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D4.3 Market uptake measures at EU level

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GREENMEUP

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Chapter 1: Introduction

In the context of GreenMeUp project, it is foreseen the design of targeted market uptake policy measures and financial frameworks, which will allow the biomethane markets to operate efficiently and effectively in the advanced and target countries where results could be replicated.

The current deliverable intends to provide a comprehensive list of market uptake measures at EU level.

The selection of the market uptake measures at EU level was based on the performed work within the context of GreenMeUp project so as to identify the respective market uptake measures at national level.

More specifically, the obtained results considering the policy recommendations and the proposed market uptake measures were analyzed and synthesized so as to identify which market uptake measures should be initiated at EU level additionally to the national ones.

It should be noted that the identification and definition of the most effective market uptake measures occurred in close collaboration with the involved stakeholders within the framework of the different hubs (e.g., policy, market, society hubs). The focus and typology of future policy interventions, which can be developed and implemented to improve the market uptake and cross border trade of biomethane value chains in EU and the target countries, resulted through the co-design of the market uptake measures.

The recommended combinations of policy measures at national level target towards a level playing field between different market segments (e.g. buildings, industry, power and transport), while they can address the main risks and challenges ensuring that the required future policy interventions will be well integrated into the national policy planning for each target country separately.

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Chapter 2: Methodological approach for selecting the market uptake measures at EU level

The proposed market uptake measures for the promotion of biomethane at EU level resulted by the analysis and synthesis of the most important outcomes delivered by GreenMeUp project.

Figure 1 outlines the most meaningful and exploitable results, which were utilized so as to draft the recommended list with the market uptake measures at EU level.

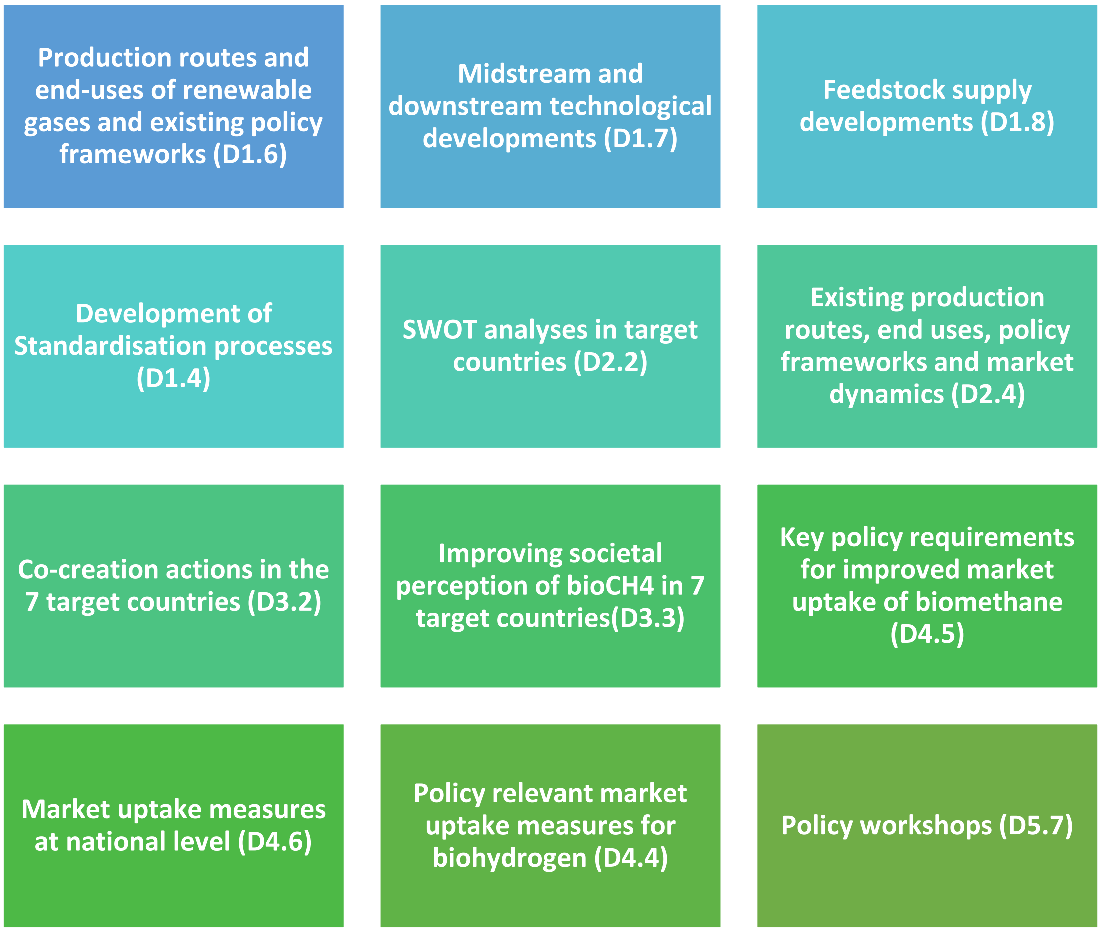

Figure 1: Exploited results of GreenMeUp project for synthesizing the market uptake measures at EU level.

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Chapter 3: Proposed market uptake measures at EU level

The implementation of the developed methodological approach led to the compilation of a comprehensive list of market uptake measures at EU level, which can facilitate the further deployment of biomethane.

It should be noted that the obtained conclusions from the overview of production routes, end-uses of renewable gases and existing policy frameworks in advanced European and Mission Innovation countries and the analysis of the key policy requirements for improved market uptake of biomethane, which were conducted within the framework of GreenMeUp project, were taken into consideration for selecting the proposed market uptake measures. The proposed policy recommendations are presented analytically in Annexes I and II respectively.

The proposed market uptake measures at EU level are described in the following sections.

3.1 Setting long-term binding targets for the production and consumption of biomethane

The specification of long-term binding targets and the political stability are crucial preconditions for the further penetration of biomethane until 2050 according to the obtained findings from GreenMeUp project. It is imperative to strengthen the current policy framework so as to ensure the further deployment of biomethane. Moreover, the specification of the binding targets should be incorporated into the National Energy and Climate Plans.

In any case, the specification of the imposed targets should be based both on the expected impacts and the quantified economic potential for the production of biomethane. The comparative analysis of the different target countries within the framework of GreenMeUp project revealed that the even if common goal conditions exist, it is essential to take into consideration the different conditions.

It is noted that the study for the quantification of the technical and economic potential for the production of biomethane should be performed using actual data with common and clear approach. In the case that the availability of the required data is not satisfactory, the appropriate data collection procedures should be established. Therefore, it is important to revise the assessed economic potential on a regular basis.

Finally, the linkage of the circular economy with the consumption and production of biomethane is imperative for achieving the defined binding targets.

Therefore, it is recommended to:

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• **Quantity the economic potential for the production of biomethane at national level**
• **Reinforce the existing policy framework through the specification of ambitious binding targets in regards the production and consumption of biomethane in the various MS until 2050**
• **Examine the adoption of stricter CO_2 emission and RES targets at national level in specific end-use sectors (e.g., buildings, transport, industry, agriculture)**
• **Set sectoral targets of waste disposal reduction and methane emission reduction at national level**
• **Ensure the continuous political support for the promotion of biomethane and avoid the adoption of a fragmented and conflicting legislative framework**
• **Include targets also for the production and consumption of BioLNG, BioCNG and biohydrogen along with the biomethane after 2030**
• **Differentiate the imposed targets considering both the different characteristics of the MS and the economic potential for the production of biomethane**
• **Ensure that the imposed targets are realistic and feasible**

3.2 Mandating the preparation of action plans for the development of the national biomethane sector

The preparation of a formal governmental strategy, plan or roadmap for biogas and biomethane at national level constitutes the fundamental pillar for the further development of the biomethane sector. It is imperative that the governments set out a long-term vision for the biomethane sector's development, to identify the benefits of biomethane production, to outline the required pathways for leveraging and maximizing the foreseen benefits and to integrate the required policies and measures into the other policy areas.

It is recommended to be in the form of dedicated Action Plan, while the consensus among the various political forces is essential in order to ensure continuity through successive governments and facilitate the social acceptance among institutions and citizens.

The political stability and commitment are considered as meaningful preconditions at national level for the massive deployment of biomethane. Therefore, the development of the Action Plans should ideally be the outcome of a co-creation approach, while the conduction of a consultation structured procedure with the active participation of all the different types of stakeholders is vital for the effective implementation of the plans.

The developed Action Plans should include clear political or legal targets on biomethane production and final consumption contributing to the attainment of the specified vision. It should be noted that the defined production and consumption targets should be officially

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binding targets anchored into the national legislation in order to become a strong driver for the development of the sector. Moreover, the specified targets should be underpinned by a government-mandated assessment of biogas and biomethane production potential.

The developed Action Plans should include the policies and measures, which are required to fulfil the specified targets and objectives. A detailed analysis of the expected impacts, the milestones, the timeline, and the funding sources should be incorporated so as to increase the robustness of the plans. The selection of the required policies and measures should be derived by the conduction of the cost-benefit analysis considering the different positive and negative cross sectoral externalities and ensuring that the maximization of the social welfare will be achieved.

Moreover, the drafted Actions Plans should be linked with the available EU funds and promote the regional and cross-border cooperation with a structured approach.

Finally, the provision of technical support is imperative for the actual preparation of the Action Plans. Priority should be given to the policies and measures, which must be incorporated into them. The applied co-creation approach, which was performed within the framework of GreenMeUp project, led to the conclusion that a versatile mixture of policies and measures is needed as presented in Tables 2 and 3 in Annex III in regards the tailor-made policies and measures, which should be implemented in the target countries for the promotion of biomethane and biohydrogen respectively. Furthermore, specific advice and guidelines should be provided for the design, implementation, monitoring, and assessment of the most important policies and measures.

It should be noted that the continuous monitoring and revision of the drafted Action Plans is critical so as to ensure their effective implementation.

Therefore, it is recommended to:

• **Request the mandatory preparation and adoption of an Action Plans for the further penetration of biomethane at national level**
• **Set minimum content requirements, specific timelines, and update cycles for the developed Action Plans**
• **Ensure the conduction of co-creation and consultation activities**
• **Monitor the implementation of the Action Plans and establish a compliance mechanism for ensuring their effective implementation**
• **Provide technical assistance for the preparation, implementation, monitoring, and evaluation of the Action Plans**
• **Develop a policy toolkit with a pool of potential policies and measures for the promotion of biomethane including guidelines for their design, implementation, monitoring, and assessment**

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3.3 Streamlining the framework for the conduction of targeted co-creation activities

The active involvement of all the different types of stakeholders is crucial both for the effective preparation of the action plans and the efficient design and implementation of the required policies and measures.

It is important to involve with the clear and transparent all the different categories of stakeholders representing with a balance option the fields of policy, market and society.

The application of the co-creation activities within the framework of GreenMeUp project was successful leading to the identification of the most significant policies and measures in the target countries. Moreover, the conducted analysis revealed considerable similarities and differences based on the different characteristics of the biomethane sector in each examined country separately.

The recommended methodological approach, which can be applied the determination of the targets and the identification of the required policies and measures, is presented in Figure 2.

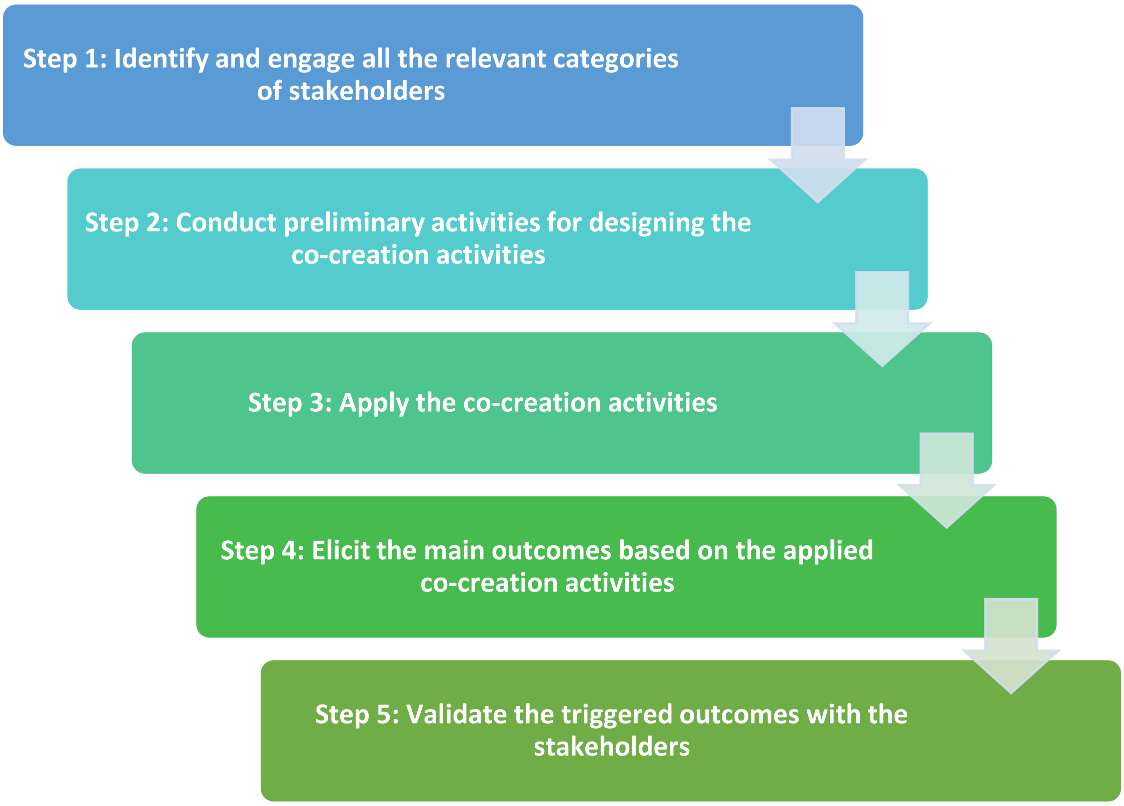

Figure 2: Applied methodological approach for the co-creation activities within the framework of GreenMeUp project.

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It should be noted that the conduction of the SWOT-TOWS and PESTEL analyses was successful within the framework of GreenMeUp project leading to concrete policy recommendations for the further penetration of biomethane, as can be concluded in Annex IV.

A similar conclusion was drawn also for the case of Fuzzy Cognitive Mapping method, which was used for the application of the required co-creation activities. The Fuzzy Cognitive Mapping method facilitated the identification of the most crucial parameters, which are linked to the effective penetration and utilization of biomethane and biohydrogen in the examined countries. Moreover, the main risks and challenges were taken into consideration during the identification of the main parameters, while the elicited policies and measures, which are presented in Annex III, can effectively address the current barriers and challenges and contribute effectively to the attainment of the main defined targets.

It is worth mentioning that additional methods can be used in order to apply the co-creation activities, such as indicatively the focus groups and the living labs.

In any case, the provision of technical assistance for the preparation of guidelines/templates and the development of IT tools for the effective conduction of these methods is essential for increasing both the participation of the targeted stakeholders and the effectiveness of the conducted activities.

Therefore, it is recommended to:

• **Institutionalize the conduction of the co-creation activities during the design, implementation, monitoring, and evaluation of the European and national policies for the promotion of biomethane**
• **Formalize stakeholder engagement mechanisms and structures**
• **Develop a common and coherent EU-based methodology for the conduction of the co-creation activities, such as the applied one within the framework of GreenMeUp project (Figure 2)**
• **Conduct training activities for the application of the co-creation activities and enable the knowledge exchange and the presentation of best practices**
• **Provide technical assistance for the conduction of the co-creation activities (e.g., common guidelines, templates, IT tools etc.)**
• **Ensure transparency and accountability of the applied co-creation activities**
• **Prioritize the co-created policies and measures for funding in order to signal the importance on the application of the co-creation activities**

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3.4 Providing investment and operational support

The provision of economic incentives to produce biomethane was considered as a prerequisite for all the target countries within the framework of GreenMeUp project according to the identified market uptake measures at national level (Annex III).

The economic measures consist of different types as described more detailed in Annex I.

Firstly, the direct support is granted directly to biomethane producers, most often related only to the energy production of the plant. Direct investment support means covering capital expenses such as the building of the production facilities or the grid connection. Direct production support is a pro rata payment per amount of biomethane produced and/or per amount of electricity from on-site biomethane combustion. Direct production support provides certainty to project developers and investors about the profitability and the return on investment. It is considered also as a prerequisite to reach a critical mass of a national industrial players able to achieve economy of scale in plant building and equipment manufacturing. Overtime, economy of scale on both the manufacturing and biomethane production side deliver cost reduction.

Feed-in tariff and Feed-in Premium are the most effective means to launch a market in the first years, if the levels of support are carefully designed considering the investment capacity of potential project developers, plant size and feedstock types. The target capacity of the support scheme should be clearly communicated to the industry, with a time horizon of at least 5 years.

Moreover, indirect support to production refers to incentives, on one hand, to provide feedstock to biomethane producers, and, on the other hand, to produce further products on top of biomethane (on-site flexible electricity generation, digestate (as organiser fertilizer) and biogenic CO2 (as an industrial gas)).

Indirect support located upstream comprise regulatory incentives for feedstock providers to direct their organic waste/residues towards anaerobic digestion and financial incentives to do so.

The inclusion of indirect support mechanisms indicates that policymakers recognize the benefits of anaerobic digestion beyond energy production. Anaerobic digestion is supported because of the benefits it provides for upstream feedstock-providers such as livestock farming (e.g., better nutrient recycling through digestate production), municipal waste (e.g., local circular energy production for municipalities), food and beverage industries (e.g., reduced GHG footprint).

Therefore, it is recommended to:

- **Simplify the current framework of State Aid so as to facilitate the provision of investment and operational aid without distorting the competition**
- **Ensure the coherence in the current framework of State Aid so that biomethane projects are eligible under multiple policy areas**

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• Launch targeted indirect support measures for both ensuring the collection of the required feedstock and promoting further products on top of biomethane (digestate as organiser fertilizer and biogenic CO_2)
• Foster the provision of investment support to agricultural and waste management investments that can increase the production both of biomethane and other by-products
• Design alternative financing instruments to facilitate the access to finance such as the provision of low-interest loans and the utilization of blended finance measures
• Support renewable energy communities and citizen energy communities to accomplish investments for the production of biomethane and the collection of the required feedstock
• Reinforce the role of Guarantees of Origin (GOs) to complement the current revenues for the producers of biomethane
• Simplify the permitting process and reduce the bureaucracy during the construction and operation of the biomethane plants
• Develop a policy toolkit with a pool of potential economic measures for supporting the production of biomethane including guidelines for their design, implementation, monitoring, and assessment

3.5 Providing demand-side incentives

The conducted analysis within the framework of GreenMeUp led to the conclusion that specific policies and instruments should be implemented to stimulate the increased consumption of biomethane across sectors such as transport, heating, and industry.

Generally, the demand-side support of biomethane can be achieved by improving the competitiveness of biomethane through tax incentives and framing biomethane into an obligation.

Demand-side incentives generally raise awareness for the actual product and improve consumers' perception of it. For instance, tax incentives create immediate financial interest compared to use of conventional fuels, while a quick growth of biomethane consumption can be triggered and a market in specific end-use segments can be created.

Demand-side incentives can also encourage biomethane production by creating certainty of the future demand, thus the profitability of new plants.

Therefore, it is recommended to:

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• **Mandate the specification of binding targets for the consumption of biomethane in transport, heating, and industry**
• **Set minimum biomethane supply obligations for gas suppliers**
• **Streamline and simplify the taxation framework at EU level so as to support the further penetration of biomethane**
• **Foster and incentivize the adoption of tax exemptions and depreciation incentives for the consumed biomethane in specific end-uses at national level**
• **Internalize the environmental benefits into the fuel prices so as to improve the competitiveness of the biomethane compared to the fossil fuels**
• **Mandate public procurement procedures prioritizing biomethane technologies in public transport, municipal services, and building heating**
• **Promote "biomethane-as-a-service" models for decentralized producers**
• **Support renewable energy communities and citizen energy communities to accomplish investments for the consumption of biomethane**
• **Foster aggregator platforms that bundle small-scale biomethane producers into larger market actors and promote biomethane purchase agreements**
• **Promote the use of biomethane Guarantees of Origin within the framework for the corporate sustainability accounting**
• **Develop a policy toolkit with a pool of potential demand-side measures for supporting the consumption of biomethane including guidelines for their design, implementation, monitoring, and assessment**

3.6 Facilitating market access to biomethane producers

Market access for biomethane refers to both access to existing gas networks and market recognition of its renewable origin and its compliance with sustainability requirements. Biomethane as a gaseous fuel is most often injected into existing gas networks. Making this access possible, simple, and affordable for project developers is therefore integral to a profitable business case of biomethane projects, thus to the development of a biomethane market.

Provided that the product of biogas upgrading, i.e. biomethane, meets the quality criteria for injection into the local natural gas network, thus ruling out any potential compatibility issue with the existing infrastructure, biomethane is in the unique position of being able to leverage the extensive NG grid to foster the deployment of production plants and attain the ambitious biomethane production capacity target set forth by RePowerEU.

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However, the large-scale introduction of biomethane into the European natural gas grid poses several challenges. One major challenge is the need for infrastructure modifications to accommodate biomethane injection points and ensure compatibility with existing pipelines.

Additionally, ensuring the quality and consistency of biomethane produced from different sources is crucial for seamless integration into the grid, and the burden of meeting such quality criteria is on the shoulders of each single biomethane producer, since each plant constitutes an injection point into the grid. Balancing biomethane supply and demand, as well as addressing potential regulatory and legal barriers, are also important considerations for the successful integration of biomethane into the natural gas grid.

The installation of reverse flow stations (a.k.a. rebours or grid reverse flow) and the process of interconnecting terminations of independent network sections are characterized by utmost importance, from a network standpoint, to let the grid accommodate the largest number of biomethane installations possible.

Therefore, it is recommended to:

• **Set mandatory biomethane blending quotas**
• **Mandate guaranteed access for biomethane producers to natural gas networks under fair, transparent, and non-discriminatory conditions**
• **Repurpose and upgrade the existing natural gas networks though the available EU funds**
• **Foster the installation of reverse flow stations and interconnecting terminations of independent network sections**
• **Simplify and harmonize grid connection procedures across the MS**
• **Launch financial instruments to support the connection infrastructure**
• **Develop uniform, clear, and achievable EU-wide gas quality specifications and standards**
• **Strengthen and harmonize biomethane Guarantees of Origin systems across the MS**
• **Enable cross-border trade of the certified biomethane**
• **Support cross-border Projects of Common Interest**
• **Design a cost-sharing mechanism for the grid connection of new biomethane plants, especially for small to medium-sized project developers who cannot afford the full investment cost**

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3.7 Exploiting all feedstock supply developments with the various midstream and downstream technologies

An extensive analysis was conducted within the framework of GreenMeUp project in order to identify both the available feedstock supply development and the main midstream and downstream technological developments, which are technologically mature and may assist in the achieving the specified targets for the production and consumption of biomethane.

Anaerobic digestion of organic residues can provide renewable energy in the form of biomethane, contributing to the reduction of conventional natural gas demand within EU. The analysis shown that if all the available feedstock consisting of livestock manure, food waste and whey, is utilised, then 23.14 bcm of biomethane can be produced. This quantity approaches the target that is set by EU and foresees delivering 35 bcm of biomethane in the natural gas network by 2030. On the other hand, if we consider that it is not feasible to valorise all this feedstock, it is obvious that other types of feedstocks should be considered in order to achieve this target value.

Considerable contributions may be given by the available quantities of cereal straw that is not used for animal feeding. Straw demonstrates some technical challenges when it has to be used as feedstock for anaerobic digestion. This is the reason that its utilisation is not that widespread till now. Those challenges, though, can be tackled successfully and its utilisation becomes more popular. According to the analysis performed in this report, there are enough quantities of straw in EU for complementing the rest anaerobic digestion feedstock sources in order to achieve the biomethane target for 2030.

The sewage sludge derived primarily form municipal wastewater treatment plants can be considered as an additional type of feedstock. This sludge has considerable biogas generation potential and there no other competitive uses that compete the valorisation as anaerobic digestion feedstock.

Competitive uses in general are something that has to be considered when we are talking about waste valorization. This is the case also with the whey which is used as ingredient in the production of food supplements and animal feed. Policy measures may help to make the use of whey or similar wastes as anaerobic digestion feedstock more feasible offering an alternative for the other markets.

High potential of woody biomass also exists which are not considered as feedstock for anaerobic digestion plants since cannot be decomposed by the microorganisms. This type of biomass can produce biomethane following other technology pathways like gasification and methanation.

Apart from the residual streams, new feedstocks can be grown under sustainable cultivating practices, such as sequential cropping and growing dedicated crops on marginal and phyto-remediated lands. Another alternative feedstock that could be used for additional biomethane production is the solid fraction of the digestate, a by-product of the anaerobic digestion.

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Sequential cropping is a technique used to cultivate two or more crops in the same field over a defined period, in specific sequences with the goal of maximizing the use of land resources and increasing crop productivity. When it comes to biomethane production, sequential cropping involved the cultivation of a food, being the primary crop and an energy crop, being the supplementary one.

Cultivating biomass on marginal lands may very well address the food vs fuel competition, preserve the soils from erosion and offer the opportunity to increase carbon stock, while producing additional biomass. However, competing claims and debates over the definition of such lands for biomass production still exist. Locating and quantifying their untapped biomass potential, together with the key issues to address from legislation, remain a challenge. Moreover, biomass supply potential, biogas productivity and economics remain still studied only at demo-scale.

According to the produced data by Task Force 3 of the Biomethane Industrial Partnership, the EU27 is estimated to have the potential to produce 44 bcm of biomethane annually from sequential and rotational cropping systems. This aligns closely with projections from Gas for Climate, which estimate 41.8 bcm/year by 2030 - of which 21% (8.8 bcm/year) would originate from sequential cropping. By 2050, the contribution from sequential crops alone is projected to rise substantially to 46 bcm/year, accounting for 47% of the EU's total biomethane potential.

Finally, digestate which a by-product of the anaerobic digestion process, can be used as feedstock for the production of biomethane. Digestate can undergo through a gasification process and then converted to Syngas. Then through various pathways biomethane can be produced. HYFUELUP project (https://hyfuelup.eu/), is one of the projects that are considering the use of sludge digestate from anaerobic digestion plants, together with low-grade biomass residues in order to deploy a first-of-its-kind value chain for biomethane production, including biomethane offtake and distribution, for contributing to the penetration of biomethane in the transport and energy systems.

Therefore, it is recommended to:

• **Conduct an in-depth assessment of all the available feedstock potential including all the different types of feedstock that can be exploited at national level and identify measures to achieve it**
• **Enable the waste valorization either through the provision of economic support or the adoption of regulatory measures**
• **Prioritize the promotion of the most technologically mature midstream and downstream technological solutions initially based on the quantification of the available feedstock potential**
• **Foster the cultivation of new types of feedstocks and the promotion of new cultivation techniques (e.g., sequential cropping and growing dedicated crops on marginal and phyto-remediated lands) so as to increase the available feedstock potential**

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• Support the development of innovative midstream and downstream technological solutions
• Provide economic support for establishing the required supply chains including the pre-treatment equipment and ensuring the sustainable supply of feedstocks on a long-term basis
• Design innovative business models focused on the collection of the required feedstock in order to create long-term entrepreneurial certainty
• Develop harmonized standards covering the different types of feedstock including the respective certification schemes
• Encourage the cross-border trade of all the available feedstock with the use of integrated IT tools and databases
• Strengthen Public-Private Partnerships both for the commercialization of innovative midstream and downstream technological solutions and the exploitation of the additional feedstocks
• Connect all the stakeholders, who are involved in the development of midstream and downstream technological solutions through EU-initiated structures such as EU-supported innovation clusters or alliances
• Organize targeted capacity building activities for farmers and waste operators to improve the current level of knowledge and skills about the effective exploitation of the available feedstock potential

3.8 Improving tradability, traceability, and standardization of biomethane

Biomethane tradability is considered as key precondition to scale-up its deployment efficiently across the MS with differing production potentials and demand.

According to GreenMeUp, tradability of biomethane as a renewable fuel depends on the creation of a system guaranteeing the renewable origin of energy quantity produced by plant operators. In the past years, it could have taken the form of a government-mandated issuing body and registry of Guarantees of Origin pursuant to the Renewable Energy Directive 2018/2001. Alternatively, an industry-initiated green certificate registry, where the certificates will be recognized by the market, including energy suppliers, as proof of renewable origin.

To improve the tradability of biomethane at the EU level, it is vital to remove market barriers, harmonize certification systems, enhance infrastructure, and establish mechanisms that support cross-border trade and market liquidity.

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The traceability of biomethane at the EU level is linked also with the tradability of biomethane. To this direction is essential to develop robust, harmonized systems that can track the origin, sustainability, quality, and destination of biomethane across its lifecycle. Effective traceability is essential for ensuring transparency, avoiding double counting, and building trust in biomethane as a credible renewable energy source.

Finally, the potential standardization was explored also within the framework of GreenMeUp project. More specifically, four different standards were examined as presented in Table 1.

Table 1: Overview of the examined standards within the framework of GreenMeUp project.

CEN Working Group/Technical Committee	Name of relevant Standard	Description
SECT/SF GAS I/JWG GQS	Gas quality standard – EN 16726	This standard specifies gas quality characteristics, parameters and their limits, for gases classified as group H that are to be transmitted, injected into and from storage, distributed and utilized.
CEN/TC 408	Biomethane and other renewable and low-carbon methane rich gases – EN 16723 and EN 16723-2	Standardization of specifications for biomethane as fuel for engines and of biomethane for injection in the natural gas grid, including any necessary related methods of analysis and testing.
CEN/CLC/JTC14/WG5	Guarantees of origin related to energy - EN 16325	Standardization in the field of energy management within the energy transition framework in close coordination with CEN/CENELEC sectorial strategy
CEN/TC 223	Soil improvers and growing media - CEN/TS 17732:2022	Standardization of two types of material used in agriculture. Compost and digestate properties when used in fertilizing products

The standardization of biomethane at the EU level is critical to be improved so as to ensure quality, safety, interoperability, trade, and trust across the MS.

Therefore, it is recommended to:

- **Establish a fully harmonized and coherent EU-wide Guarantees of Origin to enable interoperability and cross-border tradability**
- **Enable cross-border Guarantees of Origin recognition and registry Interoperability**
- **Support the development of the infrastructure for trading and delivering the Guarantees of Origin**
- **Establish a fully harmonized and coherent EU-wide Traceability Framework with the use of digitalized tracking approaches based on Blockchain or advanced IT systems**

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• **Ensure market transparency with the creation of a central EU Biomethane Registry Portal, which will facilitate public access**
• **Develop harmonized standards covering all the operational stages for the production of biomethane**
• **Request the use of a harmonized certification scheme across all the MS**
• **Establish a technical Task Force involving EU and the MS so as to discuss and propose targeted measures and interventions to facilitate tradability, traceability, and standardization of biomethane**
• **Conduct capacity building activities and provide technical assistance to all involved stakeholders for all aspects related to tradability, traceability, and standardization**
• **Develop both a holistic regulatory framework for safety and risk management with the adoption of strict protocols and a legal framework for sanitary and environmental control covering the input materials and the storage and application of digestate**

3.9 Establishing a multi-level governance mechanism

The analysis of the key policy requirements for improved market uptake of biomethane, which was performed within the framework of GreenMeUp project led to the recommendation that the establishment of a coordinated policy-making framework across agriculture, waste management, energy and transport is essential in order to foster the further penetration of biomethane.

Moreover, it is crucial to understand the meaningful role of biomethane within the energy, agricultural and waste management systems confirming that the establishment of a multi-level governance mechanism is considered as a priority.

Therefore, it is recommended to:

• **Establish an EU Biomethane Task Force involving the various departments of the EU (e.g., DG ENER, DG AGRI, DG CLIMA, DG MOVE, DG ENV, and DG GROW) and the MS to coordinate policy actions and design the legislative framework**
• **Mandate the establishment of EU Biomethane Task Force at national level to undertake the cross-ministerial coordination, to engage the national authority and to report the progress and the potential barriers to EU**
• **Support the operation of the established EU Biomethane Task Force with the provision of technical and legal support**

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3.10 Ensuring the cross-sectoral policy integration of biomethane

The cross-sectoral policy integration of biomethane into the existing legislative and policy framework is pivotal for the further penetration of biomethane and the achievement of the energy and climate targets. The further penetration of biomethane necessitates the design and implementation of integrated and cross-sectoral policies, which will manage to coordinate the promoted activities across different sectors. Simultaneously, these integrated and cross-sectoral policies should operate coherently and efficiently across beginning firstly from EU level.

Figure 3 displays the relationship between biomethane and the different sectors, which can be influenced by its production and consumption.

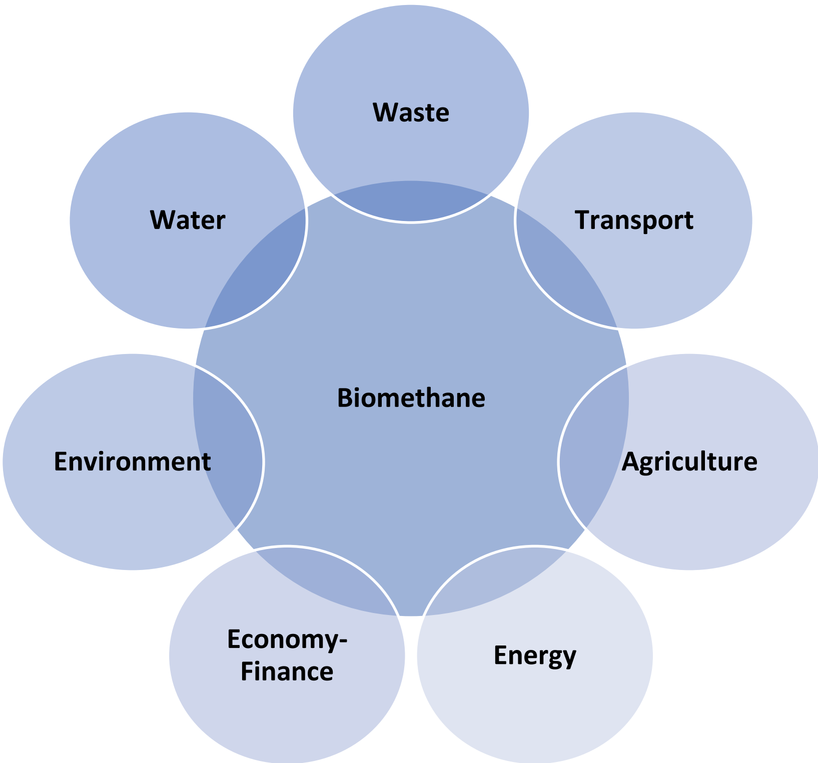

Figure 3: Relationship between biomethane and the different sectors.

Obviously, the planned policies and measures for the further development of biomethane can be implemented in more than one sector triggering different implications, which must be quantified and assessed.

Strong interdependencies and cross-sectoral linkages reveal opportunities for synergies and the necessity to address the trade-offs. The various interactions, as demonstrated by the triggered co-benefits and the adverse side effects in individual sectors, which are associated with the planned policies and measures for the further promotion of biomethane, should be quantified and taken into consideration during the decision-making process.

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Therefore, it is obvious that coordinated cross-sectoral policies and measures should be initiated mainstreaming the created interactions. It should be noted that the policy recommendations for the effective cross-sectoral policy integration of biomethane into the existing legislative and policy framework, which have been proposed within the framework of GreenMeUp project, are presented analytically in Annex V.

Therefore, it is recommended to:

• **Embed biomethane in the key EU policy frameworks of the affected sectors (e.g., energy, agriculture, transport, waste, water and finance)**
• **Develop a holistic framework for the quantification of the cross-sectoral impacts (both triggered co-benefits and the adverse side effects) including all the identified negative and positive externalities**
• **Ensure the acquisition of the environmental data for the utilized biomethane technologies in order to facilitate the quantification of the cross-sectoral impacts**
• **Adopt a coherent biomethane strategy until 2050 at EU level focusing on the maximization of the quantified cross-sectoral impacts.**
• **Prepare a targeted biomethane action plan at EU level until 2030, which will facilitate the achievement of the specified cross-sectoral targets within the context of the adopted biomethane strategy.**
• **Prioritize the promotion of the circular economy facilitating the integration of the different affected sectors and integrate mandatory circular economy targets with the current policy framework.**
• **Highlight the crucial role of biomethane as a methane mitigation measure within the framework of the EU Methane Strategy.**
• **Encourage blended finance approaches combining the various EU funds that support investments and infrastructure in the affected sectors (e.g., CAP, Cohesion Funds, InvestEU etc.)**
• **Promote cross-sectoral Public-Private Partnerships**

3.11 Reducing the fugitive methane emissions

Monitoring of fugitive methane emission is of paramount importance along the biomethane value chain setting as a priority the curtailment of biomethane fugitive emissions.

Fugitive emissions of methane are ubiquitous, occurring in most of processes and contexts where anaerobic digestion of organic matter takes place, from wastewater treatment plants to solid waste landfills. Fugitive emission of methane occurs for a number of reasons and in distinct sections of the biogas/biomethane plant. Typical sources of leaks include handling

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compartments, gas engine exhaust, flares, leaking pipes and connectors, vent and compressors of upgrading units, tanks, pressure release valve. Sections of plants where leaks happen are feedstock intake and pre-processing, digestion process, gas utilization, digestate storage and post-treatment.

EBA provided a summary of the measures that can be implemented at the operator level to reduce and mitigate biomethane fugitive emissions that include:

- Installing gas-tight covers on receiving tanks and on mixing/incorporation tanks.
- Implementing appropriate T and pH control.
- Monitoring and regulating the filling level of the gasholder, aiming at flaring before pressure release valves set off.
- Use of an enclosed flare or gas burner.
- In upgrading, limit methane slip into off-gas by adopting regenerative thermal oxidizers or SlipRec Units (Airco Process Control).
- Ensure sufficient hydraulic residence time to attain the most complete breakdown of digestible organic matter.
- Adopt gas-tight, covered digestate storage tank, connected to the gas system.
- Implement leaks detection and repair campaigns regularly and frequently.
- Conduct regular service.

Therefore, it is recommended to:

• **Introduce EU binding limits and standards for methane emissions for the biomethane plants into the relevant EU legislation**
• **Foresee EU-wide minimum requirements for the Leak Detection And Repair frequency and response time obligations to repair detected leaks**
• **Develop standardized Monitoring, Reporting & Verification approach with regular inspections**
• **Identify the Best Available Techniques (BAT) for reducing the leaks**
• **Launch financial instruments to support investments to reduce and mitigate biomethane fugitive emissions**
• **Conduct capacity-building initiatives with successful case studies and supporting activities such as the development of targeted IT platforms/repositories and dissemination and educational material that will be updated on regular basis based on the technological progress**
• **Support research and innovation activities for the development cost effective solutions to reduce and mitigate biomethane fugitive emissions**

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3.12 Enhancing the existing level of awareness and skills

The work conducted within the framework of GreenMeUp project revealed that the current level of knowledge about biomethane is limited requiring the initiation of targeted awareness-raising activities.

The examination of the social perspectives led to the conclusion that the citizens are willing to support the rather penetration of biomethane irrespective the current lack of knowledge.

The indications about the existence of NIMBY phenomenon about the production and utilization of biomethane should be considered immediately signaling the design of dissemination activities about the benefits triggered by the biomethane.

Priority should be given to the enhancement of the existing level of knowledge and the skills of the technical staff with the provision of dedicated technical training.

Therefore, it is recommended to:

• **Launch EU-wide public awareness campaigns presenting successful case studies of local biomethane projects and focusing on the triggered benefits**
• **Enable the knowledge sharing with the development of targeted IT platforms/repositories and dissemination and educational material that will be updated on regular basis based on the technological progress**
• **Develop holistic and coherent educational and training programs and explore the possibility of being included in curricula at vocational schools, technical institutes, and universities**
• **Prepare training programs and set up a certification programs for biomethane professionals**
• **Adapt the existing Green Skills Initiatives so as to include also the issues related to the biomethane or initiate a new one targeted to biomethane**
• **Create trust for the planned biomethane investments through the transparent and argumental approach to handle the potential odour and flying insects' complaints and the effective dissemination of the triggered positive impacts**
• **Connect the involved stakeholders across the MS with the organization of EU wide conferences, webinars, and forums**

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Annex I: Conclusions from the overview of production routes, end-uses of renewable gases and existing policy frameworks in advanced European and Mission Innovation countries

Vision and Targets

A vision is a useful framework for planning public policy measures and for the industry players to plan their investment. It provides the following benefits:

- Long-term policy perspectives on the value chain.
- Understanding of biomethane role within the energy, agricultural and waste management systems (what role should have biomethane production and uses, what are their most valued benefits or externalities).

For these reasons, a national vision is often asked for by the industry. It can be laid out or sketched through different, combined, means:

- A formal governmental strategy, plan or roadmap for biogas and biomethane. It can take the form of a stand-alone document or of a section within a more general official document (such as a renewable energy strategy, the National Energy and Climate Plan (NECP), or a landmark official speech of a Minister).
- Target setting: official targets on production or consumption; they can be indicative or binding; political or legal; short-term or long-term targets. Official binding consumption targets anchored into national legislation are seen as strong drivers for the development of the sector. Alternatively, indications of the government-attributed role for biomethane can be found in energy production or consumption forecasts. These may be found in national plans, such as the NECP.
- Targets may be undermined by a government-mandated assessment of biogas and biomethane production potential. Alternatively, a government can create a dialogue with the biogas industry that can lead to a recognition or an endorsement of an existing industry-led assessment.

Direct investment and production support

Direct support is granted directly to biomethane producers, most often related only to the energy production of the plant. Direct investment support means covering capital expenses such asthe building of the production facilities or the grid connection. Direct production support is a pro rata payment per amount of biomethane produced and/or per amount of electricity from on-site biomethane combustion.

Three types can be identified:

- Feed-In Tariffs (FiT): payment of a fixed price is guaranteed for each output unit and for a defined period.
- Feed-In Premiums (FiP): payment of a variable top up equal to the difference between the market value of the output and a predefined price.

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- Contracts for Difference: top up payment in the same way as a variable Feed-In Premiums but with the obligation for the beneficiary to make a payback if market prices go above the predefined price level.

Feed-In Tariffs can be granted through two different systems:

- Open access to all plants, with different levels of tariffs depending on the plant capacity. Compliance with sustainability rules is a precondition.
- A tender system through auctions: The state pre-defines volumes of subsidy by auction. During an auction, different levels of Feed-In Tariffs are offered to plants project with the lowest projected cost of production. Different tenders can be made by the state for different ranges of plant capacity.

Direct production support provides certainty to project developers and investors about the profitability and the return on investment. It is considered also as a prerequisite to reach a critical mass of a national industrial players able to achieve economy of scale in plant building and equipment manufacturing. Overtime, economy of scale on both the manufacturing and biomethane production side deliver cost reduction.

Indirect production support

Indirect support to production refers to incentives, on one hand, to provide feedstock to biomethane producers, and, on the other hand, to produce further products on top of biomethane (on-site flexible electricity generation, digestate (as organiser fertilizer) and biogenic CO2 (as an industrial gas)).

Indirect support located upstream can be of two types:

- Regulatory incentives for feedstock providers to direct their organic waste/residues towards anaerobic digestion, e.g., sectoral target of waste disposal reduction or methane emission reduction, end of landfilling with no energy utilization of organic waste.
- Financial incentives to do so, e.g., payment for farmers to deliver manure to biogas and biomethane producers.

The inclusion of indirect support mechanisms indicates that policymakers recognise the benefits of anaerobic digestion beyond energy production. Anaerobic digestion is supported because of the benefits it provides for upstream feedstock-providers such as livestock farming (e.g., better nutrient recycling through digestate production), municipal waste (e.g., local circular energy production for municipalities), food and beverage industries (e.g., reduced GHG footprint).

Indirect support mechanisms are therefore a way to reward economically the positive externalities of biomethane production. They also increase the overall competitiveness of biomethane production.

Demand-side incentives

This set of measures stimulates the consumption of biomethane (hence the term “consumption support”) in two ways:

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- Increasing the competitiveness of biomethane through tax incentives.
- Framing biomethane into an obligation.

Tax incentives can be tax reduction (on excise duty or VAT) compared to standard taxation of fossil fuels or natural gas; or tax exemption (on excise duty or carbon taxes). Toll reduction or exemption for gas-driven vehicles also belongs to this category.

When framed into an obligation, biomethane is valued as one of the options to comply with:

- An obligation of a renewable energy share (usually motor fuel suppliers are the obligated party).
- An obligation of an advanced biofuel shares by motor fuel suppliers.
- An obligation to reduce its GHG emissions, possibly as part of an emission trading system.
- Public procurement rules on the types of equipment or fuels that a public authority can procure.

Demand-side incentives raise awareness for the actual product and improve consumers' perception of it. Tax incentives create immediate financial interest compared to use of conventional fuels; they can therefore trigger a quick growth of biomethane consumption. They are instrumental in creating a market in specific end-use segments.

Demand-side incentives can also encourage biomethane production by creating certainty of the future demand, thus the profitability of new plants.

Regulation enabling market access

Market access for biomethane refers to both access to existing gas networks and market recognition of its renewable origin and its compliance with sustainability requirements. Biomethane as a gaseous fuel is most often injected in existing gas networks. Making this access possible, simple and affordable for project developers is therefore integral to a profitable business case of biomethane projects, thus to the development of a biomethane market.

Measures enabling injection include:

- A right to inject, including the obligation for grid operators to address requests for grid connection.
- Clear and achievable gas quality specifications for biomethane.
- Cost-sharing of the investment with grid operators.
- Continuity of injection ensured all-year round no matter the initial grid capacity.

Tradability of biomethane as a renewable fuel depends on the creation of a system guaranteeing the renewable origin of energy quantity produced by plant operators. In the past years, it could have taken the form of:

- A government-mandated issuing body and registry of Guarantees of Origin pursuant to the Renewable Energy Directive 2018/2001.

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- Alternatively, an industry-initiated green certificate registry, where the certificates will be recognized by the market, including energy suppliers, as proof of renewable origin.

Conclusions:

Based on the experience and success in the 10 advanced countries, the following conclusions can be drawn:

I. Governments should set out a long-term vision for the biomethane sector's development, identifying the benefits of biomethane production and usages that the State intends to leverage and maximize and how it relates to other policy areas (agriculture, transport, housing). It can be in the form of dedicated "Action Plan" or within their National Energy and Climate Plans. Consensus among political forces is best in order to ensure continuity through successive governments and facilitate social acceptance among institutions and citizens.

II. Clear political or legal targets on production or final consumption contributes to this vision. When a major role is foreseen for renewable hydrogen in the future gas mix, a renewable gas target is not enough and a clear target for biomethane should at least be decided by the government or the legislators.

III. Feed-in tariff and Feed-in Premium are the most effective means to launch a market in the first years, if the levels of support are carefully designed considering the investment capacity of potential project developers, plant size and feedstock types. The target capacity of the support scheme should be clearly communicated to the industry, with a time horizon of at least 5 years.

IV. Feed-in tariff and Feed-in Premium can be highly effective if a right to inject into gas grids as well as the "renewable value" of biomethane are already recognised. The right to inject should be set into law and implemented swiftly by the government. The market recognition of the renewable value is achieved by setting-up a voluntary registry of Certificate of Origin or by a government-mandated registry of Guarantees of Origin pursuant to the Renewable Energy Directive 2018/2001.

V. A cost-sharing mechanism for grid connection can be a major financial support to new biomethane plants, especially for small to medium-sized project developers who cannot afford the full investment cost. Level of costs borne by network operators can be regulated by law, decrees, and decisions of the national regulatory authority.

VI. Integration with agricultural policy is essential to improve profitability of biomethane plants, which also produce digestate and biogenic CO_2. This can be done by removing technical barriers to digestate marketing in the fertilizer market and/or subsidizing the utilisation of manure in biomethane production.

VII. Target of advanced biofuels and biomethane, as well as tax exemption or reduction are effective market signals to spur demand growth in transport. A combination of tax advantage for natural gas and full tax exemption for biomethane can be remarkably effective to create a diesel-to-gas switch in road freight and public fleets, as the quantity of biomethane is progressively increasing and replacing the use of natural gas in this sector.

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Annex II: Analysis of the key policy requirements for improved market uptake of biomethane

The following policy recommendations are proposed from the analysis of the key policy requirements for improved market uptake of biomethane:

Production side:

- Facilitate the effective exploitation of the agricultural residues, which is the most prevalent feedstock type for biomethane production.
- Focus also on the utilization of industrial wastes, organic municipal solid waste and sewage for biomethane.
- Promote the utilization of membrane separation as the most prevalent upgrading technology for biomethane production.
- Support the maturation and commercialization of other innovative upgrading technologies (e.g., pressure swing adsorption, water scrubbing and cryogenic separation).
- Facilitate the injection of the biomethane into the distribution grid.
- Enable both the injection of the biomethane into the transportation grid and the mobilization of off-grid applications.
- Ensure the sustainable supply of feedstocks on a long-term basis.
- Ensure the acquisition of the environmental data for biomethane technologies.
- Handle the potential odour and flying insects' complaints with transparency and arguments.

Policy and demand side:

- Promote biomethane in order to fulfil 2030's energy and climate targets in all countries.
- Continue the massive penetration of biomethane until 2050.
- Foster the penetration BioLNG-BioCNG and bioH_2 until 2030.
- Prioritize the production of BioLNG-BioCNG and bioH_2 along with the biomethane after 2030.
- Communicate with a coordinated approach all the unquestionable benefits triggered by the biomethane production and consumption.
- Focus on the delivered benefits due to the increased waste management and the exploitation of the various by-products.
- Design measures so as to address the main technical barriers (e.g., the infrastructural challenges and the poor collection, improper segregation, lack of vehicles and adequate waste transportation).
- Reinforce the existing level of knowledge and the skills of the technical staff with the provision of dedicated technical training.
- Launch financial instruments to confront the main economic barriers (e.g. the high investment cost, the lack of subsidies and financial support programmes on a long-term basis and the high cost to interconnect small biogas projects to natural gas pipeline).

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- Address the main market barriers (e.g., the high price of biogas/biomethane, the uncertainties and regulatory hurdles related to injection of biogas into the grid and the large amount of waste feedstocks that is currently not being separately collected and diverted for processing).
- Establish a coordinated policy-making framework across agriculture, waste management, energy and transport.
- Ensure the continuous political support for the promotion of biomethane and avoid the adoption of the initiation of a fragmented and conflicting legislative framework.
- Reduce the bureaucracy during the construction and operation of the biomethane plants.
- Co-design the required policies and measures with the organization of public consultation procedures so as to increase the interest of the end-users.
- Enhance the existing level of knowledge and the public awareness.
- Internalize the environmental benefits into the fuel prices so as to improve the competitiveness of the biomethane compared to the fossil fuels.
- Expand the type of use so as to include additionally to the replacement of the natural gas from the grid alternative uses, such as indicatively to use bio-CNG or bio-LNG as transport fuels, to produce heat and/or steam, to exploit the recycled fertilizers and to produce branding agricultural products with a carbon-neutral label.
- Adopt stricter CO_2 emission and RES targets at national level than those are foreseen at European level accompanied by targeted feedstock management, digestate and biogas utilization policies.

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Annex III: Results of the co-designed approach for the market uptake measure in the target countries

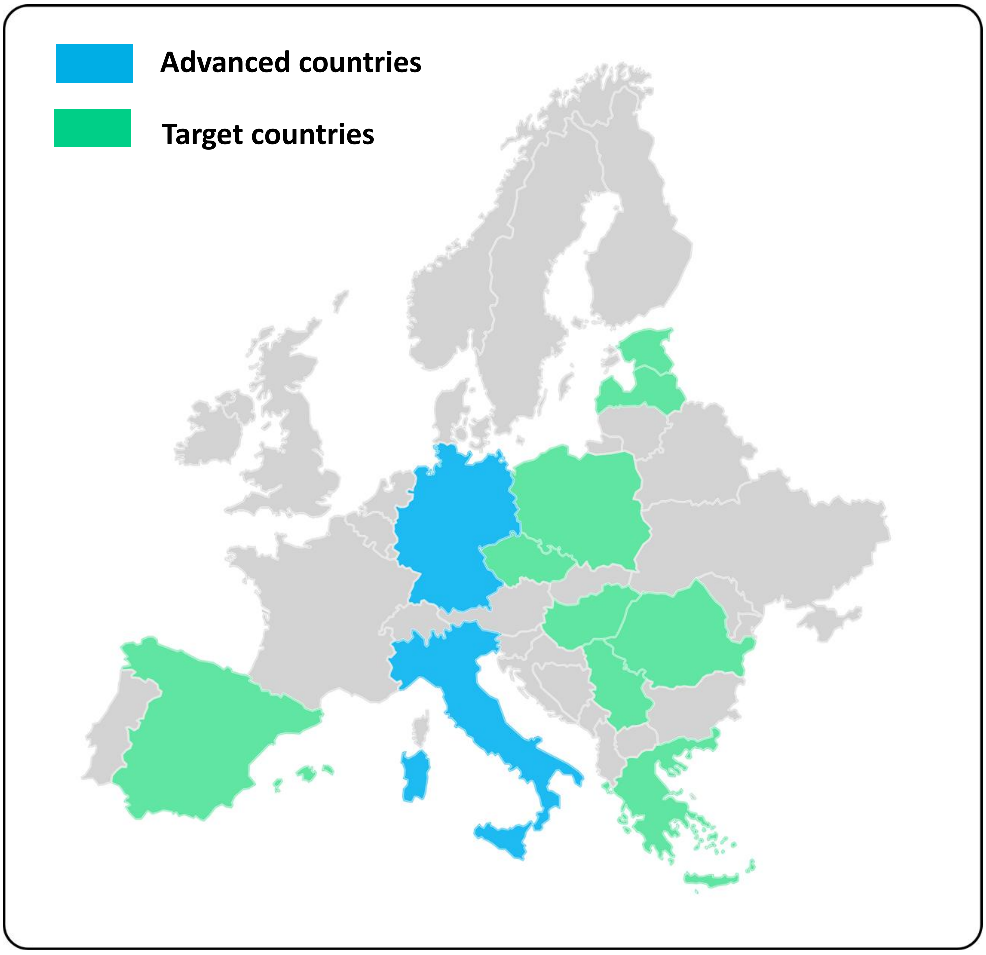

Table 2: Co-designed policy measures for the penetration of biomethane in the target countries within the framework of GreenMeUp project.

Proposed policy measure	Target countries
Introducing financial support measures	Czech Republic, Danube region, Estonia, Greece, Latvia, Poland, Spain
Drafting a roadmap with ambitious targets and adopting/improving the required legislation	Czech Republic, Danube region, Estonia, Greece, Latvia, Poland, Spain
Fostering the consumption side	Danube region, Estonia, Latvia, Poland, Spain
Assessing and exploiting the feedstock potential	Czech Republic, Danube region, Greece, Latvia, Poland
Promoting waste management and by-products	Estonia, Greece, Poland, Spain
Raising awareness with capacity building activities	Danube region, Estonia, Latvia
Promoting a common and holistic framework for cooperation and dialogue	Danube region, Spain

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Proposed policy measure	Target countries
Ensuring political and regulatory stability	Czech Republic, Latvia
Establishing the required supply chains	Danube region, Greece
Developing the required infrastructure	Greece, Latvia
Establishing efficient permitting and spatial procedures	Greece
Reinforcing the implementation of public procurement procedures	Estonia
Decreasing the administrative complexity and bureaucracy	Czech Republic

Table 3: Co-designed policy measures for the penetration of biohydrogen in the target countries within the framework of GreenMeUp project.

Proposed policy measure	Target countries
Introducing targeted financial support measures in order to implement projects for the production of biohydrogen	Czech Republic, Danube region, Estonia, Greece, Poland, Spain
Improving the social acceptance with the conduction of targeted awareness raising activities	Czech Republic, Danube region, Estonia, Greece, Poland
Fostering the consumption of biohydrogen	Czech Republic, Estonia, Greece, Poland
Adopting the legislative framework to address all the regulatory barriers for the production and consumption of biohydrogen	Czech Republic, Estonia, Greece, Spain
Assessing and exploiting the available feedstock potential for the production of biohydrogen	Danube region, Estonia, Greece
Ensuring the technological development and availability	Greece, Poland, Spain
Specifying ambitious targets for the promotion of biohydrogen	Czech Republic, Danube region
Designing pilot projects for the production and consumption of biohydrogen in order to acquire the required balance between supply and demand	Czech Republic, Estonia
Fostering the implementation of public/private partnerships for the production of biohydrogen	Danube region, Spain
Drafting a roadmap for the further production and consumption of H2 (including biohydrogen)	Estonia, Spain
Establishment of the supply chain for the collection of the required feedstocks to produce the biohydrogen	Danube region
Promoting the decentralised biohydrogen production systems	Greece
Exploiting the natural gas distribution network to facilitate the consumption of the biohydrogen	Poland

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Annex IV: Policy recommendations from the conducted PESTEL and SWOT analyses

The conduction of the SWOT analysis led to the following conclusions:

A recurring issue is the lack of clear, supportive, and long-term regulatory frameworks. Each country has highlighted specific legislative needs to encourage biomethane production, distribution and entry in end-use markets. This uncertainty hinders market development, investment and the long-term integration of biomethane in the national energetic system. In connection to the required political support, financial support measures are crucial, to reduce investment risks, and secure the economic viability of biomethane projects. Logistic challenges, such as feedstock supply chain management, high costs of grid connection and lengthy permitting processes are the most prominent. While there are also concerns about the future market price and demand for biomethane, particularly in light of competing technologies such as hydrogen and electric fuels. In addition, there is need to increase awareness about biomethane´s role in the defossilisation of national economies and continue stakeholder´s engagement to increase acceptance and disseminate knowledge about biomethane´s benefits.

Key strategies proposed by target countries partners and policy, market and society stakeholders include:

- Clear and comprehensive regulatory frameworks (Roadmaps and strategies) that provide long-term stability and certainty for biomethane stakeholders and investors. Binding targets are necessary as well as streamlined permitting processes.
- Financial support and incentives, including subsidies, grants and tax incentives. A stable return of investment and reducing the market price fluctuations effects are important for the business case.
- Improvements in infrastructure and technical support, such as grid connections, filling stations and reverse flow units. This is key to reduce logistical and operational obstacles.
- Harmonization of registers within the EU (e.g., Guarantees of Origin) can enhance market stability.
- Exploring and promoting additional value streams, such as bio-CO_2 commercialization, surplus heat utilization, and digestate valorisation, can increase the economic attractiveness of biomethane projects and enhance overall sustainability.

The conduction of the PESTEL analysis led to the following conclusions:

The target countries have indicated the necessity to further discuss the implementation of supportive schemes and sources of financing biomethane projects, the details of operational and investment support, co-financing options and subsidize gas-grid injection points creation.

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The utilization of digestate as integral part of the business model is of great importance, which not only will improve the economic profitability of the biomethane plants but benefit soil quality.

Solutions to regulatory barriers or procedural obstacles are also a key area in which together industry and decision-makers should be working.

Finally, several aspects have been identified towards the business model development, such as fostering partnerships and coordination among various stakeholders, identification of innovative opportunities with industry partners (Market Hubs), new opportunities for liquified bio-CH4, sharing of grid injection costs between network operator and biomethane producer, among others.

It is important to consider the role of the hubs in the operationalization of these proposed solutions. Also, the hubs can promote the establishment of connection among biomethane interested parties, establishing bridges of communication towards cooperation and communicating key information to policy makers in each country.

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Annex V: Policy recommendations for the cross-sectoral integration of biomethane

The following policy recommendations are proposed for the effective cross-sectoral policy integration of biomethane into the existing legislative and policy framework:

- Develop a holistic framework for the quantification of the cross-sectoral impacts (both triggered co-benefits and the adverse side effects) including all the identified negative and positive externalities.
- Adopt a coherent biomethane strategy until 2050 at EU level focusing on the maximization of the quantified cross-sectoral impacts. The strategy should include the specification of binding targets at national level considering the provisions of the Fit-For-55 package. The strategy should strengthen the existing biomethane targets under REPowerEU so as to maximize the social welfare taking into account the quantified cross-sectoral impacts. The strategy should specify cross-sectoral targets additionally to the energy and climate ones.
- Prepare a targeted biomethane action plan until 2030, which will facilitate the achievement of the specified cross-sectoral targets within the context of the adopted biomethane strategy. The action plan should include the policies and measures, which will be designed and implemented at national level.
- Establish a centralized multi-level governance mechanism for the implementation of the biomethane strategy including a dedicated monitoring and evaluation mechanism for the implemented policies and measures in order to assess their contribution to the achievement of the specific cross-sectoral targets. Designate ministries or other governmental bodies, which will be responsible to implement the cross-sectoral measures and define clearly the different areas of responsibility and their duties.
- Prioritize the promotion of the circular economy facilitating the integration of the different affected sectors. Integrate mandatory circular economy targets with the current policy framework.
- Align the GHG emission reduction targets with the sustainability targets of the EU taxonomy based on the specified cross-sectoral targets.
- Enhance the existing legislative framework of the Fit-For-55 package so as to support the production of biomethane (such as indicatively requiring the refueling infrastructure expansion within the context of the Alternative Fuels Infrastructure Regulation and promoting the targeted use of biomethane in shipping and aviation within the context of Fuel EU Maritime and Refuel EU Aviation).
- Expand the legislative framework of the Fit-For-55 package to include additional strategies and legislation, which can facilitate the cross-sectoral integration (e.g. Waste Framework Directive, Circular Economy Action Plan, Fertilizing Products Regulation etc.).
- Foster the sector coupling with the adoption of mandatory quotas to consume biomethane in specific sectors (e.g., industry, heave trucks, municipal fleets etc.).

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- Incentivize the utilization of biomethane in agriculture and transport sectors under the Effort Sharing Regulation with appropriate crediting mechanisms.
- Highlight the crucial role of biomethane as a methane mitigation measure within the framework of the EU Methane Strategy.
- Enhance biomethane production incentives in Common Agricultural Policy (CAP) to support the production of biogas from agricultural activities and waste-to-energy schemes. Align the foreseen subsidies also with biomethane feedstock supply (e.g., support for digestate use as fertilizer).
- Introduce a comprehensive and cross-sectoral framework for the CO_2 pricing.
- Allocate the collected ETS revenues to support biomethane production and to drive methane recovery from all sectors (e.g., waste and agriculture).
- Standardize the framework both of the Guarantees of Origin issuance and the Proof of Sustainability for biomethane under the RED III framework in order to create a level playing field across sectors and member states. Develop approaches for the cross-border and cross-sectoral verification, certification, and traceability of the issued Guarantees of Origin and sustainability certification.
- Develop common standards for the production and consumption of the biomethane across the EU with similar requirements and specifications for the required activities (e.g. storage, odorization etc.) in order to facilitate greater cross-border trade.
- Foster the cross-border and cross-sector cooperation for grid integration and supply chains. Support the cross-sectoral development of the required infrastructure for the further deployment of the biomethane. Installation of the filling stations based on the existing demand of the various sectors.
- Reinforce and expand the role of the Biomethane Industrial Partnership so as to contribute meaningfully to the implementation of the biomethane action plan until 2030.
- Encourage public-private partnerships for biomethane development. Leverage EU cohesion policy and regional development funds to earmark investments for local biomethane infrastructure. Provide financial support for biomethane projects combining EU funds and banking institutions.
- Engage regional and local authorities for the promotion of biomethane and the implementation of cross-sectoral measures. Stronger integration of the waste management and circular economy into the developed local and regional plans.
- Conduct awareness-raising campaigns and educational activities on the best practices and the cross-sectoral impacts triggered by the production and consumption of biomethane.
- Establish citizen and renewable energy communities in order to produce and consume local biomethane using the quantified cross-sectoral impacts as demonstration for the economic, environmental, and social impacts.

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