Ref. Ares(2025)6245436 - 31/07/2025

D4.6 Final Market uptake measures at national level (7 target countries)

Deliverable n.4.6

GREENMEUP

Funded by the European Union

Document control sheet

Project	**GreenMeUp - Green biomethane market uptake**
Call identifier	HORIZON-CL5-2021-D3-02: Sustainability and educational aspects for renewable energy and renewable fuel technologies
Grant Agreement n°	101075676
Coordinator	CRES - Centre for renewable energy sources and saving foundation
Work package n°	4
Work package title	Market uptake measures
Work package Leader	CRES
Document title	D4.6 Final Market uptake measures at national level (7 target countries)
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Reference period	01/02/2024 - 31/07/2025
Due date **Delivery date**	31/05/2025 (Month 34) 31/07/2025 (Month 36)

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

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Chapter 1: Introduction

In the context of the 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 national level for the seven target countries (e.g., Czech, Danube region, Estonia, Greece, Latvia, Spain and Poland), which will inform their national energy and climate plans (NECPs).

The identification and definition of the most effective market uptake measures will be occurred in close collaboration with the involved stakeholders within the framework of the different hubs (e.g. policy, market and 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, will be resulted through the co-design of the market uptake measures.

The active involvement of the stakeholders will be implemented with the application of the fuzzy cognitive mapping technique, which in combination with the competitive priorities and performance-based indicators, as resulted within the framework of the GreenMeUp project, will facilitate the interpretation of the policy relevant attributes, which are critical for both the establishment and operation of biomethane value chains.

The recommended combinations of policy measures will be targeted towards a level playing field between different market segments (e.g. buildings, industry, power and transport), while they will incorporate and 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: Methodology

2.1 Methodological approach

The objectives of the current deliverables have been fulfilled with the development of a specialized methodological approach, which consists of five different steps (Figure 1).

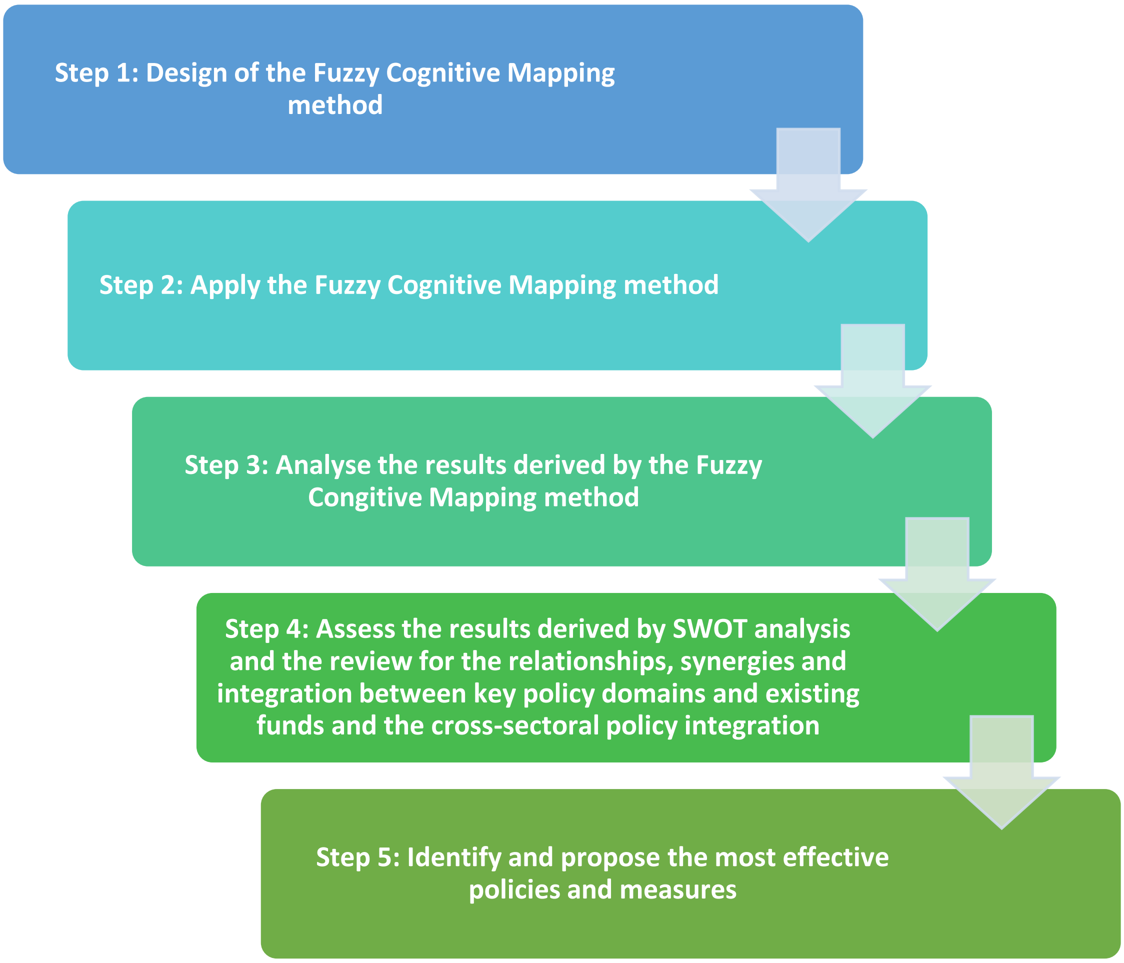

Figure 1 : Applied methodological approach for identifying and proposing the most effective policies and measures in the target countries.

Firstly, the design of the Fuzzy Cognitive Mapping method was carried out (Step 1), which has been utilized for identifying the main policies and measures for the further deployment of biomethane.

The Fuzzy Cognitive Mapping method was applied in the seven target countries (Step 2) based on the prepared guidelines for the implementation of the Fuzzy Cognitive Mapping (Annex I: Guidelines for the implementation of the Fuzzy Cognitive Mapping (FCM)) and the

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template for describing the performed activities for each interview separately (Annex II: Template for describing the performed activities for each interview separately).

It should be mentioned that the question, which was explored within the framework of the Fuzzy Cognitive Mapping method, focused on the most crucial parameters for the effective penetration and utilization of biomethane in the examined countries. Obviously, the main risks and challenges are taken into consideration during the identification of the main parameters, while the proposed policies and measures will ensure that they will be addressed effectively and the main defined targets for the further penetration of biomethane will be achieved.

The obtained feedback from the interviews were analyzed (Step 3) so as to unveil the main parameters, which should be taken into consideration for the design and implementation of targeted and effective policies and measures.

Finally, the identification of the most effective policies and measures (Step 5) was occurred taking into account the derived results of the SWOT analysis, the identified relationships, synergies and integration between key policy domains and existing funds and the perceived cross-sectoral policy integration of biomethane (Step 4). Emphasis was given on the analysis of the main regulatory and financing obstacles and drivers so as to be considered during the formulation of the policy recommendations. The identified regulatory and financing obstacles and drivers both at EU level and at national level for each target country separately are presented in Table 17 (Annex III).

The Fuzzy Cognitive Maps is considered as a powerful tool, which is based on neural networks, to solve complicated chains of casual relationships. The FCMs manage initially to depict the fuzzified relationships among nodes quantifying the degree of relationship between two specific concepts. Moreover, the FCMs construct a connection matrix and calculate the activation levels of the identified nodes as state vectors.

The construction of the FCMs is resulted by the collection of the various feedback from face-to-face interviews. The procedure for constructing the individual FCMs consists of various steps. More specifically, the various concepts, which are associated with the examined problem should be identified. Then, each interviewee assesses the causal relationship among the identified concepts with a qualitative scale, which has been determined. The utilized scores are then aggregated so as to estimate an overall qualitative weight, which is transformed into a numerical weight by utilizing the defuzzification method of the centre of gravity. It should be noted that all the specified weights are quantified from the previously transformed weights. Each produced weight provides information about the relationship between the two concepts and specifies the grade of causality between them.

The construction of the individual FCMs signals the respective construction of the collective FCMs. The procedure for resulting in the collective FCMs include the identification of the associated parameters with the examined problem, the classification of the individual parameters into groups, the determination of the causal relations and their strengths, the calculation of the strength of each link within the framework of the collective FCM, the presentation of the collective FCM and the conduction of various simulation runs for assessing the impact of each parameter separately.

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The collective FCM is characterized from additional metrics, such as number of transmitters, the number of receivers and the number of the ordinary concepts. These concepts are characterized by their out-degree and in-degree. Out-degree provides an indication about how much a given concept affects the other concepts. In-degree depicts the cumulative strength of the identified concepts.

Furthermore, the complexity of the collective FCMs is analyzed taking into account the number of Receiver to Transmitter ratios (e.g. indicating more complex FCMs in the case of higher values of ratio), the Density (e.g. presenting how connected or sparse the FCMs are) and the Centrality(e.g. displaying the overall interaction strength of each mentioned concept).

The analysis of the collected questionnaires from the participants was conducted with MS Excel based simulation tool FCMapper (available at: http://www.fcmappers.net/joomla/).

It should be noted that the outcomes of the implemented methodological approach were discussed twice with the involved stakeholders providing the opportunity to revise the formulated policy recommendations within the context of the organized policy, market and policy hubs so as to take into consideration evolution of the performed work conducted by GreenMeUp project.

2.2 Relationships, synergies and integration between key policy domains and existing funds

The European Union (EU) offers several funding opportunities to support biomethane projects, aligning with its strategic goals to increase renewable energy production and reduce dependence on fossil fuels. Besides those offered by the EIB, a number of structured funds exist within Europe that could be leveraged to support and facilitate the construction of infrastructure for biomethane transport and plants for its production.

- **Synopsis of the identified funds**

A summary of the identified funds is provided in the following section, followed by a set of identified actions that leverage those funds. Where possible, reference is made to examples of successful adoption of those funds in the biomethane sector.

- **Just Transition Fund (JTF)**

The Just Transition Fund (JTF) is a key EU financial instrument established by Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021. It forms one of the pillars of the Just Transition Mechanism under the umbrella of the European Green Deal (see OJ L 231, 30.6.2021, p. 1). The JTF is specifically designed to provide targeted support to territories and sectors most affected by the transition to a climate-neutral economy by 2050, in line with the Paris Agreement and the Union's 2030 energy and climate targets.

The Regulation institutes the JTF with the specific objective of enabling regions and people to address the social, employment, economic, and environmental impacts arising from the

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shift towards the Union's climate and energy goals (Art. 2, Reg. (EU) 2021/1056). The JTF's resources are programmed on the basis of Territorial Just Transition Plans (TJTPs), which must be developed in cooperation with relevant stakeholders and consistent with integrated national energy and climate plans.

In the context relevant to the biomethane sector, the JTF can be strategically deployed to:

- Convert or repurpose existing fossil-fuel infrastructure (e.g., coal mines, peat extraction sites, oil shale operations) into biomethane production facilities. This will support the economic transformation of carbon-intensive regions.
- Support innovation, applied research and demonstration projects in advanced biomethane technologies, including upgrading processes and integration with regional energy systems;
- Finance technical assistance, reskilling, and upskilling programs for workers transitioning from fossil fuel-based sectors to employment opportunities in the biomethane value chain;
- Foster the creation and diversification of SMEs linked to the biomethane ecosystem, following the principle of productive investment outlined in Article 8(2)(a) and recitals 12 and 16 of Regulation (EU) 2021/1056;
- Provide support for research and innovation infrastructure, deployment of clean energy systems, circular economy activities, and regional economic diversification consistent with smart specialisation strategies and complementary EU and national policy frameworks.

JTF support is conditional upon alignment with the objectives of climate neutrality, the "do no significant harm" principle (as defined in Regulation (EU) 2020/852), and the exclusion of investments related to the production, processing, transport, distribution, storage, or combustion of fossil fuels (Art. 9, Reg. (EU) 2021/1056).

Thus, through its integrated approach, the JTF acts as a cornerstone of the EU's strategy to achieve a just and inclusive green transition where no region or worker is left behind. It directly supports the deployment of biomethane as a sustainable alternative to fossil energy sources in affected territories.

- **European Regional Development Fund (ERDF)**

The European Regional Development Fund (ERDF) is established by Regulation (EU) 2021/1058 of the European Parliament and of the Council of 24 June 2021. The ERDF constitutes one of the principal instruments of the EU's Cohesion Policy, aimed at strengthening economic, social, and territorial cohesion across the Union by correcting imbalances between its regions.

The ERDF pursues its mission by financing investments that foster sustainable growth, competitiveness, and innovation, with a particular focus on less-developed, transition, and outermost regions facing structural challenges. In the context of the biomethane sector, the ERDF provides substantial co-financing opportunities for infrastructure investments including the construction and upgrading of anaerobic digestion plants, the development of dedicated

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biomethane pipelines, and the modernisation and adaptation of regional energy infrastructures for renewable gas integration.

Beyond core infrastructure, the ERDF is also instrumental in supporting the creation and enhancement of research and innovation infrastructures, living labs, demonstration facilities, and pilot projects dedicated to new biomethane technologies. Furthermore, the fund can be mobilised for integrated territorial development strategies—such as community-led local development (CLLD) and smart specialisation strategies (S3)—that promote biomethane as a strategic renewable energy asset and catalyst for regional economic diversification and decarbonisation.

- **Cohesion Fund**

The Cohesion Fund (CF) is governed by Regulation (EU) 2021/1058 of 24 June 2021. As one of the primary instruments of the EU's Cohesion Policy, the CF is expressly aimed at strengthening economic, social, and territorial cohesion across the Union by reducing disparities between Member States, especially those with a gross national income (GNI) per capita below 90% of the EU average.

The Cohesion Fund specifically targets investments in the fields of environment, including sustainable development and energy projects with environmental benefits, and in the development of trans-European transport networks (TEN-T). According to Article 6 of Regulation (EU) 2021/1058, the CF supports environmental infrastructure, renewable energy deployment, energy efficiency initiatives, and large-scale transport projects that contribute to climate change mitigation and adaptation.

In the biomethane sector, the Cohesion Fund offers tailored co-financing for Member States with lower national incomes to facilitate the construction, extension, and modernisation of biomethane pipeline infrastructure, as well as the integration of biomethane production into existing gas transmission and distribution grids. These investments are pivotal for decarbonising regional energy systems, supporting the deployment of renewable gases, and contributing directly to the achievement of regional and national climate neutrality targets in line with the objectives of the European Green Deal and REPowerEU.

Notably, Cohesion Fund resources may also be leveraged synergistically with those from the ERDF and other EU financial instruments to maximise the impact of infrastructure upgrades, enabling integrated strategies for regional economic development, environmental protection, and the rapid market uptake of biomethane technologies.

- **InvestEU Programme (Pillar 2 of the Just Transition Mechanism)**

The InvestEU Programme, established by Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021, forms the second pillar of the Just Transition Mechanism (JTM) and is a cornerstone of the European Union's investment strategy for the period 2021–2027. The Programme aims to mobilise at least €372 billion of additional public and private investment across the EU, underpinned by an EU budgetary guarantee of €26.2 billion, with the strategic objective of supporting sustainable, innovative, and job-creating projects that contribute to the Union's policy priorities, including the green and digital transitions and the achievement of climate neutrality as set out in the European Green Deal.

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Within the framework of the Just Transition Mechanism, the InvestEU Programme operates through its dedicated Just Transition Scheme, which is channeled via the InvestEU Fund and implemented by the European Investment Bank Group (EIBG) and other eligible implementing partners such as national promotional banks and international financial institutions. The Just Transition Scheme is expressly designed to address the investment needs of territories and sectors most affected by the transition to a climate-neutral economy, as articulated in the relevant Territorial Just Transition Plans (TJTPs).

InvestEU acts as a key enabler for leveraging additional finance—both public and private—for projects aligned with just transition objectives in the biomethane sector. This includes de-risking and crowding-in investment in the commercial deployment of biomethane, supporting integrated regional projects that incorporate biomethane production and use, and fostering the development of value chains in sectors such as sustainable mobility, renewable gas integration in industry, and circular economy activities. Furthermore, InvestEU can support research, innovation, demonstration, and infrastructure investments critical to biomethane market uptake, particularly in regions undergoing structural transformation away from fossil fuels.

The Programme's risk-sharing and guarantee mechanisms are pivotal in ensuring the bankability and scalability of biomethane-related investments, especially in regions with challenging market conditions or those facing higher financial risks during the transition. By doing so, InvestEU contributes directly to the objectives of the European Green Deal, REPowerEU, and regional economic diversification. It provides an integrated financial instrument complementing grant-based support from the Just Transition Fund (JTF) and facilitating synergy with other EU and national funding tools.

Regulation (EU) 2021/523 details the legal basis and operational modalities of InvestEU. It should be cited as the primary legislative act instituting the fund and defining its governance, eligibility, and implementation framework.

- **Public Sector Loan Facility (PSLF; Pillar 3 of the Just Transition Mechanism)**

The Public Sector Loan Facility (PSLF) was established by Regulation (EU) 2021/1229 of the European Parliament and of the Council of 14 July 2021. The PSLF constitutes the third pillar of the Just Transition Mechanism and aims to support public sector entities—such as local authorities and municipalities—through a combination of EU grants and loans provided primarily by the European Investment Bank (EIB) and, where applicable, other eligible finance partners.

The PSLF provides concessional financing and targeted technical assistance for projects aligned with Territorial Just Transition Plans (TJTPs) as required under Article 11 of Regulation (EU) 2021/1056. The Facility is designed to support investments addressing the development needs arising from the transition to a climate-neutral economy, in particular where public investments would otherwise face viability gaps due to insufficient revenue streams or challenging market conditions.

The PSLF is especially relevant for the biomethane sector, as it enables the financing of essential infrastructure for biomethane production, upgrading, and pipeline integration in regions most affected by the transition away from fossil fuels. Eligible actions may include

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the construction and modernisation of biomethane plants, pipelines for the connection of biomethane to gas networks, and related infrastructure consistent with broader decarbonisation and regional development objectives. The PSLF covers a wide range of sustainable investment categories as defined by Article 6 of Regulation (EU) 2021/1229, provided that these are set out in the TJTPs and do not involve activities excluded under Article 9 of Regulation (EU) 2021/1056 (such as the production, processing, or combustion of fossil fuels).

The PSLF addresses critical funding gaps and leverages additional public sector investment in just transition territories by offering a blend of non-repayable grants and EIB loans with favourable terms. This mechanism is vital for accelerating the deployment of biomethane infrastructure in regions with limited access to private finance, ensuring that the transition to renewable gases is socially fair, territorially inclusive, and fully aligned with the EU's climate neutrality ambitions.

- **Just Transition Platform**

The European Commission established the Just Transition Platform (JTP) as part of the broader Just Transition Mechanism under the European Green Deal. The JTP serves as the central knowledge-sharing and stakeholder engagement hub for regions undergoing significant structural changes associated with the transition to a climate-neutral economy. The Platform's legal basis is rooted in Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021, which institutes the Just Transition Fund (JTF) as one of the pillars of the Mechanism and explicitly mandates the development of tools fostering bilateral and multilateral exchanges of experience and best practice (see Recital 18 and Article 11(1) of Regulation (EU) 2021/1056).

The Just Transition Platform acts as a multi-dimensional technical and administrative support structure, providing:

- Stakeholder Engagement: Organisation of events, thematic working groups and platforms for dialogue inclusive of regional and national authorities, social partners, civil society, industry, youth representatives, and financial actors, thereby strengthening participatory governance and multi-level partnership as required under Article 8 of the Common Provisions Regulation (EU) 2021/1060.
- Capacity Building: Delivery of targeted technical assistance to regional and local authorities, support for the preparation of Territorial Just Transition Plans (TJTPs), and guidance on project development, implementation, and monitoring.
- Knowledge Sharing: Dissemination of information on policy developments, funding opportunities and best practices, with dedicated helpdesks and online resources to facilitate exchange between Member States and regions facing analogous transition challenges.
- Synergy Facilitation: Enabling integration and synergy among the three pillars of the Just Transition Mechanism—the Just Transition Fund (grant support), the InvestEU Just Transition Scheme (budgetary guarantees for private investments), and the Public Sector Loan Facility (blended EIB loans and EU grants)—as provided for in

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Article 11(5) and Recital 19 of Regulation (EU) 2021/1056, ensuring an aligned and coherent transition strategy.

The JTP is of high relevance for the biomethane sector in the context of:

- Fostering exchange of best practices and lessons learned: Enabling regions to learn from early adopters of biomethane technologies and business models through knowledge platforms and peer-learning initiatives.
- Enhancing regional innovation and investment ecosystems: Supporting public authorities and industry consortia in identifying pathways for the conversion of declining fossil-based assets and upskilling workforces for biomethane value chains.
- Facilitating policy and funding access: Providing guidance and support to regions and promoters to effectively leverage EU funding instruments, fulfill "do no significant harm" criteria, and align with smart specialisation strategies and TJTPs.

The Just Transition Platform catalyses effective, coordinated, and socially inclusive deployment of biomethane projects within the most affected European territories by building stakeholder capacity, disseminating technical and regulatory knowledge, and promoting the horizontal and vertical integration of transition measures.

- **Connecting Europe Facility**

The Connecting Europe Facility (CEF) is a key EU financial instrument established by Regulation (EU) 2021/1153 of the European Parliament and of the Council of 7 July 2021 and is applicable for the period 2021–2027. CEF aims to foster the development of high-performance, sustainable, and efficiently interconnected trans-European networks across the transport, energy, and digital sectors, as stated in Article 3 of the Regulation. The CEF provides financial support in various forms, notably grants, procurements, and blending operations that combine grants with other sources of public and private finance. Eligible actions under the CEF in its energy pillar include: (a) studies and works related to projects of common interest (PCIs) that advance integration of an efficient and competitive internal energy market, and (b) cross-border projects in the field of renewable energy, including storage and smart grids. CEF funding is allocated via calls for proposals laid out in multiannual work programmes, subject to specific eligibility criteria.

Regarding co-financing rates, CEF can cover up to 50% of eligible costs for most works and studies in the energy sector. This rate can be increased to a maximum of 75% for actions that provide a high degree of regional or EU-wide security of supply, significantly enhance solidarity across Member States, or deliver highly innovative solutions, as specified in Article 15 of the Regulation. The actual co-financing rate applied depends on the characteristics and strategic relevance of the action. For cross-sectoral or synergistic actions involving energy, transport, and digital elements, the highest applicable co-financing rate across the sectors involved may be applied, with a possible additional increase of 10%. CEF thus serves as a central mechanism to support eligible infrastructure, grid modernization, cross-border connections, and system integration projects, provided these align with the EU's climate, market integration, and security of supply objectives.

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CEF replaces earlier regulations (EU) No 1316/2013 and (EU) No 283/2014 and further streamlines support for comprehensive, cross-border initiatives crucial to achieving the Green Deal, REPowerEU, and trans-European integration targets.

CEF focuses on projects of common interest that further the integration of an efficient and competitive internal energy market, support interoperability of networks across borders and sectors, facilitate decarbonization of the economy and ensure security of supply (see Article 3(2)(b) of the Regulation). CEF allocates substantial co-funding—up to 50%, increasing to 75% for projects that significantly enhance regional/EU security of supply or offer highly innovative solutions. In the context of the biomethane sector, the CEF is especially relevant as it can co-finance infrastructure enabling biomethane integration into regional and transnational energy grids, promote cross-border trade and transport of renewable gases, and support innovative projects that scale up biomethane production and distribution, provided these projects align with the EU's climate neutrality and market integration targets.

Thus, CEF provides concrete support for infrastructure, grid connections, modernization, and market integration for biomethane—especially for cross-border pipeline projects or systemic upgrades facilitating renewable gas flows across EU Member States. Relevant legislative provisions can be found in Regulation (EU) 2021/1153, particularly Articles 1–4, 9, and 15.

- **Social Climate Fund**

The Social Climate Fund (SCF) was established by Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023, which provides the legislative foundation for its operation from 2026 to 2032. This regulation sets out the SCF's objectives, governance, and implementation framework, and formally institutes the Fund as a core component of the EU's strategy to ensure a fair and inclusive climate transition (OJ L 130, 16.5.2023, p. 1).

The SCF is specifically designed to mitigate the social impacts arising from the extension of the EU Emissions Trading System (ETS2) to the road transport and buildings sectors. Its primary aim is to ensure that vulnerable households, micro-enterprises, and transport users are not left behind as carbon pricing extends to fuels used for heating, mobility, and other daily needs. To achieve this, the Fund supports Member States in the development and implementation of Social Climate Plans (SCPs), which must be submitted for approval to the European Commission.

The Fund is financed through the auctioning of 50 million allowances under the EU ETS1 and at least 150 million allowances under the new ETS2, with an overall allocation of up to €65 billion in EU funding, and a total public funding mobilization of at least €86.7 billion between 2026 and 2032 when national co-financing is included. Each Member State is required to cover at least 25% of the total costs of its Social Climate Plan.

Funds are made available to Member States conditional upon the submission and positive assessment of their SCPs, which must outline (i) anticipated negative impacts of carbon pricing, (ii) the identification of vulnerable groups, (iii) specific measures (such as direct income support, energy efficiency interventions, and the promotion of zero- and low-emission mobility), (iv) milestones and targets, and (v) robust public consultation during plan preparation. Up to 37.5% of SCF resources may be used for temporary direct income support; the majority is to be spent on structural investment in decarbonization and social inclusion.

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While the SCF does not directly subsidize biomethane supply-side infrastructure, it plays an important enabling role in the wider green transition. The Fund can support grants for vulnerable households and micro-enterprises to upgrade to clean heating systems—including conversion from oil/gas boilers to biomethane-compatible units—as part of its focus on affordable building renovation and clean energy access. It can also back measures under Social Climate Plans promoting low-emission mobility, which may include biomethane-powered vehicles, particularly in rural and peri-urban areas where other alternatives may be less accessible. These indirect supports ultimately lower consumer cost barriers, stimulate demand for renewables (including biomethane), reduce energy and transport poverty, and promote a broad and socially fair uptake of sustainable technologies.

❖ **Recommended actions**

The promotion of the biomethane sector in Europe can be supported through a suite of EU funds and policy mechanisms, including the Connecting Europe Facility (CEF) and the Social Climate Fund (SCF), in addition to traditional funds like the ERDF, Cohesion Fund, JTF, and InvestEU and the support of EIB. The coordination between these funds enables the construction of infrastructure, market access, and the social acceptance required for a just and rapid biomethane transition. This multidimensional, cross-fund strategy defines the European Union's efforts to boost the biomethane sector. Effective synergies between infrastructure, innovation, and social policy instruments—including the CEF and SCF—can be key to achieving REPowerEU, climate neutrality, and energy resilience targets.

The following paragraphs contain a set of proposed actions, examples of funded projects, and the roles that the key EU funds identified can play in providing support to the biomethane sector.

I. Facilitating the Construction of New Biomethane Plants

- Using Just Transition Fund (JTF) support to convert or repurpose existing fossil-fuel infrastructure (e.g. coal mines, lignite extraction sites) into biomethane production facilities.
- Co-financing infrastructure investments, such as anaerobic digestion plants, through the European Regional Development Fund (ERDF) and the Cohesion Fund, in alignment with renewable energy and climate neutrality objectives set by the European Green Deal.
- Leveraging Public Sector Loan Facility and Just Transition Mechanism (third pillar) to mobilize investments for biomethane plants, particularly when market revenues alone cannot cover full investment costs.

Example: The European Investment Bank (EIB), with support from InvestEU and the JTF, has provided €80 million to Nortegas Group for the development of 34 biomethane production plants in Spain between 2024 and 2028. These plants utilize agricultural residues and align with EU Green Deal and REPowerEU objectives (EIB, 2024).

II. Facilitating the Market Uptake of Produced Biomethane

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- Providing technical assistance financed through ERDF or JTF to municipalities, regions, and SMEs to integrate biomethane into local energy systems and grids.
- Offering JTF grants to support innovation and research into biomethane purification, grid injection, storage, and distribution technologies.
- Collaborating with InvestEU (pillar 2 of the JTM) to promote viable commercial applications of biomethane, including potential uses in transport and industrial sectors.

Example: The ERDF has co-financed the construction of local biomethane hubs in Eastern Poland, helping rural communities inject biomethane into municipal gas grids and promote regional circular economies (see Polish Ministry of Funds and Regional Policy, 2024).

III. Facilitating the Deployment of Additional Biomethane Capacity

- Funding training, reskilling, and upskilling programs through JTF to equip workers from declining fossil-fuel industries with the skills required in biomethane production and distribution.
- Co-financing regional integrated projects (e.g., district heating transformations) through InvestEU and the Public Sector Loan Facility that use biomethane as primary energy, thereby creating market incentives and supporting broader regional transitions.
- Investing in the extension and modernization of existing gas grids through ERDF and the Cohesion Fund to accommodate higher biomethane integration.

Example: In the Czech region of Moravia-Silesia, the JTF is supporting a transition package to train workers formerly employed in coal mining for roles in the construction and operation of anaerobic digestion facilities producing biomethane (EC SWD(2021) 275).

IV. Leveraging the Connecting Europe Facility (CEF) for Biomethane Transport and Market Integration

The CEF is a key EU financial instrument supporting trans-European networks in energy, transport, and digital sectors. For biomethane, CEF can:

- Co-finance cross-border infrastructure projects that enable the integration of biomethane into EU gas grids.
- Fund modernisation of pipelines and the development of new infrastructure to support biomethane transport at the regional and transnational level.
- Support innovative solutions that overcome market barriers for renewable gas trade.

Example:A CEF-funded project launched in 2021 is constructing the "WestMed Green Gas Corridor," a biomethane-ready pipeline system connecting Spain and France, facilitating large-scale biomethane transport across borders (CEF/INEA, 2022).

V. Harnessing the Social Climate Fund (SCF) for Inclusive Biomethane Uptake

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The Social Climate Fund (SCF), operational from 2026, aims to ensure that the transition to clean energy does not exacerbate energy poverty or inequality. While SCF does not directly fund biomethane supply-side infrastructure, it creates a supportive environment for market uptake by:

- Providing grants to vulnerable households and micro-enterprises for clean heating system upgrades (e.g., converting oil/gas boilers to biomethane-compatible units).
- Supporting Social Climate Plans that encourage the adoption of low-emission mobility, including biomethane-powered buses in rural and peri-urban areas.
- Covering technical assistance and outreach to increase awareness and uptake of renewable solutions among at-risk communities.

Example: In Romania, the SCF pilot scheme (2026) co-financed the conversion of 1,200 low-income households' heating systems to biomethane-ready models, reducing heating costs and improving air quality in Jiu Valley, a former coal region (Carbon Market Watch, 2024).

VI. Facilitating the Construction of Biomethane Pipelines

- Leveraging ERDF and Cohesion Fund financing to support the construction and modernisation of dedicated biomethane pipeline infrastructure aimed at increasing renewable biomethane integration into existing gas infrastructure networks.
- Mobilising Public Sector Loan Facility resources to finance biomethane pipelines, especially where market conditions alone are insufficient to support infrastructure development.
- Using technical assistance from JTF to ensure proper planning, permitting and alignment of biomethane pipeline projects with territorial just transition plans and regional decarbonisation strategies.

Additional Complementary Actions

- Using ERDF funding to support dedicated research infrastructures, R&D clusters, and facilities focused specifically on biomethane and associated renewable energy technologies.
- Promoting integrated territorial or community-led local development strategies through cohesion policy instruments, prioritizing biomethane as a key strategic regional asset.
- Providing targeted support mechanisms via JTF, InvestEU, and Public Sector Loan Facility for regional biomethane projects aiming at reducing greenhouse gas (GHG) emissions in large enterprises or energy-intensive industries.
- Utilizing the Just Transition Platform to facilitate knowledge-sharing, exchange good practices among early adopters of biomethane technologies, and strengthen regional innovation ecosystems to enhance biomethane investment and uptake.

Example: Belgium has funded the BioWanze project—an industrial biomethane R&D cluster—by blending ERDF and national co-financing. BioWanze, in Wallonia, integrates

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biogas upgrading and biomethane fueling stations, providing direct research and industrial demonstration outcomes (Wallonie Europe, 2023).

2.3 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 the different administrative levels (such as local, regional, national and EU levels).

Figure 1 displays the relationship between biomethane and the different sectors, which can be benefited by its production and consumption. 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. Furthermore, potential competition can be created among sectors for scarce resources.

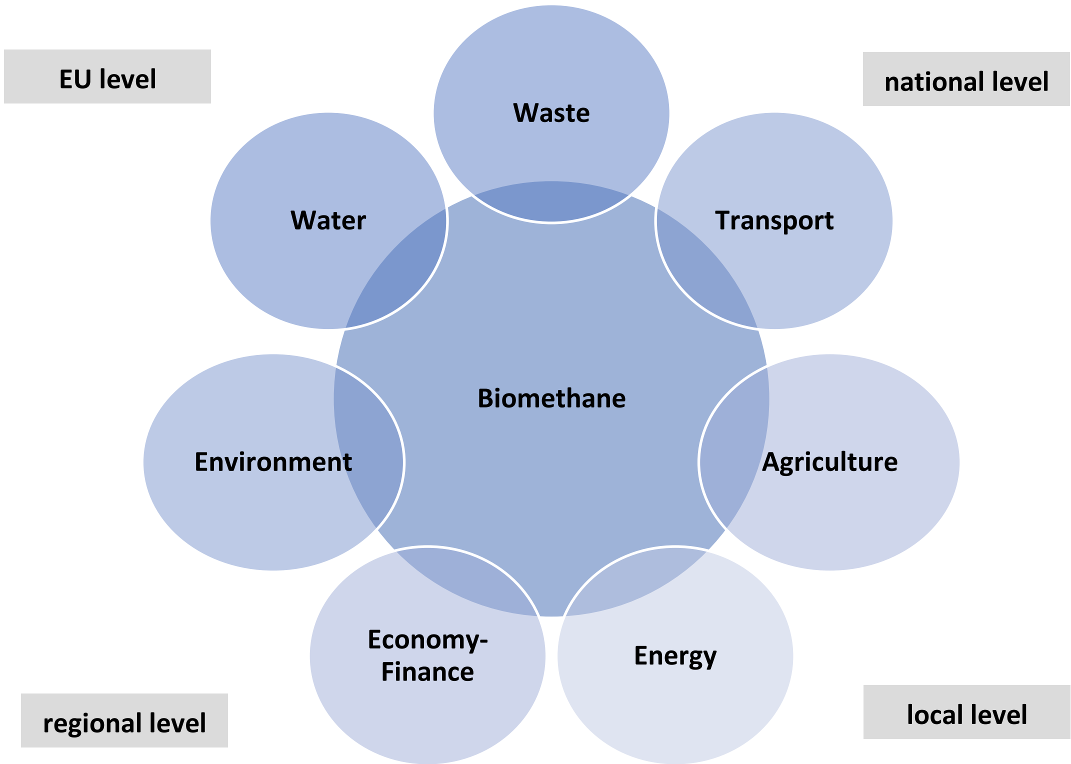

Figure 2: Relationship between biomethane and the different sectors.

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

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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.

Therefore, it is obvious that coordinated cross-sectoral policies and measures should be initiated mainstreaming the created interactions.

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 FuelEU Maritime and ReFuelEU 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, Fertilising 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 CO2 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 Guarantee of Origin (GoO) issuance and the Proof of Sustainability (PoS) 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 GoOs 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, odorisation 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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Chapter 3: Policy measures in Czech Republic

In Czech Republic, the majority of the identified parameters refer to medium- and long-term basis according to the results of SWOT analysis (see Figure 3). More specifically, emphasis is given of the required economic support as displayed by the provision of operating and investment aids and the preservation of the competitiveness of biomethane. Moreover, the role of the infrastructure is also critical taking into account the need for modernizing the current biogas plants to supply biomethane to the gas network and constructing new biomethane stations. Only one parameter that refers to the establishment of the regulatory framework (e.g. the update of the NECP and biomethane targets) has been characterized as a short-term factor.

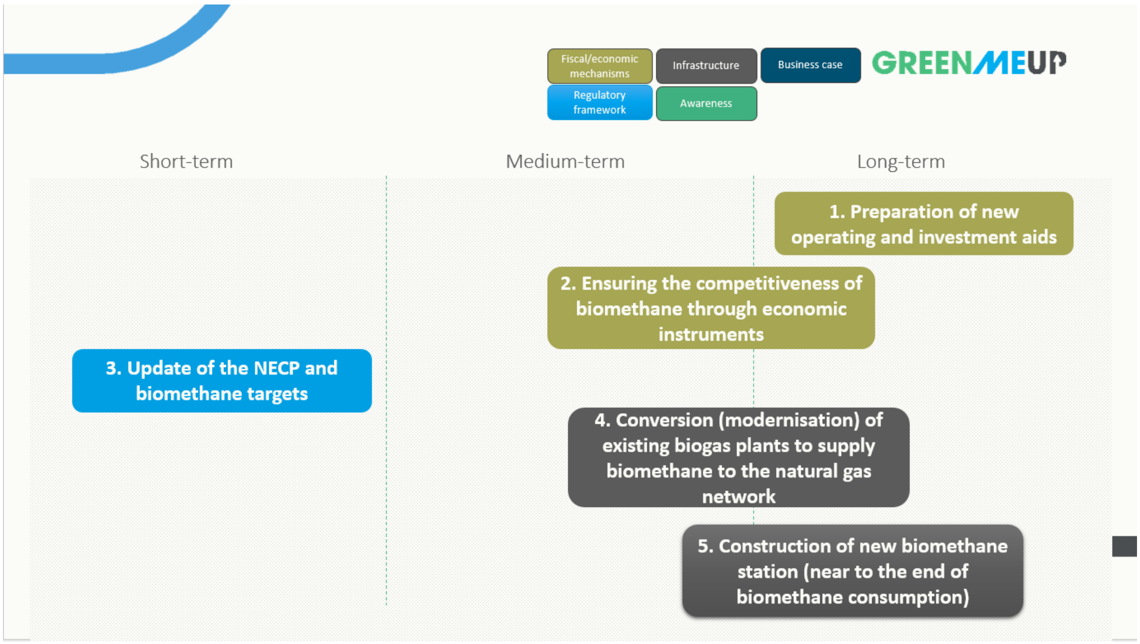

Figure 3 : Results of SWOT analysis in Czech Republic.

Totally, ten stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 1 for the case of Czech Republic.

Table 1: Overview of the applied Fuzzy Cognitive Mapping in Czech Republic.

Individual maps	Policy Hub: 3, Market Hub: 4, Society Hub: 3
Number of variables	64
Number of connections	143
Number of transmitter variables	9
Number of receiver variables	12
Number of ordinary variables	43
Receiver to transmitter ratio	1.33
Density	0.033

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According to the results of the FCM method in Czech Republic (Table 2), the unstable legislative environment, the high administrative complexity and the complex bureaucracy create investment uncertainty in the biomethane sector. The insufficient and slow governmental actions, the political instability and different industry interests are also of high significance and set a hurdle in the development of the biomethane market. Nevertheless, the main advantages of biomethane are mentioned (e.g. it is a renewable, green and local resource and helps stabilize employment opportunities in small towns and villages), while during energy crisis where natural gas shortages are recorded, finding local and renewable options, such as biogas and biomethane, can be considered as a useful alternative.

All the identified concepts are summarized in Table 2 for the case of Czech Republic.

Table 2: Results of the applied Fuzzy Cognitive Mapping in Czech Republic.

Concepts	Centrality	Outdegree	Indegree
Uncertainty of investing in biomethane	2.16	1.10	1.06
The governmental actions are insufficient and slow	1.92	0.92	1.00
Political instability different industry interests over time	1.74	1.02	0.72
Biomethane is a renewable, green and local resource	1.04	0.62	0.42
Biogas/biomethane sector helps stabilize employment opportunities in small towns and villages	0.94	0.32	0.62
Energy crisis, natural gas shortages, finding local and renewable options	0.90	0.58	0.32
Unstable legislative environment in the Czech Republic and rapid change of legislation	0.84	0.52	0.32
High administrative complexity, complex bureaucracy of the whole sector	0.60	0.50	0.10
Strong market demand for advanced biomethane, existing EU/CR targets	0.54	0.24	0.30
Synergies for agriculture	0.52	0.22	0.30
Harmony of resources and uses in the region	0.40	0.18	0.22
A large number of experienced staff and a large selection of supplier companies	0.38	0.10	0.28
Small new construction and conversion of existing ones	0.32	0.12	0.20
Problematic digestate marketing/final fertiliser production	0.32	0.16	0.16
Complex waste recovery (bureaucracy) and lack of waste to meet targets	0.30	0.20	0.10
Very challenging to set the auction bonus for biomethane due to large fluctuations in operating costs	0.30	0.08	0.22
Low demand for non-advanced biomethane	0.28	0.18	0.10
Low awareness of biomethane, lack of information	0.28	0.10	0.18
Lacks a moment of actualization	0.26	0.08	0.18
Interest in biomethane in other sectors (transport)	0.26	0.16	0.10
Insufficient network for collection of waste substrates, use of purpose-grown biomass	0.22	0.10	0.12
Connecting operators and companies interested in cooperation	0.22	0.04	0.18
Insufficiently interesting conditions for the application of biomethane on the Czech market, export of biomethane abroad	0.22	0.06	0.16

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Concepts	Centrality	Outdegree	Indegree
Retroactive change of operating rules, large bureaucratic burden for the state and operators	0.20	0.10	0.10
No guaranteed support for the price of biomethane relative to natural gas to motivate new projects	0.20	0.10	0.10
There is no declaration of green automobility that uses biomethane - ideally to have the same conditions as electromobility	0.20	0.10	0.10
Requirements to save emissions (transport, heating, reduction of carbon footprints in companies	0.20	0.10	0.10
Current investment and operating support	0.20	0.14	0.06
Provides flexibility and accumulation	0.20	0.12	0.08
Biomethane operating aid successfully notified, existing investment support	0.18	0.10	0.08
Biomethane is a great opportunity to extend the life of current BPS	0.18	0.04	0.14
Transnational, national and market targets (ESG...) for biomethane	0.18	0.06	0.12
Great potential in biodegradable municipal waste - up to 2 million tonnes/year	0.16	0.04	0.12
The investment subsidy exists, but some operators will lose it as part of the overcompensation of operations	0.16	0.08	0.08
Robust natural gas network, high potential for BMS connectivity	0.16	0.08	0.08
Recovery of WEEE/WMW	0.16	0.16	0.00
Good connectivity to the natural gas network	0.14	0.10	0.04
NIMBY effect	0.14	0.14	0.00
EU commitments/decarbonisation	0.14	0.00	0.14
Slowdown in biomethane development due to 20 years of support for CHP (2008-2013)	0.14	0.08	0.06
The biogas/biomethane sector is very well developed in the Czech Republic	0.12	0.00	0.12
Possibility of diversification of biogas product production (CHP + biomethane)	0.12	0.04	0.08
Biomethane helps sustain gas industry with RES	0.12	0.04	0.08
Under-utilization of the potential of biomethane in transport	0.12	0.06	0.06
Complex connection to the natural gas network (high pressure is remote, complex permitting processes)	0.12	0.06	0.06
Availability of financing	0.12	0.06	0.06
Insufficient discussion of European legislation	0.10	0.10	0.00
Competition of biomethane with cheaper sources (other electricity support schemes)	0.10	0.00	0.10
Conditions for digestate application/marketing	0.08	0.00	0.08
Network/ST/VT connectivity	0.08	0.00	0.08
Ambiguity in reporting (greenwashing)	0.08	0.00	0.08
High investment costs for biomethane production	0.08	0.02	0.06
Waste recovery conditions	0.08	0.08	0.00

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Concepts	Centrality	Outdegree	Indegree
In the future, electricity production from biogas will be uncompetitive compared to other RES and will stimulate the development of biomethane	0.08	0.08	0.00
Exemption from dependency/energy security	0.06	0.00	0.06
Connection complications (investor's burden with the extraction pipeline)	0.06	0.00	0.06
Still incomplete market for biomethane and allowances	0.06	0.00	0.06
Poor legislative arrangements for the operation of equipment in island systems	0.06	0.00	0.06
More space for biomethane in the media - awareness raising at national level, meeting EU targets	0.06	0.06	0.00
Demand for BioCNG, advanced biomethane in transport	0.06	0.06	0.00
Low social and political acceptance	0.06	0.06	0.00
Support for pre-manufactured waste recovery facilities	0.04	0.04	0.00
Insufficient recovery of WEEE as a resource that ends up in landfills	0.02	0.00	0.02
Insufficient sales of the resulting CO2, problematic use of the by-product	0.02	0.00	0.02

The proposed policies and measures are summarized in Figure 4 outlining the main aspects, which should be taken into consideration in Czech Republic.

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Policy measure No1 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.)
- Support the conversion of existing biogas plants to biomethane plants

Policy measure No2 **Accelerating the adoption of the legislative improvements**

- Simplify, improve and streamline the existing legislative framework
- Remove any legislative barriers

Policy measure No3 **Ensuring political stability**

- Continue, monitor and improve the existing policy framework
- Assess and improve the legislative framework

Policy measure No4 **Decreasing administrative complexity and bureaucracy**

- Simplify and streamline the permitting procedures to reduce the length and the bureaucracy

Policy measure No5 **Exploiting the available feedstock potential**

- Assess the sustainable feedstock potential
- Identify and incentivise the untapped feedstock potential
- Map the targeted feedstock potential

Policy measure No6 **Capitalizing the experienced staff and the supplier companies**

- Mobilize and exploit the existing staff and the supplier companies

Policy measure No7 **Increasing the ambition of the specified targets**

- Define more ambitious targets for biomethane production and consumption
- Incorporate the increased targets within the policy framework

Figure 4 : Proposed policies and measures in Czech Republic.

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Chapter 4: Policy measures in Danube region

In Danube region, three different SWOT analyses were implemented. As shown in Figure 5, all the parameters refer to short- and medium-term basis for the case of Hungary. More specifically, the elaboration of a national action plan with specific biomethane targets is defined as a crucial short-term parameter, while the strengthening of the regulatory framework through grid injection cost sharing between network operators and biomethane producers can be characterized as an important medium-term parameter.

Similarly, the usage of contracts for difference (CfD) and the provision of fiscal and economic incentives may have a meaningful impact also. Last but not least, the elaboration on financial support measures to sustain CAPEX for building clusters of biogas plants with a centralized upgrading facility along with fiscal and economic incentives have been recognized as important factor at long-term basis.

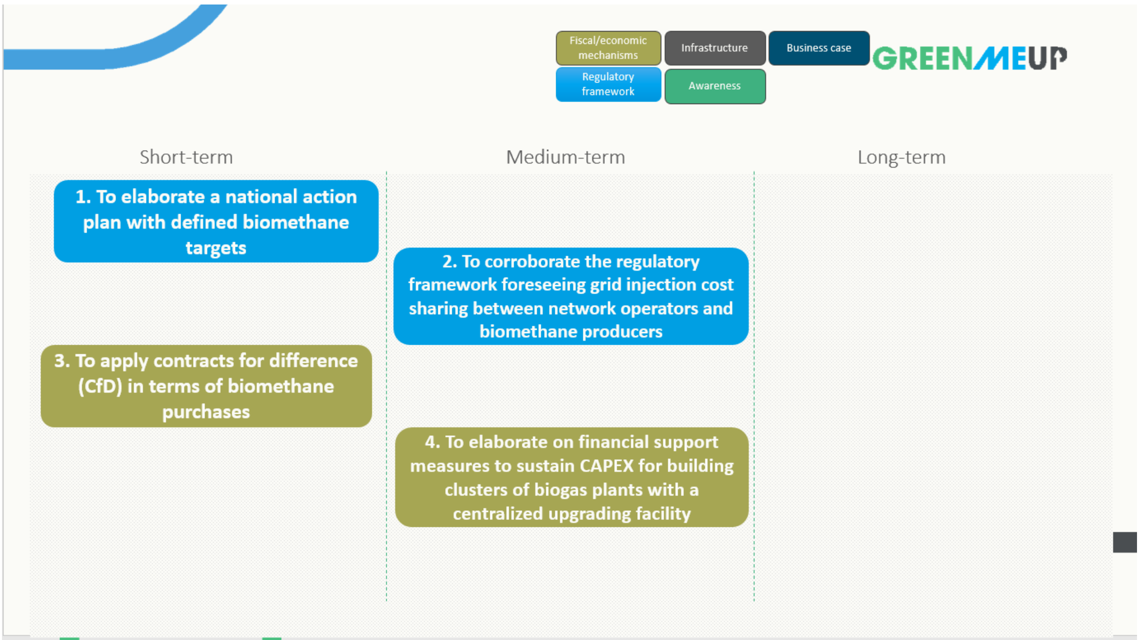

Figure 5 : Results of SWOT analysis in Hungary.

In Romania the SWOT analysis highlighted (Figure 6) that the strengthening of the knowledge of biogas/biomethane potentials through official assessments and the support of the financial sustainability of biogas/biomethane plants through digestate valorization should be implemented in the short term. In terms of regulatory framework, the elaboration of a dedicated governmental roadmap for biogas/biomethane that could/should be integrated in other strategic documents, the definition of mandatory production/consumption targets for biogas/biomethane in national strategic frameworks as well as the combination of biogas/biomethane targets with waste management policies by fostering anaerobic digestion are categorized as crucial medium-term parameters.

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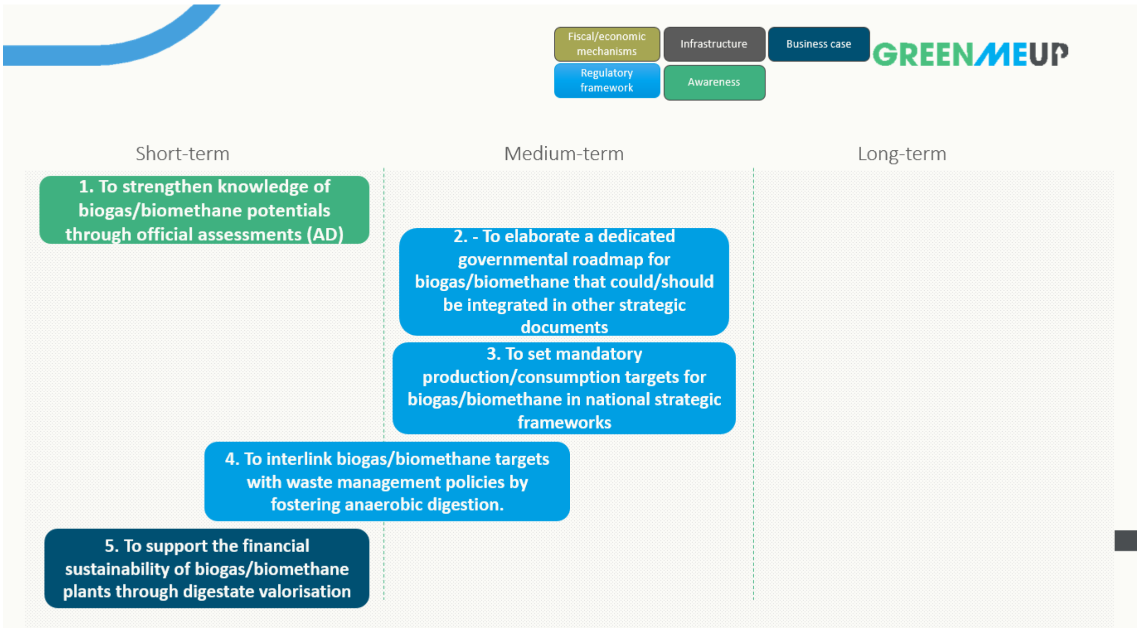

Figure 6 : Results of SWOT analysis in Romania.

According to the results of SWOT analysis in Serbia (Figure 7), the implementation of a comprehensive framework analysis to assess the prospects and needs of biomethane integration, the combination of decarbonization and waste reduction targets with biomethane production pathways and goals, the definition of an appropriate incentive scheme to mobilize untapped potential as well as the promotion of biogas/biomethane technology as a multi-purpose technology that contributes to meeting complementary objectives should be applied in the short and medium term. One parameter planned in the short term is the enhancement of the cross-sectoral cooperation between different line ministries and/or administrations.

Furthermore, a recent decision by the Executive Board of EPS JSC (Joint Stock Company Elektroprivreda Srbije– electricity generation, supply, distribution, and trading) has introduced the possibility of extending the incentive period for privileged producers of electricity from biogas. This means that existing contracts for the guaranteed purchase of electricity from biogas, originally valid for 12 years, will now be extended for an additional 8 years. Consequently, biogas plants will have the opportunity to sell their electricity at a subsidized price for a total period of 20 years.

However, challenges regarding the sustainability of the biogas sector that have affected individual biogas plants will persist even after this extension. It is essential to highlight several key considerations. Firstly, extending the status of privileged producers of electricity from biogas allows for a longer operational period and sustained business in the sale of electricity at the subsidized rate (Feed-in tariff). While this increases the net present value (NPV) of profits accumulated at the end of the project life, it does not shorten the payback period. This improvement would only occur if the Feed-in tariff amount were to increase.

In practical terms, biogas plants that benefit from the extended incentive period will operate under the same conditions, meaning their annual income will remain relatively constant unless the cost of raw materials—the largest operating expense—continues to rise. If these

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costs do increase, the only sustainable solution for the sector may involve generating additional income or savings from by-products such as digestate, thermal energy, and bio-CO2.

Overall, extending the contract for the Feed-in tariff will support the continuation of the biogas sector and prevent its gradual decline. However, to further strengthen and ensure the sustainability of this sector, additional collaborative efforts are essential. An alternative strategy would be to establish a biomethane sector in Serbia, which would be based on better conditions for plant operators.

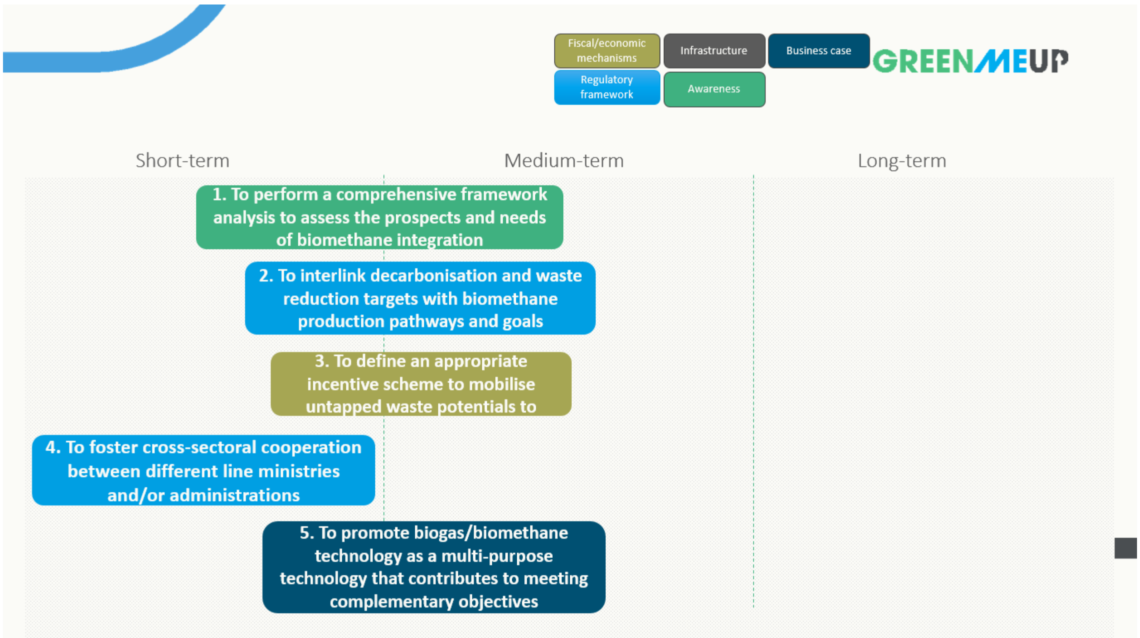

Figure 7 : Results of SWOT analysis in Serbia.

Totally, twelve stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 3 for the case of Danube region.

Table 3: Overview of the applied Fuzzy Cognitive Mapping in Danube region.

Individual maps	Policy Hub: 4, Market Hub: 4, Society Hub: 4
Number of variables	19
Number of connections	88
Number of transmitter variables	4
Number of receiver variables	0
Number of ordinary variables	15
Receiver to transmitter ratio	0.00
Density	0.244

According to the results of the FCM method in Danube region (Table 4), the most important factors consist of the definition of national biogas/biomethane strategies/action plans with production targets, the harmonized/enabling regulatory framework and the cooperation among national/sub-national administrations and sector stakeholders. Moreover, the establishment and expansion of biogas/biomethane supply chains, including by-products as

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well as the knowledge transfer, education, training on up-to-date technologies for biogas/biomethane production are considered also as highly significant parameters.

Furthermore, the support schemes for biogas/biomethane producers and consumers and the feedstock collection logistics networks and mapping of feedstock potentials are also substantial, in parallel with the development of bio-CNG/bio-LNG fuelled transport. Important parameters include the synergies with agriculture and waste management sectors, in combination with the inspection of the aforementioned sectors.

All the identified concepts are summarized in Table 4 for the case of Danube region.

Table 4: Results of the applied Fuzzy Cognitive Mapping in Danube region.

Concepts	Centrality	Outdegree	Indegree
Cooperation among national/sub-national administrations and sector stakeholders	4.02	2.48	1.53
Definition of national biogas/biomethane strategies/action plans with production targets	3.48	2.00	1.48
Establishment and expansion of biogas/biomethane supply chains, including by-products (digestate, CO2)	3.35	1.18	2.17
Knowledge transfer, education, training on up-to-date technologies for biogas/biomethane production	3.03	1.65	1.38
Harmonised/enabling regulatory framework (incl. standards, etc)	2.73	1.42	1.32
Support schemes for biogas/biomethane producers, consumers	2.68	1.20	1.48
Feedstock collection logistics networks and mapping of feedstock potentials	2.48	1.07	1.42
Improve social perception/awareness of biogas/biomethane	2.02	0.92	1.10
Support Development of bio-CNG/bio-LNG fuelled transport	1.30	0.35	0.95
Development of bio-CNG/bio-LNG fuelled transport	0.55	0.18	0.37
Pilot projects (inclusive, circular)	0.52	0.52	0.00
Offering development as regulations under the num of Res & Ro	0.33	0.17	0.17
Network operators carrying substantial part of grid injection related CAPEX	0.27	0.07	0.20
Synergies with agriculture and waste management sectors	0.17	0.08	0.08
Planning and building of infrastructure	0.13	0.13	0.00
Inspection in Waste Management	0.12	0.12	0.00
Demonstration Projects	0.12	0.12	0.00
Access to finances	0.10	0.05	0.05
Feedstock availability and characteristics	0.03	0.02	0.02

The proposed policies and measures are summarized in Figure 8 outlining the main aspects, which should be taken into consideration in Danube region.

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Policy measure No1 **Promoting a holistic framework for cooperation and dialogue**

- Engage actively all the involved stakeholders with institutionalized and co-designed approaches
- Establish a network with the balanced participation of all the involved stakeholders
- Ensure the cooperation of the involved stakeholders and promote university–industry partnerships
- Foster the cross-border cooperation with targeted measures

Policy measure No2 **Drafting a strategy and adopting the required legislation**

- Formulate a dedicated strategy for the further penetration of biomethane with specific targets and policies
- Introduce circular economy and waste reduction goals
- Adopt the required legislation for achieving the specified targets

Policy measure No3 **Establishing the required supply chains**

- Stimulate and support the development of a reliable and competitive equipment supply chain
- Facilitate the technology transfer and provide training and certification to the involved stakeholders

Policy measure No4 **Raising awareness with capacity building activities**

- Conduct capacity building and training activities to increase the existing level of knowledge
- Understand and disseminate the economic, social and environmental benefits and risks

Policy measure No5 **Harmonising/enabling the regulatory framework**

- Simplify, improve, streamline and harmonize the existing legislative framework
- Establish a trasnparent grid injection cost sharing approach among network operators
- Remove any legislative barriers

Policy measure No6 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.) aiming at the long-term price guarantees
- Support pilot and demonstration projects
- Enable aggregator models to empower smaller producers through collective access to funding and markets

Policy measure No7 **Assessing the feedstock potential**

- Assess, identify and incentivise the untapped feedstock potential
- Prioritize the use of organic waste and manure as feedstock for localized biogas plants
- Map the targeted feedstock potential

Policy measure No8 **Promoting the use of bio-CNG/bio-LNG**

- Support the use of bio-CNG/bio-LNG with economic measures and public procurement mandates
- Develop the appropriate infrastructure for the promotion of bio-CNG/bio-LNG
- Identify and boost additional demand related to the consumption of bio-CNG/bio-LNG

Figure 8 : Proposed policies and measures in Danube region.

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In alignment with the results above, further stakeholders' engagement to corroborate results emphasizes the need to develop or update national Biogas and Biomethane Action Plans, ensuring that they align with EU targets and regional investment roadmaps. Financial mechanisms such as long-term price guarantees are advocated to reduce investors' risk. Moreover, embedding biomethane deployment pathways into National Energy and Climate Plans (NECPs) with binding targets is considered critical to support infrastructure longevity and improve clarity for market participants.

Complementing these priorities, expected policy measures should prioritize the use of organic waste and manure as feedstock for localized biogas plants and promote the alignment of biomethane strategies with circular economy and waste reduction goals. Funding support for small and medium-scale digesters co-located with farms or municipalities is considered a strategic opportunity— which also translates into community-level resilience. Specific attention is placed on community involvement and social equity through institutionalized engagement during the planning and permitting stages. Ensuring procedural justice and communicating local benefits, such as energy security and job creation, are also prioritized to boost public acceptance.

Policy measures advocate for university–industry partnerships, standardized training curricula, and technical certification programs. Platforms for digital knowledge exchange and demonstration projects are identified as mechanisms to enhance technological readiness and stakeholder skills. To this aim, integrating tax incentives or excise tax reforms to support the competitiveness of biomethane, especially in the transport sector, is highly recommended. Public procurement mandates for renewable fuel usage in transport fleets, co-financing of refueling infrastructure, and carbon intensity benchmarks are introduced as actionable pathways. Emphasis is placed on encouraging joint investment models between producers and fleet operators, especially under public-private partnerships, to de-risk early adoption.

In terms of financial mechanisms, proposals include the establishment of public investment funds, access to EU-level financing instruments, and the use of guarantees, soft loans, and credit enhancements. Launching competitive calls for proposals with KPIs aligned to renewable energy and circularity goals is encouraged. Furthermore, aggregator models are suggested to empower smaller producers through collective access to funding and markets.

Cross-border cooperation is another recurring objective, with recommendations for intergovernmental coordination bodies to harmonize grid access standards, encourage joint infrastructure projects, and facilitate the implementation of a regional Guarantees of Origin (GoO) scheme. Such a framework, especially if linked to voluntary carbon markets and the EU ETS, is expected to provide transparency, stimulate investment, and promote regional trade.

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Chapter 5: Policy measures in Estonia

In Estonia, the construction of biomethane injection facilities to the Category D gas network to support biomethane feed-in to transmission network, the simplification of digestate certification and expansion of marketing opportunities as well as the reduction of market uncertainty, stabilization of price and demand with regulations, common market port, etc. are considered as the most important parameters at short-term basis according to the results of SWOT analysis (see Figure 9). The provision of subsidies and incentives for transport companies for the purchase of gas trucks and buses should be fostered in the medium term, while the expansion of the use of biomethane into new areas of use, including liquefied, such as shipping, should be implemented in the long run.

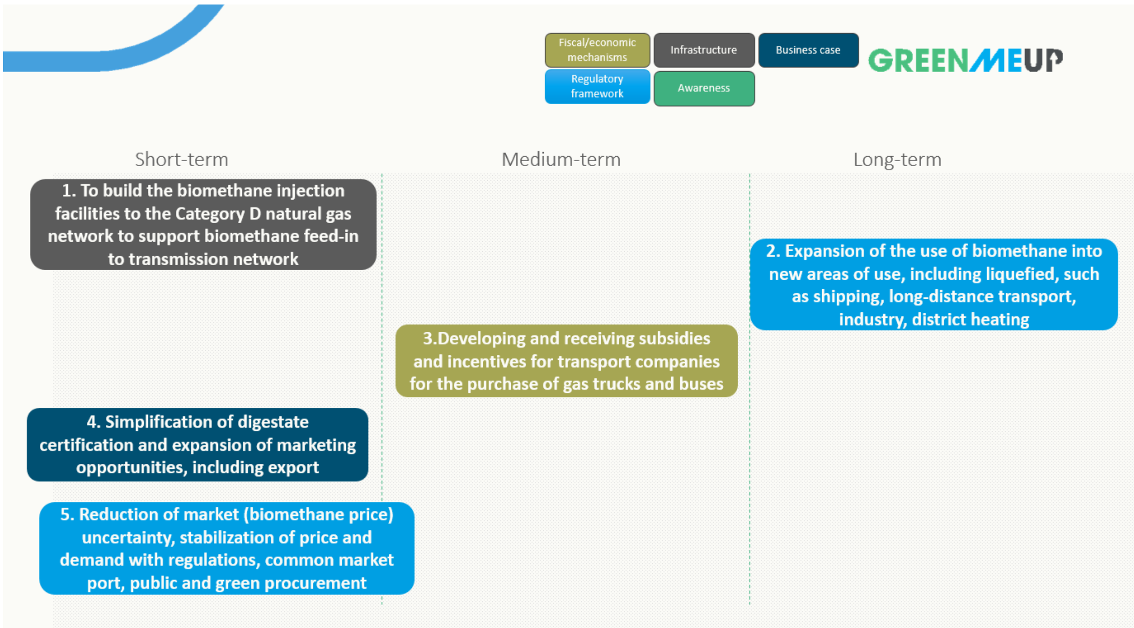

Figure 9 : Results of SWOT analysis in Estonia.

Totally, eight stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 5 for the case of Estonia.

Table 5: Overview of the applied Fuzzy Cognitive Mapping in Estonia.

Individual maps	Market Hub: 5, Society Hub: 3
Number of variables	92
Number of connections	120
Number of transmitter variables	31
Number of receiver variables	25
Number of ordinary variables	34
Receiver to transmitter ratio	0.81
Density	0.014

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

According to the results of the FCM method in Estonia (Table 8), the formulation of a vision to promote both biomethane and digestate production and consumption, the identification of the required funds and the targeted promotion of biomethane in all end-use sectors so as to create the required demand can be characterized as the most essential parameters for the development of biomethane market. Moreover, the development of a digestate market and the active role of the policy makers are considered also as highly significant parameters during the design of policies and measures.

All the identified concepts are summarized in Table 6 for the case of Estonia.

Table 6: Results of the applied Fuzzy Cognitive Mapping in Estonia.

Concepts	Centrality	Outdegree	Indegree
Government does not have vision to promote biomethane and digestate production and consumption	1.37	1.13	0.23
Lack of funding	1.13	0.27	0.87
Which technology and fuels will prevail (2035) H2, engines, electricity	1.10	0.17	0.93
Enlarging the biomethane use in other sectors, when internal combustion engine is banned	0.93	0.17	0.77
To support the biomethane production	0.93	0.43	0.50
Production and consumption of the BioCH4 is good, cheap, ready-technology	0.90	0.23	0.67
Non-decisive – not taking responsibility	0.87	0.20	0.67
To finance biogas plants is complicated	0.73	0.00	0.73
Uncertainty of biogas plant developers about the biogas production feasibility	0.73	0.00	0.73
Unclear messages from EU – is the H" really solution, if 95% H2 is made from fossil fuels	0.67	0.67	0.00
Digestate market is unregulated, the demand is unclear, and the price is unclear	0.63	0.50	0.13
Soil fertality and it connection, impact from cattle breeding	0.63	0.50	0.13
To get certificate for the biogas digestate as fertilizer is complicated	0.63	0.50	0.13
The consumption of the CBM / LBM in heavy duty vehicles is not enough high	0.60	0.00	0.60
The unpredictability of the European institutions on for how long the biogas considers as green fuel	0.57	0.57	0.00
Na-batteries might be the solutions	0.53	0.53	0.00
The impact of increased number of green biomass harvesting to the natural diversity	0.53	0.53	0.00
Car manufacturing regulations should be life-cycle based rather than fuel-type based	0.53	0.27	0.27
Public procurements should be considering environmental impact rather than price and are not fulfilled	0.53	0.27	0.27
Awareness of biogas, biomethane, impacts, energetic nature, how it contributes to climate goal	0.50	0.40	0.10
We can maybe exceed the GHG targets, which gives others breathing room or a quota will be created, 24% to reduce the generation of GHG in transport	0.50	0.10	0.40

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Concepts	Centrality	Outdegree	Indegree
Heavy transport should differentiate taxes for renewable fuel vehicles compared to fossil fuel vehicles	0.47	0.23	0.23
NH3 is with the same space-volume RUUMALA, H2 more compared to the liquefied H2	0.40	0.27	0.13
Public procurement requirements are not fulfilled	0.40	0.13	0.27
Bank guarantee demand from environmental civil servants is nonsense, if you use biowaste	0.40	0.40	0.00
Slow process of the certification of the digestate, before certification you can't sell the digestate	0.40	0.10	0.30
Unpredictable Change in consumption and among consumers	0.40	0.00	0.40
Low awareness of the civil servants and lack of practical [biogas related] experiences	0.37	0.27	0.10
Estonian companies do not have strategic goal to use biofuels	0.33	0.27	0.07
The consumer's fee is too high of using natural gas /biomethane from distribution natural gas grid	0.33	0.33	0.00
The last day to inject to transmission grid is end of 2038?	0.33	0.33	0.00
The status of the transmission grid in future is unclear	0.33	0.33	0.00
Missing biomethane promoting strategy will affect the decisions of the banks to lend money for biogas plants	0.33	0.10	0.23
The long term GO and green certificate off-take contracts are missing, no confidence, that producer can sell the biomethane certificates next ten years	0.33	0.10	0.23
To build the CNG/CBM filling station is more expansive compared to the classical fossil fuels' filling station	0.33	0.10	0.23
Confusing messages from the EC, and from the Estonian Government	0.33	0.23	0.10
Need for the biomethane injection points to the NG transmission grid	0.33	0.00	0.33
The cost of the injection point to transmission grid is too expensive for producers	0.33	0.00	0.33
Lack of qualified experts/labor force in rural areas	0.30	0.00	0.30
City buses will start to use HVO instead of the biomethane	0.27	0.27	0.00
Competition in energy market	0.27	0.27	0.00
Farming emission tax and fossil fertilizer tax might raise interest among farmers to construct new biogas plants	0.27	0.27	0.00
Biomethane plants should be bigger to bring down production costs	0.27	0.13	0.13
ETS 2 reduces the price difference of the biomethane and other renewable fuels	0.27	0.13	0.13
The price of the biogas/biomethane is much higher than the natural gas, only the molecule price Is not competitive	0.27	0.13	0.13
Universities are making unprofessional research on biogas	0.27	0.17	0.10
Existing infrastructure, lower cost (due to Sweden blending obligation drop) and higher availability	0.27	0.10	0.17
"Silo towers" effect	0.27	0.00	0.27
Safety issues are not fully recognized in the case of using bioH2 in transport	0.27	0.00	0.27
The narrow mindset of the digestate-fertilizer certification auditor	0.23	0.10	0.13

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Concepts	Centrality	Outdegree	Indegree
5% of livestock will have to be grazed, which will lower 2nd generation feedstock availability for the plants	0.23	0.23	0.00
Economic factors - HVO footprint, the competence of this certificate if it is from third countries	0.23	0.00	0.23
Methane fuels have the future on heavy duty transport	0.23	0.00	0.23
There is no technology neutrality - there is CAPEX support to the H2 filling station but not to CBM filling station	0.20	0.20	0.00
Biogas/biomethane is local, renewable fuel of Future	0.20	0.10	0.10
Different depths and speeds of procedural processes	0.20	0.10	0.10
Fuel excise tax is 0 for biomethane, which supports the biomethane	0.20	0.10	0.10
The punctuality in demands (in permitting process) not understanding the biogas technologies	0.20	0.10	0.10
Lack of less packaging system to ensure the “floor price” of the biomethane	0.20	0.00	0.20
General too low awareness of the biogas and biomethane	0.17	0.17	0.00
There is no feedback in development	0.17	0.17	0.00
The negative attitude and tease of the neighbors and if they comply constantly to the local municipality and the civil servants in this municipality is afraid of making decisions	0.17	0.00	0.17
Cheap price of the fossil fuels, again, not the combustion engine is not bad, but fossil fuel usage in it courses climate change	0.13	0.13	0.00
Children of the biogas plant workers; to pay to the children for the spatial plan; but the right to pay is only for the actual costs for the beginning decision of the spatial plan	0.13	0.13	0.00
H2 promoters unfortunately distribute negative messages about biomethane (e.g. leakages from the production) with aim to increase the importance of the H2	0.13	0.13	0.00
Natural gas grid should become 2 pipe=2 direction meaning the if you inject at the end of the distribution network, injected biomethane can be transported to upstream	0.13	0.13	0.00
Subsidies, discounts	0.13	0.13	0.00
The (safety) regulations of filling stations are fixed, clear and working well in Estonia, it is pan-European	0.13	0.13	0.00
There is political certainty/continuity	0.13	0.13	0.00
Transport sector does not value biomethane as green fuel. Footprint calculations should evaluate CI score not volume	0.13	0.13	0.00
Wood based heating systems have better energy class than biomethane based heating systems	0.13	0.13	0.00
1000ha/a will be covered with forest, which will lower the feedstock availability for biogas plants	0.13	0.00	0.13
1000ha/a will be turned into wetland, which might or might not raise the availability of feedstocks for biogas plants	0.13	0.00	0.13
Lack of regulations for biomethane use in heating	0.13	0.00	0.13
The problems of certifying the digestate	0.13	0.00	0.13
Virtual pipeline is more expensive, but the local distribution grid is not able to take in all the produced biomethane	0.13	0.00	0.13
GHG objectives of the agricultural sector	0.10	0.10	0.00

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Concepts	Centrality	Outdegree	Indegree
Not moving towards CO2 based GHG emission reduction calculation methodology in transport	0.10	0.10	0.00
Permitting process is long, annoying – the circle of the stakeholders to be invited to the public hearing should be bigger	0.10	0.10	0.00
The extreme diligence of the civil servants without seeing the “bigger picture”	0.10	0.10	0.00
The impact of foreign markets - the market is bigger and the prices are harmonizing	0.10	0.10	0.00
Which is better, RED III options for GHG reduction: volume based or CO2 reduction based	0.10	0.10	0.00
Biomethane was cheaper in the filling station compared to the price of the biofuels	0.10	0.00	0.10
Making changes in spatial plan as part of the permitting process	0.10	0.00	0.10
No biogas cluster - cooperation with hydrogen cluster	0.10	0.00	0.10
People are the root cause - where there are leaders, things happen	0.10	0.00	0.10
There are no Biostation initiatives - novelty, involvement of young people, consumption and supply	0.10	0.00	0.10
Conflict of interest, interest of market participants may be different	0.03	0.03	0.00
How the GHG calculation will be carried out	0.03	0.00	0.03
Nonsense circularity – Finnish company produces H2 from natural gas, and then e-methane from this fossil H2	0.03	0.00	0.03
Estonian message – all busses must be with 0-emissions	0.00	0.00	0.00
The single civil servant is not able to make decision will lead to the “collective responsibility” where nobody will be responsible of the consequences the “collective” decision	0.00	0.00	0.00

The proposed policies and measures are summarized in Figure 10 depicting the main aspects, which should be taken into consideration in Estonia.

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Policy measure No1 **Formulating a vision for the promotion of biomethane**

- Prepare a dedicated strategy for the further penetration of biomethane with specific targets and policies
- Adopt the required legislation for achieving the specified targets

Policy measure No2 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.) to reduce the investment uncertainty
- Support the construction of filling stations and injection points

Policy measure No3 **Fostering the consumption side**

- Provide simplified financial support for accelerating the consumption of biomethane (e.g. such as indicatively subsidies, fiscal measures etc.)
- Define targets for biomethane consumption in specific end-use sectors (e.g. heavy goods vehicles, industry etc.)

Policy measure No4 **Promoting digestate based biofertilizer production**

- Design targeted regulatory and economic measures for the exploitation of the municipal and agricultural waste
- Promote the use of digestate as soil fertilizer into a regulated digestate market
- Simplify the certification of the digestate based biofertilizer

Policy measure No5 **Reinforcing the implementation of the public procurement procedures**

- Review and adapt the public procurement legislation so as to select the utilization and consumption of biomethane
- Incentivise the use of biomethane-based transport solutions

Policy measure No6 **Raising awareness with capacity building activities**

- Conduct capacity building activities to increase the existing level of knowledge
- Provide trainings to the respective professionals to enhance their skills

Policy measure No7 **Strengthening the role of the policy makers**

- Develop and apply specialised decision-making procedures with clear duties and responsibilities
- Support technically the policy makers to identify and implement the most effective solutions

Figure 10 : Proposed policies and measures in Estonia.

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Chapter 6: Policy measures in Greece

In Greece, the conduction of SWOT analysis (Figure 11) revealed that biomethane plants should be supported with capital and/or operational subsidies as it is considered as a crucial factor. The maximum exploitation of the theoretical biomethane potential is another substantial parameter, while the promotion and utilization of the digestate as soil fertilizer and the sequential cropping can facilitate the further penetration of biomethane. Finally, the promotion of the gas market as this will be the main carrier of biomethane is also.

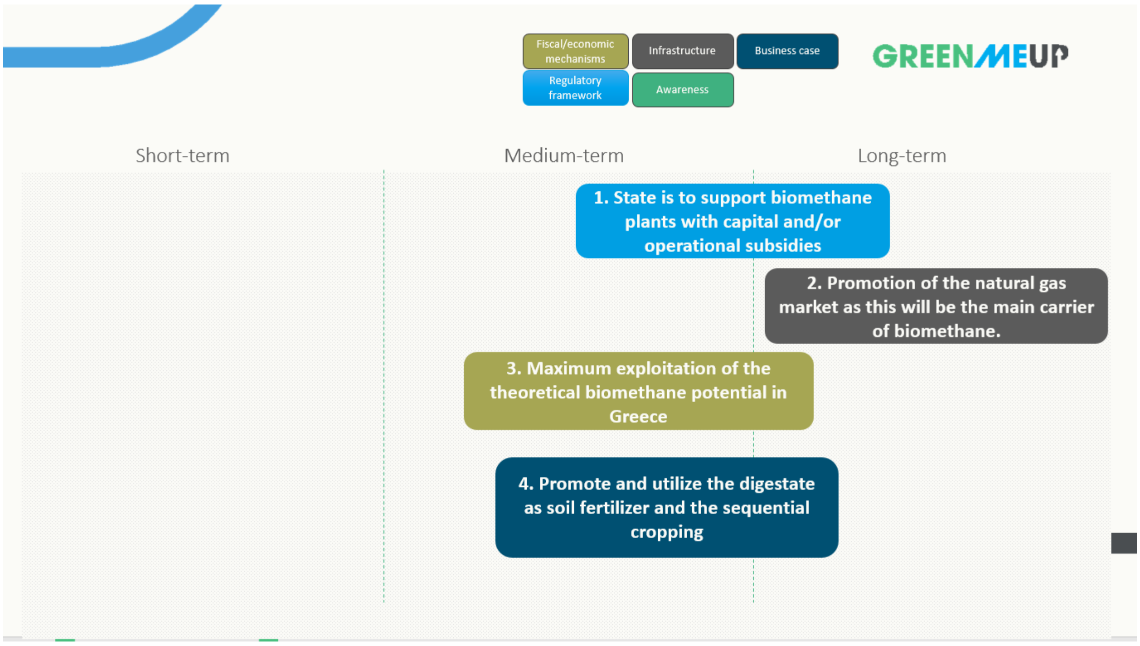

Figure 11 : Results of SWOT analysis in Greece.

Totally, eight stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 7 for the case of Greece.

Table 7: Overview of the applied Fuzzy Cognitive Mapping in Greece.

Individual maps	**Policy Hub: 2, Market Hub: 5, Society Hub: 1**
Number of variables	58
Number of connections	139
Number of transmitter variables	18
Number of receiver variables	3
Number of ordinary variables	36
Receiver to transmitter ratio	0.17
Density	0.041

According to the results of the FCM method in Greece (Table 8), the preparation of a national strategy, the adoption of a legislative framework, the introduction of investment and operational support scheme and financial incentives, the availability and collection of raw materials along with the location and licensing of units can be characterized as the most

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important parameters for the development of biomethane market. It should be noted that the promotion of waste management and the social acceptance are considered also as critical factors, which must be taken into account during the design of policies and measures.

All the identified concepts are summarized in Table 8 for the case of Greece.

Table 8: Results of the applied Fuzzy Cognitive Mapping in Greece.

Concepts	Centrality	Outdegree	Indegree
Development of biomethane market	5.83	0.05	5.78
Raw materials	2.02	1.22	0.80
Social acceptance	1.28	0.63	0.65
Location of units	1.10	0.78	0.32
Waste management	0.95	0.73	0.22
National Strategy and legislation	0.85	0.85	0.00
Licensing of units	0.83	0.48	0.35
Investment support scheme	0.75	0.42	0.33
Financial incentives	0.75	0.62	0.13
By-product management	0.75	0.47	0.28
Supply chain	0.72	0.22	0.50
Operational support scheme	0.70	0.45	0.25
Availability and collection of raw material	0.63	0.42	0.22
Consumer awareness campaign	0.60	0.35	0.25
Environmental impact of units	0.53	0.37	0.17
Legal framework	0.43	0.30	0.13
Problem solving for biogas production	0.40	0.23	0.17
Demand increase in the final consumption sectors	0.33	0.13	0.20
Disposal of digested residue	0.30	0.25	0.05
Legal framework for waste/biomass management	0.27	0.22	0.05
Virtual liquefaction	0.25	0.25	0.00
Staffing and organization of services for the licensing and control of the operation of units	0.23	0.13	0.10
Cost of gas network connection and use	0.23	0.15	0.08
Proper utilization (not electricity production)	0.23	0.15	0.08
Targets	0.22	0.13	0.08
Coverage of needs provided for by the legislative framework	0.22	0.08	0.13
Biomethane specifications	0.22	0.22	0.00
Difficulty of building large units	0.22	0.05	0.17
Existence of LNG bunkering market	0.22	0.05	0.17
Gas mobility market maturity	0.22	0.05	0.17
Use of bioLNG and bioCNG near urban area	0.20	0.15	0.05
PPAs	0.20	0.20	0.00
Certification as renewable gas	0.17	0.12	0.05
Support for upgrading existing units (anaerobic digestion and gasification) to biomethane units	0.17	0.12	0.05
Disincentives for unsustainable waste management	0.15	0.15	0.00
Terms of connection to the national grid	0.15	0.08	0.07
Economic sustainability	0.13	0.13	0.00
Technological progress (gasification)	0.13	0.08	0.05

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Concepts	Centrality	Outdegree	Indegree
Limited quantities	0.13	0.00	0.13
Market mechanisms	0.12	0.12	0.00
Positive environmental impact of units	0.12	0.12	0.00
European interconnection/harmonization	0.10	0.05	0.05
Biogas power generation incentives	0.08	0.08	0.00
Low level of knowledge	0.08	0.08	0.00
Workforce training and specialization	0.08	0.08	0.00
Transparency	0.08	0.03	0.05
Access to the distribution/transmission network	0.07	0.07	0.00
Expertise in building. operating and managing units	0.07	0.07	0.00
Non-cooperation of manure/wastewater producers – supply problem	0.07	0.07	0.00
Utilization of national and European resources	0.07	0.07	0.00
Disincentives at the biogas production stage	0.07	0.03	0.03
Secondary raw material market	0.07	0.03	0.03
Availability of urban and other wastewater treatment units	0.07	0.00	0.07
Competition with RDF/SRF	0.05	0.05	0.00
High level of bureaucracy	0.05	0.05	0.00
Use of existing infrastructure for heating buildings	0.05	0.00	0.05
RES competitive advantage	0.03	0.03	0.00
Availability/connectivity of networks	0.00	0.00	0.00

The proposed policies and measures are summarized in Figure 12 depicting the main aspects, which should be taken into consideration in Greece.

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Policy measure No1 **Assessing the feedstock potential**

- Assess and map the sustainable feedstock potential
- Identify and incentivise the untapped feedstock potential on a long-term basis
- Draft guidelines for the most effective exploitation of the identified feedstock potential

Policy measure No2 **Raising awareness with capacity building activities**

- Conduct capacity building activities to increase the existing level of knowledge
- Understand and disseminate economic, social and environmental benefits and risks
- Facilitate the technology transfer and provide trainings to the respective professionals

Policy measure No3 **Establishing efficient permitting and spatial procedures**

- Simplify and streamline the permitting procedures to reduce the length and the bureaucracy
- Conduct spatial gas grid planning based on the mapping of biomethane production potential

Policy measure No4 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.)

Policy measure No5 **Adopting the regulatory framework for waste management**

- Design and adopt a long-term regulatory and legal framework for the targeted exploitation of available wastes

Policy measure No6 **Fostering the exploitation of the by-products**

- Design targeted regulatory and economic measures for the exploitation of the available by-products
- Promote the use of digestate as soil fertilizer

Policy measure No7 **Establishing the required supply chains**

- Stimulate and support the development of a reliable and competitive equipment supply chain
- Provide training to the involved stakeholders to improve their skills and to ensure quality

Policy measure No8 **Drafting a strategy and adopting the required legislation**

- Formulate a strategy for the further penetration of biomethane with specific targets and policies
- Adopt the required legislation for achieving the specified targets
- Establish the reverse flow framework ensuring the cooperation of the involved administrators

Figure 12 : Proposed policies and measures in Greece.

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Chapter 7: Policy measures in Latvia

In Latvia, the conduction of SWOT analysis (Figure 13) outlined that the provision of targeted investments and incentives as well as the leverage of current infrastructure for EU funding are perceived as the most important parameters. The strengthening of the regulatory framework and the conduction of awareness-raising and education campaigns should be foreseen in the short term, while the integration of biomethane with circular economy is anticipated in the long run.

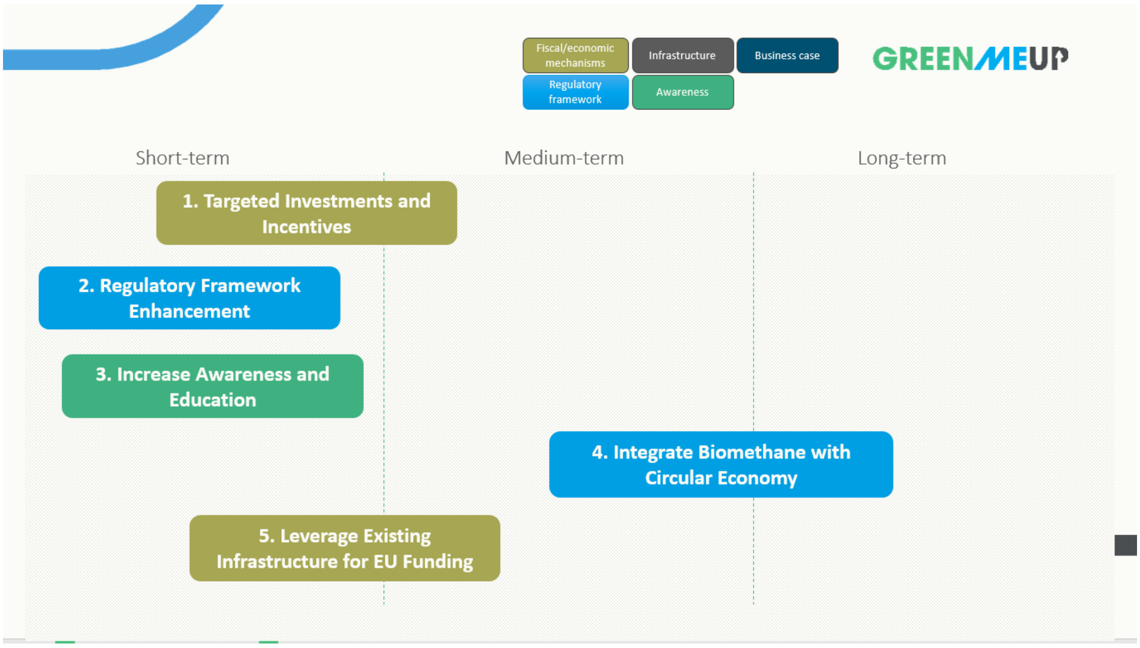

Figure 13 : Results of SWOT analysis in Latvia.

Totally, eight stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 9 for the case of Latvia.

Table 9: Overview of the applied Fuzzy Cognitive Mapping in Latvia.

Individual maps	Policy Hub: 2, Market Hub: 6
Number of variables	54
Number of connections	108
Number of transmitter variables	6
Number of receiver variables	11
Number of ordinary variables	37
Receiver to transmitter ratio	1.83
Density	0.037

According to the results of the FCM method in Latvia (Table 10), the lack of current legislation, the frequent change of regulations, the willingness to invest in biomethane as well as the developed targets for biomethane use in transport sector appear to be of high importance. At the same time, the low potential and the need for investments of biomethane production,

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the incentives for biomethane consumption, the lack of support for infrastructure development as well as the existence of an appropriate infrastructure in terms of input into the network and for the consumption and transmission filling are also vital factors.

All the identified concepts are summarized in Table 10 for the case of Latvia.

Table 10: Results of the applied Fuzzy Cognitive Mapping in Latvia.

Concepts	Centrality	Outdegree	Indegree
Willingness to invest (availability of funds, support for equipment, infrastructure)	1.18	0.18	1.00
Frequent change of regulations	1.02	0.90	0.13
Lack of support for infrastructure development	0.97	0.45	0.53
Low potential of biomethane production	0.70	0.35	0.35
Lack of current legislation	0.62	0.32	0.30
Developed targets for biomethane use in transport sector	0.60	0.17	0.43
Investments in production	0.58	0.00	0.58
Normative regulation. its existence	0.55	0.30	0.25
Biomethane consumption. consumption incentive	0.50	0.30	0.20
Infrastructure (input into the network) and also for filling (consumption and transmission)	0.50	0.20	0.30
Lack of support for transport	0.50	0.22	0.28
Unstable electricity generation price/market price fluctuations	0.47	0.40	0.08
Local businesses lack motivation to purchase locally produced biomethane	0.45	0.22	0.23
CAPEX support	0.43	0.28	0.15
EU energy and climate targets	0.43	0.38	0.05
Biogas is not a priority in energy policy	0.40	0.15	0.25
Restrictions on methane utilization in gas supply	0.40	0.20	0.20
Availability of raw materials	0.35	0.30	0.05
Wide applicability of gas as a transport fuel	0.35	0.10	0.25
Lack of support from municipalities for biomethane development	0.35	0.17	0.18
Clearly defined goals (in policy planning documents)	0.32	0.32	0.00
Lack of long-term strategy	0.30	0.13	0.18
Public opinion	0.30	0.25	0.05
Public awareness of biomethane	0.30	0.30	0.00
Project profitability	0.28	0.10	0.18
Availability of vehicles	0.25	0.13	0.13
Transport energy law	0.25	0.25	0.00
Cross-border trade (import/export)	0.23	0.03	0.20
Opportunities for companies to use biomethane as green energy to meet their sustainability goals	0.23	0.13	0.10
Political settlement	0.22	0.17	0.05
Negative previous experience of support mechanisms	0.20	0.13	0.08
Unstable and unclear political environment	0.20	0.00	0.20
Employment in the industry	0.18	0.08	0.10
Lack of infrastructure/specificity	0.18	0.08	0.10
Tax policy	0.18	0.10	0.08

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Concepts	Centrality	Outdegree	Indegree
Equipment prices	0.18	0.00	0.18
The price difference between biomethane and methane	0.13	0.08	0.05
Support of commercial banks for project implementation (not financed)	0.13	0.05	0.08
Low biofuel targets	0.13	0.00	0.13
Low fines in the transport sector for failure to meet targets	0.13	0.00	0.13
No standardized methodology for biogas statistics	0.13	0.00	0.13
Support for infrastructure	0.13	0.13	0.00
Vehicle policy for CNG/LNG (lower taxes. purchase support)	0.13	0.13	0.00
Lack of recognition in society and government	0.10	0.05	0.05
Support for transport development	0.10	0.00	0.10
Bureaucratic disorder from a legal perspective involves establishing points of pressure	0.08	0.03	0.05
Clear and reasonable technical requirements that must be met for the injection point	0.08	0.03	0.05
The issue of land property rights	0.08	0.00	0.08
Equipment delivery time limits	0.05	0.05	0.00
Lack of support for producers in purchasing biomethane equipment. insufficient utilization of EU financial resources	0.05	0.03	0.03
Restriction of fossil fertilizers and untreated manure in agriculture	0.05	0.03	0.03
Stability in the market	0.05	0.00	0.05
The desire to farm more efficiently. to produce electricity more efficiently	0.05	0.00	0.05
Integration and system ambiguity of GO and POS systems	0.03	0.00	0.03

The proposed policies and measures are summarized in Figure 14 presenting the main aspects, which should be taken into consideration in Latvia.

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Policy measure No1 **Ensuring political and regulatory stability**

- Continue, monitor and improve the existing policy framework
- Assess and improve the legislative framework
- Remove any legislative barriers

Policy measure No2 **Drafting a roadmap and adopting the required legislation**

- Prepare a roadmap for the further penetration of biomethane with specific targets and policies
- Adopt the required legislation for achieving the specified targets

Policy measure No3 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures etc.)

Policy measure No4 **Assessing and increasing the feedstock potential**

- Assess the sustainable feedstock potential
- Identify and incentivise the untapped feedstock potential
- Map the targeted feedstock potential

Policy measure No5 **Fostering the consumption side with targeted incentives**

- Provide financial support for accelerating the consumption of biomethane (e.g. such as indicatively subsidies, fiscal measures etc.)
- Define targets for biomethane consumption

Policy measure No6 **Developing the required infrastructure**

- Accelerate the construction of the required infrastructure based on the mapping of biomethane production potential
- Develop a zoning approach according to infrastructure grid and assess future needs

Policy measure No7 **Raising awareness with capacity building activities**

- Conduct capacity building activities to increase the existing level of knowledge
- Understand and disseminate economic, social and environmental benefits and risks
- Facilitate the technology transfer and provide trainings to the respective professionals

Figure 14 : Proposed policies and measures in Latvia.

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

Chapter 8: Policy measures in Poland

The development of a biomethane strategy in Poland with a clear target in different energy sectors, the promotion of the decarbonisation of the transport sector by including biomethane as key transportation fuel, the promotion of the involvement of local actors in knowledge transfer and innovation as well as the introduction of improvements to obtain required permits are considered as the most important factors at short-term basis according to the results of SWOT analysis (Figure 15). The only parameter that refers to the short and medium term is the introduction of economic instruments to support the biomethane market.

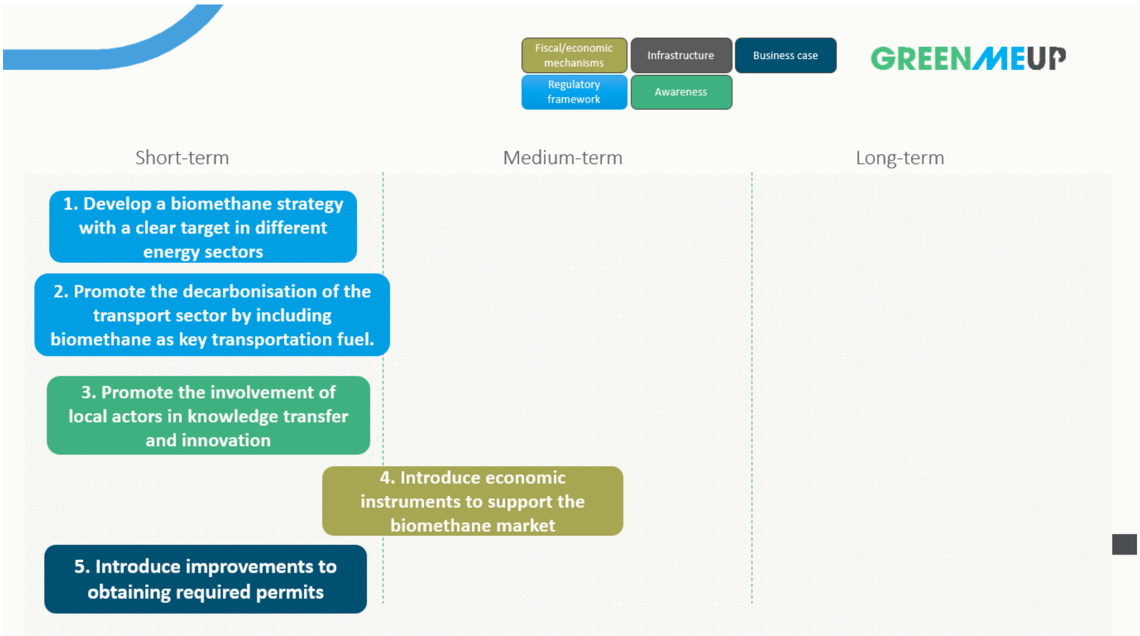

Figure 15 : Results of SWOT analysis in Poland.

Totally, ten stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 11 for the case of Poland.

Table 11: Overview of the applied Fuzzy Cognitive Mapping in Poland.

Individual maps	**Policy Hub: 2, Market Hub: 3, Policy-Market Hubs:4 and Policy-Society Hubs: 1**
Number of variables	23
Number of connections	66
Number of transmitter variables	5
Number of receiver variables	2
Number of ordinary variables	16
Receiver to transmitter ratio	0.40
Density	0.125

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

According to the results of the FCM method in Poland (Table 12), the large feedstock potential resulting from the agri-food industry and waste management and its interest in using green gas in conjunction with closed-loop waste management are the most important parameters that will help protect the environment. In addition, the introduction of reference prices for biomethane, the financial support for renewable energy projects, the further development of gas network, gaining some independence from imported gas, as well as several difficulties with fulfilment of EU requirements concerning share of RES in transport in RED are of paramount importance.

All the identified concepts are summarized in Table 12 for the case of Poland.

Table 12: Results of the applied Fuzzy Cognitive Mapping in Poland.

Concepts	Centrality	Outdegree	Indegree
Large feedstock potential resulting from the agri-food industry and waste management	2.48	1.66	0.82
Industry e.g. agri-food sector are interested in use of green gas - reduction of GHG emissions from their production	1.30	0.48	0.82
Closed-loop waste management will help protect the environment	1.24	0.58	0.66
Amendment of the RES Act in 2023	1.04	0.78	0.26
Introduced reference prices for biomethane	0.96	0.52	0.44
Financial support for renewable energy projects	0.90	0.68	0.22
Developed gas network	0.78	0.28	0.50
Difficulties with fulfilment of EU requirements concerning share of RES in transport in RED	0.70	0.10	0.60
Gain some independence from imported gas	0.66	0.16	0.50
EU climate policy	0.64	0.32	0.32
Increasing demand for carbon dioxide from renewable sources will improve the return on investment	0.48	0.16	0.32
Ability to replace about 20% of current natural gas imports with biomethane	0.46	0.18	0.28
10% of gaseous fuels transported via gas grids should be renewable and low-emission ones in 2030 (PEP2040)	0.42	0.00	0.42
OPEX support by biogas plants	0.30	0.12	0.18
Plans of the distribution companies for the increase of the absorption capacity of the gas networks	0.28	0.14	0.14
Introduced new biofuels – biomethane and biohydrogen for the fulfilment of the national indicative target	0.20	0.00	0.20
Current geopolitical situation (war in Ukraine, gas and energy prices)	0.16	0.10	0.06
An amendment of PEP 2040 is under preparation	0.16	0.16	0.00
Lack of a biomethane development strategy with clear targets	0.12	0.06	0.06
Social protests against biogas and biomethane projects	0.10	0.10	0.00
Problems with obtaining administrative permissions	0.10	0.10	0.00
No clear rules of cooperation between gas system operators and producers	0.08	0.08	0.00
Lack of support system for larger biomethane installations (> 1 MW)	0.04	0.04	0.00

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

The proposed policies and measures are summarized in Figure 16 summarizing the main aspects, which should be taken into consideration in Poland.

Policy measure No1 **Exploiting the feedstock potential**

- Assess the sustainable feedstock potential
- Identify untapped feedstock potential that should be targeted
- Map the targeted feedstock potential

Policy measure No2 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.)

Policy measure No3 **Promoting waste management**

- Design targeted regulatory and economic measures for the exploitation of the available wastes

Policy measure No4 **Fostering the consumption side**

- Provide financial support for accelerating the consumption of biomethane (e.g. such as indicatively subsidies, fiscal measures etc.)
- Define targets for biomethane consumption

Policy measure No5 **Improving the legislative framework**

- Simplify, improve and streamline the existing legislative framework
- Remove any legislative barriers

Policy measure No6 **Setting more ambitious targets**

- Define more ambitious targets for biomethane production and consumption
- Incorporate the increased targets within the policy framework
- Exploit the developed natural gas network

Figure 16 : Proposed policies and measures in Poland.

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

Chapter 9: Policy measures in Spain

In Spain, the conduction of SWOT analysis (Figure 17) led to the conclusion the adjustment of a realistic roadmap with clear biomethane targets, in line with the REPowerEU objectives, the implementation of a consumption incentive system with quotas for gas traders and the increase of the intensity of coordination to integrate the solutions that biogas/biomethane brings to the issues of environment, agriculture, livestock and depopulation are considered as vital factors for the further deployment of biomethane.

Similarly, the promotion of a common framework for cooperation and dialogue between stakeholders (i.e. producers, investors, traders, final consumers, etc.) and the proposal of a system of economic and fiscal incentives for the development of the projects should be fostered in the short term.

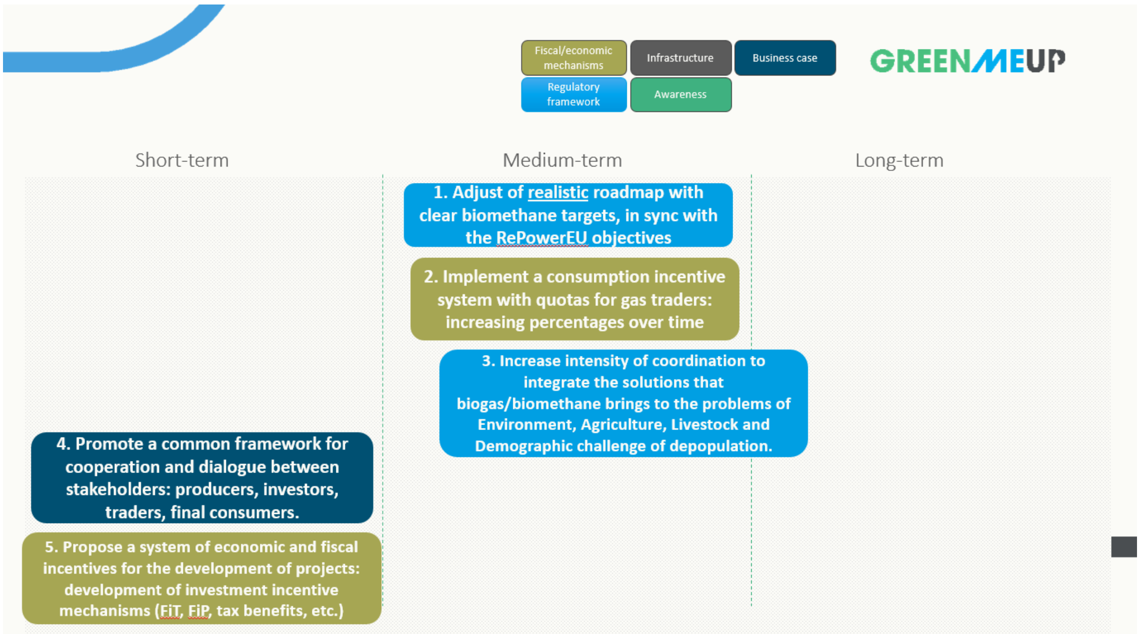

Figure 17 : Results of SWOT analysis in Spain.

Totally, twelve stakeholders participated in the application of the FCM analysis. The main results of the FCM method are presented in Table 13 for the case of Spain.

Table 13: Overview of the applied Fuzzy Cognitive Mapping in Spain.

Individual maps	Policy Hub: 1, Market Hub: 8, Society Hub: 3
Number of variables	13
Number of connections	29
Number of transmitter variables	1
Number of receiver variables	3
Number of ordinary variables	9
Receiver to transmitter ratio	3.00
Density	0.172

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According to the results of the FCM method in Spain (Table 14), a system of economic and fiscal incentives, with a focus on positive externalities, as well as a consumption incentive scheme should be initiated. Moreover, the legal framework and legal certainty, the development of a realistic roadmap with clear objectives, the adoption of a clear legislation on digestates and the establishment of a common framework for cooperation and dialogue are also required taking into account their importance.

All the identified concepts are summarized in Table 14 for the case of Spain.

Table 14: Results of the applied Fuzzy Cognitive Mapping in Spain.

Concepts	Centrality	Outdegree	Indegree
Economic and Fiscal Incentives System	0.78	0.38	0.40
Focus on positive externalities	0.77	0.08	0.68
Consumption Incentive Scheme	0.70	0.20	0.50
A legal framework and legal certainty	0.70	0.57	0.13
Realistic roadmap with clear objectives	0.38	0.32	0.07
Clear legislation on digestates	0.33	0.28	0.05
Need for Reverse Flow Units	0.23	0.17	0.07
CAPEX aid	0.18	0.12	0.07
Regulate the establishment of the Polluter Pays Principle	0.17	0.08	0.08
Influence of increased coordination in the implementation of biogas/biomethane policies	0.15	0.15	0.00
Promoting a common framework for cooperation and dialogue	0.12	0.00	0.12
Circular Economy and Cooperation Proposal	0.12	0.00	0.12
Creation of a quota system for gas traders	0.07	0.00	0.07

The proposed policies and measures are summarized in Figure 18 outlining the main aspects, which should be taken into consideration in Spain.

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

Policy measure No1 **Introducing financial support measures**

- Define and introduce financial support measures for the production of biomethane (e.g. indicatively subsidies, fiscal measures, CfDs etc.)
- Encourage the operation of Reverse Flow Units

Policy measure No2 **Integrating positive externalities into the decision-making**

- Develop a methodology for assessing and quantifying the triggered externalities by the production and consumption of biomethane
- Adopt the respective legislative framework for taking into consideration the quantified externalities

Policy measure No3 **Fostering the consumption side with targeted incentives**

- Provide financial support for accelerating the consumption of biomethane (e.g. such as indicatively subsidies, fiscal measures etc.)
- Define targets for biomethane consumption
- Imlement a biomethane consumption quota system for gas traders, similar to the obligations already established for liquid biofuels

Policy measure No4 **Adopting the regulatory framework for the by-products**

- Design and adopt a long-term regulatory and legal framework for the targeted exploitation of the produced by-products
- Adopt a robust legal framework for sanitary and environmental control, covering both input materials and the storage and application of digestate

Policy measure No5 **Drafting a roadmap and adopting the required legislation**

- Prepare a roadmap for the further penetration of biomethane with specific targets and policies
- Adopt the required legislation for achieving the specified targets
- Adopt safety protocols from leading EU countries, using stricter benchmarks where national rules are still under development

Policy measure No6 **Promoting a common framework for cooperation and dialogue**

- Engage actively all the involved stakeholders with targeted activities
- Establish a network with the balanced participation of all the involved stakeholders
- Ensure the cooperation of the involved stakeholders
- Pursue the early-stage collaboration to overcome social resistance and accelerate permitting

Figure 18 : Proposed policies and measures in Spain.

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Chapter 10: Conclusions

Totally, 68 stakeholders participated into the application of the FCM identifying 323 concepts, which are related to the further penetration of biomethane.

A synopsis of the main outcomes of the FCM in the seven target countries is presented in Table 15.

The analysis of the numerous maps in combination with the obtained results by SWOT analysis led to identification of the most effective policies and measures in the examined target countries.

Table 15: Overview of the applied Fuzzy Cognitive Mapping in the target countries.

Individual maps	**68**
Number of variables	323
Number of connections	693
Number of transmitter variables	74
Number of receiver variables	56
Number of ordinary variables	190

The identified policies and measures are displayed in Table 16.

It should be noted that the 49 proposed policies and measures are characterized by both considerable similarities and differences demonstrating that both the main national conditions and priorities have been taken into consideration during the applied co-designed approach within the framework of the GreenMeUp project.

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Table 16: Overview of the proposed policies and measures in the target countries.

Czech Republic	Danube Region	Estonia	Greece	Latvia	Poland	Spain
PM1: Introducing financial support measures **PM2**: Accelerating the adoption of the legislative improvements **PM3**: Ensuring political stability **PM4**: Decreasing administrative complexity and bureaucracy **PM5**: Exploiting the available feedstock potential **PM6**: Capitalizing the experienced staff and the supplier companies **PM7**: Increasing the ambition of the specified targets	**PM1**: Promoting a holistic framework for cooperation and dialogue **PM2**: Drafting a strategy and adopting the required legislation **PM3**: Establishing the required supply chains **PM4**: Raising awareness with capacity building activities **PM5**: Harmonising/enabling the regulatory framework **PM6**: Introducing financial support measures **PM7**: Assessing the feedstock potential **PM8**: Promoting the use of bio-CNG/bio-LNG	**PM1**: Formulating a vision for the promotion of biomethane **PM2**: Introducing financial support measures **PM3**: Fostering the consumption side **PM4**: Promoting digestate based biofertilizer production **PM5**: Reinforcing the implementation of the public procurement procedures **PM6**: Raising awareness with capacity building activities **PM7**: Strengthening the role of the policy makers	**PM1:** Assessing the feedstock potential **PM2**: Raising awareness with capacity building activities **PM3**: Establishing efficient permitting and spatial procedures **PM4**: Introducing financial support measures **PM5**: Adopting the regulatory framework for waste management **PM6**: Fostering the exploitation of the by-products **PM7**: Establishing the required supply chains **PM8**: Drafting a strategy and adopting the required legislation	**PM1**: Ensuring political and regulatory stability **PM2**: Drafting a roadmap and adopting the required legislation **PM3**: Introducing financial support measures **PM4**: Assessing and increasing the feedstock potential **PM5**: Fostering the consumption side with targeted incentives **PM6**: Developing the required infrastructure **PM7**: Raising awareness with capacity building activities	**PM1**: Exploiting the feedstock potential **PM2**: Introducing financial support measures **PM3**: Promoting waste management **PM4**: Fostering the consumption side **PM5**: Improving the legislative framework **PM6**: Setting more ambitious targets	**PM1**: Introducing financial support measures **PM2**: Integrating positive externalities into the decision-making **PM3**: Fostering the consumption side with targeted incentives **PM4**: Adopting the regulatory framework for the by-products **PM5**: Drafting a roadmap and adopting the required legislation **PM6**: Promoting a common framework for cooperation and dialogue

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Annex I: Guidelines for the implementation of the Fuzzy Cognitive Mapping (FCM)

I. Conduct the required preparatory activities

Please organize the interviews, which have to be carried out for the implementation of the FCM.

At least ten interviews should be conducted with the most important stakeholders.

Ideally, three stakeholders from each of the different category of stakeholders (namely decision makers, market and society) have to participate into the planned interviews.

The foreseen work should be implemented for the seven target countries (e.g., Czech, Danube region, Estonia, Greece, Latvia, Spain and Poland).

II. Formulate the question

Firstly, present very briefly the main objective of the interviews, which is to identify the most important design aspects for achieving the design and implementation of the required market uptake measures for the further penetration of the biomethane.

It is recommended to present very briefly the obtained results within the framework of both the D4.1 and the performed SWOT analysis.

Then, please make the following question:

- ***What are the most important enabling factors for the market uptake for the further penetration of biomethane in your country?***

It is recommended to mention indicative key words according to the priorities as outlined within D4.1 and the SWOT analysis (such as the provision of investment and operational subsidies, the establishment of the required supply chain, the selection of the most effective technology etc.)

III. Draw the main factors

Please display all the factors into a sheet as identified by the interviewee.

Please ask from the interviewee to elaborate about the reasons for selecting them.

It is recommended to mention potential factors without affecting his judge.

IV. Connect the identified factors

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Please connect with an arrow the identified factors, which are affected. It should be noted that the line → indicates that the one factor affects the other one, while the line ↔ indicates that a mutual interaction exists between the identified factors.

V. Quantify the influence of each connection

Please quantify the influence of each connection with the following Likert scale:

- -5 negatively very strong connection
- -4 negatively strong connection
- -3 negatively medium connection
- -2 negatively weak connection
- -1 negatively very weak connection
- 1 positively very weak connection
- 2 positively weak connection
- 3 positively medium connection
- 4 positively strong connection
- 5 positively very strong connection

VI. Complete interview protocol

Please complete the template, which is presented in Annex, for each interview separately in order to summaries the performed activities.

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Annex II: Template for describing the performed activities for each interview separately

i. Information about the interview

Please provide information about the conducted interview such as:

- Place
- Date
- Name of the interviewee
- Position of the interviewee
- Other

ii. Identified factors

Please elaborate briefly about the main rationale, which led the interviewee to the selection of the factors.

iii. Relationships among the identified factors

Please document briefly the reasons for the specified direction of the arrows among the identified factors.

iv. Influence of the identified relationships

Please document briefly the reasons for the specified strength of influence of the arrows among the identified factors.

v. Fuzzy Cognitive Map

Please insert the developed Fuzzy Cognitive Map as resulted by the previous steps.

vi. Areas of improvement

Please mention briefly potential difficulties, which confronted during the conduction of the interview.

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Annex III: Identified regulatory and financing obstacles and drivers both at EU level and at national level

Table 17: Overview of the Identified regulatory and financing obstacles and drivers both at EU level and at national level for the target countries.

Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
EU-level	2nd EBA Investment Outlook on Biomethane		Total investment on biomethane capacity of 24.5 billion Euros in Europe by 2030; Enlargement of biomethane capacity by 6.3 bcm/year by 2030 (based on interviews with 26 investors/project developers)
	EBA	Lack of ambition for biomethane on Gas Regulation deal put forward by European Parliament Gas regulation trialogue dropped target for biomethane Missing bottom-up approach to favor biomethane injection into gas network	Agreed Gas Regulation includes 100% tariff discount for injection of biomethane into networks
	EBA REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EU) 2019/1242	No mechanism to account for the contribution of renewable fuels	European Parliaments recognition of biomethanes significant contribution of the decarbonisation of the transport sector (especially heavy-duty vehicles) Introducing CO2 neutral fuel definition
	Net Zero Industrial Act (NZIA)		Biomethane is declared as strategic net-zero technology

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	EBA Position Paper – Net Zero Industry Act	Proposal lacks a goal and concrete measures that would effectively address the needs to expand the manufacturing capacity Proposed criteria not suitable for biogas and biomethane sector Facilitate public support to EU-based biomethane by focusing on the “resilience” contribution to the sector	
	EBA	Europeans parliament´s Committee on Environment (ENVI) excludes sustainable biogas and biomethane technologies from the scope on the Net Zero Industry Act	
	EBA (EU general analysis)	No biomethane standard Standards help to provide regulatory coherence, increased product safety and quality, lower transaction costs and prices, strengthening of EU single market	
	REPowerEU		Targets for biomethane production (35 bcm by 2030) Investment needs 37 billion Euros (till 2030) Establishing an industrial biogas and bio-methane partnership to stimulate the renewable gases value chain Taking additional measures to encourage biogas producers to create energy communities Providing incentives for biogas upgrading into bio-methane

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
			Promoting the adaptation and adjustment of existing and the deployment of new infrastructure for the transport of more bio-methane through the EU gas grid Addressing gaps in research, development and innovation Facilitating access to finance, and mobilise EU funding under CEF, Cohesion Policy, RRF and the Common Agricultural Policy Possibility to transfer 12,5% of their allocation under the European Agricultural Fund for Rural Development to the Recovery and Resilience Facility → speed up implementation of relevant projects, allowing farmers to receive necessary financial support to increase the production of sustainable biomethane
	Implementing the REPowerEU Action Plan: Investment needs, hydrogen accelerator and achieving the bio-methane targets	Renewable Energy Directive should be revised → increasing the scope to cover all uses of biomethane and not only the use as transport fuel Permitting processes are lengthy High cost of biogas upgrading as barrier for individual operators into biomethane production (proposal: cost-sharing concepts) Uncoordinated application of existing CEN gas quality standards leads to barriers for cross-border flow	Proposed actions: Create a biogas and biomethane industrial partnership/forum promoting sustainable production and use Develop national strategies on sustainable biogas and biomethane production or integrate them into the NECPs EU considers of developing EU strategy for energy transition in rural areas (decentralization) Addressing R&D and Innovation gaps Provide access to grants and loans from existing EU funds (see below)

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
			Increase funding under Horizon Europe (reallocating unused resources from UK) Innovation Fund → innovative production/usage can apply for that fund Access to other financial instruments: EIB with InvestEU support (for precommercial plants) Financial support can be accessed via: Invest EU European Regional Development Fund Cohesion Fund Just Transition Fund Connecting Europe Fund ETS Funds European Agricultural Fund for Rural Development
	Waste Framework Directive		By 2024, member countries have to collect organic waste separately
	BIP (Biomethane Industrial Partnership)		Launch of Biomethane Industrial Partnership: Creation of industrial partnership to promote biomethane 6 taskforces that collaborate on specific topics Taskforces: National biomethane targets, strategies and policies Accelerating biomethane project development

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
			Sustainable potentials for innovative biomass sources Cost efficiency of biomethane production and grid connection Research, development and innovation needs Integration of Ukraine as a supplier of sustainable biomethane
	Commissions recommendation on permitting for renewable energy projects		Speeding up permitting processes for renewable energy projects Facilitating Power Purchase Agreements Technical Support Instrument to provide expertise to design and implement reforms, including those to streamline the framework for authorization and permit granting process and promoting the use of power purchase agreements Renewables and their infrastructure qualify for the most favorable procedure in planning and permitting as they are presumed being in the overriding public interest and in the interest of public safety Establishing binding deadlines (clearly defined, accelerated and short as possible) for all steps required from granting permits to operate plant Establishment of timeframes and procedural rules to ensure efficiency of legal proceedings Stimulation of citizen and community participation

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
			Streamlining and effective coordination between national, regional and municipal levels (regarding roles and responsibilities) Fully digital permitting process Sufficient and adequate staffing for permit-granting/environmental assessment authorities Using funding possibilities of EU for up-/reskilling Ensure that system operators apply a transparent and digital procedure for grid connection and provide information on grid capacities and all its use by power plants combining multiple complementary technologies Provide legal certainty for repurposing of natural gas pipelines Regulatory sandboxes to grant targeted exemptions from legislation for innovative projects to facilitate permitting
	Manual for National Biomethane Strategies	Inconsistent application of European CEN gas standards hinders cross border trade	
	European Council: Gas package		Hydrogen and renewable gases seeking to access the gas grid → tariff discounts for renewable gases (100%)
	Revised Directive EU/2023/2413 (promotion of energy from renewable sources)	Suppliers are required to demonstrate final consumer quantity of energy from renewable resources in the energy mix Ensuring the guarantees of origin	Promotion of production of biogas and its injection into gas grid instead of using it for energy production (one of twelve measures of which 2 should be implemented by MS)

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	Revision of Directive 2018/2001	Biomass fuels shall fulfill the sustainability and greenhouse gas emissions saving criteria Transport sector: minimum share for renewable fuels from non-biological origin No incentive creation to use biofuels and biogas produced from food and feed crops in transport	MS may increase their minimum share of biofuels and biogas produced from feedstock to the transport sector Ensuring the guarantees of origin
	Different Funds where biogas/biomethane projects could apply to		InvestEU (sustainable transport, energy, supply and processing of raw materials) European Regional Development Fund (make regions more competitive, greener, closer to citizens) Cohesion Fund (several countries of GMU project are concerned by the fund, supports environment and trans-European networks) Just Transition Fund (transition to sustainable, climate-neutral economy, promote structural change in regions that were heavily reliant on fossil fuels) Connecting Europe Facility (Energy Infrastructure and Cross-border Renewable Energy Projects) EAFRD (rural development program to promote competitiveness, sustainable management of natural resources, climate action, balanced territorial development of rural economies and communities)
	European Renewable Gas Registry		Platform that counts stakeholders in the renewable gas sector - Role: to allow national registries to trade Certificate of Origin between each other

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	Fit for 55		Package of inter-connected proposals, which all drive towards the goal of ensuring fair, competitive and green transition by 2030 and beyond (regarding biogas/biomethane → cleaner mobility and transport fuels, energy, innovation and investment in competitive transition)
Czech Republic	GreenMeUp project, Deliverable 2.1	National Energy and Climate plan was outdated when finalized → reflects attitude of Czech Republic government towards renewable energies EU directive 2018/1999 → no increase of energy crop growth	REPowerEU biomethane target for CZ: 1.2 billion m^3 biomethane by 2030 National Energy and Climate Plan follows EU directive 2018/1999 (but was already outdated when implemented) (→ increase efficiency of waste management) EU support (investment support, operational support (2.4 billion EUR for biomethane production) Market operator OTE issues Guarantee of Origin for international trade
	GreenMeUp project, Deliverable 3.1	Meet REPowerEU targets: steady update of existing 400 biogas plants, 100 wastewater treatment plants, 70 landfill gas plants for biomethane production	
	GreenMeUp project, Deliverable 3.2	European policies: too much and radical intervention in biomass energy use Lack of realistic plan to achieve European goals	

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	GreenMeUp project, SWOT analysis	-	REPowerEU targets and taxonomy requirements (share of green investments in total investment) for biomethane development
	GreenMeUp project, TOWS Analysis	-	Implementation of European law and showing the legislator the importance of the sector (e.g. employment, energy independence)
Estonia	GreenMeUp project, Deliverable 2.1		Estonian 2030 National Energy and Climate Plan follows EU 2018/2001/EL renewable energy directive (biomethane/biogas related targets → increase biofuel consumption to 14% by 2030) REPowerEU biomethane target for Estonia: 100 Mio Nm^3 by 2030 Negotiations with European Commissions about financing proposals Local platform (Elering) gives out Guarantees of Origin (to meet standards set in renewable energy directive 2018/2001/EU for international trade) Estonian Biogas Association: Biogas & Biomethane Roadmap → measure to implement EU Green Deal (besides others)
	GreenMeUp project, Deliverable 3.2		From 2024 on, Guarantees of Origin will allow producers to inject and trade internationally
Greece	GreenMeUp project, Deliverable 2.1		REPowerEU: biomethane target 2.1 TWh for 2030

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
			Strong political will of EU towards promotion of green gaseous fuels from biomass → significant opportunity for entrepreneurship and recovery of the economy 2009/28/EC: report compiled for meeting 20-20-20 goals 2009/28/EC: regarding biogas integration into natural gas network, there is no discrimination in the transmission and distribution of biogas Directive 2018/2001: use of natural gas systems and networks is allowed for trans-movement of renewable gases (and many rules that apply for natural gas also apply for biogas/methane)
	GreenMeUp project, Deliverable 3.1		Hub-meeting discussion: implementing RED into national law
Latvia	GreenMeUp project, Deliverable 2.1	Lacks comprehensive Guarantee of Origin system	
	GreenMeUp project, TOWS Analysis		Leverage existing infrastructure for EU funding and apply for EU funds Highlight potential EU-export gains
Poland	GreenMeUp project, Deliverable 2.1	Decarbonization of transport: difficulties to fulfill EU requirements concerning the share of RES in transport in RED and RED II	Funding under EU: European funds Infrastructure, Climate and Environment, European Funds for Kujawy and Pomerania, Lubelskie, Lodz, Swietokrzyskie, Pomerania, Wielkopolska (2021-2027) EU climate and energy policy as driver for biomethane use on national market

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.

Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	GreenMeUp project, Deliverable 3.2	Access to EU funds could be facilitated	
	GreenMeUp project, SWOT analysis		Renewable energy projects (biogas/biomethane) can be funded under EU programs (CAPEX) and structural funds
Spain	GreenMeUp project, Deliverable 2.1	Fit for 55 Package and REPowerEU: need to increase targets in NECP and creation of Biogas Roadmap for more ambition and getting in line with REPowerEU	EC working document 2023 Country report: high additional biomethane production capacities by 2030 (approx. 4.1 bcm/year) European Green Deal: supports holistic approach of Spanish strategy (Circular Economy, Renewable Energy, Environmental Improvement, Waste Valorization, etc.)
	GreenMeUp project, SWOT Analysis	There is no realistic Roadmap with clear environmental targets in sync with REPowerEU	
Danube Region: Bacs-Kiskun and Csongrad-Csanad (Hungary)	GreenMeUp project, Deliverable 2.1	Need for government regulation on GHG emission savings from biogas/biomethane would contribute to achieving objectives of scaling up biogas/biomethane production → Government regulation could provide an easy bridge between ETS quota holders and biomethane producers EU Renewable Energy Directive: states that the only function of Guarantees of Origin is to inform consumer about origin → does not foster deployment → broader guarantees would could be used for meeting domestic blending quotas or even EU ETS	Directive 2009/28/EU: corresponding law regarding renewable transport fuels, setting rules for land use Directive 2018/2021/EU: promotion of renewable energies transposed into local law Regulatory environment and registration system must be designed to enable operators to enter the EU market

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
	GreenMeUp project, Deliverable 3.2	Adaption of EU policies (Fit for 55, REPowerEU) is in progress und needs to be implemented Challenge: access to European biomethane market Updated EU/2023/2413 (RED II) needs to be transposed into national legislation	Expected that Guarantees of Origin are operational from July 2024
	GreenMeUp project, SWOT analysis	Access to European biomethane market not established	EU CAP (Common Agriculture Policy): Investment support to agriculture and food industries Guarantee of Origin as an enabler for export
Danube Region: West Region (Romania)	GreenMeUp project, Deliverable 2.1		Europe 2020 strategy: Romania has a memorandum that documents the established measures to counteract climate change (incl. the increase in share of energy produced from natural resources) Directive 2003/30/EC: transposed into Romanian law to promote usage of biofuels/other renewable fuels in transport Regulation 2019/1009: digestate has to comply with EU regulations → laying down rules on making available on the market of EU fertilizing products
	GreenMeUp project, Deliverable 3.2	Absence of biomethane register (no Guarantees of Origin) hinders cross-border trading	
	GreenMeUp project, SWOT analysis	European Commissions feedback on the National Integrated Energy and Climate Change Plan 2023-2030 →lack of detailed measures	

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Target country	Data source	Regulatory and financing obstacles	Regulatory and financing drivers
Danube Region: Autonomous Province of Vojvodina (Serbia)	GreenMeUp project, Deliverable 2.1	Sustainability criteria for biogas/biomethane are in accordance with outdated RED I (instead of RED II)	
	GreenMeUp project, Deliverable 3.2	CO2-taxes will have negative impact on the competitiveness of RS products on EU market Frequent changes in local law to adapt EU law create difficult environment for investors	

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