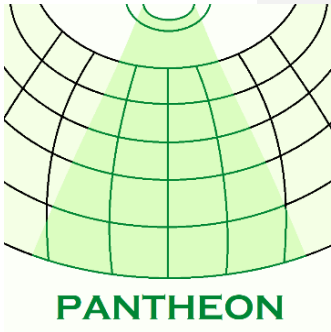


PANTHEON AT ROME



GENERATE IMAGES FROM POLICY DISCOURSE NETWORK ANALYSIS

PANTHEON

Version 2.0 – 15/04/2026

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Executive Summary

This deliverable presents the visual outputs of the Policy Discourse Network Analysis (PDNA) conducted within the PANTHEON project in relation to decarbonization debates. Its purpose is to make the graphical results of the analysis accessible in a concise and user-friendly format for dissemination and consultation purposes.

The figures included in this deliverable report the main network visualizations generated from the analysis of stakeholder positions on decarbonization-related themes. They are intended to support the identification of relevant actors, thematic clusters, and patterns of agreement and disagreement across the analyzed material.

This deliverable should be read in conjunction with Deliverable D4.2, which provides the full methodological and analytical foundation of the work. In particular, Deliverable D4.2, Part 1 (available at <https://pantheon-decarbonisation.com/deliverable-4-2>) explains the data source, analytical pipeline, coding process, and visualization procedure used to generate the figures presented here. Accordingly, D4.1 is conceived as a complementary visual companion to D4.2 rather than as a standalone methodological report.

To facilitate interpretation, this document also includes a brief guide on how to read the figures and clarifies the scope of the visual outputs presented. The deliverable is designed to support both project dissemination and the broader accessibility of the results for readers interested in the stakeholder landscape surrounding decarbonization policy debates.

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1. Introduction

The transition towards a decarbonized economy represents a central priority within European and global climate policy frameworks. Achieving ambitious greenhouse gas reduction targets requires not only technological and economic transformations, but also a clear understanding of the policy discourse shaping these transitions. In this context, identifying key stakeholders, their positions, and the relationships between them is essential for informing policy development, stakeholder engagement, and subsequent analytical activities within the PANTHEON project.

A Policy Discourse Network Analysis has been conducted to examine how different actors engage with decarbonization-related themes. This approach enables the systematic mapping of stakeholders and policy issues, as well as the identification of patterns of agreement and disagreement across a structured corpus of documents. The results of this analysis are expressed through network visualizations, which represent the relationships between actors and thematic areas in a graphical format.

This deliverable (D4.1, available at <https://pantheon-decarbonisation.com/project-results/deliverable-4-1>) focuses specifically on the visual outputs of this analytical process. It provides a curated set of network graphs generated from the analysis, which are made available through the PANTHEON project website for dissemination purposes. The aim is to offer an accessible representation of the stakeholder landscape and thematic structure emerging from the analyzed material.

It is important to note that this deliverable does not provide a detailed account of the methodological framework, data processing steps, or analytical procedures underpinning the results. These elements are fully described in Deliverable D4.2, which constitutes the main report of the analysis (available at <https://pantheon-decarbonisation.com/deliverable-4-2>). In particular, Part 1 of D4.2 provides the methodological basis and analytical context necessary to understand the figures presented in this document, including data collection, preprocessing, topic modelling, sentiment coding, and network construction.

Accordingly, D4.1 is designed as a complementary deliverable to D4.2. While D4.2 explains how the analysis was conducted and interprets the results, D4.1 provides graphical representations that make it possible to explore these results visually. The two deliverables should therefore be read together to obtain a complete understanding of the work.

In this report, additional elements have been introduced to improve clarity and usability. In particular, a dedicated section explains how to read and interpret the network graphs, and references to D4.2 have been strengthened throughout the document to ensure coherence between the deliverables.

The visualizations presented in this report are intended to support ongoing project activities, including stakeholder identification and engagement in subsequent work packages, and to contribute to the broader dissemination of results by providing an intuitive entry point into the analysis of policy discourse on decarbonization.

2. How to Read This Deliverable

This section provides guidance on how to interpret the visual outputs presented in this deliverable. The figures included in this report are network visualizations derived from a Policy Discourse Network Analysis and are designed to represent relationships between stakeholders and policy-related themes in a structured and graphical format.

2.1. Nature of the Visualizations

The figures are bipartite networks, meaning that they consist of two distinct types of nodes:

- Stakeholder nodes, representing organizations (e.g. companies, business associations, public authorities, NGOs, and other institutional actors);
- Theme or topic nodes, representing key areas of policy discourse identified through the analytical process (e.g. energy and renewables, policy instruments, transport, buildings, carbon capture).

Connections between these nodes (edges) indicate that a stakeholder has expressed a position in relation to a given theme within the analyzed material.

2.2. Interpretation of Nodes and Edges

Each element in the network visualizations carries specific meaning:

- **Nodes (points):** Nodes represent either stakeholders or themes. Stakeholders are typically grouped and color-coded according to their type (e.g. business actors, NGOs, public authorities), while themes are represented as distinct categories derived from the analytical process.
- **Edges (links):** Edges connect stakeholders to themes and indicate the presence of a coded relationship in the dataset. These relationships are based on identified statements linking actors to specific topics.

- **Type of relationship (agreement/disagreement):** Where applicable, edges differentiate between:
 - Agreement, indicating that a stakeholder supports or positively engages with a theme;
 - Disagreement, indicating opposition or critical positioning.

These distinctions are based on the sentiment classification process described in Deliverable D4.2.

- **Node size:** The size of a node reflects its relative prominence within the network. Larger nodes indicate stakeholders or themes that are connected to a higher number of relationships, suggesting a higher level of engagement within the analyzed material.
- **Network structure and clustering:** The spatial arrangement of nodes is determined by network visualization algorithms. Nodes that are more closely connected tend to be positioned nearer to each other, allowing the identification of clusters of stakeholders and themes that are more densely interconnected.

2.3. Scope of the Visual Outputs

The visualizations presented in this deliverable reflect the structure of the analyzed dataset and the methodological pipeline used to process it. They provide a structured representation of stakeholder–theme relationships within the selected material, highlighting patterns of engagement across different policy areas.

However, it is important to note that these figures:

- do not represent the full universe of stakeholders involved in decarbonization debates;
- are limited to the specific data sources and selection criteria described in Deliverable D4.2;

- reflect relationships as identified through computational analysis and coding procedures.

As such, the visual outputs should be interpreted as analytical representations rather than exhaustive mappings of the entire policy landscape.

2.4. Relationship with Deliverable D4.2

For a complete understanding of how these visualizations were generated, including details on data sources, preprocessing, topic modelling, sentiment classification, and network construction, readers are referred to Deliverable D4.2 (in particular Part 1).

3. Overview of Analytical Workflow

This section provides a concise overview of the analytical process used to generate the visual outputs presented in this deliverable. It is intended to offer readers a general understanding of the workflow without duplicating the full methodological detail, which is provided in Deliverable D4.2 (Part 1).

The Policy Discourse Network Analysis underlying this deliverable follows a structured pipeline that combines natural language processing techniques, large language models, and network analysis tools to extract and visualize relationships between stakeholders and policy themes.

3.1. Data Source

The analysis is based on a structured corpus of policy-relevant material. In particular, the dataset used for the figures presented in this deliverable derives from the **EU consultation process on the 2030 Climate Target Plan**, specifically from the structured stakeholder inputs included in Annex C of the consultation report. This dataset provides a curated set of stakeholder statements and positions related to decarbonization.

3.2. Data Processing and Analysis

The analytical workflow consists of several sequential steps:

- **Text extraction and preprocessing:** Relevant textual content is extracted and cleaned to remove non-informative elements, ensuring that the analysis focuses on meaningful statements.
- **Topic identification (topic modelling):** Natural language processing techniques are used to identify recurring themes and topics within the dataset. These topics represent key areas of policy discourse related to decarbonization.

- **Theme labelling and refinement:** Identified topics are further refined and labelled to ensure interpretability and consistency across the analysis.
- **Actor–theme linkage:** Stakeholders are linked to themes based on the content of their statements, allowing the construction of relationships between actors and policy issues.
- **Sentiment classification:** Statements are classified according to their orientation towards specific themes (e.g. agreement or disagreement), enabling the differentiation of stakeholder positions within the network.
- **Network construction:** The processed data is transformed into a network structure, where stakeholders and themes are represented as nodes and their relationships as edges.

3.3. Visualization

The resulting network data is visualized using dedicated network analysis software. The visualizations are designed to:

- Represent relationships between stakeholders and themes in a clear and structured manner;
- Highlight the relative prominence of actors and topics;
- Allow the identification of patterns of engagement across the dataset.

3.4. Link to Full Methodological Description

The description provided above is intended as an overview to support the interpretation of the figures included in this deliverable.

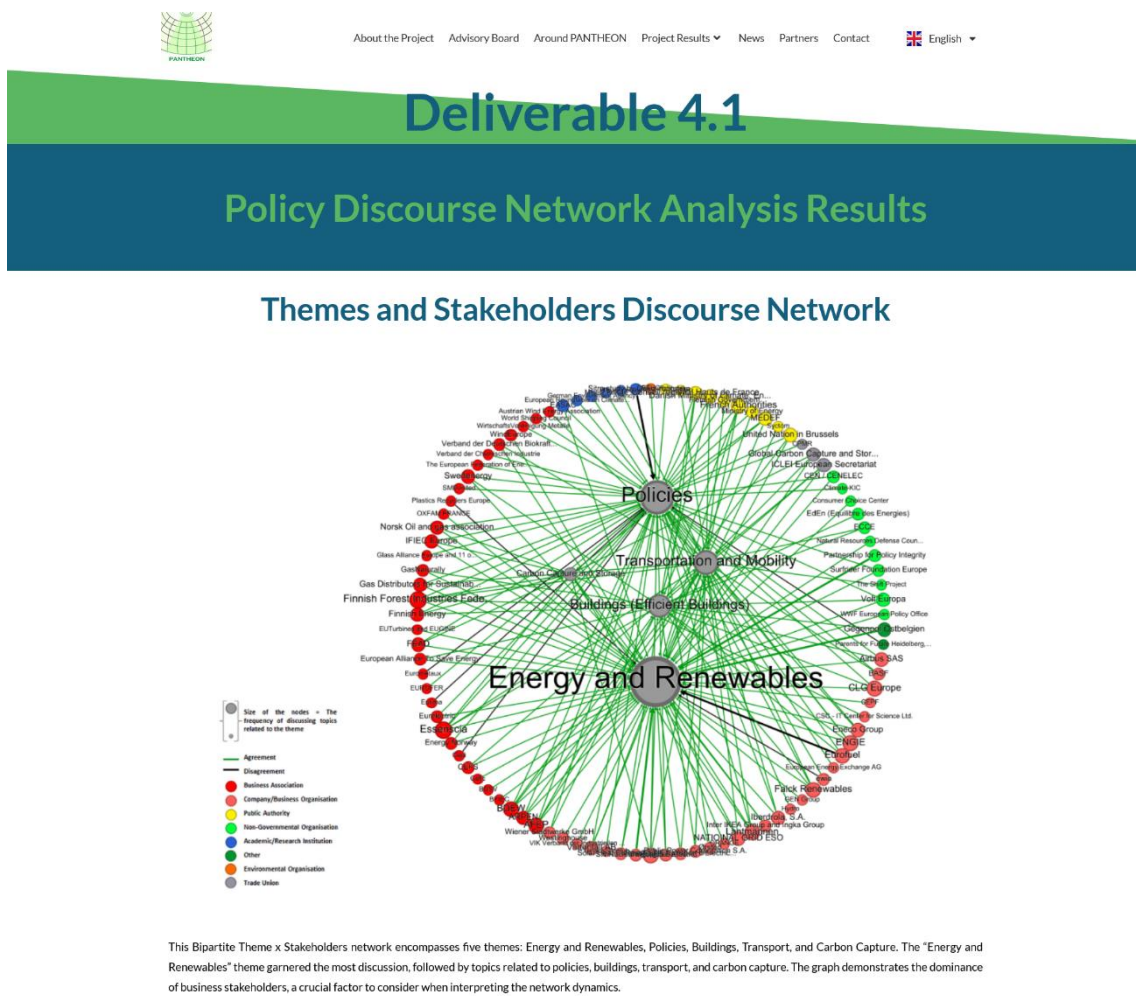
Readers seeking a full understanding of the methodological framework are therefore strongly encouraged to consult D4.2 in conjunction with this deliverable (<https://pantheon-decarbonisation.com/deliverable-4-2>).

4. Policy Discourse Network Analysis Results

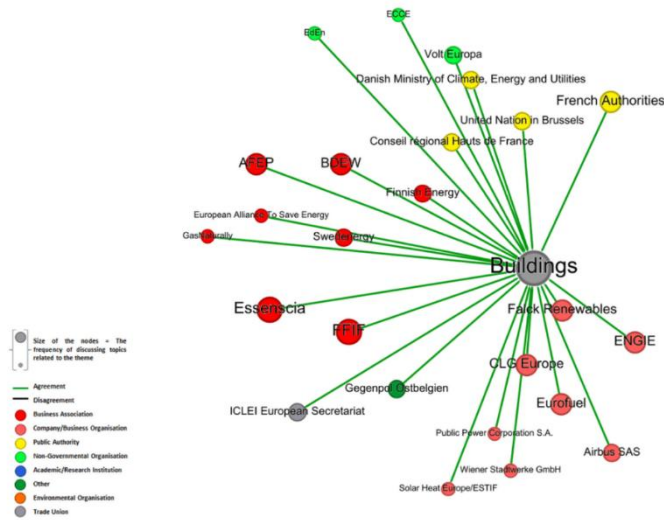
The outcomes of the Policy Discourse Network Analysis have been reported as graph visualizations and uploaded to the PANTHEON website for public dissemination purposes.

The results, reported in Figure 1, can be accessed via the following link: <https://pantheon-decarbonisation.com/project-results/deliverable-4-1/>

Figure1. PANTHEON Project website: images from policy discourse network analysis

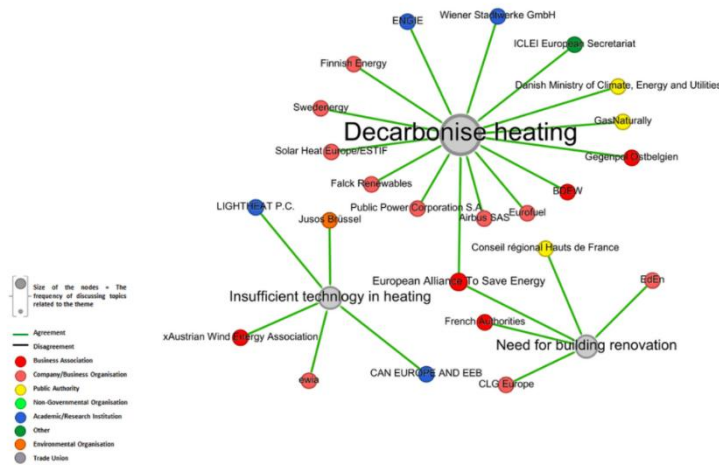


1. Building Theme vs Stakeholders Discourse Network



The graph reveals stakeholders involved in discussions about the Building theme, with node size indicating discussion frequency. While businesses dominate the overall network, a notable presence of public authorities suggests active engagement in building-related topics.

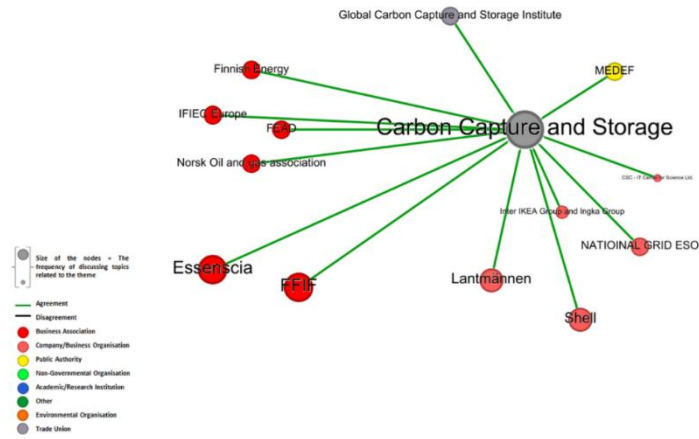
1.1. Building Topics vs Stakeholders Discourse Network



The network highlights topics regarding decarbonizing buildings. Decarbonizing heating is a central topic, with strong participation from business actors (red and salmon pink tones) such as BDEW, ENGE, and Falck Renewables, showing industry interest in clean heating solutions. Building renovation also sees contributions from both public authorities (yellow) and business actors, reflecting a shared focus on improving energy efficiency.

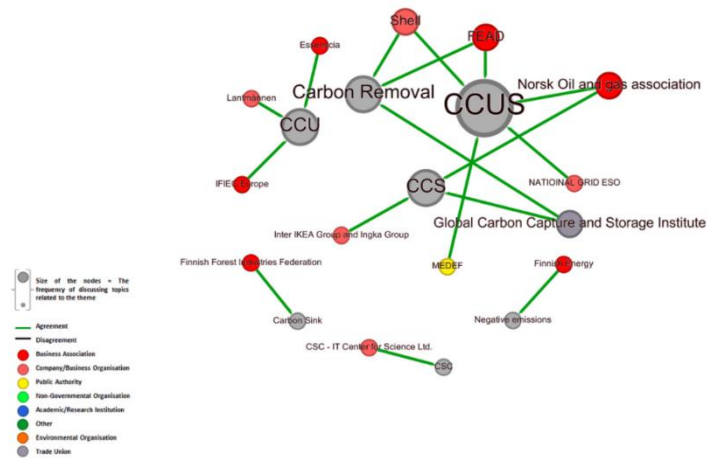
Discussions on insufficient technology in heating involve fewer stakeholders, including NGOs (green tones) like CAN Europe and EEB, raising concerns about technological gaps. Overall, the network shows broad consensus on heating decarbonization and building efficiency, with limited disagreement. However, challenges like technological limitations in heating may require further innovation and collaboration to address.

2. Carbon Capture Theme vs Stakeholders Discourse Network



The graph reveals stakeholders involved in discussions about the Carbon Capture theme, with node size indicating discussion frequency. Business associations and companies dominate the overall network.

2.1. Carbon Capture Topics vs Stakeholders Discourse Network

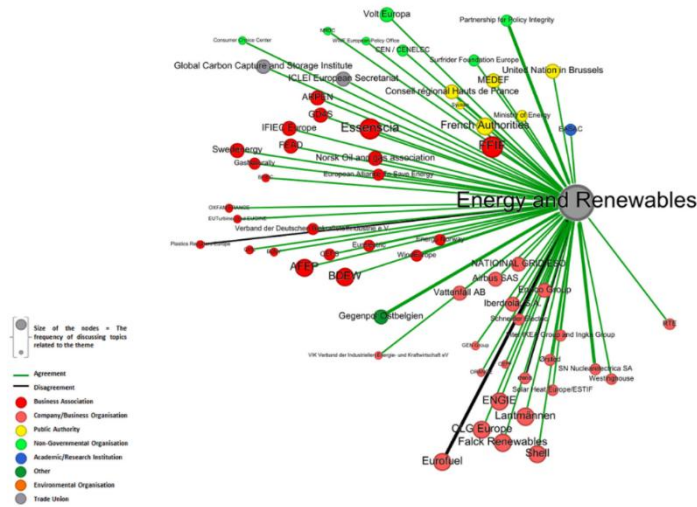


The graph indicates that the discussion on carbon capture related topics like carbon removal, negative emissions, and etc is dominated by business-related actors (red and salmon pink tones).

Key industrial participants include Norsk Oil and Gas Association, Shell, and Finnish Energy, Essenscia and National Grid ESO, which suggest that the topic is primarily driven by industry interests, likely reflecting their focus on technological solutions for achieving decarbonization targets.

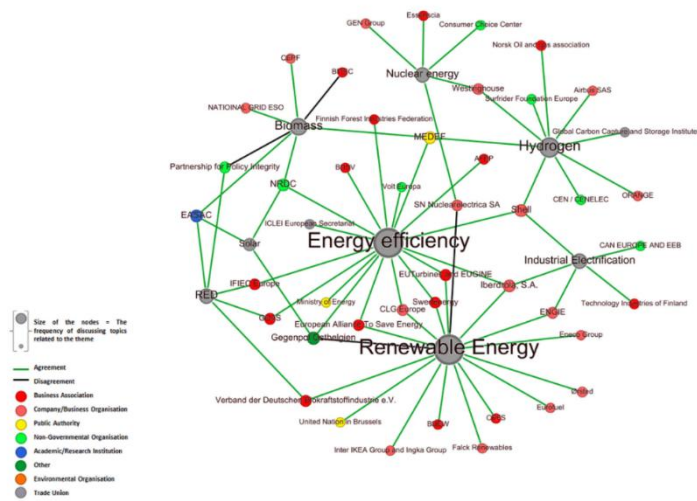
The lack of participation from NGOs, public authorities, and other non-business actors highlights a narrow scope of engagement, potentially limiting the diversity of perspectives in these discussions. While CCUS and carbon removal are central topics, peripheral nodes like carbon sinks suggest areas that are less developed or less discussed within this group.

3. Energy Theme vs Stakeholders Discourse Network



The graph reveals stakeholders involved in discussions about the Energy theme, with node size indicating discussion frequency. The network sees a concerted involvement by multiple stakeholder types, including Companies, Business Associations, Public Authorities and NGOs. Less relevant is the contribution from other stakeholders, such as Research Institutions.

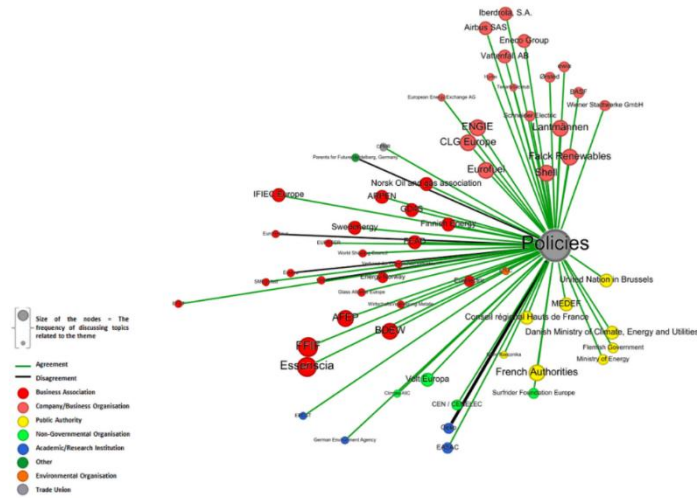
3.1. Energy Topics vs Stakeholders Discourse Network



The discourse network shows that **business actors** (red and salmon pink) are well represented. Overall, there's **low disagreement** across the network, but it's still important to note areas of contention. For example, in **biomass**, arguments that forest-burning biomass should not be considered a decarbonization method suggest it could become a potential area for **polarization**.

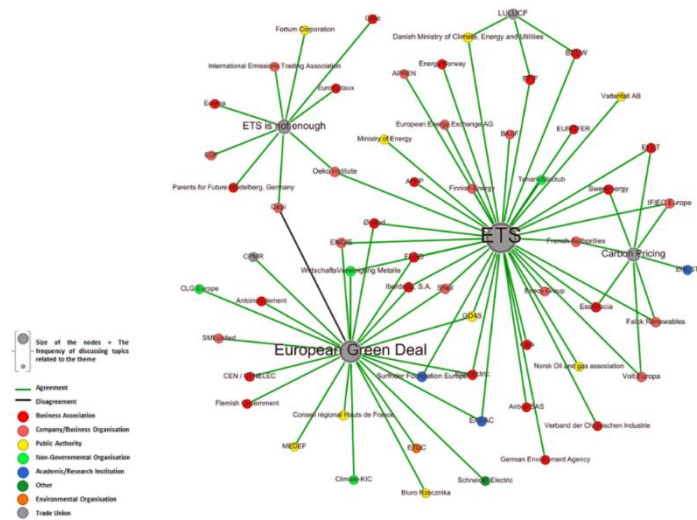
NGOs (green tones) actively support topics like **renewable energy** and **energy efficiency**, contributing to discussions around sustainability. We also observe that while **energy efficiency** and **renewables** are central to the discourse, topics like **nuclear energy** and **biomass** remain more peripheral. Those actors who agree to renewable energy was one was overly discussed renewable energy over nuclear energy, Gegenpol Ostbelgien (Not CEPI) is against renewable energy as supply is unstable and insufficient.

4. Policy Theme vs Stakeholders Discourse Network



The graph illustrates the connections between a variety of stakeholders involved in discussions around decarbonization policies. Black edges indicate disagreements on topics within policy themes. Thicker lines represent more frequent disagreements made by an actor.

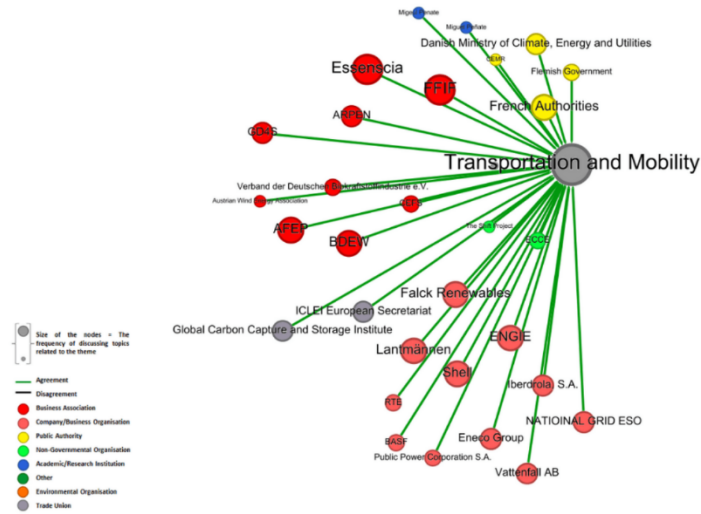
4.1. Policy Topics vs Stakeholders Discourse Network



The network highlights **carbon pricing** and **ETS** as central topics, with strong participation from **business actors** (red and salmon pink), **public authorities** (yellow), and **NGOs** (green). While many actors support ETS, the argument that "ETS is not enough" reveals an area of disagreement, particularly among business stakeholders, indicating differing views on its effectiveness. Discussions on **LULUCF** and the **European Green Deal** are more peripheral, with fewer connections. Business actors dominate the discourse, particularly around **market-based solutions** like ETS and carbon pricing, showing their key role in shaping climate policy.

Overall, the network demonstrates **active engagement** from business actors but also highlights areas of contention regarding the adequacy of current decarbonization measures.

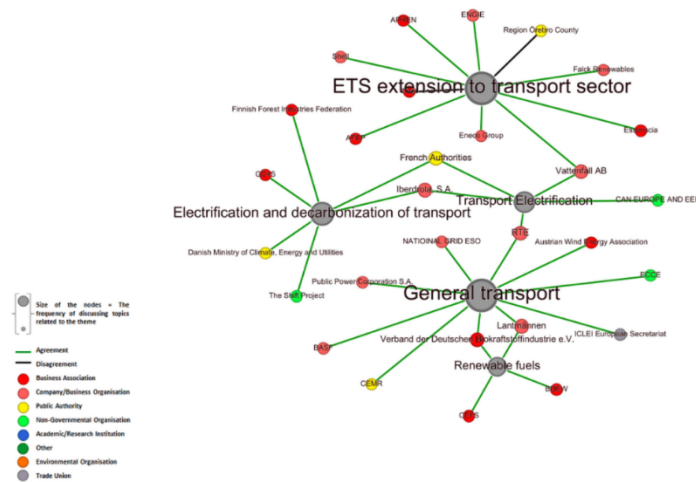
5. Transport Theme vs Stakeholders Discourse Network



The network illustrates the connections between a variety of stakeholders involved in discussions around Transport and Mobility implications of decarbonization.

Companies, Business Associations and Public Authorities results as the most represented stakeholders within the network. To a lesser extent, other actors such as NGOs, Trade Unions, Research Institutions are involved in the discourse on this theme.

5.1. Transport Topics vs Stakeholders Discourse Network



The graph highlights **transport electrification** and the broader **decarbonization of transport** as core topics, with a good level of stakeholder engagement. **Transport infrastructure for CO₂ storage** and **renewable fuels** appear as more peripheral topics with fewer connections.

There are **two instances of disagreement** regarding the **extension of ETS to the transport sector**, which may signal a potential area of conflict. However, overall, the network shows a **fairly balanced participation** across stakeholder groups, with contributions from **business actors**, **NGOs**, **public authorities**, and others.

This balance, along with the few areas of disagreement, shows there is generally broad consensus on decarbonization goals, but specific topics—like the ETS extension—stand out as areas that may need further discussion to address differing views.

Total visitors: 13

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5. Limitations of the Visual Outputs

The visualizations presented in this deliverable provide a structured representation of stakeholder-theme relationships derived from the analyzed dataset. While they offer a useful overview of how different actors engage with decarbonization-related policy issues, it is important to acknowledge the scope and limitations of these outputs.

First, the figures are based on a specific and bounded dataset, namely the stakeholder contributions included in Annex C of the EU consultation report on the 2030 Climate Target Plan. As such, the visualizations reflect the structure of this curated source and do not capture the full range of stakeholders or positions present in the broader decarbonization policy landscape.

Second, the analysis relies on processed textual data and computational methods, including topic modelling and sentiment classification. While these approaches enable systematic and scalable analysis, they inherently involve a level of abstraction and simplification. The relationships shown in the network graphs are therefore based on coded representations of stakeholder statements rather than direct or exhaustive accounts of their full positions.

Third, the dataset and analytical pipeline are based on English-language material, which may influence the representation of stakeholders and themes. In particular, this may result in a stronger representation of actors operating within European policy contexts, while perspectives from other regions may be less visible.

Finally, the figures should be interpreted in conjunction with Deliverable D4.2, which provides the full methodological framework and analytical context. The present deliverable focuses on the visual representation of results and does not aim to provide a comprehensive or exhaustive analysis of the policy discourse.

The analysis presented in this deliverable should therefore be understood as part of an evolving research process. Further developments are ongoing within the project and will include the integration of additional policy documents, the expansion of the dataset, and the incorporation of a broader range of regional perspectives. These updates are expected to

progressively enrich the analytical basis and provide a more comprehensive representation of the policy landscape in future project outputs.