**919**	2018	Latbio
MT							**0**	**0**	2016	NREAP
NL				**13**	245		**245**	**258**	2016	NREAP
PL	9,000	7,832		**16,832**	992		**992**	**17,824**	2016-2018	Polbiom
PT	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**	**n.a**		

Country	Short Rotation Coppice (SRC)				Grassy energy crops			Total	Year	Sources
	Poplar	Willow	Other SRC	Total	Miscanthus	Other	Total			
RO[3]	2,600	600		**3,200**	600	2,530	**3,130**	**6,330**	2016	NREAP, Eurostat
SE	1,672	8,587	673	**10,932**		691	**691**	**11,623**	2016	NREAP
SI					400		**400**	**400**	2016	BEECO
SK					200		**200**	**200**	2016	BEECO
UK				**3,000**	10,000		**10,000**	**13,000**	2016	DEFRA
UA	175	4,200[4]		**4,375**	1,500		**1,500**	**5,875**	2018	BEECO

[3] Additional 5,500 hectares of giant reed
[4] Ukraine's Progress Report On The Promotion And Use Of Energy From Renewable Sources in Ukraine in the years of 2016-2017 https://www.energy-community.org/documents/reports.html

2. Common Agricultural Policy

The Common Agricultural Policy is the main policy instrument supporting the biomass supply-side and deployment of bioenergy in rural areas

The Common Agricultural Policy (CAP) represents almost 40 % of the European Union expenditure and it is a major political and financial instrument with implications in agricultural, food and health but equally energy policy. The current financial framework, which ends this year, increased the mobilisation of funds for environmental and climate chapters and reinforced income support schemes and measures to grant generational replacement in the farms.

With the current CAP funding period coming to an end in 2020, the negotiations on the upcoming period (2021-2027) are currently being held simultaneously to those concerning the Multiannual Financial Framework for the same period. The main innovation from the European Commission proposal is the introduction of Strategic Plans by the Member States covering all CAP-related interventions. This is targets, flexibility between pillars and investments with co-financing from national budgets and aiming to a minimum level of environmental and climate expending. The co-financing, together with the flexibility between pillars and the environmental funding, is subject of intense negotiations at the time of this report.

2.1.Conditionality

Mainstreaming environmental and climate conditionality in the CAP can open new opportunities for bioenergy mobilisation, in particular the ban on burning straw and the promotion of permanent pasture, buffer strips in water sides and not productive areas.

Conditionality refers to the environmental objectives that are mandatory for farming activities. The European Commission proposal brings together environmental and climate conditionality in the attempt to simplify the conditionality requirements.

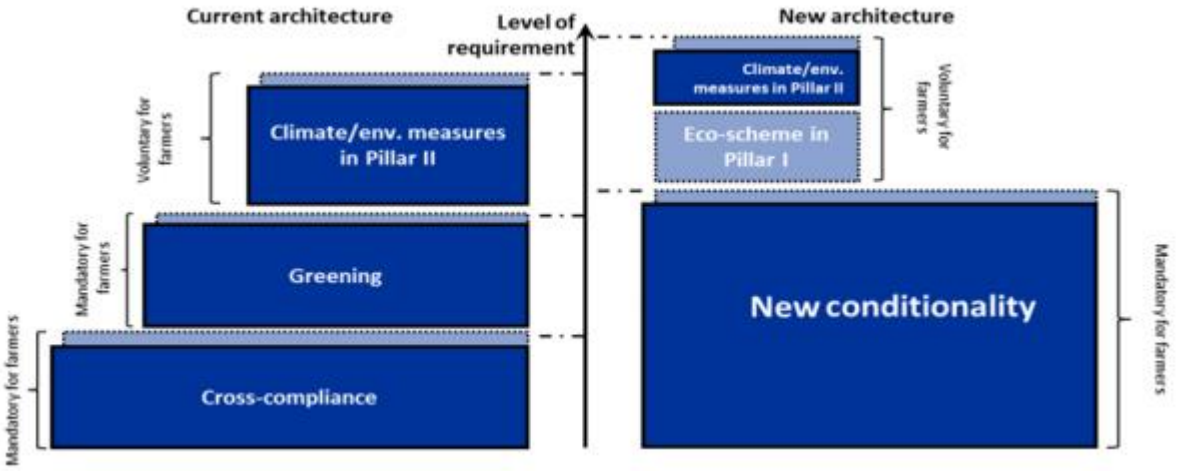


*Figure 1: Conditionality structure in the CAP (*Source: IEEP)[5].

In the Strategic Plans proposal, three greening practices related to bioenergy are amongst the Good Agricultural and Environmental Conditions (GAEC): GAEC 1 on permanent pasture, GAEC 4 on buffer strips along water and GAEC 9 on non-productive areas (replacing Ecological Focus Areas). It should be noted that compared to the greening practices such as eco-schemes the GAEC standards are quite general and remains to be seen how they will be implemented at the Member State level. On the other hand, exemptions applying for the current greening measures (e.g. organic farms, farms below a certain size/arable area) have been eliminated.

The following table summarises the proposed changes in GAEC standards. In order to ensure that all agricultural land, especially land which is no longer used for production purposes, is maintained in good agricultural and environmental conditions, Member States shall define minimum requirements on the basis of Annex II of Council Regulation (EC) No 1306/2013. Minimum GAECs requirements should be defined by taking the specific characteristics of areas concerned into account, including soil and climatic condition, existing farming systems, land use, crop rotation, farming practices and farm structures[6].

Table 1: Changes in GAEC (Source: CAP Reform).

2014-2020	2021-2027
Climate change	
	GAEC 1. Maintenance of permanent grassland based on a ratio of permanent grassland in relation to agricultural area
	GAEC 2. Appropriate protection of wetland and peatland

[5] https://ieep.eu/uploads/articles/attachments/4791a221-8525-4410-848f-8fb84f5a621a/IFOAM%20EU_Eco-scheme_Report_Final.pdf?v=63718564537#:~:text=The%20eco%2Dscheme%20would%20be,the%20CAP's%20wider%20green%20architecture

[6] https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Good_Agricultural_and_Environmental_Conditions_(GAEC)

2014-2020	2021-2027
GAEC 6. Maintenance of soil organic matter level through appropriate practices including ban on burning arable stubbles, except for plant health reasons	GAEC 3. Ban on burning arable stubble, except for plant health reasons
Water	
GAEC 1. Establishment of buffer strips along water courses	GAEC 4. Establishment of buffer strips along water courses
GAEC 2. Where use of water for irrigation is subject to authorisation, compliance with authorisation procedures	
GAEC 3. Protection of ground water against pollution	
	GAEC 5. Use of Farm Sustainability Tool for Nutrients
Soil protection and quality	
GAEC 5. Minimum land management reflecting site specific conditions to limit erosion	GAEC 6. Tillage management reducing the risk of soil degradation, including slope consideration
GAEC 4. Minimum soil cover	GAEC 7. No bare soil in most sensitive period(s)
	GAEC 8. Crop rotation
Biodiversity and landscape	
	GAEC 9. Maintenance of non-productive features and area to improve on-farm biodiversity: • Minimum share of agricultural area devoted to non-productive features or areas • Retention of landscape features • Ban on cutting hedges and trees during the bird breeding and rearing season • As an option, measures for avoiding invasive plant species
	GAEC 10. Ban on converting or ploughing permanent grassland in Natura 2000 sites

For the application of the GAEC, the Member States should define at national or regional level, minimum standards for beneficiaries. The minimum standards must consider the specific characteristics of the areas concerned including; soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices, and farm structures. Additionally, Member States will have the capacity to prescribe additional standards according to Article 12 of the proposal, should they wish to do so, opening the door for an increased ambition. Finally, Member States must implement and detail in the National Strategic Plan a series of eco-scheme (Article 28), voluntary for farmers.

The ban on burning stubble has the potential to increase the residues available for bioenergy with the limits of maintaining organic matter explicitly mentioned in GAEC 3. This objective has been recognised as having a direct impact on climate change mitigation and indirect impact on farmland biodiversity, soil

functionality, climate change adaptation and resilience to fire. Additionally, the maintenance of GAEC 1, (now GAEC 4) can promote energy crops over water courses as allies to halt erosion.

Table 2: MFF proposals by expending area (Source: CAPreform).

MFF 2021-2027 CAP budget proposals, EU-27

	EU-27 2014-2020+EDF	EU-27 2020 * 7 +EDF	Commission proposal 2021-2017 May 2018	Parliament proposal 2021-2027 Nov 2018	Finland Presidency Dec 2019	Michel 1st MFF proposal 14 Feb 2020	Commission reinforced MFF inc. assigned revenue from ERI May 2020	% change, G compared to B
	A	B	C	D	E	F	G	H
Constant 2018 prices								
1. Total MFF	1,082,320	1,107,138	1,134,583	1,324,089	1,087,327	1,094,827	1,850,000	
2. In % of GNI (EU-27)	1.16%		1.11%	1.30%	1.07%	1.074%	2.00%	
3. CAP spending	382,855	367,621	324,284	383,255	334,284	329,284	348,264	-5%
4. EAGF	286,143	273,743	254,247		254,247	256,747	258,251	-6%
5. EAFRD	96,712	93,877	70,037		80,037	72,537	90,013	-4%
6. % CAP (3/1)	35.3%	33.2%	28.5%	28.9%	30.7%	30.1%	30.3%	
Current prices								
1. Total MFF	1,063,101	1,151,866	1,279,408	1,493,701			2,049,422	
2. In % of GNI (EU-27)	1.16%		1.11%	1.30%			2.0%	
3. CAP spending	375,429	382,473	365,005	431,946			391,440	2%
4. EAGF	280,351	284,803	286,195				290,702	2%
5. EAFRD	95,078	97,670	78,811				100,738	3%
6. % CAP (3/1)	35.3%	33.2%	28.5%	28.9%			30.3%	

2.2. Income support

While under the current financing period, miscanthus and short rotation coppice have been supported under the first pillar (as part of the Ecological Focus Areas); for the upcoming period Member States will have to offer a catalogue of eco-schemes voluntary for farmers, with the potential also to support bioenergy mobilisation.

The first pillar of the CAP (Income support or direct payment) provides a direct financial incentive to farmers. Farmers generally receive income support based on their farm's size in hectares. Member States offer a set of obligatory payments: basic payment, the greening structure, and payments for young farmers. These can be complemented by any other payment focus on specific crops or sectors based on their situation There are specific schemes designed to help small and medium sized farms, young farmers, farmers who operate in areas of natural constraint and/or sectors undergoing difficulties[7]. This is in contraposition with market prices or subsidies based on production and is aimed at financing public goods such as environmental protection or improving income for farmers.

[7] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/income-support-explained_en

While there is no direct support for bioenergy utilisation following the abolition of the Energy Crops Scheme, miscanthus and short rotation plantations ("short rotation coppice") are classified as “permanent crops”. Hence, they are funded within the Basic Payment Scheme under the CAP Guidelines 2014-2020. Member states might further define suitable tree varieties and maximum harvest cycles[8].

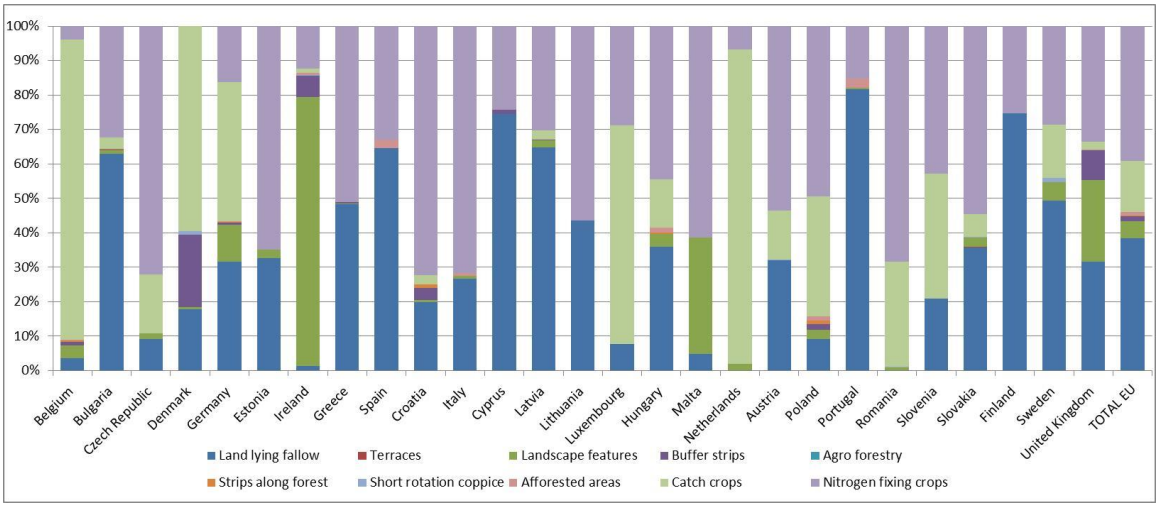
In most member states short rotation plantations are qualifying as Ecological Focus Area (EFA) to fulfil ‘Greening’ requirements. This might include further cultivation standards (e.g. no mineral fertilizer pesticides) which are defined on national level.

2.2.1 Ecological Focus Areas

Farmers with more than 15 hectares of arable land must devote an equivalent of 5 % of that land to Ecological Focus Areas (EFAs). EU legislation provides for 19 distinct EFA types with which farmers can meet this obligation including, land lying fallow, catch crops, nitrogen-fixing crops and several types of landscape features. However, individual Member States may decide to offer their farmers fewer EFA options. The main objective defined for EFAs is to safeguard and improve biodiversity.[9]

During the current financing period, this has been one of the main areas of support for bioenergy feedstock, although its weight has been limited over the eligible areas and interventions. While short rotation coppice is an intervention itself it has not been significantly used by Member States. Miscanthus is qualified for Ecological Focus Areas since 2017 reform and currently eligible in seven Member States: Germany, Spain, France, Luxembourg, Austria, Romania, and in Belgium (Wallonia only). The table below summarizes the EFA types by member state (data not available for France)[10].

Table 3: EFA types by Member State (Source: EC, member states’ uptake data 2015).



[8] Commission Regulation (EC) No 1120/2009
[9] https://op.europa.eu/webpub/eca/special-reports/greening-21-2017/en/
[10] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2017%3A152%3AFIN

2.2.2 Greening direct payments in 2021-2026: Eco-schemes

Eco-schemes refer to series of measures compulsory for Member States but voluntary for farmers. They will be part of the direct payments and their objective will be to support and incentivise farmers to observe climate- and environmental-friendly practices[11] beyond existing agricultural and environmental conditions such as, the minimum requirements for the use of fertiliser and the conditions established for the maintenance of the agricultural area. Eco-schemes shall take the form of an annual payment per eligible hectare and it shall be granted as either:

a) payments additional to the basic income support as set out in Subsection 1.3.2 of this report
b) payments compensating beneficiaries for all or part of the additional costs incurred, and income foregone as a result of the commitments as set pursuant to Article 65 (Environmental, climate and other management commitments)

Member States shall establish the list of agricultural practices beneficial for the climate and the environment. The Commission is empowered to adopt delegated acts with further rules on the eco-schemes.

A set of eco-schemes suggested by the European Commission, include some with potential of supporting biomass for energy utilisation, e. g. a higher share of permanent devoted areas and additional types of elements to be retained beyond GAEC 9[12].

2.3. Rural development

Rural development is currently supporting renewable energy projects in rural areas including bioenergy. For the upcoming period, Member States will have to co-finance new interventions and decide whether to continue currently funded projects during the transition period in order to foster the economic recovery post-COVID-19.

2.3.1 Funding period 2014-2020

Rural development constitutes the second pillar of the CAP and refers to all supplementary measures devoted to improving economic conditions in rural areas. Rural development measures shall be programmed to align with the overall policy objectives of the CAP, in particular the GAECs.

To achieve those objectives, different measures are identified in the Regulation 1305/2013 on support for rural development:

- Measure 4. Investment in physical assets
    - Sub-measure 4.1. Support to improve the overall performance and sustainability of an agricultural holding. There are 17 Rural Development actions using this sub-measure, eight of which support renewable energy sources.

[11] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en
[12] https://enrd.ec.europa.eu/sites/enrd/files/w40_environment_cap-interventions_opfermann-gumbert.pdf

- Sub-measure 4.4. Support for non-productive investments linked to the provision of agri-environmental climate objectives, including biodiversity conservation status of species and habitat as well as enhancing the public amenity value of a Natura 2000 or other high nature value area. Some investments in renewables under sub-measure 4.1 are also funded under 4.4 in relation with farm viability. This support ranges from 20% to 75% or eligible costs (exceptions for outermost regions and climate farming).

- Measure 16 Aid for cooperation in the forestry sector
  - Sub-measure 16.6. Support for cooperation among supply chain actors for the sustainable provision of biomass for use in food and energy production and industrial processes. This sub-measure aims to promote the establishment of aggregations between producers of forestry or agricultural biomass, undertakings that use such biomass, and processors of biomass for energy use, in order to set up vertical supply chains able to add value to local resources. It does not directly support biomass production, but organisation of their supply chain (provision not production). It is programmed in 24 Rural Developments Plans in 9 Member States (Belgium, Denmark, Germany, Spain, Finland, France, Italy, Malta and United Kingdom).[13]

Member States must address at least four priority areas out of six in their Rural Development Plans. Priority 5 (Resource-efficient, Climate-resilient Economy) is the most closely related to renewable energy production and decarbonisation, especially in the following focus areas:

- 5C: Facilitating the supply and use of renewable sources of energy, of by-products, wastes and residues and of other non- food raw material, for purposes of the bio-economy. This focus area is measured by the total investment in renewable energy production and additionally by the renewable energy produced from supported projects.

- 5D: Reducing greenhouse gas and ammonia emissions from agriculture. This focus area is calculated as the addition of land use concerned by investments in live-stock management in view of reducing GHG and/or ammonia emissions and the share of agricultural land under management contracts targeting reduction of GHG and/or ammonia emissions. Complementary result indicators include reduced emissions of methane and nitrous oxide, and reduced ammonia emissions.

[13] https://enrd.ec.europa.eu/sites/enrd/files/rdp_analysis_m16-6.pdf

Table 4: Rural development measures (Source: ENRD).

6. Measure mix per Member State

The following table shows the weight that each Member State has given to the various measures available in order to achieve the targets set for this Focus Area. Highlighted cells indicate the highest budget share allocation per MS. The last row presents the EU-28 planned total public expenditure for each measure (million EUR).

= Highest budget share allocation per MS

	M01 - Knowledge transfer & information actions	M02 - Advisory services	M04 - Investments in physical assets	M06 – Farm & business development	M07 – Basic services & village renewal	M08 - Investments in forest areas	M16 - Cooperation	Total	Planned expenditure (million EUR)
AT	1%	1%	17%	16%	53%	13%	0.3%	100 %	211
BE	6%			94%				100 %	5
BG	0.5%	0.2%	38%		61%		1%	100 %	115
CY			100%					100%	4
CZ				89%			11%	100%	14
DE		2%	25%		10%	60%	3%	100 %	26
DK			53%		48%		0.01%	100 %	36
EE	4%	0.1%		21%		64%	11%	100 %	14
ES	4%	3%	24%	13%	12%	37%	7%	100 %	110
FI	2%	3%	84%				10%	100 %	67
FR	1%	0.3%	36%	40%	2%	12%	8%	100 %	141
GR	2%	0.5%	48%			41%	10%	100 %	67
HR			100%					100%	94
HU						100%		100 %	15
IE									
IT	5%	5%	20%	30%	18%	9%	13%	100 %	213
LT		0.1%	6%	94%				100%	48
LU									
LV				100%				100 %	16
MT			88%				12%	100 %	9
NL									
PL									
PT			88%			3%	9%	100 %	30
RO				100%				100%	2
SE			29%	58%			13%	100%	29
SI									
SK	2%		54%	27%			16%	100%	18
UK	2%	3%	10%		34%	26%	26%	100 %	57
EU-28 (%)	2%	2%	35%	20%	21%	14%	7%	100 %	1 341
EU-28 (mil. EUR)	23	20	473	272	276	187	90	-	

2.3.2 Proposal for the funding period 2021-2026

The European Rural Development Fund will continue to cover compensation for additional costs/income losses arising from commitments incurred by farmers and landowners in land subject to ineligibility of direct payment. It is structured in multi-annual contracts (usually of 5-7 years) and it can take the form of collective schemes or result-based payment schemes.

There are 8 broad EU interventions to be tailored and defined by Member States (replacing the around 70 existing measures and sub-measures:

- *Environmental, climate and other management commitments.* These can include agro-environmental-climate commitments, conversion to or maintenance of organic farming, forest services and conservation and animal welfare
- *Natural or other area-specific constraints (ANCs).* Interesting in relation to the natural constrains and the possibilities for land restoration from Art. 29 of RED II, which aims to provide restoration of land for biofuels, bioliquids and biomass fuels
- *Area-specific disadvantages resulting from certain mandatory requirements.* Mainly Natura 2000 or Water Framework Directive, relevant for forest owners.
- *Risk management tools.* Financial and insurance tools.
- *Investments.* Productive investments might include capital investment compatible with bioenergy value chain, but not afforestation if not consistent with climate and environmental objectives in line with sustainable forest management principles, as developed in the Pan-European Guidelines for Afforestation and Reforestation.
- *Cooperation.* Considering current funding under measure 16 (aid for cooperation in the forestry sector), this can support mobilisation of agrobiomass.
- *Exchange of knowledge and information.* This has the potential to support exchange of information and practices related with bioenergy, up to 75 % of eligible costs.
- *New businesses and rural-business start-up.* Potential to support innovative business models integrating circular and bio-based economy.

The Commission proposal establishes that 30% for interventions should address environmental climate objectives, while Member States ask for more flexibility between pillars. Considering that rural development is the main source of funding within the CAP, higher investments rate in renewable energy such as bioenergy should be supported.

2.4. Transitional measures

Given the impossibility to have the new rules in place for the new funding period, transitional measures were proposed by the European Commission for 2021 as for the first year of the previous funding period. The European Parliament rapporteur proposed the possibility to extend it to two years if the new legislation is not in place on time.

The Commission proposal for this period is based on the “same rules, new budget” principle with a reduction in budget allocations, especially for rural development (15 %). However, ongoing rural development programs can be extended for a year.

The European Parliament proposed a flexible extension of up to two years. As in the European Commission proposal, the current programmes can be extended, should the Member State agree on it. The proposal aims to maintain current rules and current funding.

Member States will be able to decide whether to extend ongoing programmes during the transition period, or transfer the allocations to the new funding period. The Council[14] has shown interest in moving forward investments to promote subsequent economic recovery.

Table 5: EC proposal for funding allocation under the transitional period (Source: CAPreform).

Member State allocations in draft transition regulation in 2021 compared to 2020 envelopes, before flexibilities between Pillars

Country	Direct payments			Rural development		
	2020	2021	Per cent change	2020	2021	Per cent change
Belgium	505,266	485,604	-4%	79,314	67,178	-15%
Bulgaria	796,292	773,772	-3%	332,604	281,711	-15%
Czech Republic	872,809	838,844	-4%	305,522	258,773	-15%
Denmark	880,384	846,125	-4%	89,509	75,813	-15%
Germany	5,018,395	4,823,108	-4%	1,168,761	989,925	-15%
Estonia	169,366	167,722	-1%	103,751	87,876	-15%
Ireland	1,211,066	1,163,938	-4%	312,485	264,671	-15%
Greece	1,947,177	1,856,029	-5%	597,652	509,592	-15%
Spain	4,893,433	4,710,172	-4%	1,182,076	1,001,203	-15%
France	7,437,200	7,147,787	-4%	1,427,719	1,209,259	-15%
Croatia	298,400	344,340	15%	332,167	281,342	-15%
Italy	3,704,337	3,560,186	-4%	1,499,799	1,270,310	-15%
Cyprus	48,643	46,750	-4%	18,875	15,987	-15%
Latvia	302,754	299,634	-1%	138,500	117,307	-15%
Lithuania	517,028	510,820	-1%	230,443	195,183	-15%
Luxembourg	33,431	32,131	-4%	14,511	12,291	-15%
Hungary	1,269,158	1,219,770	-4%	491,392	416,202	-15%
Malta	4,689	4,507	-4%	14,413	12,207	-15%
Netherlands	732,370	703,870	-4%	86,366	73,151	-15%
Austria	691,738	664,820	-4%	567,266	480,467	-15%
Poland	3,061,518	2,972,978	-3%	1,555,975	1,317,891	-15%
Portugal	599,355	584,650	-2%	582,317	493,215	-15%
Romania	1,903,195	1,856,173	-2%	1,139,927	965,503	-15%
Slovenia	134,278	129,053	-4%	120,721	102,249	-15%
Slovakia	394,385	383,806	-3%	268,815	227,683	-15%
Finland	524,631	506,000	-4%	344,777	292,021	-15%
Sweden	699,768	672,761	-4%	249,769	211,551	-15%

Sources: 2020 amounts from annexes in the Direct Payments Regulation 1307/2013 and Rural Development Regulation 1305/2013 in current prices; 2021 figure from COM(2019) 581. Pre-allocated market-related expenditure for sectoral interventions not included.

3. Biodiversity Strategy to 2030

The Biodiversity Strategy calls to minimise the use of "whole trees food and feed crops for energy production" and opens the door to new bioenergy value chains, in particular in relation to landscape features management and soil quality improvement.

[14] https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/649388/EPRS_ATA(2020)649388_EN.pdf

On 20th May 2020 the European Commission launched the EU Biodiversity strategy for 2030. One of the objectives of the strategy is to unlock 20 billion EUR/year for biodiversity through various sources, including EU funds and national and private funding. the strategy, calling for the establishment of protected areas on land and sea (30%) respectively, includes a chapter on "win-win solutions for energy generation" including sustainable bioenergy. The strategy points at the direction of a strengthened sustainability approach by minimising the use of "whole trees food and feed crops for energy production". A better mobilisation of agrobiomass, in particular agricultural residues, would be therefore a welcomed development to fully untap bioheat potential and better integrate biodiversity and circularity considerations.

Additionally, two reports have assessed the impact of the CAP in biodiversity:

- The European Court of Auditors considered the CAP ineffective for halting the biodiversity loss.[15]
- The European Commission study sees an overall positive impact of the greening architecture over biodiversity, however recognises the limitation of the Ecological Focus Areas and links it to the Member States choices.

15 https://www.eca.europa.eu/Lists/ECADocuments/SR20_13/SR_Biodiversity_on_farmland_EN.pdf?utm_source=Associate+Members&utm_campaign=27f8f1b40d-EMAIL_CAMPAIGN_2018_11_07_05_13_COPY_01&utm_medium=email&utm_term=0_00bf999edc-27f8f1b40d-245981269

Table 6: Biodiversity spending (Source: ECA).

(EUR million, commitment appropriations)

Heading	Fund	2017	2018	2019 (estimate)	Total 2014-2020
HEADING 1A: Competitiveness for growth and jobs	European Earth Observation Programme (Copernicus)	107,8	102,0	104,5	677,5
HEADING 1A: Competitiveness for growth and jobs	The Framework Programme for Research and Innovation (Horizon 2020)	159,6	434,1	612,1	2 771,6
HEADING 1A: Competitiveness for growth and jobs		**267,4**	**536,1**	**716,6**	**3 449,1**
HEADING 1B: Economic, social and territorial cohesion	European Regional Development Fund (ERDF)	878,4	903,5	930,6	5 987,6
HEADING 1B: Economic, social and territorial cohesion	Cohesion Fund (CF)	804,6	834,8	865,4	5 773,3
HEADING 1B: Economic, social and territorial cohesion		**1 683,0**	**1 738,3**	**1 796,0**	**11 760,9**
HEADING 2: Sustainable growth: natural resources	European Agriculture Guarantee Fund (EAGF)	5 795,0	5 856,0	5 838,0	36 220,0
HEADING 2: Sustainable growth: natural resources	European Agricultural Fund for Rural Development (EAFRD)	4 253,0	4 266,0	4 250,0	29 486,0
HEADING 2: Sustainable growth: natural resources	European Maritime and Fisheries Fund (EMFF)	134,0	136,7	138,0	943,0
HEADING 2: Sustainable growth: natural resources	Programme for the Environment and Climate Action (LIFE)	242,8	266,0	282,6	1 726,2
HEADING 2: Sustainable growth: natural resources		**10 424,8**	**10 524,7**	**10 508,6**	**68 375,2**
HEADING 4: Global Europe	Instrument for Pre-accession Assistance (IPA II)	15,0	12,3	12,4	64,3
HEADING 4: Global Europe	European Neighbourhood Instrument (ENI)	40,4	42,6	44,8	309,8
HEADING 4: Global Europe	Development Cooperation Instrument (DCI)	229,0	202,4	215,6	1 174,3
HEADING 4: Global Europe	Partnership Instrument for cooperation with third countries (PI)	9,5	17,7	10,2	61,9
HEADING 4: Global Europe		**293,9**	**275,0**	**283,0**	**1 610,3**
Total Biodiversity		**12 669,1**	**13 074,1**	**13 304,2**	**85 195,5**
Biodiversity / EU budget		***8,1 %***	***8,3 %***	***8,2 %***	***8,0 %***
Total EU budget (Commission — Section III)		***155 910,4***	***156 696,0***	***161 500,3***	***1 066 413,8***

Source: ECA, based on the Draft General Budget of the European Union for the financial year 2019.

4. Renewable Energy Directive

The recast of the Renewable Energy Directive introduced for first time an indicative target for Member States in the uptake of renewables in heating and cooling but also strengthens the sustainability criteria, although only applicable for large-scale heating and/or power production.

The Renewable Energy Directive establishes the requirements for energy production to be considered as renewable, therefore being included in the Renewable energy targets and subject to public funding. The EU-wide target for Renewable energy by 2030 is at least 32 % without Member-States specific targets, in contraposition to the last decade where Member States had national renewable energy targets for 2020. Instead, a bottom-up approach is adopted where Member States propose a target as part of their National Energy and Climate Plans (NECP) and the European Commission assesses the collective ambition, following the itinerary towards it.

The recast of the Renewable Energy Directive[16] - commonly known and referred to as "REDII" – sets the framework for the promotion of renewable energy in the European Union from 2021 to 2030 while the current Renewable Energy Directive 2009/28 (RED) will be repealed in July 2021. The Directive defines the forms in which renewable energy can be produced. These include the use of biomass defined as "the biodegradable fraction of products, waste and residues from biological origin from agriculture - including vegetal and animal substances, from forestry and related industries, fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin. "

In the current directive, sustainability and greenhouse gas savings criteria cover all types of biomass used in the biofuels and bioliquids sectors (e.g. agricultural biomass as well as forest biomass). These criteria do not cover biomass used for heat and power. The recast directive (which will be implemented as of July 2021) introduces several changes specifically regarding the EU sustainability for bioenergy.

The sustainability criteria in REDII cover biomass used in transport as well as large heat and power installations, and cover both agricultural and forest biomass irrespective of their final use. Compliance with the criteria is mandatory in order for biomass to be accounted towards the union target and be eligible for financial support.

Solid biomass fuels must fulfil the sustainability and greenhouse gas emissions savings criteria if used in installations with a total rated thermal input equal or exceeding 20 MW. However, Member States may apply the sustainability and greenhouse gas emissions saving criteria to installations with lower total rated thermal input if they find this necessary. Extension of the EU sustainability and GHG saving criteria to biomass for large-scale heating & cooling and electricity generation include:

- New GHG saving threshold for biomass and biogas used for large-scale heating & cooling and electricity generation (for plants starting operations in 2021 70 %, in 2026 80 %)

[16] Directive 2018/2001 of the European Parliament and of the Council of the 11th of December 2018 on the promotion of the use of energy from renewable resources.

- New efficiency criteria for large-scale electricity-only installations using biomass
- Application of the existing land criteria to agricultural biomass
- Criterion addressing soil quality and soil carbon impacts of agricultural waste and residues
- Criterion avoiding the production of agriculture biomass from highly biodiversity forests
- New risk-based sustainability criteria dedicated only to forest biomass

Finally, the REDII establishes an annual average increase of the share of renewable energy in in the heating and cooling sector by 1.3 percentage points (calculated for 2021-2025 and 2026-2030).

5. Emissions limits for biomass heating facilities

Implementing Regulations of the Ecodesign Directive and the Medium Combustion Plant Directive set emission limits for biomass heating facilities up to 500 kW and from 1 to 50 MW respectively.

Most agrobiomass types are currently excluded from the scope of the Ecodesign Regulations, while agrobiomass is covered by the MCP Directive.

An upcoming review of the Ecodesign Regulation for solid fuel boilers may introduce EU-wide emission limits for the "missing" capacity gap between 500 and 1,000 kW, as well as set specific limits for pollutants from agrobiomass combustion in small scale facilities.

5.1.Ecodesign Directive and Regulations

The Ecodesign Directive[17] provides consistent EU-wide rules for improving the environmental performance of products, such as household appliances, information and communication technologies or engineering. The directive sets out minimum mandatory requirements for the energy efficiency of these products. This helps prevent creation of barriers to trade, improve product quality and environmental protection.

The Ecodesign Directive is complemented by specific regulations on different products. Heating appliances with biomass fuels are covered by so-called LOTs 15 (solid fuel boilers) and 20 (space heaters).

5.1.1 Ecodesign for solid fuel boilers (LOT 15)

The main scope of Regulation (EU) 2015/1189[18] is solid fuel boilers with a rated heat output of 500 kW. The Regulation does not apply in the following cases:

(a) boilers generating heat exclusively for providing hot drinking or sanitary water;

(b) boilers for heating and distributing gaseous heat transfer media such as vapour or air;

(c) solid fuel cogeneration boilers with a maximum electrical capacity of 50 kW or more;

(d) non-woody biomass boilers.

The Regulation provides the following definitions for "woody" and "non-woody" biomass:

- "woody biomass" means biomass originating from trees, bushes and shrubs, including log wood, chipped wood, compressed wood in the form of pellets, compressed wood in the form of briquettes, and sawdust.

[17] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

[18] Commission Regulation (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers

- "non-woody biomass" means biomass other than woody biomass, including straw, miscanthus, reeds, kernels, grains, olive stones, olive cakes and nut shells.

As such, Ecodesign excludes from its scope many agrobiomass types; it does however include agricultural prunings and plantation removal biomass, since it can be classified as "woody".

The Regulation for solid fuel boilers has come into force since 1 January 2020. Solid fuel boilers within the scope of the Regulation have to comply with specific requirements regarding their seasonal space heating efficiency and emissions, as well as production information, which are described in Annex II of the Regulation. The following table summarizes the seasonal[19] efficiency and emission limits for solid biomass boilers.

Table 7: Ecodesign Regulation seasonal efficiency and emission limits for solid biomass boilers.

Feeding Method	Nominal heat output	Seasonal space heating energy efficiency	Seasonal space heating emission limits (mg/m³ at 10 % oxygen concentration)			
			Carbon Monoxide, CO	Organic Gaseous Compounds, OGC	Particle Matter, PM	Nitrogen Oxides, NOx
Manual	≤ 20 kW	≥ 75 %	700	30	60	200
	> 20 kW	≥ 77 %				
Automated	≤ 20 kW	≥ 75 %	500	20	40	
	> 20 kW	≥ 77 %				
Benchmarks for Best Available Techniques (BATs)		90 % condensing 84 % non-condensing	6	1	2	97
Note: At the time of entry into force of the Regulation, no single solid fuel boiler was identified meeting all the benchmark values. Several solid fuel boilers met one or more of these values.						

A review of the Regulation for solid fuels boilers is foreseen under Article 7 by 1 January 2022 at the latest with the aim to:

(a) to include solid fuel boilers with a rated heat output of up to 1,000 kW;

(b) to include non-woody biomass boilers, with ecodesign requirements for their specific types of pollutant emissions;

(c) to set stricter ecodesign requirements beyond 2020 for energy efficiency and for emissions of particulate matter, organic gaseous compounds and carbon monoxide; and

(d) to vary the verification tolerances.

[19] The seasonal space efficiency and emission limits are defined as a kind of weighted average between the values at the rated thermal output and a reduced (30 or 50 %) thermal output. The exact definitions for measurements and calculations are provided in Annex III of the Regulation.

5.1.2 Ecodesign for solid fuel space heaters (LOT 20)

The main scope of Regulation (EU) 2015/1185[20] is solid fuel space heaters with a rated heat output of 50 kW or less. The Regulation does not apply in the following cases:

(a) solid fuel local space heaters that are specified for the combustion of non-woody biomass only;

(b) solid fuel local space heaters that are specified for outdoor use only;

(c) solid fuel local space heaters of which the direct heat output is less than 6 % of the combined direct and indirect heat output at nominal heat output;

(d) solid fuel local space heaters that are not factory assembled, or are not provided as prefabricated components or parts by a single manufacturer which are to be assembled on site.

(e) air heating products;

(f) sauna stoves.

The definitions for "woody" and "non-woody" biomass are the same as in Regulation (EU) 2015/1189 for solid fuel boilers.

The Regulation for solid fuel space heaters will come into force in 1 January 2022. Solid fuel space heaters within the scope of the Regulation have to comply with specific requirements regarding their seasonal space heating efficiency and emissions, as well as production information, which are described in Annex II of the Regulation. The following table summarizes the seasonal[21] efficiency and emission limits for solid biomass boilers.

Table 8: Ecodesign Regulation seasonal efficiency and emission limits for solid biomass space heaters.

Space heater type	Seasonal space heating energy efficiency	Seasonal space heating emission limits (mg/m³ at 13 % oxygen concentration)			
		Carbon Monoxide, CO	Organic Gaseous Compounds, OGC	Particle Matter, PM*	Nitrogen Oxides, NOx
Open fronted	≥ 30 %	2,000	120	50	200
Close fronted (firing solid fuels other than wood pellets)	≥ 65 %	1,500	120	40	200
Close fronted (firing wood pellets)	≥ 79 %	300	60	20	200
Cookers	≥ 65 %	1,500	120	40	200
* When measured according to the method described in Annex III, point 4(a)(i)(1). Additional measurement methods are also provided, with different values for seasonal PM emission limits.					

[20] Commission Regulation (EU) 2015/1185 of 24 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel local space heaters

[21] The seasonal space efficiency and emission limits are defined as a kind of weighted average between the values at the rated thermal output and a reduced (30 or 50 %) thermal output. The exact definitions for measurements and calculations are provided in Annex III of the Regulation.

A review of the Regulation for solid fuel space heaters is foreseen under Article 7 by 1 January 2024 at the latest with the aim to:

(a) consider whether it is appropriate to set stricter limits for energy efficiency and emissions

(b) modify verification tolerances.

However, the introduction of limits for non-woody biomass local space heaters is not considered.

5.1.3 Labelling

Since 1994, and further expanded in 2004, energy labels have been helping consumers to choose products which are more energy efficient. At the same time, it also encourages manufacturers to drive innovation by using more energy efficient technologies. The A+++ to D system is being substituted by A to G scale.

With the same LOT structure as the Ecodesign Directive, LOT 15 is in place since 26th September 2019. LOT 20 has a progressive implementation, where from 1st January 2018 energy labels cover space heaters that are not flueless heaters or open to chimney heaters using solid fuels. From 1st January 2022 labels will also cover flueless heaters or open to chimney heaters using solid fuels. Both are only applicable to woody biomass or multi-fuel appliances.

At the end of last year, the European Commission distributed a discussion paper regarding the combination of the energy label for local space heaters (LOT 20) and air-to-air heat pumps (LOT 10), questioning "whether or not consumers should be able to compare the energy efficiencies of those products by means of a single energy label, e.g. by introducing the same energy efficiency classes for all products on a 'combined' energy label (air-to-air heat pumps ≤12 kW and local space heaters ≤50 kW)."

5.2. Medium Combustion Plant Directive

The Medium Combustion Plant (MCP) Directive[22] regulates emissions from combustion plants with a thermal input between 1 and 50 MW.

Combustion plants under the MCP are grouped into two main categories:

- "Existing", meaning a combustion plant put into operation before 20 December 2018 or for which a permit was granted before 19 December 2017 pursuant to national legislation provided that the plant is put into operation no later than 20 December 2018.
  "New", meaning a combustion plant other than an existing combustion plant.

The MCP Directive includes agrobiomass in its scope and in fact introduces some specific emission limits for straw. Some facilities are excluded from its scope, such as "on-farm combustion plants with a total rated thermal input less than or equal to 5 MW, that exclusively use unprocessed poultry manure, as

[22] Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants

referred to in Article 9(a) of Regulation (EC) No 1069/2009[23] of the European Parliament and of the Council, as a fuel". The main emission limits for combustion plants using solid biomass are provided in Annex II of the Directive; it should be noted that some exceptions for specific installations may apply.

Table 9: Solid biomass emission limits under the MCP Directive.

Medium combustion plant type (other than engines and gas turbines)	Rated thermal input (MW)	Emission limits (mg/m^3 at a 6 % oxygen concentration) for solid biomass		
		Sulphur Dioxide, SO_2	Nitrogen Oxides, NOx	Dust
Existing	1 - 5	200 * / 300 (straw)	650	50
Existing	> 5	200 * / 300 (straw)	650	30
New	1 – 5	200 *	500	50
New	5 – 20	200 *	300	30
New	20 – 50	200 *	300	20
* Not applicable for plants firing exclusively woody biomass				

A review of the MCP Directive is foreseen in Article 12. In particular:

- By 1 January 2020, the Commission shall review progress in relation to the energy efficiency of medium combustion plants and assess the benefits of setting minimum energy efficiency standards in line with best available techniques.
- By 1 January 2023, the Commission shall assess the need to review the provisions concerning plants which are part of SIS or MIS, as well as Part 2 of Annex II, on the basis of state-of-the-art technologies.
- As part of this review, the Commission shall also assess whether for certain or all types of medium combustion plants there is a need to regulate CO emissions.
- Thereafter, a review shall take place every ten years and shall include an assessment of whether it is appropriate to set stricter emission limit values, in particular for new medium combustion plants.

The European Commission shall submit a report on the results of the aforementioned reviews to the European Parliament and to the Council accompanied by a legislative proposal where appropriate.

[23] Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption

6. Air Quality under the European Green Deal

The European Green Deal calls to close the gap between the European Environmental Agency (EEA) and World Health Organization (WHO) standards for air quality. While this has several implications for the concentration of different pollutants, when it comes to particle matter closing the gap would lead to a reduction of the limit - in some cases of half of the current values. The Air Quality report[24] already provides the share of household falling under WHO values and the difference between urban and suburban areas.

Table 10: Limits on PM outdoor concentration (Source: Bioenergy Europe).

	EU Ambient Air Quality Directives	WHO
PM2.5	25 µg/m3	10 µg/m3
PM5	40 µg/m3	20 µg/m3

A tightening in the concentration values could lead to a spill over effects in the emission limits of the Ecodesign Regulations for solid fuel boilers and space heaters.

[24] https://www.eea.europa.eu/publications/air-quality-in-europe-2019

7. Recovery Plan

While the scope of the Recovery Plan and the instruments included need to be clarified, it seems clear that the mobilisation of funds devoted to renewable energy and environmental interventions subject to support bioenergy would be significant.

The kernel of the EU Recovery Plan is the project of new "Next Generation" fund. It is proposed that 560 billion euros will be offered in the form of free grants to the bloc's member states, while 250 billion euros will be made available in loans to repair the single market following the economic impact of the Coronavirus. For the energy sector these funds should support investments in line with the Integrated Energy and Climate Plans.

Based on the leaked details of the Green Transition Fund, resources form this pool will be devoted to development of bioeconomy and bioenergy value chains in the rural areas.

Within bioeconomy area, EUR 14 billion (via CAP/LIFE/new fund), will be invested to:

- Afforestation with the objective of planting 3 billion trees by 2030
- Peatland restoration with the objective of reducing 50Mt CO2 per year
- Soil management, such as nitrogen fixation, with the objective of saving 9 Mt CO2
- Conversion to agro-forestry with the objective of expanding the usable land to 2.6 million hectares.
- Launch of the EU Carbon Farming programmes with pilot projects in at least 40 regions

Moreover, EUR 4 billion will be reserved for measures facilitating the development of renewable energy in rural areas. In this regard, it will be crucial to reduce methane emissions from livestock by investing into anaerobic digesters for biogas production as well as biogas production from different residues. The potential for the development of biomass as well as wind and solar projects is also mentioned.

The Plan mentions two priority areas of investments:

- Optimal use of waste and residual streams for biogas production with the objective to increase the production of biogas or biomethane by 15 Mtoe by 2030.
- Energy crops for production of advanced and sustainable biogas and biofuel with the objective to provide about 5 Mtoe of sustainable bioenergy feedstock by 2030.

The development of the bioenergy value chain is included also in other financial instruments such as, Just Transition Fund (additional EUR 32.5 billion) and EU Agricultural Fund (additional EUR 15 billions). Nevertheless, the scope of these funds is much wider and they primarily address other issues.

7.1. The renovation wave and the need to address rural areas and vulnerable groups first

The renovation wave was first mentioned in the European Green Deal as a mean to increase energy efficiency in buildings. Since then, its role has been enhanced as part as the European Commission's plans for the economic and social recovery after COVID-19 pandemic. According to the European Commission's roadmap consultation, the initiative will also address the uptake of renewables in buildings, mainly heating and cooling through heat pumps and district heating and cooling systems. 45 % of rural heat demand in Europe is coming from fossil fuels (heating oil and coal)[25]. Substituting them with biomass would result in a substantial decrease of GHG emissions and wider deployment of RES across the heating sector. According to a recent report from the Future of Rural Energy in Europe (FREE) initiative, about 40.7 million households (nearly 19 % of households in Europe) are not connected to the natural gas grid.

The European Parliament is now negotiating its own initiative to influence the debate. While it shares the scope with the European Commission text (building envelop and uptake of renewables), some MEPs are advocating for a scrapping scheme, supporting the replacement of old inefficient and fossil fuel heating appliances by renewable ones. Another issue identify by the European Parliament is the need to address energy poverty when designing the renovation plans. 7.6 % of the EU population is unable to keep their homes warm due to energy poverty.[26] Bioenergy is recognised as the only cost-competitive technology in the European Commission's report on Competitiveness of the heating and cooling industry and services[27], with the ability to further reduce utility bills, addressing energy poverty.

[25] https://www.rural-energy.eu/wp-content/uploads/2018/11/Summary-Scenarios-for-decarbonising-homes-in-Europe%E2%80%99s-rural-areas-%E2%80%93-November-2018.pdf
[26] https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=sdg_07_60&plugin=1
[27] https://op.europa.eu/en/publication-detail/-/publication/b23af898-c48e-11e9-9d01-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=37085&WT.ria_f=3608&WT.ria_ev=search

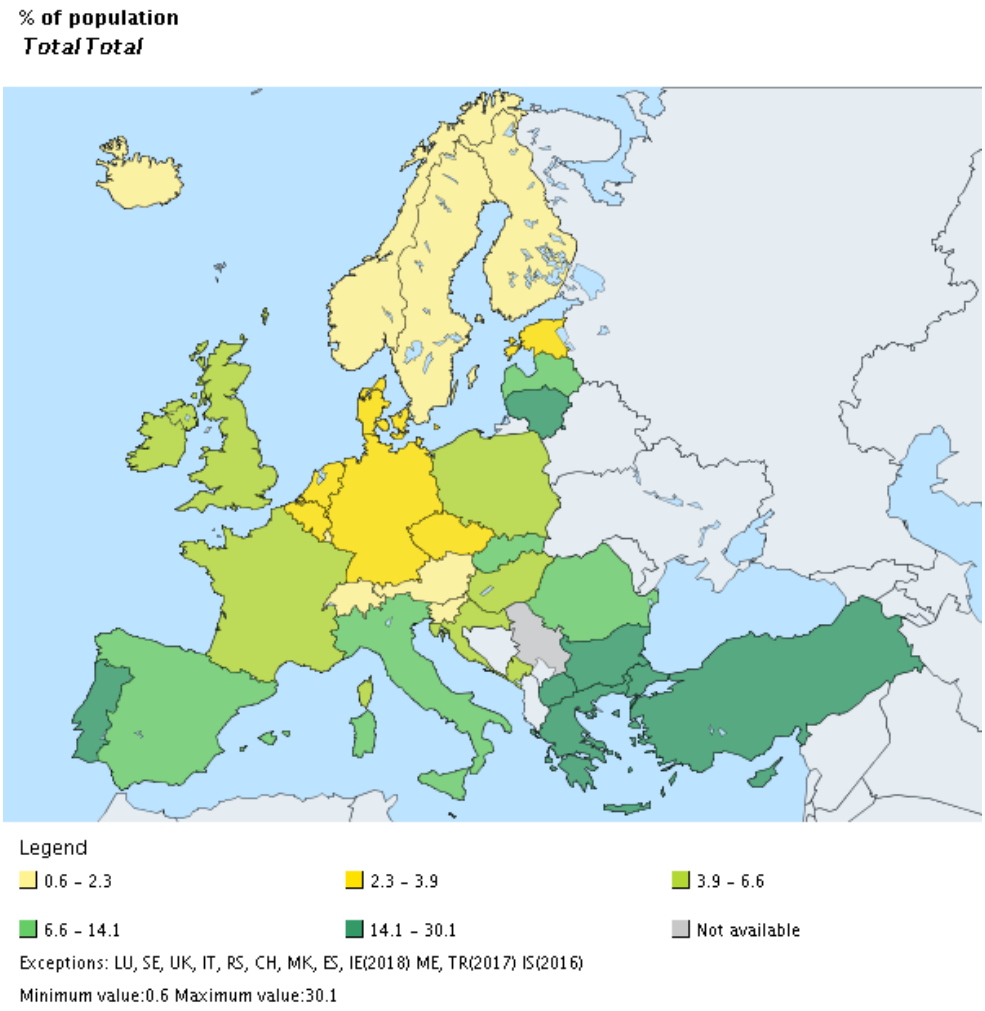
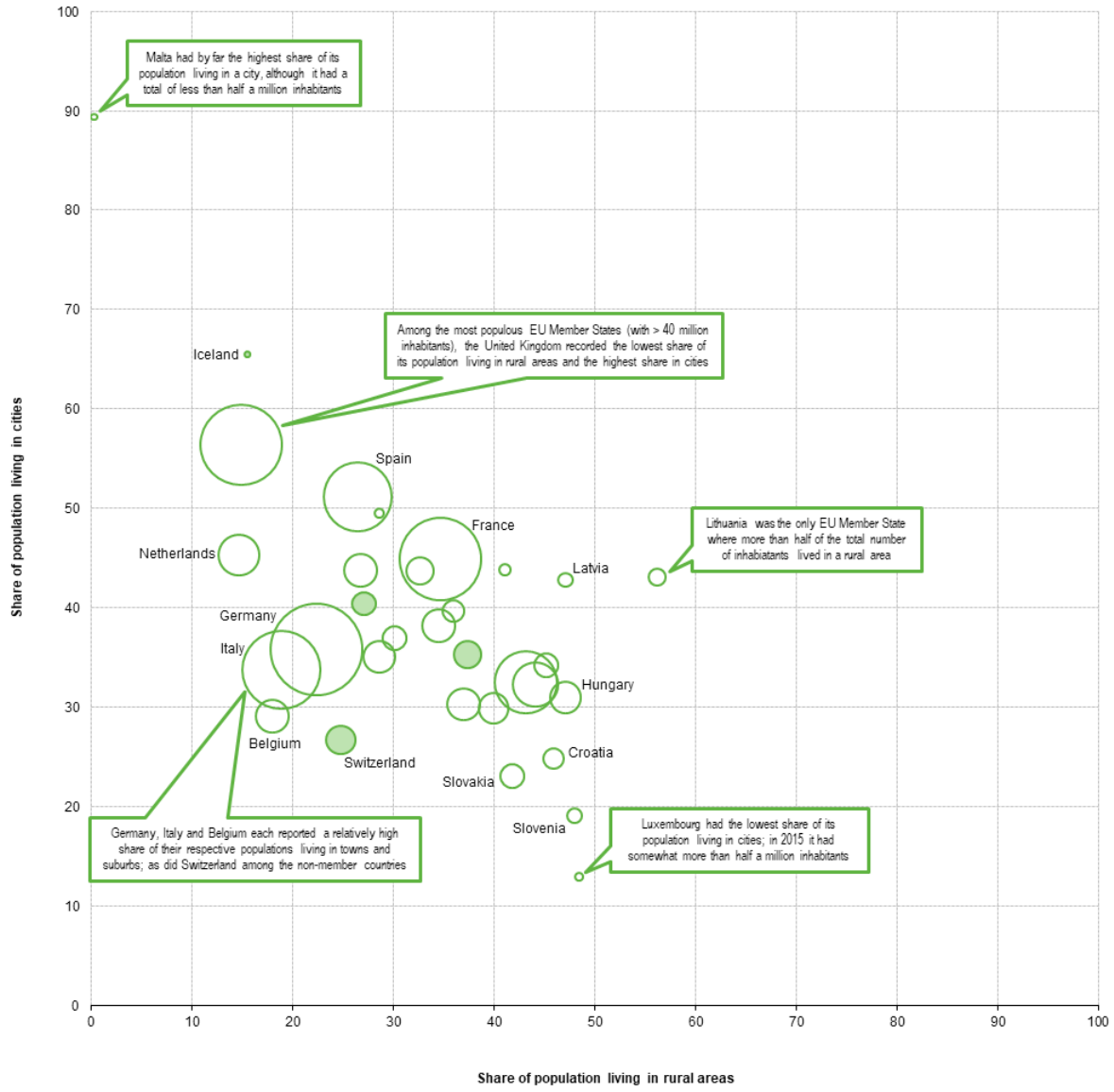


Figure 2: Population unable to warm their houses due to energy poverty (Source: Eurostat).

7.2. The need to tackle rural land abandonment



Note: the area of each circle is proportional to its average population in 2015; the shaded circles denote non-member countries (Iceland, Norway, Switzerland and Serbia).
Source: Eurostat (online data codes: ilc_lvho01 and demo_gind)

Figure 3: Urban and rural population by EU Member State (Source: Eurostat).

According to the JRC, between 2015 and 2030 about 11 % (more than 20 million hectares) of agricultural land in the EU is under high potential risk of abandonment due to factors related to biophysical land suitability, farm structure and agricultural viability, population and regional specifics.[28] The study mentions the potential of the CAP to revert or mitigate those numbers, in "mostly Eastern countries and regions –

[28] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/agricultural-land-abandonment-eu-within-2015-2030

Estonia, Latvia, Romania, Cyprus". The abandoned land for the period 2015-2030 is expected to reach 4.2 million ha net (about 280 thousand ha per year on average) of agricultural land, up to 5.6 million ha of abandoned land by 2030, the equivalent of 3% of total agricultural land.

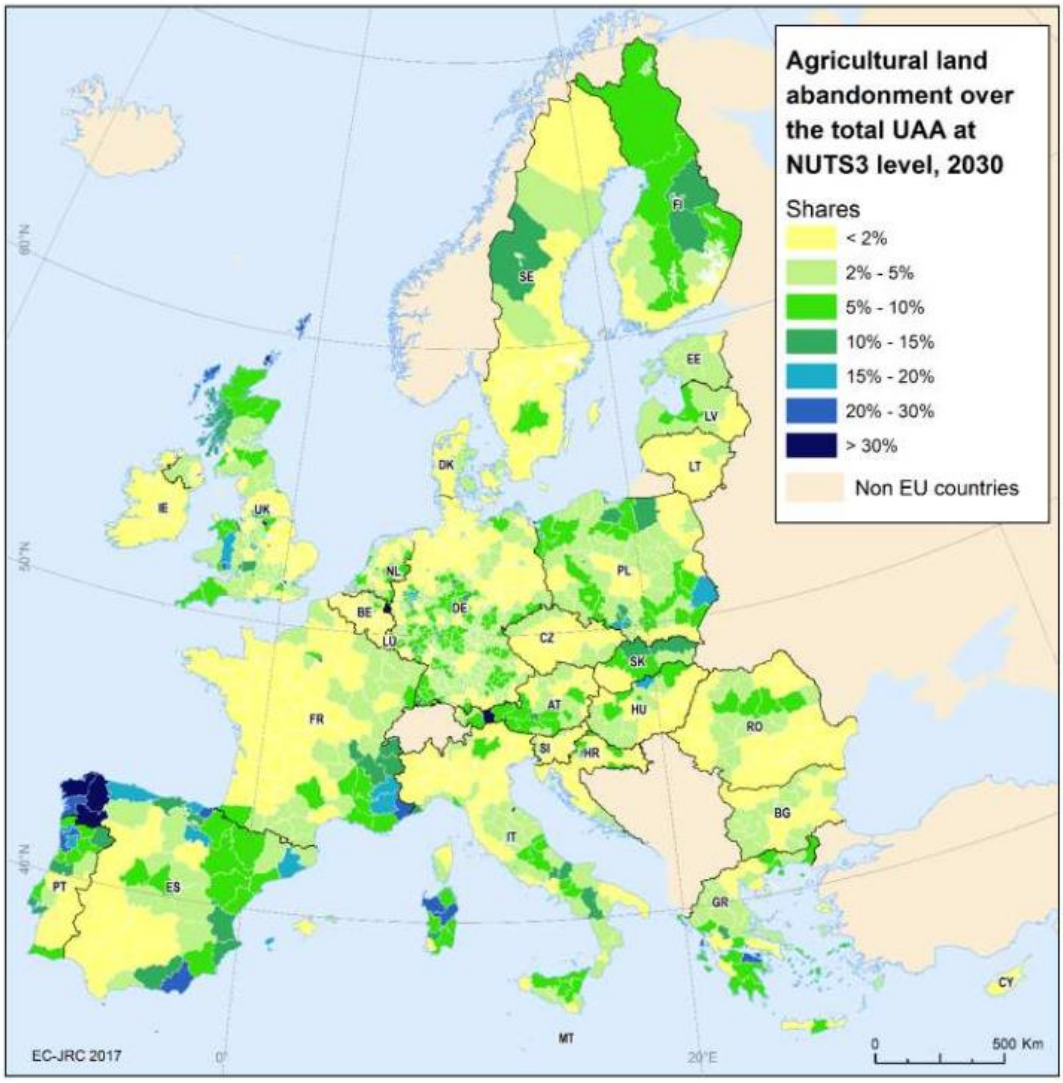


Figure 4: Estimated agricultural land abandonment in 2030 by NUTS3 (Source: EC-JRC 2017).

This map of areas with higher risk of land abandonment contrast with the availability of land for biomass and especially the cost of mobilisation. Availability of land for biomass is especially low in areas with higher risk of land abandonment, such as Portugal, Poland, Romania and with moderate prices in Spain, and Slovakia.

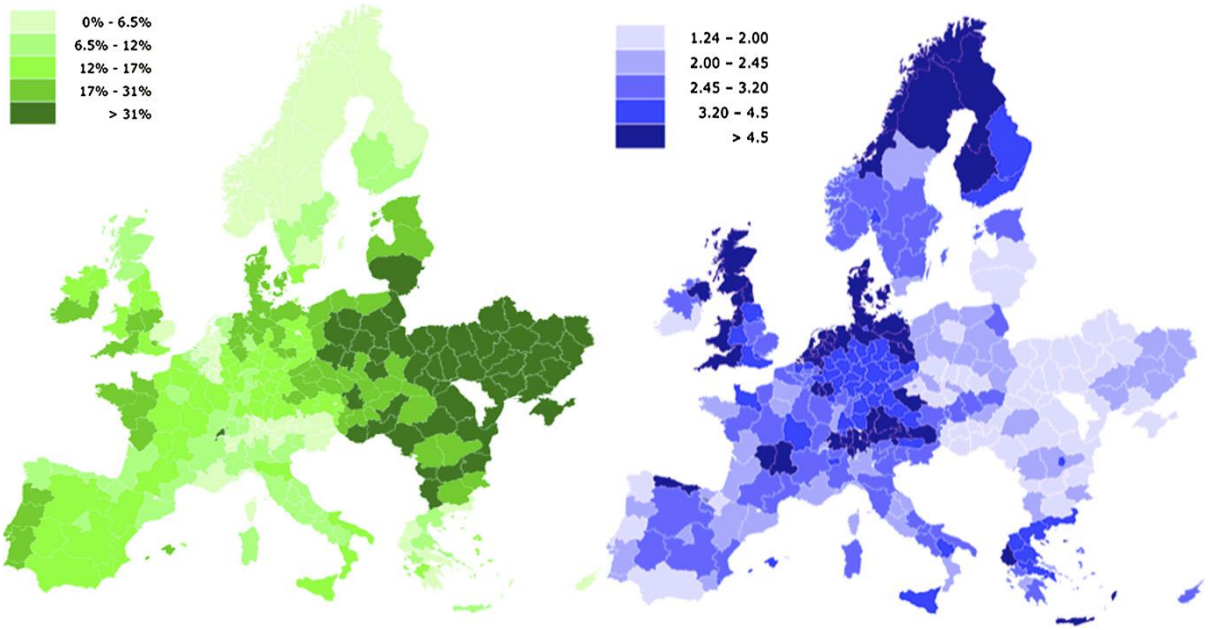


Figure 5: Surplus land for woody crops in 2030 (left) and production costs in 2005 (right) (Source: de Wit et al., 2010)[29]

On the left: The 'surplus' land potentially available for the production of biomass by 2030 (green shades indicate the amount of surplus land as a percentage of the total land). On the right, the production costs for woody crops in 2005 (blue shades indicate the production costs of woody crops)

[29] M.de Wit, M. Junginger, S. Lensink, M. Londo, A. Faaij (2010) Competition between biofuels: Modeling technological learning and cost reductions over time. Biomass and Bioenergy 34(2): pp. 203-217.

8. National Energy and Climate Plans

After submitting the draft plans last year and in accordance with the Regulation for the Governance of the Energy Union, Member States must send their final plans once the European Commission assessed their draft. They were required to do so by 31st December 2020, but many Member States delayed the submission. The European Commission assessment is expected to be published soon considering that only Ireland is missing.

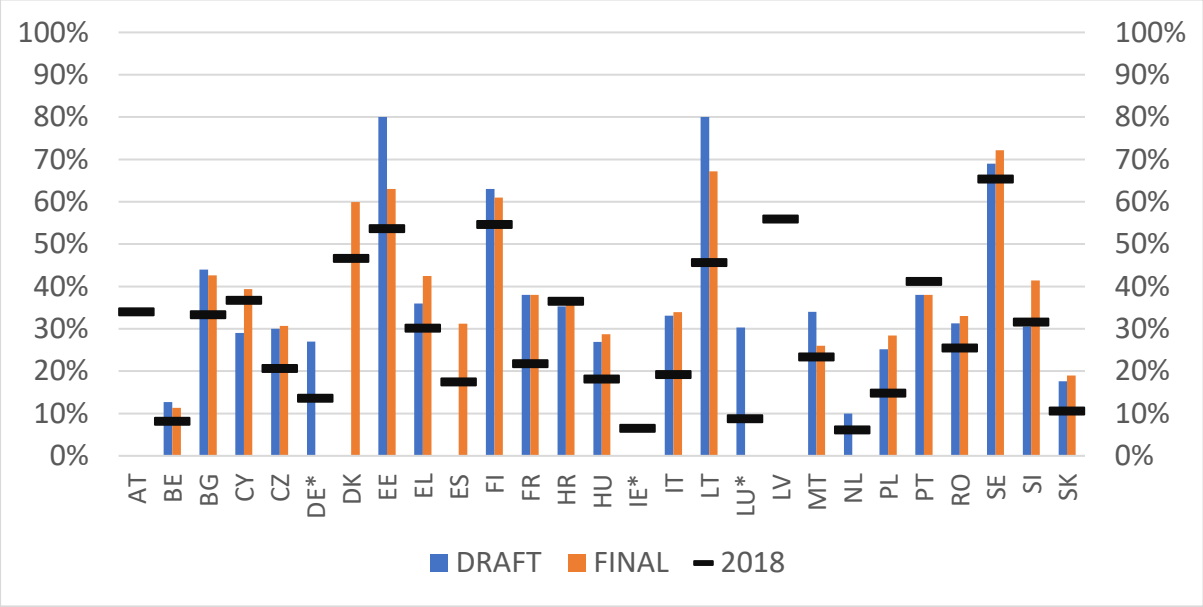


Figure 6: Share of renewable heating and cooling in draft and final NECPs.

*Notes: Final NECP missing at the time of edition of the graph for DE, IE & LU. When no data is presented it means that this data was not available in the NECP. * 2030 data from the draft NECP*

Bioenergy will remain the leading source of bioheat in most of the EU countries, especially in Hungary, Finland and Czech Republic. In absolute terms, France will lead the sector (Germany submitted their NECP after the compilation of data presented).

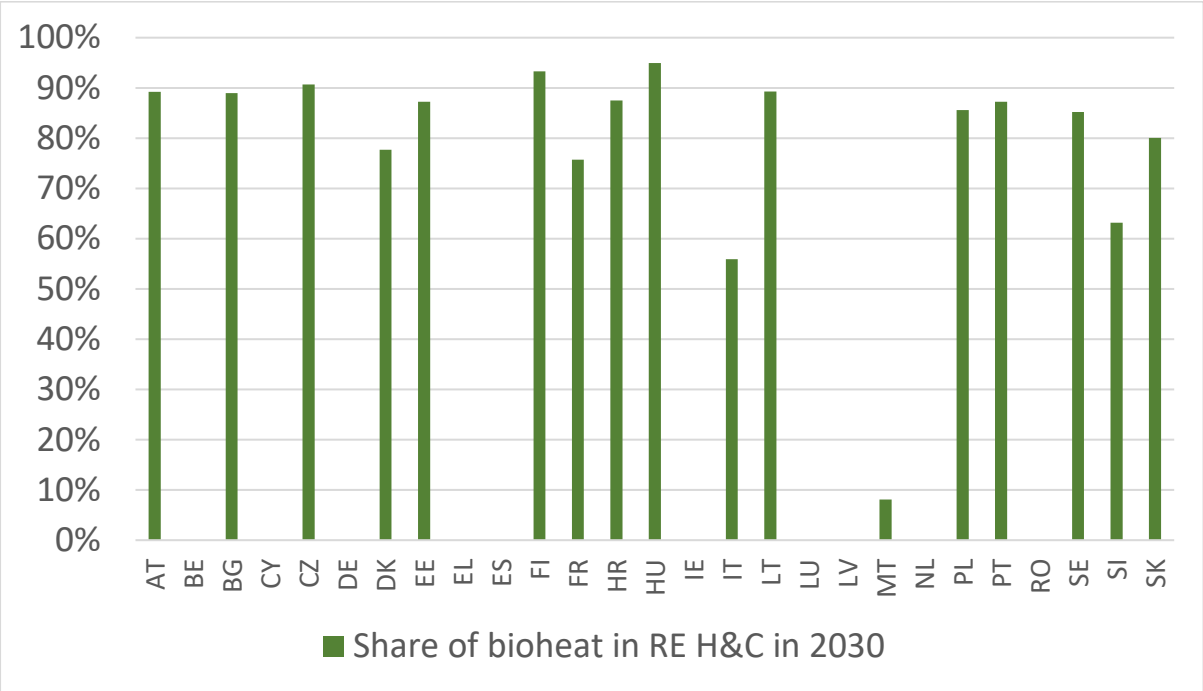


Figure 7: Share of bioheat within renewable heating and cooling in the NECPs.

*Notes: Final NECP missing at the time of edition of the graph for DE, IE & LU. When no data is presented it means that this data was not available in the NECP. * 2030 data from the draft NECP*

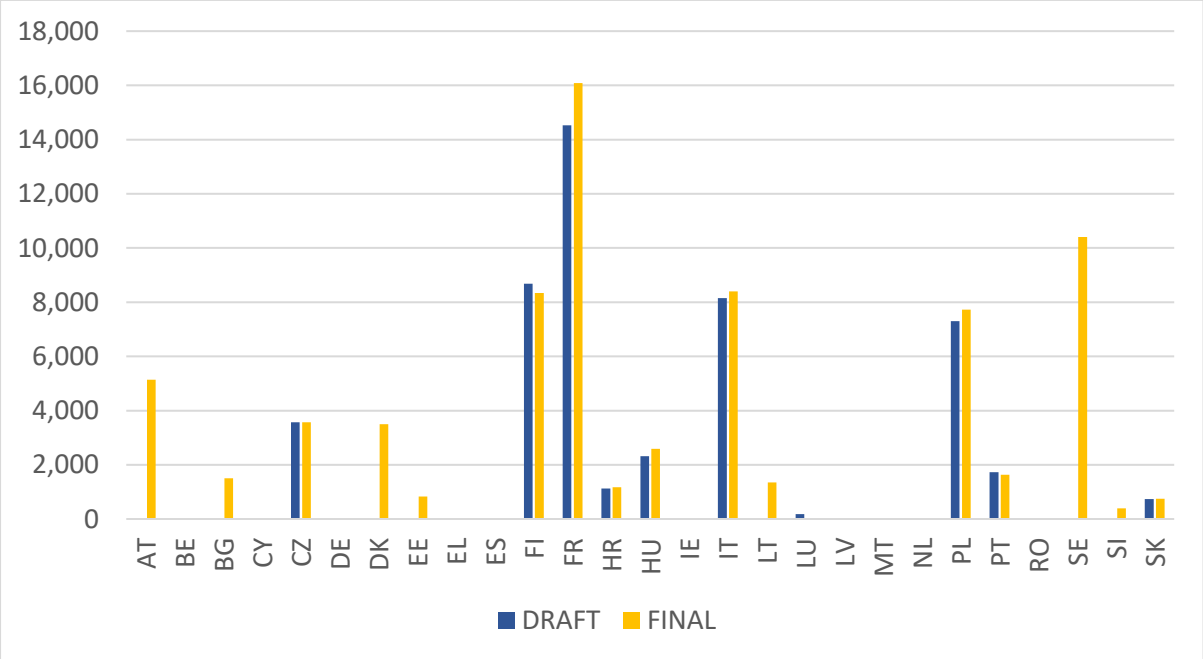


Figure 8: Planned installed capacity of bioheat in 2030 in ktoe.

*Notes: Final NECP missing at the time of edition of the graph for DE, IE & LU. When no data is presented it means that this data was not available in the NECP. * 2030 data from the draft NECP*

Since 2006 the bioheat industry has experienced a growth of +34%, while the available data from the NECPs estimates a growth of 26 % from 2018 to 2030, with substantial differences between Member States as displayed in the previous chart. This is based in the historical progression, assuming general growth based in the countries that provide a trajectory in their NECPs.

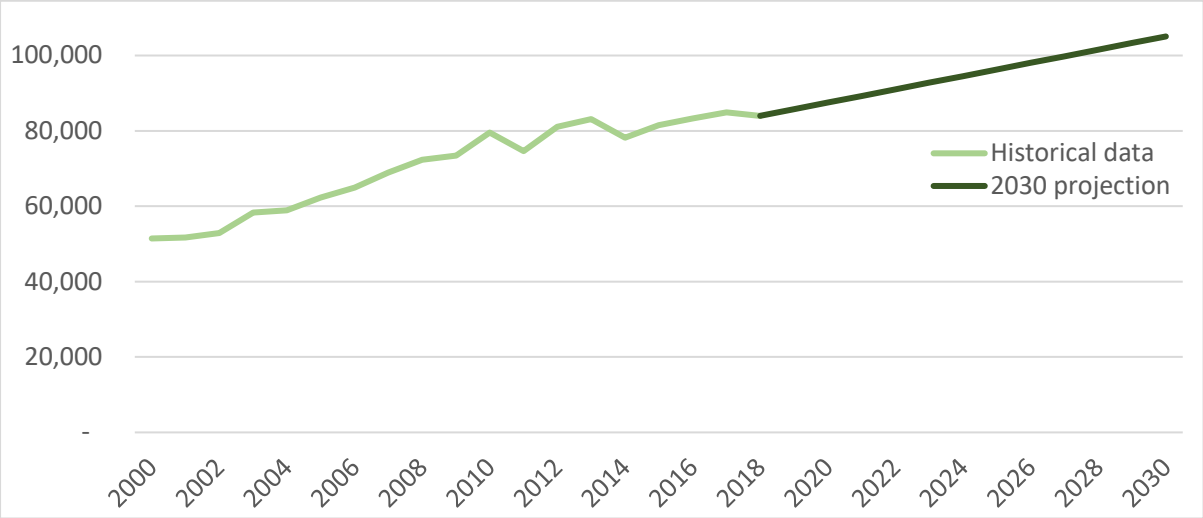


Figure 9: Progression of bioheat in the EU-28 (Source: Eurostat and Bioenergy Europe)

Note: when data not available for a country (BE,CY, DE, ES, IE, LV, RO) it was considered that their bioheat will grow with the same growth rate than the average for all the EU countries with data available (i.e. +30%)

9. Climate Law

The objective of carbon neutrality by 2050 would require an increased uptake of renewable energy sources, including - according to most of the studies - bioenergy. This requires an increase in the land that will be used for the cultivation of 2nd generation (lignocellulosic) energy crops.

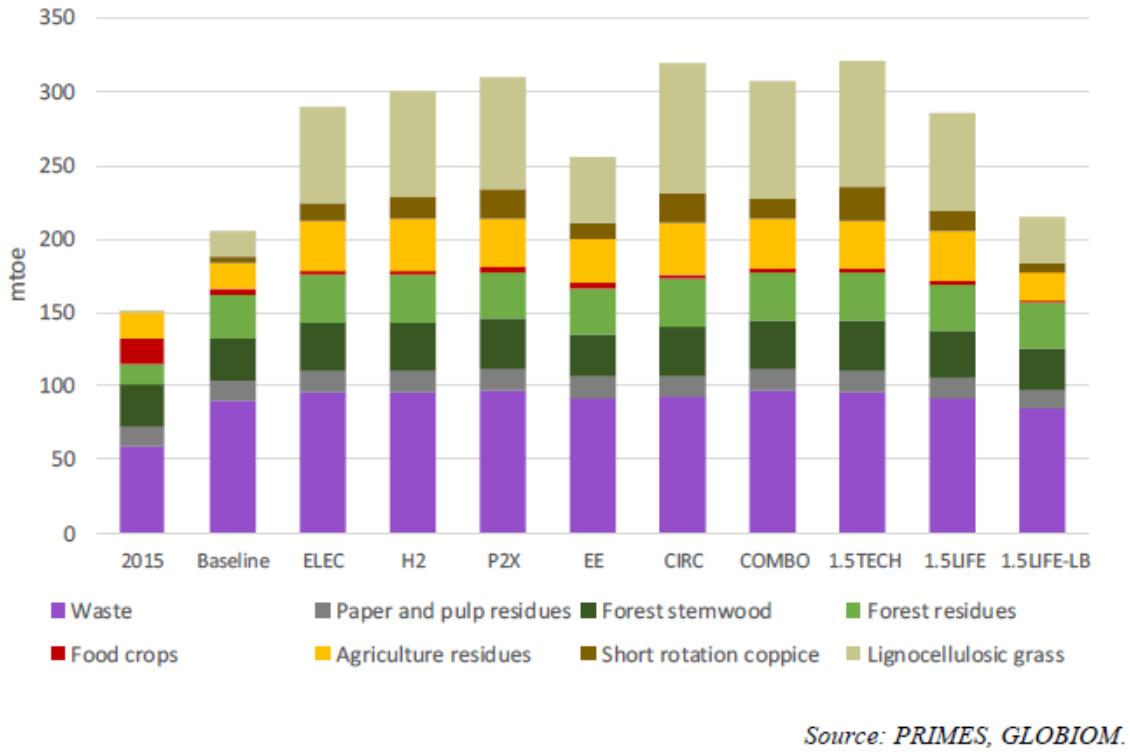
The recently proposed Climate Law is set to deliver a legally binding target of net zero greenhouse gas emissions by 2050, as already demanded by the European Parliament and agreed by the European Council.

The objective of carbon neutrality and the intermediate step of 2030 target (to be determined in September 2020 following the impact assessment) and between 50 and 55 % greenhouse gases emission reduction from 1990, will most probably require a review of the renewable energy and energy efficiency targets of RED II. This process can take place in the framework of the Climate Law as part of the review of the sectoral legislation in 2021 or in the review of the RED II targets in 2022.

9.1. Agrobiomass contribution to carbon neutrality by 2050

The European Commission presented 8 scenarios for 2050 within the In-depth analysis accompanying the Communication "A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy"[30]; two of these (1.5 LIFE, including LIFE-LB and 1.5 TECH) aim to achieve carbon neutrality. In regard to the bioenergy sector, we can appreciate among all scenarios substantial reduction in food crops and an exponential growth in short rotation coppice and the mobilisation of waste and agriculture and forest residues. Most of the demand is supplied via lignocellulosic grass such as switchgrass and miscanthus while short rotation coppices providing 20 to 25 % of the demand in energy crops.

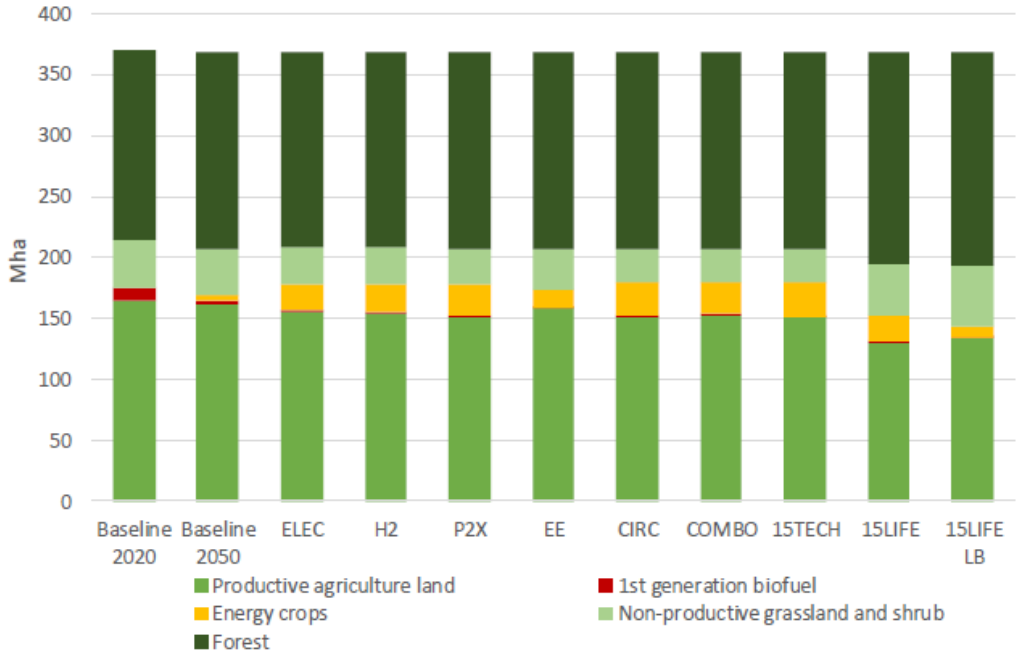
[30] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf



Source: PRIMES, GLOBIOM.

Figure 10: Bioenergy feedstock in the European Commission scenarios for 2050 (Source: PRIMES, GLOBIOM).

Concerning the use of land, in all scenarios there is an increase in forest covered areas while land devoted to 1st generation biofuels almost disappears. This is substantially replaced by energy crops where depending on the scenario, the land used for energy crops vary between 9 and 29 million hectares. Most of the changes happen through a large switch towards lignocellulosic grass from unused grassland, and the replacement of 1st generation biofuels.



Source: GLOBIOM.

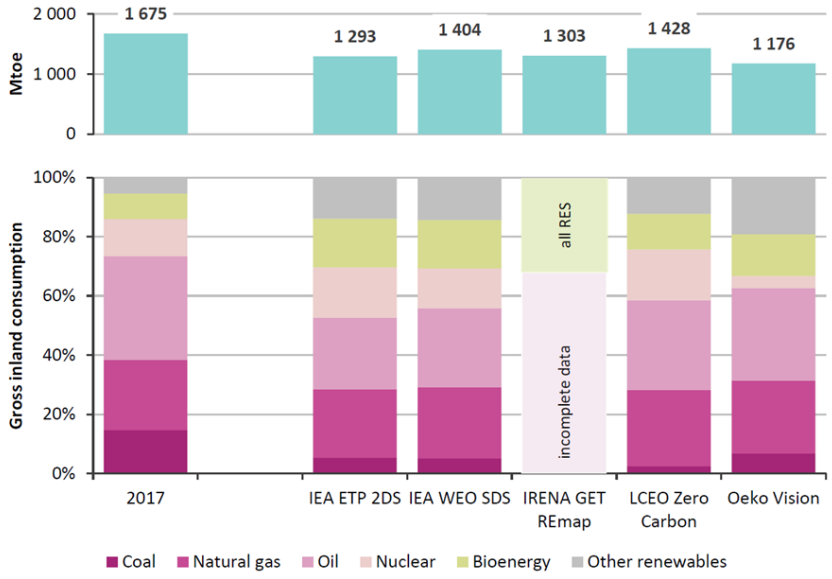
Figure 11: Use of natural land under the European Commission scenarios for 2050 (Source: GLOBIOM).

At state-level there are also remarkable efforts on the potential of energy crops. For example, United Kingdom's Committee on Climate Change proposes to plant 23,000 new hectares of energy crops per year reaching up to 0.7 million hectares by 2050. The proposal includes the plantation of miscanthus on existing cropland, short rotation coppice (SRC) and short rotation forestry (SRF) on existing grassland. Sweden is planning an increase in the use of catch crops and cover crops on 400,000 hectares; agroforestry on 50,000 hectares, with 40,000 hectares of agricultural land taken out of production devoted for energy crop cultivation, mainly Salix and Poplar.

The European Commission scenarios are included in the JRC report *Towards net-zero emissions in the EU energy system by 2050*[31]. In this review, the JRC compares existing scenarios achieving more than 50% reduction in GHG by 2030 and climate neutrality by 2050. For 2030, the studies diverge on the increase of bioenergy, from little to up to 60%. For 2050, the studies agreed on a growth in bioenergy from 9% of total energy today up to 20%, especially in the industry and transport sectors.

[31] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC118592/towards_net-zero_emissions_in_the_eu_energy_system_-_insights_from_scenarios_in_line_with_2030_and_2050_ambitions_of_the_european_green_deal_on.pdf

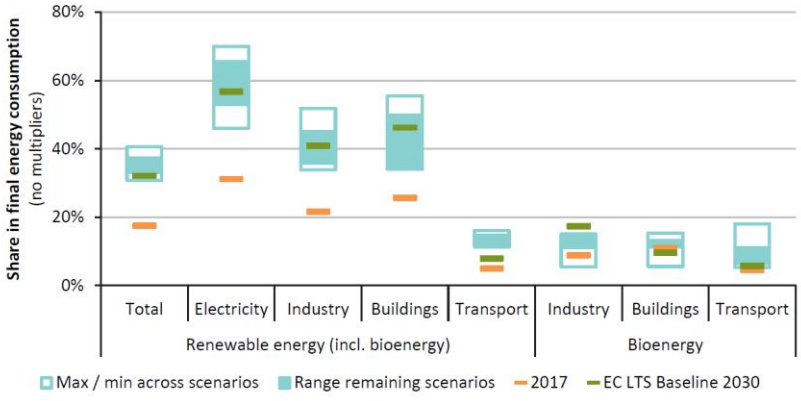
Figure 6 Gross inland consumption in scenarios that reach at least 50% emission reduction in 2030



Note: "Other renewables" includes hydropower, wind, solar, geothermal, ocean energy, ambient heat and imports of e-fuels. IRENA GET REmap does not provide more detailed disaggregation. *Source*: JRC.

Figure 12: Gross inland consumption in scenarios reaching at least 50% GHG emission reduction in 2030 (Source: JRC).

Figure 19 Share of renewable energy and bioenergy in scenarios that reach at least 50% emission reduction in 2030 and benchmark with projections for 2030 under the existing policy framework



Note: White-filled boxes correspond to the maximum and minimum values across all scenarios for 2030; inner boxes include the remaining scenario values for 2030. The green marker indicates projections of EC LTS Baseline for 2030 and is used for comparison only, as it does not meet the required emission reduction. *Source*: JRC.

Figure 13: Share of renewable energy and bioenergy in scenarios reaching at least 50% GHG emission reduction in 2030 (Source: JRC).

Peatlands are the largest natural terrestrial carbon store[32], with their drainage releasing an enormous amount of carbon into the atmosphere. Wet farming in organic soil (paludiculture) for biomass not only avoids the release of GHG emissions from the drainage, but also provides an economic incentive for farmers to switch from dry to wet agriculture. Food and non-food crops that can grow in water, such as

[32] https://www.iucn.org/resources/issues-briefs/peatlands-and-climate-change

sphagnum, blueberries and reeds, for example, can be used for bioenergy production and further reduce GHG emissions by substituting fossil fuel. Currently, there are pilot projects rewetting land with bioenergy uses in Germany[33], Belarus[34], Ukraine and Romania[35]. In Sweden, the government aims to create incentives to rewet 100,000 hectares of forest land and 10,000 hectares of former agricultural land on peatland previously drained for farming and forestry, up to 2040.

[33] https://www.moorwissen.de/doc/paludikultur/projekte/vip//endbericht/Endbericht%20%20BMBF%20Verbundprojekt%20VIP%20-%20Vorpommern%20Initiative%20Paludikultur.pdf

[34] https://succow-stiftung.de/tl_files/pdfs_downloads/Projektinfos/Wichtmann%20et%20al.%202012_Bioenergieforum_Rostock.pdf

[35] https://www.ramsar.org/sites/default/files/documents/library/7_tanneberger-_paludiculture_in_europe.pdf

10. Circular Economy

The Circular Economy Action Plan for next 10 years aims to increase the use of waste and bi-products and a regime for negative emissions, both are defining features of the bioenergy industry.

The Communication Circular Economy Action Plan[36] envisages a future where the reuse of critical and secondary raw material enhances an economic model based on green growth linked with the Industrial Strategy. Bio-based economy potential for farmers and agricultural business is also recognised in the Farm to Fork Strategy.

The Circular Economy Action Plan makes a reference to support the sustainable bio-based sector through the implementation of the Bioeconomy Action Plan, and the extension of bioeconomy as a driver for the transition to renewable sources. Biomass (for food, energy and fibres) is considered responsible for almost 90 % of global water stress and land-use related biodiversity loss, and more than 30 % of greenhouse gas emissions related to resources (not including emissions from land use change).[37]

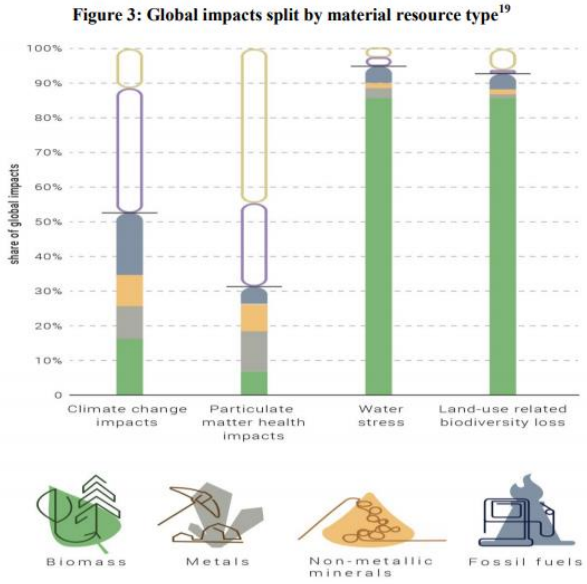


Figure 14: Global impacts split by material source[38]

Source Adapted from IRP (2019), Global Resources Outlook 2019. Summary for Policymakers, p. 16.

As of 2020, the Communication calls to improve the synergies between circular economy and climate mitigation and adaptation, including the promotion of circularity in the national energy and climate plan,s and in the Environment and Energy Aid Guidelines that will be reviewed in 2021.

[36] https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf
[37] P.20
[38] https://ec.europa.eu/environment/circular-economy/pdf/leading_way_global_circular_economy.pdf , p 6

In this sense, one of the most relevant measures is the introduction of a regulatory framework for carbon removals (p. 20): *"incentivise the uptake of carbon removal and increased circularity of carbon, in full respect of the biodiversity objectives, the Commission will explore the development of a regulatory framework for certification of carbon removals".*

Concerning the European Green Deal, the renovation wave will be implemented in line with the principles of a circular economy. In the chapter on *making circularity work for people, regions and cities,* Just Transition Fund and Cohesion Policy are mentioned, among other initiatives which will contribute to finance the move to a circular economy: InvestEU, a SME guarantee facility and the Green Deal Investment plan will be at the forefront of the mobilisation of funds.

On the financing chapter, the Communication propose to "*use Level(s) to integrate life cycle assessment in public procurement and the EU sustainable finance framework and exploring the appropriateness of setting of carbon reduction targets and the potential of carbon storage*" .

Other EU initiatives and legislation already address to a certain extent sustainability aspect of products, either on a mandatory or voluntary basis. Notably, the Eco-design Directive successfully regulates energy efficiency and some circularity features of energy-related products. At the same time, instruments such as the EU Ecolabel or the EU Green Public Procurement (GPP) criteria are broader in scope but have reduced impact due to the limitations of voluntary approaches. The European Commission will therefore propose a sustainable product policy legislative initiative, to make products climate neutral. The Industrial Emissions Directive will also be reviewed as of 2021, including the integration of circular economy practices in upcoming Best Available Techniques reference documents.

Bellow some of the initiatives mentioned in the Annex of the Plan which could have an impact in the bioenergy sector:

Table 11: Initiatives from the Circular Economy Action Plan.

Year	Initiative
2020	→ **Social Economy, the Pact for Skills and the European Social Fund Plus.** → **Improving measurement, modelling and policy tools to capture synergies between the circular economy and climate change mitigation and adaptation at EU and national level.** → **Mainstreaming circular economy objectives in the context of the rules on non-financial reporting, and initiatives on sustainable corporate governance and on environmental accounting.** → **Supporting the circular economy transition through Cohesion policy funds, the Just Transition Mechanism and urban initiatives.**

Year	Initiative
2021	→ Reflecting circular economy objectives in the revision of the guidelines on state aid in the field of environment and energy → Updating the Circular Economy Monitoring Framework to reflect new policy priorities and develop further indicators on resource use, including consumption and material footprints → Scoping the development of further EU-wide end-of-waste and by-product criteria → Legislative proposal for a sustainable product policy initiative → Review of the Industrial Emissions Directive, including the integration of circular economy practices in upcoming Best Available Techniques reference documents
2022	→ Launch of an industry-led industrial symbiosis reporting and certification system
2023	→ Supporting the circular economy transition through the Skills Agenda, the forthcoming Action Plan for Regulatory framework for the certification of carbon removals

11. Conclusions

In the analysed countries, besides their different land use and agricultural practices, there is margin for a substantially higher mobilisation of agricultural residues and increase in the land dedicated to lignocellulosic energy crop according with the European Commission scenarios achieving carbon neutrality by 2050. While there is a big potential for mobilisation of agricultural residues and dedicated crops for bioenergy, the different approach between Member States and the future development of the CAP makes it challenging to obtain conclusion of the European supporting mechanisms for agricultural biomass for bioheat for the period 2021-2027.

The coming months are decisive with the formulation of the Strategic Plans and the enshrinement of the 2030 GHG emissions target and additional measures required to this new level of ambition. The renovation wave push for renewable sources and the renovation strategies from the Member States can further clarify and maybe enhance the role of bioenergy for heating as established in the National Energy and Climate Plans. A potential increase in renewable energy targets for this decade would have to include new feedstocks for bioenergy according to most of the scenarios modelled. The review of the eco-design regulation has the potential to further promote agricultural feedstocks.

The development of bioenergy from agricultural residues and energy crops has a remarkable economic impact by providing additional income to farmers, promoting a competitive source of heat and fostering rural economy. Energy crops for bioenergy can increase carbon absorption and contribute to sustainable forest and landscape management, this carbon capture is exponential in marginal land and through wet farming (paludiculture).

The challenges for the sector are also present on the supply side: to be supported by the CAP and to recognise their contribution to biodiversity, in particular to enhance landscape features and soil quality improvement from energy crops and the potential of agricultural residues. On the demand side, the eco-design review will provide a framework for the development of appliances specifically targeting the agrobioheat sector.