This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874

SEEMLA

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

SEEMLA Project Grant Agreement no. 691874

Report

On regional policies for the use of biomass from MagLs and strategies for pilot cases

6 April, 2017

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 691874

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874

I. About the SEEMLA project

The aim of the Horizon 2020-funded "Sustainable exploitation of biomass for bioenergy from marginal lands in Europe" (SEEMLA) project is the reliable and sustainable exploitation of biomass from marginal lands (MagL), which are used neither for food nor feed production and are not posing an environmental threat. The project will focus on three main objectives: (i) the promotion of re-conversion of MagLs for the production of bioenergy through the direct involvement of farmers and foresters, (ii) the strengthening of local small scale supply chains, and (iii) the promotion of plantations of bioenergy plants on MagLs. The expected impacts are: Increasing the production of bioenergy, famers' incomes, investments in new technologies and the design of new policy measures. FNR coordinates the project with its seven partners from Ukraine, Greece, Italy and Germany.

Project coordinator

Agency for Renewable Resources Fachagentur Nachwachsende Rohstoffe e.V.	FNR	Germany

Project partners

Salix Energy Ltd.	SALIX	Ukraine
Institute for Bioenergy Crops & Sugar Beet of the National Academy of Agricultural Science	IBC&SB	Ukraine
Legambiente	LEGABT	Italy
Democritus University of Thrace	DUTH	Greece
Decentralized Administration of Macedonia and Thrace	DAMT	Greece
Brandenburg Technical University Cottbus-Senftenberg	BTU CS	Germany
Institut für Energie- und Umweltforschung Heidelberg GmbH	IFEU	Germany

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874

II. About this document

This report corresponds to D3.2 Report on regional policies for the use of biomass from MagLs and strategies for pilot cases. It has been prepared by:

Due date of deliverable:	2016-12-31
Actual submission date:	2017-01-31
Start date of project:	2016-01-01
Duration:	36 months

Work package	WP3
Task	T3.2
Lead contractor for this deliverable	Agency for Renewable Resources (FNR)
Editor	Wibke Baumgarten (FNR)
Author(s)	First author: Wibke Baumgarten (FNR); Co-authors: sections 2.1.1 to 2.1.5 BTU; sections 2.2.1 to 2.2.5 DAMT and DUTH; sections 2.3.1 to 2.3.5 SALIX and IBC&SB
Quality reviewer	Birger Kerckow

Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Version	**Date**	**Author(s)**	**Reason for modification**	**Status**
0.1	*2016-11-22*	*Wibke Baumgarten*	*Request for input from partners*	*finalised*
1.1	*2016-12-14*	*Wibke Baumgarten*	*Integration of input from partners*	*finalised*
1.2	*2017-01-16*	*Wibke Baumgarten*	*Request for input from partners and Integration of input*	*finalised*
1.3	*2017-01-25*	*Wibke Baumgarten*	*Request for final revision*	*finalised*
2.0	*2017-01-31*	*Wibke Baumgarten*	*Final version*	*finalised*
3.0	*2017-04-06*	*Wibke Baumgarten*	*Request for revision by PO*	*finalised*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874.

III. Background

This deliverable "D3.2 Report on regional policies for the use of biomass from MagLs and strategies for pilot cases" is mainly based on the task as described in the Grant Agreement Annex I of the Horizon 2020 project SEEMLA (GA no. 691874).

- Task T3.2 Translation of policy mapping outcomes into proposals for EU and regional policy legislation (Lead: FNR)

The aim of this task is to translate the policy maps developed in task 3.1 for the use of MagLs into outputs for other regions not yet using MagLs. Within this task the different policies which have been identified will be analysed according to their impact on the use of MagLs for biomass production as well as their interference with other uses. Furthermore they will need to be assessed regarding their impact in terms of abatement of sustainability risks in cooperation with WP4. The exact assessment will be coordinated by the work package leader and supported mainly by the regional partners.

The remaining partners will add input as far as it involves their field of expertise and they can provide an assessment of the policies identified in task 3.2. Possibly national/regional stakeholders can be involved to provide comments on the proposals for legislation. This can be done by interviews within the expert groups (WP7 –"themed webinars") or within regional workshops which are taking place in WP 7. Feedback from stakeholders is essential, as only they can give a realistic assessment of which policies have an impact in practice and which have not.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874

Content

1 Introduction

In deliverable 3.1 of the SEEMLA project, an overview to the policy landscape in the EU-28 and the SEEMLA partner countries was given, considering general aspects of the current policy framework and the legal status regarding biomass production for bioenergy, including aspects of environmental protection and sustainability. However, the potential use of marginal lands (MagLs) was not specified on the regional and/or national level.

In this report, relevant measures for the use of biomass for bioenergy from MagLs and strategies for SEEMLA pilot case sites in Germany, Greece and Ukraine will be elaborated on regional and/or national level based on D3.1. In SEEMLA the chosen supply chain will focus on the use of biomass from MagLs for the heating sector in form of e.g. pellets. Hence, the following potentially relevant legislation will focus on this sector, but will also include aspects of other sectors, e.g. electricity and transport. In WP2 marginal areas and suitable bioenergy crops for biomass production on MagLs were identified. The selection of energy crops will be considered in this report, e.g. with regard to their use in form of pellets and/or wood chips as renewable source for heating, but also with regard to environmental [mid and/or long-term] effects, and measures adapted adequately with respect to potential considerations in already existing national legislation of the SEEMLA partner countries with pilot cases.

2 SEEMLA partner countries' specific concept to regulations and financial support related to biomass from marginal lands

2.1 Germany

2.1.1 Promotion of renewable energy

The promotion of biomass from marginal lands for bioenergy on regional level is not supported directly, yet. Rather in general terms of promotion of renewable energy, there are several national funding opportunities in Germany. As given in one of the latest reports of the Federal Ministry of Economic Affairs and Energy (BMWi), biomass in solid, liquid and gaseous form is being used for electricity and heat generation and for the production of biofuels. Almost 60% of the total final energy from renewable sources was generated by the different types of biomass used to the end in 2015.[1]

Until the **Renewable Energy Sources Act** (RES; in German EEG: Erneuerbare Energien Gesetz) was revised with effect from 1 August, 2014, operators of plants that generate electricity from renewable energy sources were entitled to receive fixed remuneration from

[1] http://www.bmwi.de/EN/Topics/Energy/Renewable-Energy/renewable-energy-at-a-glance.html (last access: 15 January, 2017)

the transmission system operators for each fed-in kilowatt-hour for a period of usually 20 years. The market premium compensates for the difference between the fixed feed-in tariff and the average trading price for electricity; In future, the level of funding for renewable energy in the electricity sector will largely be determined by competition. With the introduction of the **2017 Renewable Energy Sources Act**[2]**,** the phase of technology specific funding in which prices were set by the government is brought to an end. Therein it is stated, that the level of the fees paid for electricity generated from renewable energy will be determined by auction. This ensures that future expansion will take place at competitive prices. Auctions will be held for funding for onshore and offshore wind energy, photovoltaic energy, and biomass.

The revision of the EEG 2017 is based on the following three principles:

- Future RES expansion will be cost-efficient.
- All stakeholders will have a fair chance in the auctions. Stakeholder diversity will be maintained.
- The deployment corridor for renewable energy will be adhered to.

The following conditions and aims are intertwined to the EEG 2017: Small installations are exempted from this system; the revision of the Renewable Energy Sources Act in 2014 succeeded in stabilising the EEG surcharge. It amounted to 6.4 ct/kWh in 2016. The development corridor for biomass foresees that from 2017-2019 150 MW will be auctioned each year, and in the period from 2020-2022 200 MW each year (gross). Installations generating 150 kW or more can bid. Existing installations (including those <150 kW) can take part in the auctions in order to receive 10-year follow-up funding, provided that they generate electricity in a flexible and demand-based manner.Under the EU Renewable Energy Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission **National Renewable Energy Action Plans** (NREAPs) outlining pathways which will allow to meet their 2020 renewable energy, energy efficiency and GHG cuts targets.[3] Germany set its target on 18% of share of energy generated from renewable sources in gross final energy consumption. In Germany, the most important means to promote electricity from renewable sources is the ***feed-in tariff*** as set out in the Renewable Energy Sources Act (EEG). The act aims to increase the gross consumption of electricity produced by renewable energies (**Figure 1**) to 35% by 2020, 40%-45% by 2025 and to 55%-60% by 2035 to at least 80% by 2050, and to integrate these quantities of electricity in the electricity supply system. The amount of tariff for a given plant is the tariff level as defined by law minus the degression rate, which depends on the year in which the plant was put into operation. The objective of the EEG is to continue steady deployment of renewable energy in Germany in a cost efficient manner by fostering the integration of renewable energy sources into the market. One mean to reach this goal is, among others, to rise the installed performance of biomass energy plants up to 100 MW per year (gross) (EEG, § 3(4)). In connection with the EEG the specifications for the energetic use of biomass are described in the **Biomass Ordinance** (in German: Biomasseverordnung; BiomasseV).

[2] http://www.bmwi.de/EN/Topics/Energy/Renewable-Energy/renewable-energy-sources-act-2017.html (last access: 19 January, 2017 and https://www.clearingstelle-eeg.de/eeg2017, last accessed 30 January, 2017)
[3] https://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans (last access 30 January, 2017)

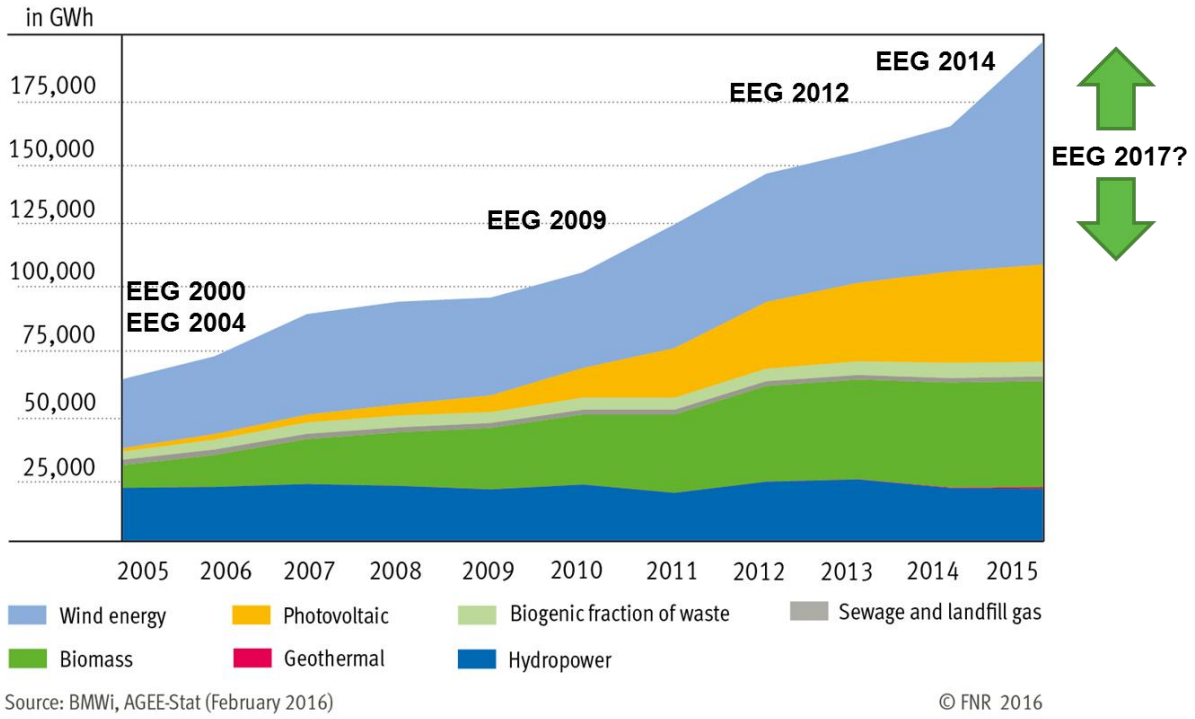

Figure 1 Electricity generation from renewable resources: Development. (FNR 2016)

The Biomass Ordinance regulates for the scope of the EEG, which materials are classified as biomass, what technical procedures for power production from biomass apply for the EEG and what environmental requirements have to be met when producing power with biomass (BiomasseV, § 1). The Biomass Ordinance is valid on regional and national level.

Beside the EEG, a number of policies and measures work on promoting the energy production with renewable resources. For instance the national **Energy Concept** that has been in force since 2010 compiles several policy goals and aims to secure supply and protect the climate while at the same time promoting the growth and competitiveness of German industry.[4] The concept describes specific targets and development paths through the year 2050 and contains a wide variety of specific measures to meet these targets. On top of this, there is an immediate action programme consisting of ten especially urgent measures.

Finally, Germany also provides policies for the promotion of renewable energy sources covering training, certification and research programmes, a self-commitment of public authorities, the support of district heating networks and the introduction of building obligations regarding the use of heat produced from renewable energy.[5]

[4] http://ec.europa.eu/energy/en/topics/energy-efficiency (last access: 11 January, 2017)
[5] cf. also to www.biomasspolicies.eu (last access: 11 January, 2017)

The **Biomass Electricity Sustainability Regulation** (in German: Biomassestrom-Nachhaltigkeitsverordnung; BioSt-NachV[6]) stipulates the sustainability requirements for bioliquids, according to the Renewable Energy Directive. Operators of biogas plants producing electricity from liquid biomass under the EEG or – by cross-reference with the Renewable Energies Heat Act (in German: Erneuerbare Energien Wärme Gesetz, EEWärmeG, *cf. 2.1.1.1*) - obligated under EEWärmeG when fulfilling commitment through liquid biomass. Instead of receiving the feed-in tariff for electricity from renewable sources, a plant operator may choose to sell his electricity directly, i.e. to a third party by a supply agreement or at the stock market, and claim the so-called **market premium** (EEG, § 33g) from the grid operator. The amount of the market premium shall be calculated each month. In general, plant operators are free to choose between the feed-in tariff and the market premium for direct selling. Biogas plants with an installed capacity of more than 750kW put into operation after 31 December 2013 will not be eligible for a feed-in tariff, but they are eligible for a market premium. The operators of biogas plants who sell their electricity directly, i.e. sell them to third parties by supply agreements or at the stock market, may claim a **flexibility premium** (EEG, § 33i) for providing additional installed capacity for on-demand use. For a plant operator to be eligible for the flexibility premium, he shall provide additional installed capacity that may only be used on demand rather than on a regular basis. This premium may be received on top of and separately from the market premium.

With regard to the SEEMLA approach, it may be of greater interest to not only use grown biomass on MagL in form of pellets or wood chips for heating, but probably also as biomass source for biogas plants, and hence for the generation of electricity. Hence, the above mentioned ordinances and financial support tools may be of relevance, attracting more stakeholders and end-users on regional level.

2.1.1.1 Renewable Energies Heat Act

Renewable sources of energy are to be increasingly used not only to generate electricity. Renewable energy is to be increasingly used also to generate heat and in the transport sector. Within the heat market, the use of renewable energies is regulated by the **Renewable Energies Heat Act** (in German: Erneuerbare Energien Wärme Gesetz; EEWärmeG) and applies on regional and national level. Under this law, constructors of new buildings are required to generate a percentage of their heating requirements from renewable sources of energy, to undertake certain compensatory measures such as installing additional insulation, or to use combined heat and power systems or district heating.
The Renewable Energies Heat Act regulates the obligation to use renewable energy in new buildings. Owners of new buildings must cover part of their heat supply with renewable energies. This applies to residential and non-residential buildings for which a building application or construction notification was submitted after 1 January, 2009. The share depends on the source of renewable energy used in the building. It is 15% for solar energy, 30% for heat from a biomethane or biogas fired combined heat and power (CHP) plant and

[6] https://www.clearingstelle-eeg.de/BioSt-NachV (last access: 30 January, 2017)

50% for other sources, i.e. biomass fuels (firewood, pellets, chips, etc.) can only be used in high-yield boilers that comply with air quality legislation. Regarding biomass from marginal lands this relates only to plants with CHP as for example wood gasifiers.

In addition to the Renewable Energies Heat Act, the Federal Government uses the **Market Incentive Programme** (in German: Marktanreizprogramm; MAP) to increase the proportion of heat generated from renewable sources. Under this programme that applies on regional and national level, assistance is provided primarily for existing buildings to promote the use of renewable energy technology in the heat market, such as solar thermal installations, wood pellet heating systems and efficient heat pumps.

2.1.1.2 Potential state subsidies for furnaces using biomass from marginal lands

In Germany the use of renewable energy can be promoted by different measures from public funds. The German Federal Government supports the development of renewable energies in the heating market through investment grants (Federal Office for Economic Affairs and Export Control, BAFA[7]) or under the KfW-programme (Reconstruction Credit Institute[8]) as repayment bonus for early partial redemption of long-term low-interest loans.[9]

BAFA renewable heat investment support

In the framework of the Market Incentive Programme (MAP) BAFA provides investment support for heat produced in existing buildings. Wood chip firings can be subsidized with € 3500/plant when a buffer of at least 30 l/kW is installed. Combined boilers for wood chips and logs can be supported as well if a buffer volume of at least 55 l/kW is available for the manually loaded part of the plant. Automatically fed systems for wood pellets with automatic ignition can be subsidized with 80 €/kW.[10] The following minimum amounts apply:

- Pellet stove (5 to 25 kW) with water pocket: 2,000-3,000 €
- Pellet boiler (5 to 37.5 kW): 3,000-5,250 €
- Pellet boiler (5 to 43.7 kW) with buffer capacity (min. 30 l/kW): 3,500-5,250 €
- Wood chips boiler with buffer capacity (min. 30 l/kW): 2,500 €
- Combination bonus for solar thermal plant, heating pump or heating grid: 500 €

Here the promotion of combined boilers is possible as well. Retrofitting of condensing- or filter-technology in existing plants can be subsidised with 750 €. The promotion applies to renewals of existing heating systems (at least 2 years old) in existing buildings. Other onuses can be granted if biomass systems are used in particularly innovative or efficient applications, for example, in combination with thermal solar systems.

[7] www.bafa.de (last access: 13 January, 2017)
[8] www.kfw.de (last access: 13 January, 2017)
[9] cf. also to www.greengain.eu (last access: 11 January, 2017)
[10] Agentur für Erneuerbare Energien (AEE), 2016. Bioenergie richtig fördern lassen. Renews Kompakt, No. 37, 6 p., www.unendlich-viel-energie.de (last access: 20 January, 2017)

Eligible applicants are private individuals, freelancers, businesses, corporations, associations and municipalities. The agricultural house belongs to the private assets. If other objects are heated, it must be ensured that the majority of the heat is used privately or commercially. Whether the application must be made before or after completion of a measure depends on the respective project. For agricultural holdings the application focuses on what is to be heated. If there are mainly private properties (residential house) the application may be made after the investment (6 months). If the largest share of renewable energy is used in the business area of the company, it is considered as commercial applicant and the request must be made prior to the investment. Previous application is always advisable to ensure that no deadlines are missed. Other provisions should be taken from the extensive funding guidelines.

2.1.1.3 Reconstruction Credit Institute (KfW) Renewable Energy Programme Premium

In the framework of the **Market Incentive Programme** (MAP), **KfW** provides low-interest loans with grant payback support for the development and expansion of heat installations/plants. Support is given to:

- Plants for the purification of biogas to natural gas quality and biogas pipelines for non-purified biogas;
- Plants with automatic feeding for the burning of solid biomass for thermal use >100 kW nominal heat output including hot water storage;
- CHP using solid biomass including buffer storage Gas Network Access Regulation (GasNZV).

Support for feeding biogas into the gas network:

- Grid connection cost allocation now 25% for connectee, 75% for grid operator;
- Ensure the long term availability of grid connections of at least 96%;
- Implementation road map which establishes the timeframes for grid connection.

The section 'Standard' of the 'Renewable Energies' programme promotes combined heat and power (CHP), thus the production of electricity and heat at the same time. In the section 'Premium' automatic firings for burning solid biomass with an installed nominal heat output of more than 100 kW can also be promoted.

For biomass plants the redemption grants amount 20 €/kW. In addition, a bonus of 10 €/kW can be paid, if a buffer memory of at least 30 l/kW is installed. Another bonus of 20 €/kW is granted, if the dust emissions amount a maximum of 15 mg/m^3 flue gas. Furthermore, the establishment or expansion of a heating network can be promoted if it is fed at least 50% with heat from renewable energies. For the network in average a minimum level of heat sales of 500 kWh/a m heat line has to be proven; grant: € 60/m for newly constructed paths and 80 €/m for extensions of existing networks. House transfer stations can be funded with up to 1,800 €. For larger projects, which might include insulation or extensive modifications to the

heating system, further loan programmes of the KfW can be used as for example the programme 'Energy Efficient Renovation-Supplementary credit'.

Since 2016 the named programmes can be supplemented with the so called 'APEE'-promotion, the **incentive programme of energy efficiency** (in German: Anreizprogramm Energieeffizienz). The aim is to noticeably speed up modernisation and to complement the existing funding landscape. Exchanging an outdated heating system with a modern, fuel-efficient one and at the same time optimizing the overall heating system, e.g. by insulating heating pipes or installing modern thermostatic heads, justifies for additional funds. The potential bonus of 600 € is possible for both, the investment grant (BAFA) as well as the redemption grant (KfW).

Due to strained fiscal positions of the German Federal States renewable energy projects are often funded at the state level only as so-called 'lighthouse projects'. From other programmes, such as the **Agricultural Investment Promotion Programme** (in German: Agrarförderprogramm, AFP), grants for energy measures may be possible, but certainly more difficult to obtain than the above described programmes.

The **Energy Tax Act** (EnergieStG) regulates the amount of taxes on energy consumption on German territory. The Act also includes tax incentives for the production of biofuels. The tax deduction is only granted if the produced amount of biofuel is pure and not used to fulfil the biofuel quota. Following biofuels are exempted from this rule, namely:

- Synthetic hydrocarbons or synthetic hydrocarbon mixtures which are obtained by thermochemical conversion of biomass.
- Alcohols that have been produced through biotechnological processes to reveal cellulose.

The first exemption would be accounting for synthetic hydrocarbons or synthetic hydrocarbon mixtures which are obtained by thermochemical conversion of biomass from marginal lands.

2.1.2 Expected impact from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

The re-use of MagL in terms of the SEEMLA definition (i.e. sites degraded due to anthropogenic influences, including reclaimed areas, cf. SEEMLA D2.1) is of growing importance, particularly in the Eastern German states, where large former industrial areas were set aside during the last 25 years and where two of the largest lignite mining districts in Central Europe are located as well as in the [former] mining districts of North Rhine-Westphalia. The sustainable re-use of such sites for biomass production should be in accordance with claims resulting from the soil protection act (BBodschG) considering the protection of soil functions (natural, cultural and production functions) and the removal of harmful soil transformations. Further it can be of importance with regard to the obligations resulting from the natural protection act (BNatSchG) considering the minimization of human impact on nature and environment.

It can be expected that the use of such lands will provide the following benefits on regional and national level: (i) general improvement of the landscape scenery by removing residues from former industrial use (particularly in urban regions), (ii) conservation of rural sceneries by conserving agrarian landscapes (particularly if agroforestry systems can be established), (iii) establishment of new landscape structures with importance for biodiversity, and the (iv) establishment of positive economic effects and new income opportunities for rural areas. It can be assumed that the introduction of MagLs to regional/national legislation comprises issues regarding subsidies and risk management to raise attraction of bioenergy production and to foster its establishment as part of the risk might be covered by state. Generally, if a sufficient amount and size of marginal areas are available and reasonable product prices can be realized by producers, positive impacts could be expected for employment, suppliers for goods and services during establishment and maintenance of plantations (landscape planning, nursery gardens, planting, maintenance, harvesting and respective machinery) and energy conversion (technology development, particularly smaller scale units and related providers for goods and services).

2.1.3 Expected interferences with other users from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

The use of MagL for biomass production is often seen critically from nature conservationists as such sites frequently offer habitats for protected rare plant and animal species which are adapted to extreme site conditions. Local and regional authorities, e.g. nature or environmental protection agencies, as well as non-governmental organisations as e.g. NABU, BUND would be the corresponding associations which are involved in the development of a sustainable SEEMLA approach. Main concerns could be the loss of biodiversity due to monocultures, e.g. large areas of short rotation coppices with a mono-structured landscape, suppression of specifically adopted species particularly on non-agricultural soils, loss of natural landscape and diversity, use of additional pesticides and fertilizers affecting ground and surface waters, plant diseases due to monocultures etc.

Due to the fact that farmers so far have been using agricultural soils for establishing SRC or agroforestry, additional bioenergy production from unused land may possibly result in decreasing prizes for the end product, e.g. pellets. The cultivation of unused and particularly devastated land can potentially offer several benefits with respect to soil protection, minimizing soil erosion, soil rehabilitation, ground water protection, and may even increase biodiversity. With regard to former industrial sites, interferences are possible with general concepts of urban planning. Post-industrial sites are often located within cities and offer potential for the urban development, e.g. housing construction etc. Post mining landscapes have to be used in accordance with the regulations provided by the Federal Mining Act (in German: Bundesberggesetz, BBergG) and other laws of the federal states, e.g. landscape and regional planning acts or specific planning regulations for lignite open cast mining areas (cf. 'Braunkohlenpläne'). Post-industrial sites are frequently contaminated so that a direct use

can be difficult. Recultivation might be needed which increases the costs and makes the use of such sites uneconomic.

2.1.4 Suitable strategies for the SEEMLA pilot cases

An assessment of potential MagL is needed for planning the use of such sites on a larger scale. This assessment must be based (1) on soil properties and soil fertility assessments and (2) on a spatially explicit selection of suitable sites with an adapted GIS approach. Additional data and information reflecting basic site conditions must be available for this purpose.

If MagL in post-mining landscapes are considered, an early coordination with the respective mining authority as well as with the mining company is necessary (at least if the site is still under mining supervision and owned by the mining company). The regulations from superordinate laws and official plans with legal character (e.g. lignite mining plans; Braunkohlenpläne) must be considered carefully. It is further of crucial importance to identify potential land users (farmers) from the region which are able and willing to maintain and cultivate the plantations. This clearly depends on the legal framework for state or European allowances for farmers and on the development of markets and potential incomes from selling biomass. Specific grants for the re-use of MagL could be an incentive for farmers to be active in this field.

In urban regions with post-industrial sites, integration into urban planning processes is of importance. Conflicts with general land-use plans must be avoided and the inhabitants of the city convinced (e.g. by opening parts of the sites for recreation and by an overall attractive planning of the plantation). A land user must be identified which can be difficult as farmers have long access routes to the sites from their farms outside the cities. Further, it is of importance to guarantee larger connected areas so that the use of large machinery is economically efficient. Furthermore it would be necessary to identify respective survey data can be gained from, e.g. land registers.

2.1.5 Suitable assessment/approach for an abatement of sustainability risks

Sustainability risks might arise if (i) environmental threats result from the use of MagL (e.g. the loss of biodiversity or of habitats of rare and protected species), if (ii) the biomass yields are too low for an economic use of the lands (e.g. due to extreme soil conditions), or if (iii) the land use is not accepted by wide parts of the inhabitants of the region or town. A careful selection of MagL which are suited for biomass production against the background of nature protection is needed. The integration of relevant authorities but also of nature conservation organizations in an early stage of the planning processes is inevitable. The assessment of land potentials within a region must be based on comprehensive information and a careful classification of MagL. Soil analyses and assessment of soil fertility must be carried out at

the selected sites. Recommendations with regard to soil cultivation, fertilization and suitable bioenergy crops have to be derived from site conditions. For that reason catalogues with plant requirements and adapted soil assessment tools both for MagL have to be further developed for single European regions. It must be guaranteed that the potential biomass yields are larger than the energy input caused by cultivation measures. The involvement of the local population, including regional stakeholders, e.g. regional administration, farmers and foresters, into planning processes is of crucial importance for an acceptance of the use of MagL. Conflicts with traditional local use of such sites, e.g. for recreation, must be considered and solutions implemented into plans. This is of particular interest in urban areas where open space between existing building developments is of greater importance for the living quality.

The SEEMLA assessment approach should cover likely dependencies and interactions to evaluate the sustainability of a certain measure, e.g. with respect to (i) detrimental environmental effects due to the use of pesticides, fertilizers, irrigation and e.g. loss of biodiversity, (ii) detrimental agricultural effects, e.g. plant diseases due to monocultures and abdication on pesticides, and (iii) detrimental socioeconomic effects as the decline of employment due to large and highly mechanized production units and additionally (see above) strong dependency on market prizes and revenues respectively.

2.2 Greece

2.2.1 Promotion of renewable energy

In Greece there is no specific regulation that is related to the use of MagL for biomass production for bioenergy on regional level; national legislation applies also on regional level. According to the Greek NREAP, renewable energy sources (RES) account for 15% of gross final energy consumption in Greece. A national target of a 20% share in gross final energy consumption by 2020 has been defined under Law 3851/2010[11], exceeding the national target of 18% according to the EU Directive 2009/28/EC[12,13]. The specific trajectory for achieving this target is presented in the National Renewable Energy Action Plan (NREAP) of 2010. Specific targets for RES electricity share (40 %), RES heating and cooling share (20%), and RES transport share (10%) have been defined in order to achieve the national RES target until 2020.[14,15] This target is supposed to be achieved through a combination of measures for energy efficiency and the large-scale penetration of RES technologies in electricity production, heat supply and transport sector. The predicted biomass resource use up to 2020 will be regarding to:

- Significant amount of pellets;
- Significant amount landfill gas;
- Sewage sludge gas;
- Biomethane from sewage sludge gas and landfill gas injected to natural gas network;
- Biogas from food industry and cattle breeding farms;
- Bio-ETBE;
- Other energy crops.

The outcomes of the energy sector modelling carried out in the scope of compiling the Greek NREAP demonstrated that a near tripling of the contribution of RES plants in power generation is necessary for meeting the 2020 targets which requires the further development of different RES technologies in the sectors of electricity, heat and cooling, and transport (**Figure 2**, projection for 2020). These figures are however currently being revised in the context of the national energy planning, taking into consideration the lower than expected levels of energy consumption due to the economic crisis as well as the differences between the NREAP and the actual development of different RES technologies. A number of significant reforms aiming at a further liberalization of the energy sector, its integration with neighbouring countries and the reform of energy markets are currently being implemented.

[11] http://www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3D&tabid=37 (last access: 11 January, 2017)
[12] http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32009L0028 (last access: 11 January, 2017)
[13] TRANSrisk (2016). D3.2 – Context of Case Studies: Greece. 60 p. http://transrisk-project.eu/sites/default/files/Documents/D3_2_CaseStudy_Greece.pdf (last access: 26 January, 2017)
[14] NREAP Greece: http://www.iea.org/policiesandmeasures/renewableenergy/?country=Greece; also available on: http://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans (last access: 11 January, 2017)
[15] YPEKA, Ministry of Environment, Energy and Climate Change. (2012). National Energy Planning, Roadmap for 2050, March 2012.

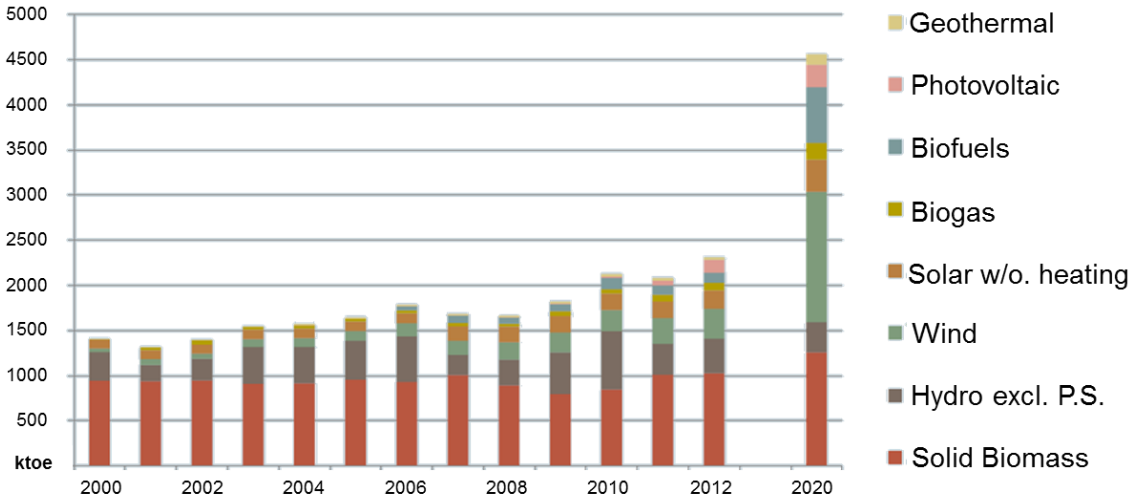

Figure 2 Shares of RES in total primary energy supply in Greece, development from 2000-2012 and assumption for 2020 (Biomass Policies.eu, CRES[16], 2012)

In addition, the Greek support scheme for electricity production from RES is currently undergoing a major transition in order to improve the integration of RES in electricity market and to ensure conformity with requirements under EU state aid regulations.

Around 61% of Greece's energy needs are covered through imports with the remaining 39% being covered through national energy sources, mainly lignite (77%) and RES (22%) which equals appr. 2,300 ktoe. Nearly half of RES account for solid biomass, including e.g. wood ships and pellets. However, with regard to 2020 wind energy, PV, and solar heating are supposed to be the most promising renewable energy sources in future (**Figure 2**). Imported energy sources are mainly petroleum products that account for 44% of total energy consumption and natural gas with a share of around 13 %.[17]

Until the end of 2015, the support mechanism for electricity generation from RES in Greece has been based mainly on Law 3468/2006[18] and Law 3851/2010[19]. According to these laws, priority is given for the injection of electricity from RES into the electricity grid. The electricity produced has been remunerated by a technology-specific feed-in tariff (FIT). These FITs were further differentiated according to the size of the RES installation with smaller systems benefitting from higher FIT (**Table 1**). Payment of the FIT was guaranteed for a period of 20 years (25 years for small PV systems and solar thermal power plants) in the context of a sales contract (Power Purchase Agreement – PPA). Regular degression rates are only applied to FIT for photovoltaic energy systems of the special programme for rooftops, while the rest of photovoltaic installations are been supported by a type of a fixed coefficient on the basis of last year's average SMP.

[16] http://www.cres.gr/kape/epixeiriseis_ependites_uk.htm
[17] http://www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3d&tabid=37 (last access: 11 January, 2017)
[18] http://www.res-legal.eu/search-by-country/greece/sources/t/source/src/law-no-34682006/ (last access: 11 January, 2017)
[19] http://www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3D&tabid=37 (last access: 11 January, 2017)

Table 1 Renewable Energy Sources Feed-in Tariffs according to Law 3851/2010 (Greek Ministry of Environment, Energy and Climate Change; BiomassPolicies.eu, 2012)

RES Feed-in Tariffs, Law 3851/2010	per unit support, €/MWh
wind energy (onshore) with installed capacity > 50 kW	88 (100 for non-connected islands)
wind energy (offshore)	108
PV depending on plant capacity, year of installation, type of producer	300-400
small hydro plants up tp 15MW installed capacity	88
concentrated solar power plants	265
concentrated solar power plants with storage facility	285
geothermal energy of low/high temperature	150/100
biomass plants up to 1MW installed capacity (exc. Biodegradable municipal waste)	**200**
biomass plants >1MW and ≤5MW installed capacity (exc. Biodegradable municipal waste)	**175**
biomass plants >5MW installed capacity (exc. Biodegradable municipal waste)	**150**
biogas plants from landfill and sewage sludge gas up to 2MW installed capacity (incl. Biodegradable municipal waste)	120
biogas plants from landfill and sewage sludge gas up to >2MW installed capacity (incl. Biodegradable municipal waste)	99
biogas plants from animal farming and agricultural residues and waste with installed capacity up to 3MW	220
biogas plants from animal farming and agricultural residues and waste with installed capacity >3MW	200

The FITs for new RES projects until the end of 2015 have been defined by Law 4254/2014[20]; they were fixed at the time of commissioning and differentiated between projects supported under the investment law - or any other support programme - and projects without any kind of additional support. Moreover, Law 4254/2014 provided cumulative capacities until 2020 for biomass (40 MW), and e.g. biogas (50 MW). There are only few biomass energy projects for electricity generation that have been developed in Greece, mainly for the utilization of municipal wastes in biogas plants. The total installed capacity of biomass energy currently stands at 52 MW for a total of 12 individual projects. During the year 2015, biomass capacities of 5 MW have been added. There are no biomass projects installed on the non-interconnected islands. Throughout 2015, a total of 222 GWh of electricity was produced by biomass energy plants. The FIT for biomass energy projects have been differentiated according to the technology (biomass combustion, biogas, gas from landfills and sewage treatment plants).

[20] http://www.res-legal.eu/search-by-country/greece/sources/t/source/src/law-no-42542014/ (last access: 11 January, 2017)

2.2.2 Expected impact from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

In general, it can be expected that a sustainable use of MagL in accordance with current legislation for environmental and soil protection, will regulate the water cycle, will prevent soil erosion and further land degradation; it will increase carbon sequestration, and hence lead to a decrease in greenhouse gas emissions and will have a positive impact on climate change effects. As long-term effect, marginal lands can potentially turn into productive agricultural lands; however, iLUC is to be avoided in the SEEMLA approach.

According to the EU regulation 1305/2013 on the support for rural development by the European Agricultural Fund for Rural Development (EAFRD)[21] it is stated:

(12) […] "The evolution and specialisation of agriculture and forestry and the particular challenges faced by micro and small and medium-sized enterprises ("SMEs") in rural areas require an appropriate level of technical and economic training as well as an increased capacity to access and exchange knowledge and information including through the diffusion of best agricultural and forestry production practices. ***Knowledge transfer and information actions should not only take the form of traditional training courses but should also be adapted to the needs of rural actors. Workshops, coaching, demonstration activities, information actions and also short-term farm and forest-exchange schemes and visits should therefore also be supported.*** *The knowledge and information acquired should enable farmers, forest holders, (…) and rural SMEs to, in particular, enhance their competitiveness and resource efficiency and improve their environmental performance while at the same time contributing to the sustainability of the rural economy. When providing support to SMEs, Member States have the possibility to give priority to SMEs linked to the agriculture and forestry sectors.* ***In order to ensure that knowledge transfer and information actions are effective in delivering these results it should be required that the providers of knowledge transfer services have all the appropriate capabilities****." […]*

From this regulation a creation of new jobs and provision of incentives to keep people in rural areas and employed in the agroforestry sector is foreseen by mid- and long-term means. Local scale infrastructures for exploiting biomass is supposed to be fostered as well as the financial income from MagL that cannot be used for agricultural purposes e.g. for cultivation or grazing.

The introduction of the SEEMLA approach will probably also have an impact to the national and regional legislation from the incorporation of MagL use for biomass production for bioenergy and will require adaptations/modifications in the following policies and legislation:

- Common Agricultural Policies (alternative use of low potential agricultural lands);
- Forestation regulation (Measure 2.2.1 "First forestation of agricultural lands based on Joint Ministerial Decision 800/16.01.2015 (Official Gazette 128/B/2015, sub measure 8.1 of the Rural Development Programme 2014-2020);
- Energy Performance of Buildings Regulation (KENAK) for the use of renewable energy in buildings, based on law 3851/2010; Article 10 of Law 3851/2010 modified Law 3661/2008 (Government Gazette 89/A/2010) "Measures to reduce energy

[21] EU (2013). Regulation (EU) No 1305/2013 of the European Parliament and the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005. http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1305&from=DE (last access: 20 January, 2017)

consumption in buildings and other provisions", which is the main law for the transposition of the EPBR into national legislation, to include the use of renewable energy sources in buildings;
- Policies for accounting impact in the LULUCF sector;
- Tax Deductions for Solar water heating, CHP, Biomass boilers, (mainly for households): Financial support for non-food crops; subsidies on RES investments (tool: development law);
- Law 4414/2016[22], New support scheme for renewable energy (RES) and high efficiency heat and power (CHP). Provisions for legal and functional segregation of supply and distribution sectors in natural gas market and other provisions. Official Gazette A' 149/09.12.2016;
- Establishment of procedures and structure of supply chains (private vs. public property);
- Establishment of legal framework to identify MagLs, supported by decision making tools such as the ones to be developed by SEEMLA;
- Potential impact on the legislation of related sectors (forestry, livestock, biomass production and use from other sources, etc.);
- Changes in the regional framework for spatial planning and sustainable development;
- Changes and direct effect on local grazing schemes (ongoing studies in each prefecture).

2.2.3 Expected interferences with other users from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

The expected interferences are mainly related to possible conflicts of (i) biodiversity issues and nature conservation stakeholders, i.e. NGOs, environmental organizations, forest services, (ii) livestock breeders that use the marginal lands as pastures, (iii) farmers that need to be convinced of the SEEMLA approach and its benefits, the possible use of new crop species and new appropriate cultivation techniques, (iv) conflicts with bioenergy production based on biomass from productive lands and (v) with bee farming, hunting and recreational activities. Moreover, conflicts with funding for environmental improvement of degraded pasture actions that are conferred to sub measure 10.1 of the Rural Development Programme may arise.

One major obstacle will probably be to persuade local farmers and other land owners to start cultivating biomass on MagLs for bioenergy production due to the long rotation periods in relation to food crops, uncertainty in production due to natural risks and unstable economic situation. Also, the main stakeholders involve ageing populations in rural areas that are more conservative and require more effort and solid evidence to convince. In Greece the heating period is short; hence the demand for pellets and/or woodchips as heating material may be

[22] http://www.wfw.com/wp-content/uploads/2016/09/WFW-Briefing-Greek-Renewables-Support-Scheme-August-2016.pdf (last access: 26 January, 2017)

low. However, still, small farms especially in rural, abandoned areas, biomass as produced on marginal lands should be promoted, and farmers encouraged to grow bioenergy crops in order to become independent from conventional energy sources; the combination of solar thermal plants and boiler may offer a solution.

2.2.4 Suitable strategies for the SEEMLA pilot cases

Funding for land forestation projects already exists in Greece in terms of sub-measure 8.1 of the Rural Development Programme 2014-2020[23], measure 2.2.1 'first forestation of agricultural lands' based on the Joint Ministerial Decision 800/16.1.2015 (Official Gazette 128/B/2015), which are in accordance with EU regulation 1305/2013 and the Greek National Renewable Energy Action Plan against desertification. It supports the cultivation of *Populus* and *Pinus* species and could be extended to include more woody bioenergy crops proposed by the SEEMLA project, taking into account the fact that a re-examination of the duration of felling cycle (depending on selected species) is needed. Regulation 1305/2013 used to include *Eucalyptus* sp. and *Robinia pseudoacacia,* which were excluded in the last call. This strategy does not currently have a clear, financial outcome, since there is no record of the wood harvested from each land parcel. The selected lands are not thoroughly investigated to determine the most productive crops. The objective of the regulation is to increase forest cover and there is no provision for commercial use of the wood products. Adapting this regulation on the basis of SEEMLA approach would provide multiple benefits. Ex-ante and post-ante evaluation will be required and a monitoring system should be established to document the impact of the project on multiple levels, e.g. biomass production, LULUCF, carbon sinks, protection of land from degradation and similar. Rather in general terms, clear and specific determination of the term "Marginal Lands", also from a legal viewpoint; marginal lands should be identified and registered at both national and regional level.

Funding for investments in forestry and technologies in manufacturing, distribution and trade of forest products through sub-measure 8.6 of the Rural Development Programme 2014-2020 should be promoted. It involves modernizing the infrastructure and equipment for wood harvesting and process, as well as standardization of its products. This is complementary to sub-measure 8.1 regarding the establishment of wood plantations which could support the establishment of new supply chains and the modernization of existent ones.

Incentives for growing bioenergy plants either on private or on public land, e.g. forest associations, private individuals or companies, should be provided. Leasing of land for biomass production could also be supported. The modification of regulations that are currently in effect will be required to promote the effective use of MagLs. In Greece subsidies are provided for some agricultural crops, regardless of the land productivity but based on the average regional production; including both MagLs and productive agricultural land in the

[23] http://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/el_en (last access: 23 January, 2017)

average calculation makes the cultivation of MagLs with certain agricultural crops economically feasible. Changing the subsidies policy, i.e. by relating the subsidy to the specific productivity of each land parcel, will reveal actually marginal lands and the application of the appropriate incentive will promote their use for bioenergy.

Existing supply chains for biomass should be adapted to the SEEMLA approach by including marginal lands in the local supply chains. Financial support for businesses and private individuals in remote, mountainous areas should be established to enforce the Energy Performance of Buildings Regulation (KENAK) for the use of renewable energy in buildings, based on law 3851/2010[24]. With regard to this, the use of biomass for energy production in public buildings through energy performance contracting should be promoted and supported.

Business opportunities for investments in the biomass production for bioenergy, e.g. Energy Service Companies (ESCOs) need to be provided; in law 4281/2014[25] ESCOs were first mentioned first, but it was then suspended. Financial tools, e.g. financial aid or subsidies, tax reductions, fee reductions, etc., in terms of state funding and development of banking products, e.g. contract farming programmes, loans, etc. should be specified and offered.

Another strategy would be the promotion of good practice experiences in business. For example, 'Komotini Paper Mill'[26] replaced its heavy fuel consuming oil boiler with a biomass boiler in 2012 using sunflower pellets. Its main suppliers are based in Bulgaria, which are 300 km away from the plant. The biomass contracts with the suppliers would be for 1-2 years. The company set itself the aim of improving its competitiveness through interventions in its environmental footprint and the efficient use of environmental and other resources and has now almost eliminated emissions of greenhouse gases. The public should be informed about the creation of new job positions at local or regional level in the bioenergy sector, especially related to the SEEMLA approach.

2.2.5 Suitable assessment/approach for an abatement of sustainability risks

Tools for the identification of MagLs and the most suitable bioenergy crops based on their characteristics to facilitate the selection for cultivation should be developed. Bureaucracy for the establishment of bioenergy crops in MagLs should be minimized. Farmers need to be supported by using risk management measures, i.e. compensations in case of losses due to natural disasters and other reasons or income stability tools. Local processing facilities (short supply chains) are to be established to ensure that the use of the biomass which is produced remains locally. Incentives for private users and public institutions should be provided at local scale to use locally produced biomass for energy production, i.e. modification of existing heating systems to use biomass, in accordance with law 3851/2010 that promotes renewable energy projects for local stakeholders, and establishes specific regulations for the use of

[24] http://www.ypeka.gr/LinkClick.aspx?fileticket=qtiW90JJLYs%3D&tabid=37 (last access: 20 January, 2017)
[25] http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=100579 (last access: 20 January, 2017)
[26] http://www.komotinipaper.gr/en (last access: 20 January, 2017)

renewable energy in buildings and Investment Law 3908/2011[27] that supports the installation of RES-heating plants in Greece. The promotion of public awareness and showcase success stories should be fostered in order to motivate and convince stakeholders, policy makers and public or private institutions. Terms and conditions for cultivating marginal lands in protective areas need to be specified, since this land category occupies large areas in Greece and has not been registered, yet; principle regulations of Natura 2000, the Birds and Habitats Directive, the Water Framework Directive, Nitrates Directive, soil protection etc. need to be taken into account and considered for the SEEMLA approach. With regard to networking and communication, an exchange of knowledge with other relevant projects and institutions should be fostered, e.g. by workshops, seminars etc. to find synergies and to multiply their impact; stakeholders, representatives from the administrative sector and interested persons from NGO's should be involved also by using modern media opportunities.

2.3 Ukraine

2.3.1 Promotion of renewable energy

In Ukraine there is no specific legislation that regulates biomass production in MagL for bioenergy on regional level; national legislation applies rather generally to the bioenergy sector, including biomass production. The adopted Law 'On Amendments to the Law of Ukraine On Electric Power Industry to stimulate the production of electricity from alternative energy sources' (No: 5485-VI of 20/11/2012) stipulated the establishment of a 'Green Tariff' since 1 April, 2013[28] for electricity produced from biogas and biomass galvanizes the flow of investment in the bioenergy sector. However, until December 2016, only 6 companies were using the Green Tariff for electricity from biomass and biogas (**Table 2**).

In comparison, the number of companies that have used the green tariff for electricity from solar radiant energy for the same period was 58. Currently, resolutions of the Cabinet of Ministers of Ukraine providing for compensation for the difference between the economically justified tariff for producing heat from biofuels and unprofitable tariff for producing heat energy for the public heating are effective[29,30]. In addition, mechanism of compensation for 20% of the loan amount to the public for purchasing solid fuel boilers is effective.

[27] http://startupgreece.gov.gr/procedures-laws-regulations/investment-incentives-law-39082011 (last access: 20 January, 2017)
[28] https://www.iea.org/policiesandmeasures/pams/ukraine/name-38470-en.php (last access: 30 January, 2017)
[29] On Stimulating the Replacement of Natural Gas in the Heating. Resolution of the Cabinet of Ministers of Ukraine No: 293 of 09/07/2014. http://zakon4.rada.gov.ua/laws/show/293-2014-%D0%BF (last access: 26 January, 2017)
[30] On Stimulating the Replacement of Natural Gas in the Production of Calorific Energy for Institutions and Organizations Financed by the State and Local Budgets. Resolution of the Cabinet of Ministers of Ukraine No: 453 of 10/09/2014. http://zakon1.rada.gov.ua/laws/show/453-2014-%D0%BF (last access: 26 January, 2017)

Also approved was a Roadmap of Measures to Reduce Consumption of Natural Gas and Renewable Energy Development for the period up until 2020[31]. Implementation of these measures allowed doubling the share of biofuels in the total energy consumption in Ukraine within five years from 1.3% in 2010 to 2.5% in 2015, with the share of bioenergy in the structure of renewable energy in 2015 accounted for 81.3% (**Table 3**).

Table 2 Number of energy producing companies as of October 2016[32].

Energy source	**Number of companies**
Wind energy	17
Biomass energy	6
Biogas energy	12
Solar energy	111
Energy from small water power stations	122

Table 3 The structure of energy consumption in Ukraine[33].

Year	Total (toe)	**Percentage of the total energy consumption**					
		Natural gas	Coal and peat	Crude oil and oil derivatives	Electrical energy	Caloric energy	Biofuels
2015	**50,831,000**	**31.5**	**12.4**	**18.6**	**20.1**	**14.8**	**2.5**
2014	61,460,000	34.1	14.9	16.5	18.0	14.5	2.0
2013	69,557,000	35.9	12.5	16.2	17.0	16.8	1.6
2010	74,004,000	38.4	11.3	16.5	15.6	16.9	1.3

In Ukraine, an amount of produced in 2015 biofuel was equivalent to 3.26 billion m³ of natural gas, and the average growth rate for the period 2010 to 2015 amounted to 38% annually (**Figure 3**), with the primary energy from biofuels equivalent to 2.63 billion m³ of natural gas. The difference between biofuel production and supply of energy produced from it can be explained by significant exports of biofuels (pellets, wood chips, wood, etc.)

[31] The National Action Plan on Renewable Energy for the Period until 2020. Orders of the Cabinet of Ministers of Ukraine No: 902-p of 01/10/2014. http://zakon4.rada.gov.ua/laws/show/902-2014-%D1%80/page (last access: 26 January, 2017)
[32] State Agency for Energy Efficiency and Energy Saving of Ukraine. http://saee.gov.ua/uk/news/489 (last access: 26 January, 2017)
[33] Express Bulletin of the State Statistics Service of Ukraine. Energy Balance of Ukraine for 2015. No: 455/0 /8.4 - 16 of 20/12вн/2016

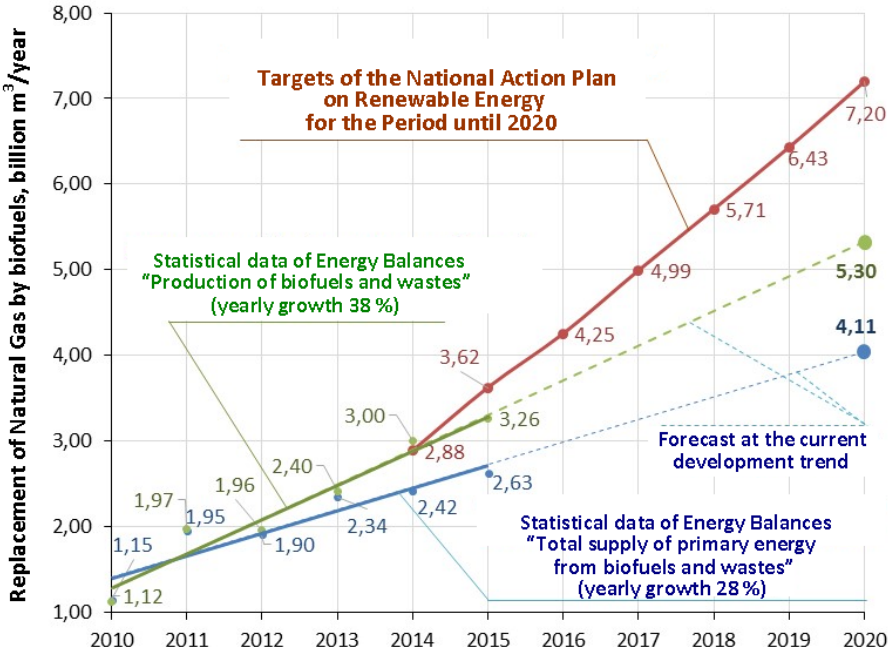

Figure 3 The growth of bioenergy in Ukraine (UABio 2016)

In addition, on 22 September, 2016, the Supreme Council of Ukraine adopted the bill No. 4334 "On Heat Supply" to stimulate the production of energy from alternative fuels. The bill stipulates prescribing the special tariff for heat produced from alternative energy sources that makes 90% of current tariff for the heat produced from natural gas. The bill is expected to promote 30-50% substitution of natural gas within 3-5 years and creation of 25,000 new jobs.

In addition, under the **Tax Code** of Ukraine[34] there are a number of tax exemptions for producers of RES-electricity, namely:

- 75% reduction in land tax for land used for renewable energy power plants;
- limits on rental payments for land leased from state and municipal authorities;
- exemption from import VAT and customs duties for renewable energy equipment;
- exemption from the tax duty in the form of a special mark-up on produced electricity (3% of produced electricity); and
- an exemption from corporation tax on profit derived from the sale of electricity produced from renewable sources.

The Feed-in Tariff scheme applies to electricity generated from any type of non-conventional energy source (including wind, solar, biomass and hydro and certain secondary energy sources), with the exception of electricity produced from coke gas and gas from blast furnaces. The *Green Tariff* is calculated by applying a certain coefficient to the consumer

[34] http://www.bio-prom.net/index.php?id=8517&L=2#c25215 (last access: 12 January, 2017)

retail tariff set as at 1 January 2009, the latter being 584.6 UAH. NERC sets the tariff on a monthly basis to reflect the fluctuating UAH/Euro exchange rate, but the tariff can never be less than the minimum tariff for the relevant technology (**Table 4**). The minimum Green Tariff rate protects investors from an extreme decrease in tariff rates.

The Green Tariff Law sets this scheme until 2030 for plants commissioned. The coefficient will be reduced by 10%, if plants are commissioned after 2014, by 20%, if plants are commissioned after 2019 and by 30% if plants are commissioned after 2024.[35] The main buyer of renewable energy is Ukraine's national wholesale electricity market operator (WEM). WEM is the union of suppliers and producers of electricity and is represented by the government-owned energy company, Energorynok.

The Green Tariff Law has established a manifold support scheme for the production of RES-electricity. However, there are still important provisions that need to be elaborated on, modified, and settled. Several key regulations necessary for the implementation of feed-in tariff projects have not been adopted, yet, e.g. the framework of a uniform procedure for the connection to power grids, or the compensation of expenses related to such connection. Assuming that the FIT levels remain stable until 2030, in accordance with the Green Tariff Law, then this will probably motivate investors to overcome the obstacles to deployment which remain in this initial market stage. Such projects would benefit from economies of scale and a higher internal rate of return.

Table 4 Feed-in tariff rates in Ukraine (REmap 2030)[36].

Type of energy	Eligible power stations	Coefficient	Peaking coefficient	min. tariff (€ / kWh)
Wind	Under 600 kW	1.2	n/a	0.0646
	600-2000 kW	1.4	n/a	0.0754
	Over 2000 kW	2.1	n/a	0.1131
Solar energy	Power plants on the ground	4.8	1.8	0.4653
	Rooftop capacity in excess of 100 kW	4.6	1.8	0.4459
	Rooftop generating capacity up to 100 kW	4.4	1.8	0.4265
Biomass	All biomass (except biogas)	2.3	n/a	0.1239
Small hydropower plants	Up to 10 MW	0.8	n/a	0.0775

[35] IBP Inc. (2015). Ukraine Energy Policy, Laws and Regulations Handbook, Volume 1: Strategic Information and Basic Laws. Lulu Press, Ukraine, 270 p.
[36] IRENA (2015), REmap 2030 - Renewable Energy Prospects for Ukraine. 53 p. https://www.irena.org/remap/IRENA_REmap_Ukraine_paper_2015.pdf

Green Tariff Rates for Biomass and Biogas

The procedure for establishing Green Tariff rates for electricity generated using biomass will undergo a major change following the adoption of the Law 'On Stimulation of Production', in force since 1 April, 2013, that has changed the definition of biomass.
Biomass is considered a non-fossil, biologically renewable substance of organic origin that comes in the following forms:

(i) biodegradable waste from forestry and agricultural operations (both crops and livestock),
(ii) fishery and related industries, and
(iii) the biodegradable components of industrial and municipal waste. In the new law, biogas is referring to gas generated from biomass. These new definitions of "biomass" and "biogas" have lifted restrictions as specified by current legislation.

Accordingly, the green tariff shall apply to biomass of both plant and animal origin and the usage of biomass shall not be restricted to incineration. Moreover, there is a clear opportunity to use biogas for the production of energy. Furthermore, also since 1 April, 2013 biomass (and consequently, biogas) must be generated exclusively from 'waste'; this includes also residues and/or by-products from wood production and processing that is grown in SRC systems on e.g. marginal lands. As a result, agriculture products (i.e. technical crops) cannot be used for the production of energy that is eligible for Green Tariff rates. However this may change, if biomass is produced on abandoned land (=MagL).

In general, in the Ukrainian legislation a clear definition of what is considered *'waste'* that could be used for power generation in the Green Tariff framework is still missing. References to definitions of waste contained in regulations unrelated to Green Tariff laws and regulations do not support resolving this issue. This uncertainty remains an obstacle for the use of some energy sources, which cannot be unambiguously declared as 'waste', i.e. wood pellets or wood chips (*wood waste*).[37]

Solid biomass use for heating

The use of RES by consumers, e.g. transport, industry, and residential and commercial buildings, is rather limited. Biomass is the main source of renewable energy in end-use sectors, and Ukraine has focused on it as a domestic resource worth exploiting. National sources indicate that Ukraine has 750-1,465 PJ (18-35 Mtoe/a) of primary biomass economic potential that can substitute 22-26 billion m^3 of natural gas (Bioenergy, 2014)[38,39]. Potential estimates are updated annually, and depend on parameters, i.e. agricultural yields, cropping patterns, weather and climate conditions. Each year, Ukraine produces about 120 mio. t of biomass feedstock, including waste, animal, wood and food processing residues, and crop

[37] IRENA (2015), REmap 2030 - Renewable Energy Prospects for Ukraine. 53 p. https://www.irena.org/remap/IRENA_REmap_Ukraine_paper_2015.pdf
[38] Bioenergy (2014), Ukrainian Biomass Pellets Market. Brief Overview, June 2014. http://ukraineagrovalley.com/site/files/Biomass_Pellets_Market.pdf.
[39] Priorities for energy efficiency and renewable energy development in Ukraine. SAEE, Kiev. http://corrente.gse.it/Immagine%20GSE/News/ Presentation_SAEE.pdf.

production. Of the total production 54% are further processed, 45% are wasted and 1% is used for power and heat generation (ProMarketing Ukraine, 2013).[40] In 2010, a total of 93 PJ of biomass was used in Ukraine, 48 PJ/a of which was by end-use sectors (IEA, 2014)[41], and residential heating accounted for 47 PJ. A report by the Centre for Renewable Energy Sources and Savings estimated a total demand at 108 PJ for covering the 2009-2010 fiscal year, and 128 PJ for 2010-2011 (CRES, 2012)[42]. According to Matveev (2014)[43], total biomass demand was constant at 93 PJ from 2010 to 2012, or 2,231 ktoe. Firewood is the most common feedstock and is used by 92% of the households reporting biomass consumption. Half of firewood is supplied from biomass supply centres and 30% directly from forests. Ukraine is also a producer of solid biomass products. In 2012, there were 44 pellet producers in Ukraine and 155 fuel briquette production companies with a total production of ca. 290 kt/a. These are mainly small companies with production outputs ≤2 kt of pellets or 1 kt of briquettes per month. Over 90% of solid biofuel products were exported to EU countries, where effective incentive programmes for renewable energy are in force (CRES, 2012). In **Tables 5** and **6** the prices of solid biofuels in 2015 and the development of average prices of solid biofuels from 2008 to 2013 are given.[44]

Table 5 Price of solid biofuels in Ukraine (2015)[45]

Type of solid biofuel	Range of price, UAH/t (incl. VAT) (1 € = 29.3 UAH, 25.1.2017)
Wood pellets	55-90 (1.90-3.10 €)
Wood briquettes	65-85 (2.20-2.90 €)
Sunflower husk pellets	35-55 (1.20-1.90 €)
Straw pellets	45-55 (1.50-1.90 €)
Straw briquettes	85 (2.90 €)

[40] ProMarketing Ukraine (2013). Business opportunities in the bio-based economy in Ukraine. November 2013. ProMarketing Ukraine, Kiev.http://www.biobasedeconomy.nl/wp-content/uploads/2011/08/ BBE-Ukraine-study-2013-12-13.pdf.
[41] IEA (2014), Extended energy balances 2014.OECD/ IEA, Paris.
[42] CRES (2012). Biomass consumption survey for energy purposes in the energy community. Ukraine national report. 7 November 2012. CRES, Pikermi. http://www.energy-community.org/pls/portal/docs/1378194.PDF.
[43] Matveev, Y. (2014). Utilization of agricultural waste/ residuals for biogas and biomethane production. 26 September 2014, Kiev. http://iet.jrc.ec.europa.eu/remea/ sites/remea/files/files/documents/events/15._uriy_ matveev_ukraine.pdf.
[44] Bioenergy4Business „Uptake of Solid Bioenergy in European Commercial Sectors"; D2.1: Country Summary Report of promising market segments for use of bioenergy, http://www.bioenergy4business.eu/wp-content/uploads/2015/06/B4B-WP2_Country_Summary_Report_Ukraine_ 13-08-2015.pdf (last access: 25 January, 2017)
[45] Biomass availability and logistics analysis in Ukraine. SEC Biomass Report for IFC, 2015

Table 6 Dynamics of average prices of solid biofuels in Ukraine[46]

Type of wood biomass	2008	2009	2010	2011	2012	2013
Wood pellets	110	68-90	77-96	73-82	101	113
Sunflower husk pellets	110	63-81	77	73-82	89	85
Straw pellets	No production	90-117	67-96	82-91	101	94

Also with regard to the SEEMLA approach, biomass (woody, lignocellulosic, herbaceous etc.) will definitely be the main source of renewables in Ukraine in the future. However, there are no regional or national regulations to mandate the use of bioenergy where an exploitable resource exists, especially not considering the use of MagL. In addition, policy support will be needed to create a sustainable and affordable biomass supply market. There is a significant supply potential, but how it will be 'mobilized' needs to be carefully developed also in order to be able to meet the future energy demand growth. There are some important considerations regarding logistics and marketing which need to be taken into account: Ukraine has a large territory and biomass resource potential is dispersed across the country. Firstly, it will be important to locate processing and conversion plants close to supply areas. Nevertheless, utilising the biomass supply potential will still require transport infrastructure to ensure that supply meets the demand in heating, power generation and biofuel production. This is a major barrier to exploit Ukraine's forestry for the heating and power generation sectors.[47]
Another important issue is land use and land ownership. During the land reform which started in 1991, land was distributed to the workers of the collective and state farms. Today, most landowners lease their land. This has led to the rise of agriculture holdings which are increasingly accounting for a larger share of land ownership, and potentially having more power in terms of controlling and decision making for Ukraine's land use and agriculture sector (Plank, 2013)[48]. New policies to increase energy crop and agricultural residues supply would need to be formulated carefully to ensure sustainability by considering the specific characteristics of the Ukrainian land ownership.

2.3.2 Expected impact from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

The introduction of the definition of marginal land could potential entail significant positive changes. According to the National Land Cadastre of Ukraine[49] there are about 8 Mio. ha of degraded, former agriculture lands, that do not legally belong to anyone at this time; in addition a rough estimate of at least 3 Mio. ha of those are abandoned farmland land in

[46] Analysis of biofuel of vegetable origin in Ukraine and Kyiv region. SEC Biomass Report for Kyivenergo, 2013.
[47] IRENA (2015), REmap 2030 - Renewable Energy Prospects for Ukraine. 53 p. https://www.irena.org/remap/IRENA_REmap_Ukraine_paper_2015.pdf
[48] Plank, C.(2013), Land grabs in the Black Earth: Ukrainian Oligarchs and International Investors. 30 October 2013. Heinrich Boell Stiftung, Berlin. http://www.boell.de/en/2013/10/30/land-grabs-black-earth-ukrainian-oligarchs-and-international-investors.
[49] http://land.gov.ua/ (last access: 18 January, 2017)

Ukraine. The following consequences from introduction of use of MagL for biomass production for bioenergy to the national legislation may arise:

- Ability to assess actual quantity of MagL, which would in turn allow a more sustainable overall land use by growth of bioenergy crops;
- Stimulate rural development: since in the framework of Ukrainian legislation, fees and taxes from using MagL would flow into local budgets;
- Simplification of operations for currently existing enterprises, as well as popularization and encouragement of producing biomass for bioenergy from MagL on broad scale.
- Rise of general public awareness, attitude towards MagL as well as towards bioenergy;
- Further development of legislation towards possible future diversification of MagL use (e.g. long rotation crops for timber production, afforestation of the areas, etc.)

As for regional legislation - we may only theorize that some areas based on the quantity and quality of MagL, or other conditions would receive special policies, but without actual data on MagL structure we can only go so far. Introduction of the use of MagL for biomass production for bioenergy would potentially require reworks and changes made to the following major acts and regulation:

- The Land Code of Ukraine of No 2768-III[50]
- National classification of entrepreneurial activities
- Single and Comprehensive Strategy for Agriculture and Rural Development in Ukraine for 2015-2020
- Law of Ukraine "On Alternative Energy Sources" of No 555-IV[51]
- Resolution of the Cabinet of Ministers of Ukraine "On approval of the Energy Strategy of Ukraine until 2030" No1071-p[52]

2.3.3 Expected interferences with other users from the introduction of the use of MagL for biomass production for bioenergy to regional/national legislation

A question of social injustice could arise. Field areas nearby the settlements were distributed to the people already. This distribution took place in the different regions, cities, villages, over 10 years ago and soil quality varies a lot in different locations, which may lead to some discontent among the citizens. Also, interference could arise from the territorial departments responsible for land distribution and control of land use in case they decide to investigate the reasons that have led to soil degradation, and pursuit responsible for land degradation persons. Poorly prescribed definition of marginality also may stall implementation of the legislation and formation of the MagL determination system. To minimize or eliminate such

[50] http://cis-legislation.com/document.fwx?rgn=8688
[51] http://www.res-legal.eu/en/search-by-country/ukraine/sources/t/source/src/law-no-555-iv/
[52] http://www.bio-prom.net/index.php?id=8517&L=2#c25215 (last access: 20 January, 2017)

perspectives it is important to keep in mind these factors during law-making, and foster the needed additions to the territorial legislation.

Considering that the dominant type of MagLs in Ukraine are abandoned lands, it it rather unlikely that potential stakeholders, or land owners would show dismay or raise significant objections.

Hence, only a few interference scenarios are foreseen:

- Grazing areas and pastures: lands that are currently in use for livestock grazing, but potentially may be used for bioenergy crops cultivation
- Industrial zone/district/object construction: abandoned lands, especially ones in convenient location for specific industries may be of interest for potential development
- Beekeeping: if lands are used by beekeepers; (however some of the species cultivated for biomass are also suitable for beekeeping, e.g. Paulownia)
- Depending on the type of land marginality: there may be cases of interferences with conventional agriculture.

Conflicts with biodiversity and environmentalist adherers are not expected, as noted by producers - since the beginning of energy crops cultivation on MagLs, their soil qualities are gradually improving due to intense fertilization from a significant amount of organic matter or remnants from crops, stimulating soil improvement related processes in contrast with the previous situation(abandonment). Such change in land use and stimulation of spot ecosystems also positively affects biodiversity: animal species that have not been sighted in such abandoned areas for a prolonged period of time are rather attracted by plantations.

2.3.4 Suitable strategies for the SEEMLA pilot cases

Suitable strategies should be developed with regard to the integration of MagLs to national (incl. regional) legislation considering environmental, agricultural and economic aspects. Therefore, a clear and exact legal definition and/or classification of MagL would be needed, either in terms of a definition per se or in relation to land evaluation. MagLs should be incorporated into local supply chains for local consumption of locally/domestically produced biomass.

Established enterprises, e.g. Salix Energy Ltd. should share and promote their experiences in biomass for bioenergy production, e.g. Salix Energy Ltd. offers information and advice for starting up related businesses. Stimulating the transition from traditional resources for energy generation to biomass on the local scale by the means of temporary abolishment of taxes, financial aid, or other means under understandable, clear and specific conditions, based on Section 3 Law of Ukraine "On Alternative Types of Fuel" of No1391-XIV would be essential.[53] Moreover, MagL as a separate category of lands should be integrated into the land classification system of the National Land Cadastre of Ukraine. The use of biomass

[53] http://www.reee.org.ua/en/policy-support/legislation/laws/ (last access: 20 January 2017)

originating from MagLs should be incorporated into the national and regional strategy of bioenergy development.

2.3.5 Suitable assessment/approach for an abatement of sustainability risks

Based upon the classification land for being MagL, all aspects and factors (cf. Müller et al. 2007)[54] of its marginality should be reviewed in combination with spatial location of the land plot and surrounding area. Based on these factors, evaluation of potential risks for the plot itself as well as for the surrounding areas should be conducted.

Stakeholders, i.e. local farmers and foresters should be informed about best practices, policy frameworks and funding opportunities, sharing experiences with other stakeholders and collaborate with local/regional as well as national administration; in turn administrations could offer information platforms, workshops, seminars or similar, subjecting to e.g. amendments in legislation, financial aid programmes or similar. The introduction of state-wide regulatory body that would inspect and monitor related activities could be established, and could interfere when notable sustainability risks are foreseen. Networking and communication between stakeholders and administration as well as to R&D institutions, e.g. IBC&SB NAAS, Kiev, would be of important for a successful establishment of the SEEMLA approach.

At a later stage, the implementation of a unified certification system e.g. certified sustainable production of biomass from MagLs, subdivided by region, by specific parameters for each region, and based on the individual likelihood of risks or potential sustainability issues in each particular area should be established.

However, sustainability issues are mainly not considered in the policy framework in Ukraine. By an increasing use of renewable sources, energy efficiency, and substitution of natural gas the use of MagL for biomass production for bioenergy could be a great step towards an energetic self-supplying Ukraine, as well as potentially for other countries, that are still developing, and depend greatly on imported energy sources. The national viewpoint is that there are no alternatives to successful development of an independent energy sector in Ukraine but the exploitation of renewable sources including biomass from MagL.

[54] Müller, L., Schindler, U., Behrendt, A., Eulenstein, F. & Dannowski, R. (2007). The Müncheberg Soil Quality Rating. Leibniz Institute for Agricultural Research (ZALF e.V.), Müncheberg, Germany, 103 p.

3 General remarks to regulations and financial support related to biomass from marginal lands

The SEEMLA approach is at an early stage of market deployment (cf. BiomassPolicies Project). At this stage of initial market development a strategy and action plan are crucial (**Figure 4**). Main financial support tools would be R&D grants, investment subsidies, loans or credit lines, followed by tax exemptions in the transgression state from the initial to the early stage. It can be hence assumed that SEEMLA will possibly have reached and/or achieved the second stage after three years. However, major aims will be (i) to create an attractive incentive programme for stakeholders, i.e. farmers, forester, to use MagLs for sustainable biomass production for bioenergy, (ii) to share experiences in each partner country internally and transnationally between SEEMLA partner countries and other EU MS, and to (iii) apply the EU Common Agricultural Policy (CAP) to the SEEMLA approach and possibly find a way to adapt it to and to modify the CAP, e.g. 'greening', and other relevant legislation, e.g. European water protection, nature conservation, soil protection, nitrates directive and related regulations, frameworks, and financial supporting programmes.

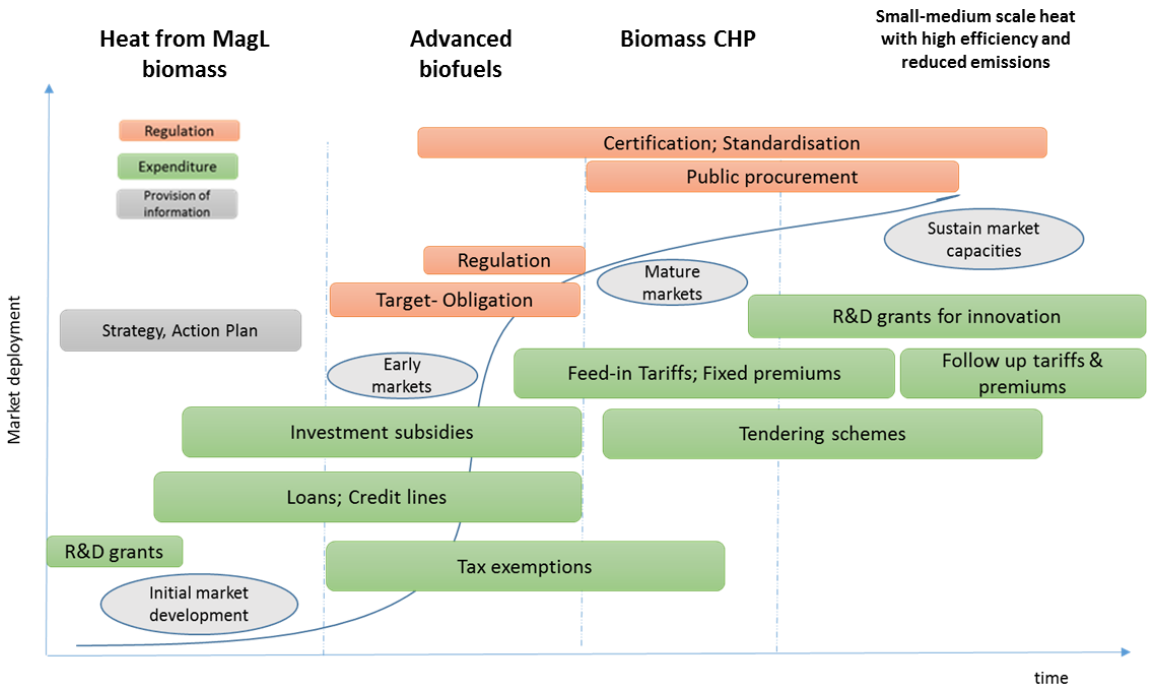

Figure 4 Policy and administrative regulations for biomass production on MagL for bioenergy – selected value chains (modified and adapted from BiomassPolicies.eu, C. Panoutsou, 2016)

Table 7 Policy mechanisms relevant to biomass from marginal land per value chain step, type of policy and market stage development (adapted from BiomassPolicies.eu, C. Panoutsou, 2016)

	Mechanism	Marginal lands	Harvesting/ Collection	Logistics	Trade
Regulatory	Common Agricultural Policy Act on ecological products and farming practices Nitrates Directive (91/676/EEC)	Early markets	Mature markets Sustain markets		Mature markets Sustain markets
	Certification/ Standardisation		Mature markets Sustain markets		Mature markets Sustain markets
Financial support	Investment subsidies, direct payments	Early markets	Early markets	Early markets	
	R&D Grants	Early markets	Early markets		
	Tax exemptions			Mature markets Sustain markets	Mature markets Sustain markets
Information provision	Strategies/ Action plans	Early markets	Early markets	Early markets	Early markets
	Capacity building	Early markets Mature markets	Early markets Mature markets	Early markets Mature markets	

Regulations suitable for biomass from Marginal Lands

Based on recommendations of the BiomassPolicies project[55] and adapted to SEEMLA, it should be ensured that CAP measures from pillar 1 'direct payments' and pillar 2 'rural development' are integrated into local planning and that there are provisions for biomass from marginal lands. In detail, regarding CAP pillar 2 targeted national and/or regional rural development programmes should be introduced (where they are not existing) focusing on shift to low-carbon economy, including targeted measures for municipalities. Action plans should be developed including all measures dealing with the use, management, conservation and protection of planted public areas where biomass production on MagL exists. Biomass certification activities should be enhanced at national level, whereas national preconditions could be better taken into account by national policy.

Financial support measures suitable for biomass from Marginal Lands

With regard to CAP pillar 1 for direct payments, budget from 'Green Direct Payments' should include appropriate marginal land management activities matched to regions, municipalities, local ecosystems and practices. This can lead to optimised biomass mobilisation. Subsidies for improving the types of species in MagLs with [indigenous] fast growing species should be offered as well as for SMEs, cities, municipalities etc. in order to purchase equipment for improved harvesting and handling (chippers, pelletisers, etc.) operations. The preparation of a MagL management plan should be supported and be provided in form of grant or tax exemptions for improving existing biomass trade centres to include such biomass forms in their selling products, etc.

[55] A themed webinar was arranged on 22 September, 2016, invited presenters: Calliope Panoutsou (BiomassPolicies) on the Legal Framework of biomass production in the EU, and Saori Miyake (TU Darmstadt, IWAR, DAAD PostDoc) on the Definition of MagL.

Information provision mechanisms suitable for biomass from marginal lands

Knowledge should be transferred and human resource capital at local, municipality level should be improved. Capacity building for improved practices should be provided with regard to quality, handling and storage of biomass from MagLs, as well as capacity building to existing wood trade centres on handling biomass from MagL. Learning from good practices is of great relevance for a successful development of a suitable SEEMLA approach and the foreseen introduction to the policy framework of the partner countries and, in long-term perspectives, to EU legislation.

4 Summary and Outlook

In the long-term, the 2030 emissions reductions targets will require a dedicated and continued switch to low-carbon energy sources and an applied focus on greater energy efficiency. As already described and introduced in D3.1, the SEEMLA approach may contribute to 'filling the gap' of future demand in biomass for bioenergy purposes. From this report it can be derived that SEEMLA partner countries [with pilot cases], namely Ukraine, Greece and Germany, are at very different stages with regard to the use of renewable sources and policy frameworks on national and regional level.

Firstly, Ukraine may be the "youngest" also in terms of being conscious about the need and long-term benefit use of renewable sources for energy consumption in future. Nevertheless, Ukraine is also a state that probably has the highest motivation for a transition from fossil fuels to renewables. Using domestic renewable sources, e.g. biomass, would offer the option becoming energetically independent; and the potential is great due to the availability of large areas that would be suitable for growing bioenergy crops also on MagLs. Due to the introduction of feed-in tariff (FIT) laws, i.e. the Green Tariff, and the Tax Code the renewable energy development has been strongly promoted. Secondly in Greece, legislation regarding energy generation from RES is mainly based on law 3851/2010 and the CAP. The need for the use of biomass for RES-heating and power generation might not be as relevant as e.g. wind power or PV; however, a lot of land is highly degraded and mostly unsuitable for being used as e.g. agricultural land or for pasture. Hence, using MagL for growing predominantly pine due to afforestation would be a benefit in ecological terms and also for gaining biomass for bioenergy. Thirdly, Germany has a well-developed bioenergy market already and many opportunities for financial support are available, e.g. MAP, KfW, BAFA, APEE. But still, the energy gap needs to be filled until 2020 and beyond. Legislation with regard to bioenergy is well-established correspondingly, e.g. EEG, EEWärmG, BiomasseV, and the CAP. However, the use of MagL for biomass production for bioenergy needs to be promoted and supported, as it is not embodied in the policy framework.

On 30 November, 2016 the European Commission presented the **"Clean Energy for All Europeans"** proposals[56], which are aiming at three main goals: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. Therein the new targets for 2020 beyond are defined, i.e. cutting CO_2 emissions by at least 40% by 2030, and supporting e.g. a biomass based bioenergy future, based upon an even more transparent market and better developed regulation and policy framework that will offer more opportunities for civil society to become more involved in the energy system.

With the European 7th Environment Action Programme to 2020, soil degradation is declared as serious environmental problem. With the loss of soil, its functions are disturbed and can be irrecoverably lost, e.g. storage of water and nutrients. The use of [strongly] degraded land for non-food biomass production for bioenergy would be an important contribution to slow down this process, to minimize erosion and GHG emissions due e.g. the loss of organic matter. The SEEMLA concept is aiming at such degraded, underutilized, abandoned sites (=marginal) land. On one hand aspects of environmental protection are in the centre of attention; on the other hand the economic, but still sustainable – also considering environmental and social aspects[57] - use of MagLs for the production of woody or lignocellulosic biomass, e.g. in form of short rotation coppice, for bioenergy is of great interest in order to be able to cover the future demand of renewable energy sources and to become more and more independent from fossil fuels. Short-term results (≤5 years) may be an expected increase of biomass production on MagL due to e.g. SRC, with poplar, willow, and miscanthus. The choice of plant species will have a significant effect on soil properties and biodiversity: additional planting of e.g. Sica or Paulownia potentially increases soil organic carbon, e.g. due to plant residues, and hence the storage of water and nutrients in the top soil, minimizing erosion, and lead to an increase in diversity of fauna, e.g. bees, and flora, e.g. primary succession plants. Mid-term effects (5-10 years) would be in general the successive soil improvement on MagL: perennial crops will increase C sequestration and further more improve soil functions, soil aeration by deeper root channelling, e.g. due to miscanthus. This in turn will also affect soil biodiversity. For long-term cultivation (≥10 years) of MagL, financial support of stakeholders by European Regulations, e.g. CAP or national law, e.g. incentive programmes, should be developed, introduced and made available for the public. As a side effect, the *long-term* use of marginal land for biomass production may lead to an altered nutrition status due to carbon sequestration (C from organic compounds) or greening (C and N enrichment), turning MagL into a higher productive area. Consequently in this case the SEEMLA definition of MagL would need to be re-considered. Hence, the long-term existence of MagL should be guaranteed and alteration in terms of iLUC prevented, since MagL sites also offer an important habitat for specified plant and animal species. Experiences achieved from former lignite mining sites show that primary succession are likely to occur which turns such degraded, reclaimed MagLs into highly valuable sites.

[56] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition (last access: 30 January, 2017)
[57] http://www.iso.org/iso/catalogue_detail?csnumber=52528 (last access: 30 January, 2017)

In summary, bioenergy produced from biomass from marginal lands offers a reliable perspective, if local problems in bioenergy production and utilization are addressed and solved, (ii) low priced biomass feedstocks are available, (iii) available bioenergy technologies are high efficient and economical feasible, and (iv) the whole production and utilization chain of biomass is backed-up by reliable framework. This could be realised by the development and introduction of specific incentives for sustainable bioenergy products. At the same time public acknowledgement for the advantages of bioenergy to fix energy imbalances, save the climate and develop rural areas needs to be present.

5 Links to partner projects

www.forbio-project.eu
www.biomasspolicies.eu
www.biomassfutures.eu
www.greengain.eu
www.s2biom.eu
www.bio-prom.net
www.bioenergy4business.eu

6 Abbreviations

AEE	Agency for Renewable Energies (Agentur für Erneuerbare Energien)
AFP	Agricultural Investment Promotion Programme (Agrarförderprogramm)
AGEE	Working Group Renewable Energy Statistics (Arbeitsgemeinschaft Erneuerbare-Energien-Statistik)
APEE	Incentive programme energy efficiency (Anreizprogramm Energieeffizienz)
BAFA	Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle)
BBergG	Federal Mining Act (Bundesberggesetz)
BBodSchG	Federal Soil Protection Law (Bundesbodenschutzgesetz)
BBodSchV	Federal Soil Protection and Contamination Ordinance (Bundesbodenschutz- und Altlastenverordnung)
BiomasseV	Biomass Ordinance (Biomasseverordnung)
BioSt-NachV	Biomass Electricity Sustainability Regulation (Biomassestrom-Nachhaltigkeitsverordnung)
BMWi	Federal Ministry for Economic Affairs and Energy (Bundesministeriums für Wirtschaft und Energie)
BNatSchG	Nature and landscape conservation under the Nature Protection and Landscape Conservation Act (Bundes-Naturschutzgesetz)
BUND	Friendes of the Earth Germany (Bund für Umwelt und Naturschutz) Deutschland
CAP	Common Agricultural Policy
CHP(P)	Combined Heat and Power (Plant)
CRES	Centre for Renewable Energy Sources
DE	Germany
EAFRD	European Agricultural Fund for Rural Development
EC	European Council
EEG	Renewable Energy Sources Act (Erneuerbare Energiengesetz)
EEWärmeG	Renewable Energies Heating Act (Erneuerbare Energien Wärme Gesetz)
EL	Greece
EnergieStG	Energy Tax Act (Energiesteuergesetz)
EPBD	Energy Performance of Buildings Directive
ESCO	Energy Service Company
ETBE	Ethyl Tertiary Butyl Ether
EU	European Union
FIT	Feed-in tariff
FNR	Agency for Renewable Resources (Fachagentur Nachwachsende Rohstoffe e.V.)
GasNZV	Gas Network Access Ordinance (Gasnetzzugangsverordnung)
GHG	Greenhouse gas
IEA	International Energy Agency
iLUC	indirect Land Use Change
KENAK	Greek Regulation for the Energy Efficiency of Buildings
KfW	Reconstruction Loan Corporation (Kreditanstalt für Wiederaufbau)

LULUF	Land-use, land-use change and forestry
MagL	Marginal Land
MAP	Market Incentive Programme (Marktanreizprogramm)
MS	Member State(s)
NABU	Nature And Biodiversity Conservation Union (Naturschutzbund Deutschland)
NERC	National Electricity Regulatory Commission
NGO	Non-governmental organisation
NREAP	National Renewable Energy Action Plan
PPA	Power Purchase Agreement
R&D	Research and Development
RED	Renewable Energy Directive
RES	Renewable energy sources
SAEE	State Agency on Energy Efficiency and Energy Saving of Ukraine
SME	Small and medium-sized enterprises
SRC	Short Rotation Coppice
UA	Ukraine
UAH	Ukrainian hrywnja; 1 UAH = 0.03 €; 1 € = 29.2 UAH (25 January, 2017)
WEM	Wholesale electricity market

Units

MW	megawatt
GW	Gigawatt
TW	Terawatt
kWh	kilowatt hour
MWh	Megawatt hour
GWh	Gigawatt hour
TWh	Terawatt hour
t	tonne
kt	kilotonne
PJ	Petajoule
oe	oil equivalent
toe	tons oil equivalent
ktoe	kilo tons oil equivalent
Mtoe	Mega tons oil equivalent
1 PJ	= 23.88 ktoe
100 ktoe	= 4.19 PJ
kilo (k)	= 10^3
Mega (M)	= 10^6
Giga (G)	= 10^9
Tera (T)	= 10^{12}
Peta (P)	= 10^{15}