A cluster without geographical proximity?

Textometry and social network analysis of the TENLOG cluster in Occitania

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1. Introduction

Geographical proximity is often the first aspect that comes to mind when one considers issues of proximity, frequently portrayed as a virtue and a facilitator of economic and social relations. This notion is associated with short distances or the availability of transport means that makes it easy to connect two or more locations. It is mainly seen as beneficial for the development and harmonization of social relations, as exemplified by the approaches to industrial clusters (Porter, 1998), where geographical proximity is regarded as a key variable in the success and viability of these systems.

However, research on proximity has long emphasized that geographical proximity is not the only significant factor in spatial interactions, nor is it the only form of proximity. Other types of proximity, which are non-spatial in nature, come into play and interact with issues of distance or location (Torre & Rallet, 2005). They include social, institutional, technological, and cognitive dimensions (Boschma, 2005), which shape alternative ways of being close, sometimes even at a distance, as seen in social networks or diasporas. These are generally classified under the term "organized proximity," which highlights the importance of organizational variables in the functioning of human societies.

One might question the roles played by these two main categories of proximity, often considered complementary or closely intertwined at the local level, and their respective

importance. This is particularly relevant in the context of industrial clusters, where their functioning is generally presented as the result of the interaction between the two categories of proximity (Torre, 2014). Proximities are thus a driving force in the coordination process, facilitating both the exchange of ideas among different actor spheres and the creation or maintenance of local networks. One way to explore this question is to study the functioning of a cluster where geographical proximity relationships are weak or stretched. Can it still function satisfactorily despite distances and geographical fragmentation?

In this article, we examine the case of the TENLOG logistics cluster, a rapidly evolving system located in the Occitania Region (South-west of France). This cluster holds strategic importance for the Regional Council, which is committed to ecological transition, and for logistics sector actors seeking competitiveness. At its inception in 2005, the initial cluster was based on shared rules among different actors, with a focus on transport along a geographical axis following the Mediterranean arc. At that time, there were multiple proximities in the cluster, as actors were located at short distances (geographical proximity) and simultaneously shared values and exchanged knowledge and expertise (organised proximity). However, in 2018 and 2022, the initial cluster was reformed and expanded; the new cluster now includes various actors who are often located several hundred kilometres away.

Then, question that arises is the legitimacy of the participants belonging to the same system and the homogeneity of the cluster. Does the so-called TENLOG cluster make sense, or is it mainly artificial, due to the weakness of geographical proximity relations? Does the remaining of remote relations between the players lead not only to the loss of geographical proximity but also to the loss of valuable links and interfaces?

To address this question, we analyse the close relations at stake within the TENLOG cluster to determine whether the actors continue to work together and share the same values. Organised proximity depends on a set of factors that remain difficult to measure: norms, languages, systems of ideas, and interactions within a network of actors. We employ textometry and network analysis to assess the level of organised proximities among the members, and to understand the logic of belonging and similarity, respectively (see definitions in Annex 1). The complementary nature of these two approaches lies in their capacity to evaluate an organisation's potential for fostering integration and facilitating interaction among its members. Several methods are used: the Reinert method to determine lexical worlds, analysis of specificities, intertextual distances, and similarity analysis. Combined with graph theory, they provide valuable insights into the roles of actors in the clustering process.

First, we examine the approaches to proximity applied to the case of industrial clusters (Part 2), before presenting the characteristics of the TENLOG cluster (Part 3) and the strategy for analysing organised proximities (Part 4). Our results show that, despite

physical distance, organied proximities persist (Part 5) and that the challenges of "clustering at a distance" are not as significant as initially thought (Part 6), allowing us to remain optimistic about its development (Conclusion, Part 7).

2. Clusters and proximity analyses

Clusters and local production systems have indeed been integral to economic landscapes for centuries, with notable early examples in the textile industry of 19th-century England and later in Northern Italy (Marshall, 1920; Bellandi et al., 2025). Initially, geographical proximity was seen as inseparable from the clusterisation process, as it was observed that cluster actors and members were located within a geographically limited area. However, it became evident that it was insufficient to fully explain the success and economic advantages of clusters. Consequently, other types of proximities, beyond geographical ones, have been explored to better understand the functioning and dynamics of these local systems. They include social, institutional, technological, and cognitive proximities, which play crucial roles in fostering innovation and collaboration within clusters.

2.1. Clusters and local systems

Porter's work was instrumental in formalising the understanding of clusters as a strategic tool for economic development (Martin & Sunley, 2003). He described these geographical agglomerations of economic activities as enhancing the competitiveness of companies and regions, defining them somewhat vaguely as geographical concentrations of interconnected businesses, suppliers, related industries, and associated institutions within a particular field (Porter, 1990).

Clusters play a crucial role in regional and local economic development by fostering innovation, increasing competitiveness, and promoting job creation (Porter, 1998). By specialising in specific sectors, they allow firms to benefit from shared infrastructure, efficient supplier networks, and a pool of talent, and enhance productivity by enabling businesses to operate more efficiently due to proximity to suppliers and customers. Clusters also encourage innovation through collaboration and competition among firms, leading to the rapid dissemination of new technologies and practices (Audretsch & Feldman, 1996; Breschi & Malerba, 2005). They attract investment and skilled labour, reinforce their economic impact (Rosenfeld, 1997), and promote entrepreneurial activity (Delgado et al., 2010).

Influenced by the success of Porter’s concept, the cluster approach has been integrated into national and regional economic policies over the decades to stimulate economic development (Bathelt et al., 2004; OECD, 2007). Empirical studies show that regions with developed clusters exhibit faster economic growth and more robust job creation compared to other regions (Saxenian, 1994). Moreover, while the initial definitions

focused on industrial sectors, the variations of this notion have been numerous, such as agribusiness clusters (Giuliani & Bell, 2005), or green clusters, based on environmentally friendly activities (Zahra & Nambisan, 2012).

Clusters share common factors, such as robust infrastructure, access to a skilled workforce, and supportive policies (Cooke, 2001). Collaboration between firms, universities, and government agencies is crucial for fostering innovation and economic development (Moulaert & Sekia, 2003). Among the most famous clusters worldwide is Silicon Valley in California, known for its technology sector and innovations in software and hardware (Kenney & Von Burg, 1999), home to leading tech companies like Apple, Google, or Facebook, as well as startups, benefiting from a network of venture capitalists, research institutions, and a skilled workforce (Saxenian, 1994). Other famous examples can be found, like the fashion district in Milan (Rantisi, 2002), the technology and manufacturing cluster of Shenzen in China (Zeng, 2011), or Bengaluru in India (Upadhya & Vasavi, 2008).

2.2. Clusters and proximity relations

Proximity appears central to understanding the structure and the dynamics of industrial clusters. Indeed, the latter consist of an agglomeration of geographically proximate firms and labs specialising in similar or complementary industries, which benefit from various types of proximities that influence knowledge exchange, internal relations, the role of institutions, and their dynamic evolution.

Several studies highlight that strong internal proximity relations, built on trust and collaboration, are essential for sustaining competitive advantages in clusters. The intricate web of relationships fosters a collaborative environment where businesses can engage in joint problem-solving and co-innovation, leading to the development of new products and processes. Scholars illustrate the importance of geographical proximity to customers (Weterings & Boschma, 2009) but also argue that while it facilitates initial interactions, social and organisational proximities strengthen relational capabilities, enabling firms to access external knowledge and resources (Hervás-Oliver & Albors-Garrigós, 2009).

Literature underscores that knowledge exchanges within clusters heavily rely on the cognitive alignment of firms and their capacity to engage in meaningful interactions. The presence of shared knowledge bases and mutual understanding enables cluster members to leverage local expertise and innovations, thus maintaining a competitive advantage. Cases like the footwear district of Southern Italy (Boschma and Ter Wal, 2007), the Chilean wine industry (Giuliani, 2007) or the GNSS industry in France (Balland et al., 2013), emphasise the role played by geographical and non-geographical proximities in the transfer and sharing of knowledge and the construction of common knowledge bases.

Local institutions also play a pivotal role by providing a supportive framework through policies, grants, and infrastructure. Studies emphasise that institutional proximity can legitimise innovative practices and support cluster development and innovation (Molina-Morales et al.; 2015). Moreover, institutions function like gatekeepers and intermediaries facilitating knowledge flows and innovation (Rychen & Zimmermann, 2008). They help translate external knowledge into local contexts, enabling firms to adapt and apply new insights effectively. Their presence helps overcome potential barriers related to trust and communication, allowing clusters to leverage both local and global knowledge networks more efficiently.

Recent authors insist on the fact that different types of proximity, geographical and non-geographical ones, play distinct roles in cluster dynamics. They underscore that the interplay of various proximities allows clusters to harness local synergies while maintaining global competitiveness. The literature emphasises the multifaceted nature of proximity, and the crucial role played by non-geographical proximities (cognitive and social ones) in the dynamics of clusters, especially at the urban level (Fitjar & Rodríguez-Pose, 2017). Several authors demonstrate that proximity is not solely about physical distance but involves shared mental frameworks and trust (see a large UK study by Crescenzi et al., 2016).

In quantitative terms, the study of proximity was dominated by the analysis of sectoral related varieties (Weterings & Boschma, 2009). This approach, focused on technological proximities, was partly tautological because sectoral differences are, by definition, small within clusters. In recent years, studies have increasingly been based on social network analysis (Polge et al., 2018; Niang et al., 2022), with a focus on the study of internal relations between cluster participants. It allows analysing the geographical proximities according to geographical distance or transport infrastructure, but also the other proximities, based on their levels of interaction (Torre et al., 2019). It is thus possible, through the combination of proximity and social network analyses, to identify the main components of a cluster, its central actors as well as its gatekeepers, for example (Jambou et al., 2022; Torre et al., 2019).

A few empirical studies have focused on clusters where geographical proximity is deliberately weak or absent, a configuration that challenges the foundational assumption that spatial contiguity is a necessary condition for cluster vitality (Martin & Sunley, 2003). The TENLOG case offers a rare opportunity to examine how a “cluster without proximity” can function, and whether organised proximities can compensate for, or even replace, geographical closeness. This study directly addresses this gap by applying textometry and social network analysis to quantify organised proximity. We show that even in the absence of geographical contiguity, organised proximity can be empirically captured through discourse similarity and relational embeddedness (closeness centrality, for example),

offering a replicable framework to move beyond output-based assumptions and into the relational and semantic architecture of clusters.

3. The TENLOG Cluster: between spatial recomposition and networks of actors

The Occitania region, located in the south-west of France, was formed in 2015 through the merger of two former regions, Languedoc-Roussillon and Midi-Pyrénées (Torre & Bourdin, 2023). Its numerous logistics activities are distributed along the Mediterranean axis, from Perpignan to Nîmes, and extend in "glove fingers" around Toulouse, following the major transport routes. The region is traversed by several significant logistics flows, connecting Spain to Italy, Germany, the Mediterranean Sea, and the Atlantic Ocean. The region plays a pivotal role in the logistics sector, supporting projects such as logistics parks and introducing ecological regulations in this domain. Various local authorities, including Sète Agglopôle and Toulouse Métropole, aim to reorganise their logistics flows through platform projects and urban logistics charters.

We define logistics as a set of activities that contribute to the circulation of products and the coordination of supply and demand by making goods available at the right place at the right time (Heskett, 1976). It links the different segments of the production and distribution systems in space and time (Hesse & Rodrigue, 2006), and operates on multiple scales, reaching into the heart of city centres and neighbourhoods(Dablanc & Rodrigue, 2014) . The logistics sector can be defined as a set of activities that facilitate this intermediation and the smooth movement of goods (Heitz et al., 2019).

The TENLOG logistics cluster, established by the Regional Council of Occitania and the Pyrénées-Orientales Département, aims to foster a more profound dialogue among logistics stakeholders, both sectoral and territorial (see Fig. 1). It addresses various issues: employment and training, multimodality, urban logistics, and innovation. The current structure includes approximately 70 members (including stakeholders operating across multiple regional directorates, such as GRDF). Its governance is organised into concentric circles, consisting of the board, the administrators, the members (see Fig.1), and finally the distant network (not shown on the map), with "friendly" organisations. Each circle necessitates a different level of investment and involvement. The members are divided into colleges that bring together companies, institutions, and research or training organisations and are intended to be representative of the logistics sector.

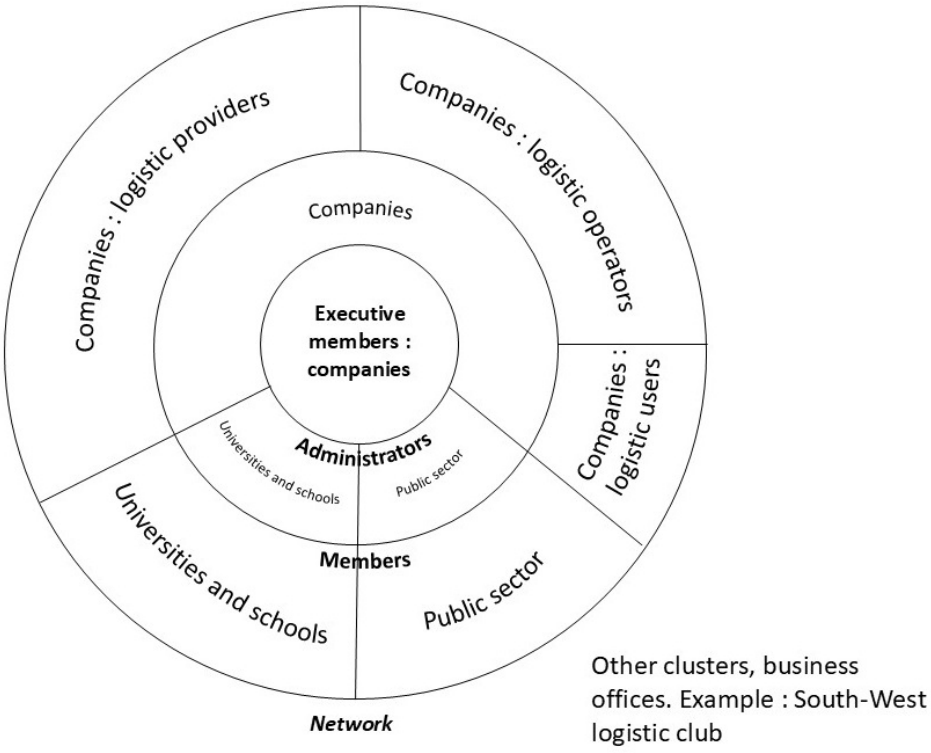


Figure 1: Governance of the TENLOG cluster (authors)

TENLOG is the result of the prior merger of two previous clusters: TransTen, focused on innovation in road transport (goods and passengers) and motorisations, whose members primarily hailed from the Midi-Pyrénées region, and We4LOG, a more generalist cluster, mainly led by companies and institutions from Montpellier and Perpignan (see Fig.2). This rapid evolution reflects the challenges faced by the logistics sector in the Occitania Region and the efforts to unify the different players. The governance of logistics thus proceeds through successive mergers, expanding the geographical perimeters, fields of action, and spheres of actors, following a logic of modularity.

Three main periods can be distinguished, according to recent developments in logistics and its cluster in the Occitania region:

1) Translog and the MP2 platform (2003-2018)

Translog Sud de France and MP2, organisations centred around Montpellier and Perpignan, with a clear separation between private and public players, operated from 2003 to 2018. Translog's goal was to promote the competitiveness of the logistics sector, particularly by reporting certain issues to the public authorities. The MP2 platform (Pyrénées-Orientales) was oriented towards modal shift through combined road-rail transport.

2) We4LOG: A Transitional Cluster (2018-2022)

We4LOG resulted from the merger of the two structures: the facilitators and founding members were taken over from MP2, and some members came from Translog. The system became much more extensive geographically, covering the perimeter of Occitania and bringing together companies, institutions, and training organisations. Geographical dilution was manifested by an increased average time of 40 minutes to reach meetings and decision-making venues (see Fig. 3), which discouraged some members and deterred more distant actors from joining. The location of the members, mainly in Toulouse, Montpellier, and Perpignan, was strongly influenced by the administrative perimeter as well as by the economic geography of the logistics sector. Between 2018 and 2022, there were three hosts and several presidents. A parallel cluster called Transten taking over the players in the transport of goods and passengers was merged with We4LOG in 2022.

3) TENLOG: The Current Cluster (2022-onwards)

From 2022, We4LOG was renamed TENLOG, without any major break in governance methods. Refocused around Toulouse, the cluster is led by a former road freight transport company manager and former president of Transten. It has grown in terms of membership, leadership, and goal setting, but successive mergers pose challenges in terms of governance and influence the coordination of the logistics sector, particularly regarding the choice of decision-making and meeting venues.

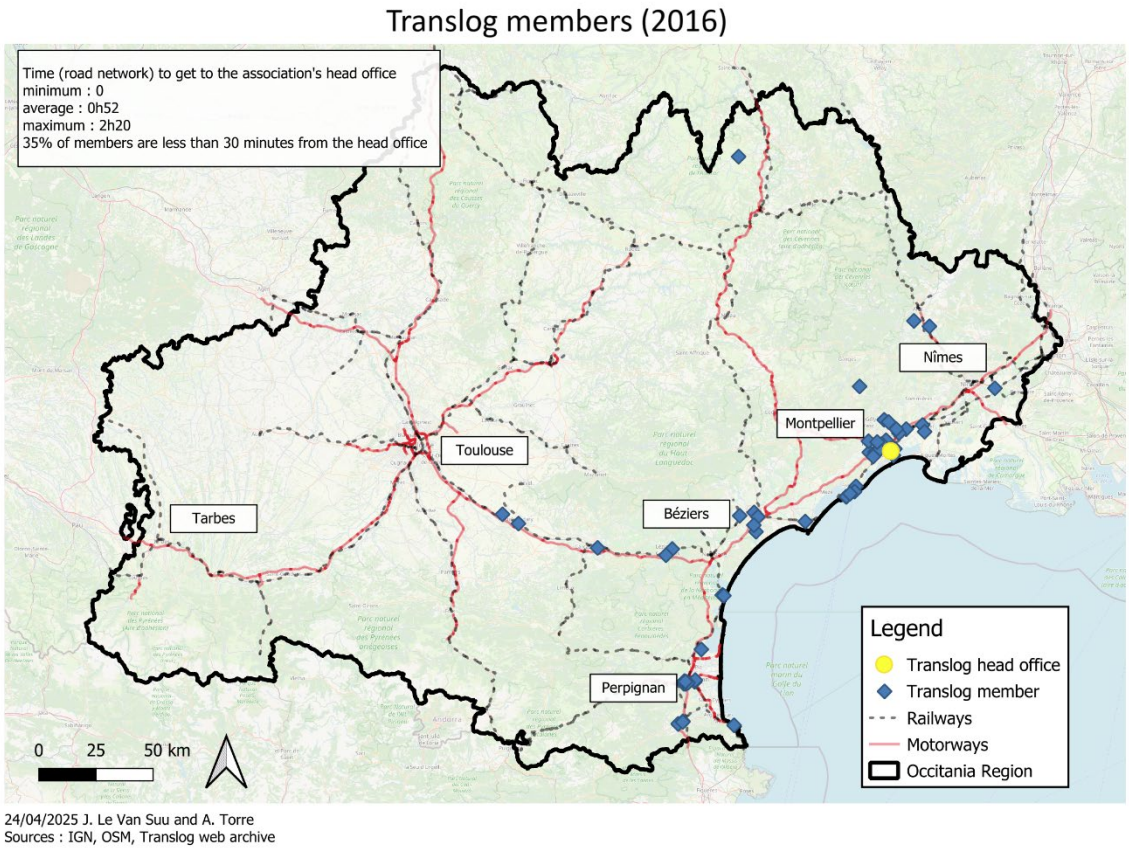
In summary, there was a process of spatial expansion from 2016 to 2021, followed by a refocusing of specific priority themes and territories from 2021 to 2025. In terms of geographical proximity, it increased significantly before declining more moderately.

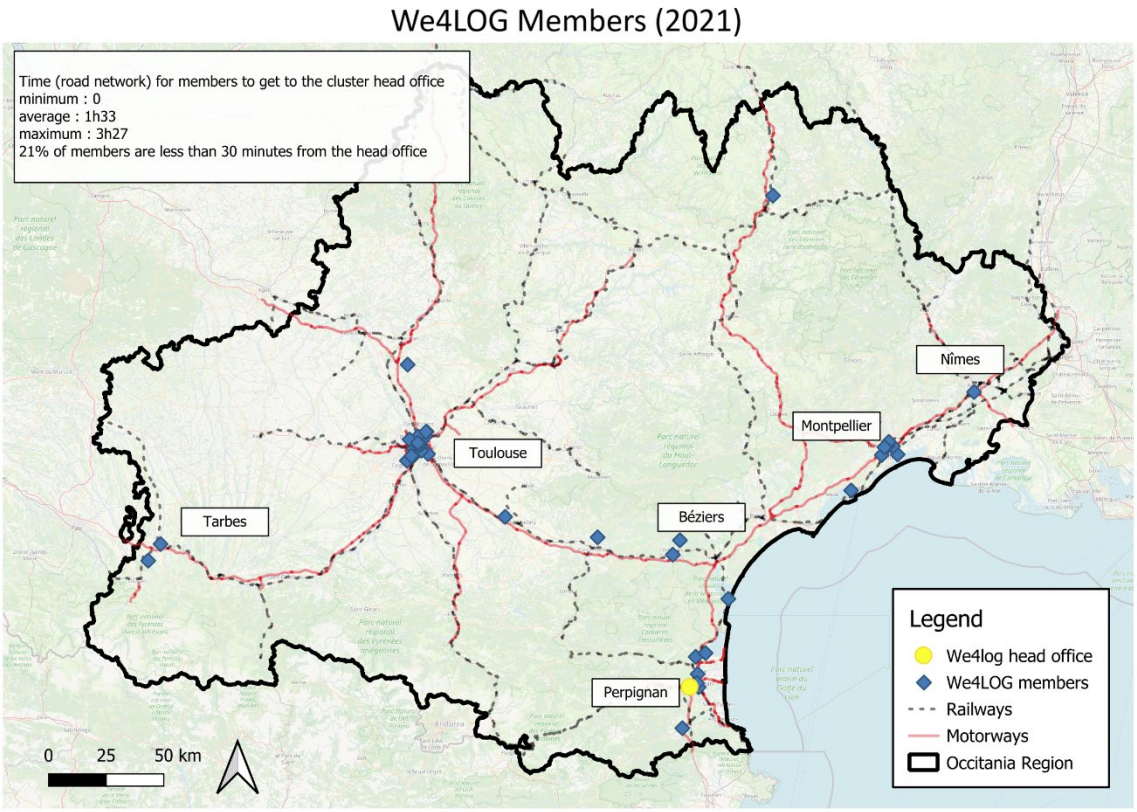
Certain constants persist throughout the process of recomposition, suggesting continuity in the construction of a common language and shared objectives. TENLOG primarily regroups the historical players in road freight transport; inherited from We4LOG and Translog. The assistant facilitator, despite the evolution of job titles, accompanied each step, thus guaranteeing the continuity of the process. Over time, the issues of ecological transition and modal shift have increasingly occupied space in discussions and cluster's logistics actions. Overall, the system has maintained coherence in its objectives and in the aggregation of new elements. However, despite the general satisfaction of the actors surveyed from 2018 to 2021, these mergers did not occur without internal conflicts, power struggles, and resistance. For example, in 2020, players from the former Midi-Pyrénées region believed that strategic positions were exclusively occupied by business leaders from the former Languedoc-Roussillon.

Clusters' names	Dates	Main financial and political backing	President	Spatial dynamic	Members (max)
MP2	2003-2019	Departmental Council of Pyrénées-Orientales	Departmental Councilor (2008-2021)	County scale	3 (public)

Translog Sud de France	2005-2019	CCI	Multimodal transport company manager	Regional scale	~70 (companies)
We4LOG	2019-2022	Occitania Region and Pyrénées-Orientales Departmental Council	Several successive Presidents	New Occitania Region)	~50 (companies and public)
Transten	2018-2022	Private	Former head of a road freight transport company	Around Toulouse	~50 (companies)
TENLOG	Since 2022	Occitania Region and Pyrénées-Orientales Departmental Council	Former head of a road freight transport company	Around several important cities	~70 (companies and public)

Fig. 2: Changes in the successive governance of logistics clusters in Occitania





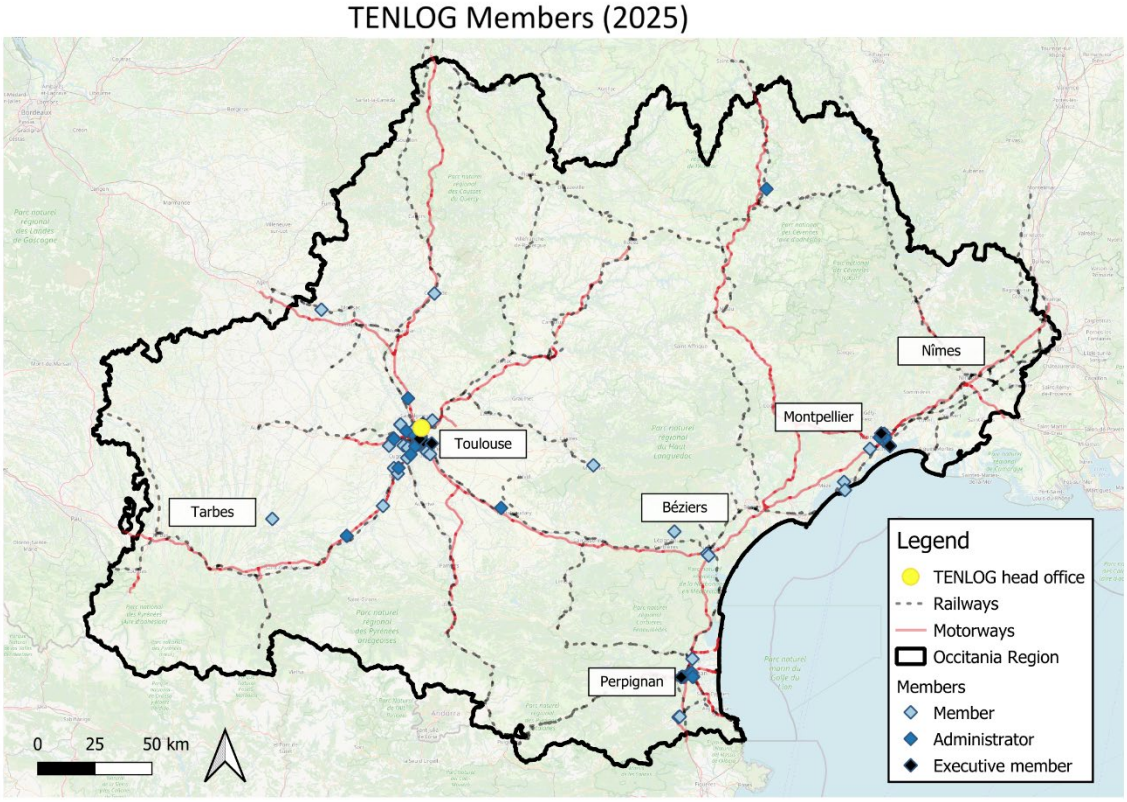


Figure 3: Spatial recompositions in the logistics clusters in Occitania

4. Methodology and research strategy: tools to analyse organised proximity

The proximity analysis grid is underpinned by robust theoretical foundations and is informed by numerous case studies, including the network approach (Torre et al., 2019; Niang et al., 2022). These studies frequently integrate geographical proximity dimensions with the logic of belonging of organised proximity, through the examination of interactions between actors. Conversely, the logic of similarity is seldom addressed, likely due to the absence of reliable analytical methods.

By cross-referencing various indicators, which correspond to the logics of belonging and similarity, we can examine the properties of organised proximity relationships in the case of the TENLOG cluster in the Occitania Region. We use textometry and social network tools. The strategy implemented is executed in four steps (Fig 4), based on the calculation of indicators derived from interviews conducted within a professional social network centred on logistics:

- Construction of a dataset through semi-structured interviews, aimed at exploring the representations of logistics in Occitania. The questions are as consistent as possible. The guide also delves into the issue of mutual acquaintances and the network of actors.
- Analysis of the registers of discourse, contrasts, and similarities, to comprehend the logic of similarity of organized proximity.
- Construction of a social network based on the interacquaintances mentioned in the interviews.
- Analysis of the social network through various metrics, including centrality, to understand the logic of belonging in organized proximity.

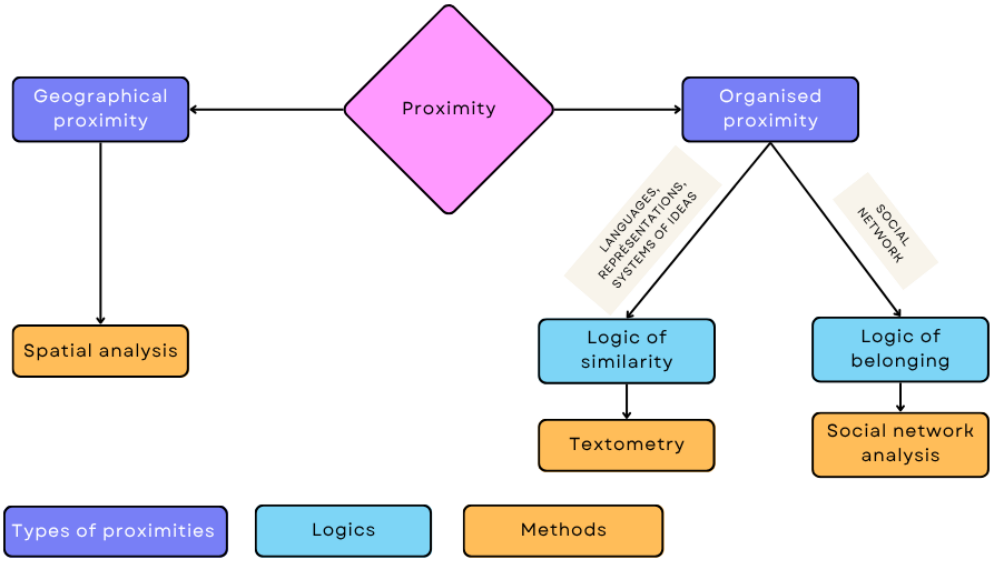


Figure 4: Types of organised proximity and methods used

4.1 Interviews and fieldwork

40 semi-structured interviews, fully transcribed, were conducted during two campaigns: from 2019 to 2020, and in 2025. The resulting corpus contains over 304 488 transcribed words. We categorised the actors into six groups based on their professional or associative status: public officials (10 respondents), company heads (9 respondents), logistics staff (8 respondents), trade unionists and activists from environmental associations (4 respondents), cluster facilitators (6 respondents), and local politicians (3 respondents). These categories are justified by the discourse: except for the "business manager" group, actors within a professional category tend to produce relatively homogeneous responses. Other variables, such as age (ranging from 20 to 75 years) or gender, do not have a significant effect. Half of the respondents are members of the cluster, allowing for a comparison of the dynamics at work both within and on the margins of this system.

To minimise biases, the guide was constructed with a time constraint: each interview lasted between 45 and 75 minutes. Additionally, the questions posed to participants remained consistent and open-ended to avoid any reformulation of the terms contained in the questions. Finally, a specific question in the interview guide addressed the interacquaintance between the actors, which helps structure the network of actors, even if respondents did not spontaneously mention this theme.

4.2 Textometry: a mixed method in the toolbox of proximity analyses

We use textometry, a mixed method that combines qualitative and quantitative approaches, to facilitate an examination of the similarity logic of organised proximity. It

enables the transformation of qualitative materials, such as semi-structured interviews or press articles, into quantitative data using statistical and algorithmic methods. Textometry tools allow to quantify the linguistic and semantic dimensions of the actors' discourses, thereby revealing the relationships of organized proximity that stem from the logic of similarity. For instance, it is possible to classify the registers used by the actors (and their proximity), conduct analyses of the tone of a discourse, or directly calculate the "distance" between two texts. It offers several advantages:

- Abductive Nature (Van Hulst & Visser, 2025): queries can reveal new themes and challenge certain preconceived ideas. For instance, actors from the maritime and railway sectors use similar lexical worlds (related to massification), despite their distinct professional cultures. Although textometry shares similarities with automated language processing (NLP, used in machine learning models) through the algorithms and inputs employed, it differs in its objectives: detecting contrasts and specificities, and requiring researcher intervention throughout the data mining process.
- Reproducibility: the corpus of the analysis can be reused, and the operations performed with the IRaMuTeQ software duplicated. This promotes transparency and allows for the verification of the results obtained.
- Visualisation: due to their visual nature, the results can be integrated into local consultation processes, offering a better understanding of positions and encouraging stakeholder participation.

4.3 Logic of similarity: statistical treatments to approximate representations

The use of textometry techniques allows for the approximation and quantification of the logic of similarity of organised proximity, through lexical worlds, discourse analysis (Mayaffre et al., 2019), motives, and specificities. The methods employed in the treatment of interview material leverage the functionalities of the IRaMuTeQ software and are centred on lemmas, the fundamental semantic units in textometry. They correspond to dictionary entries; for instance, in the sentences "A truck is currently loading the goods" and "A truck loaded the goods", the words "loaded" and "loading" are distinct but belong to the same lemma. The interviews are segmented into text blocks, each comprising 40 lemmas, aligning with the "average" size of the texts in the corpus, and these segments form the "analysis block". The classification methods outlined below utilise these blocks to identify frequently associated lemmas.

4.3.1 General Textual Statistics

Textual statistics involve counting lemmas and are visually represented through word clouds or histograms. The software can be queried regarding the presence of different

types of contrasts, such as deviations from the average use of a lemma by an actor or a category of actors on a given date.

4.3.2 Labbé's intertextual distance

The intertextual distance (Labbé & Labbé, 2006) serves as an indicator of distance between multiple texts or groups of texts, and is particularly effective for analysis from a computational perspective (Brunet, 2003). Let i represent a form present in both texts; the distance is then calculated as the number of differences between the two texts, divided by the maximum theoretical differences.

$$D_{(A,B)} = \frac{\sum D_i}{\sum \mathrm{Dmax}_i}$$

If two texts share no common words, their distance is 1; and 0 if they have identical word frequencies. To measure the deviation from the "average" speech, we also compute the sum of the Labbé distances between an actor's speech and all others (sum of a row in the distance matrix).

4.3.3 Reinert Method

The Reinert Method (Dalud-Vincent, 2011; Reinert, 1993) enables the classification of text segments or interviews into "lexical worlds" (see Fig. 6). This algorithm is valuable for building typologies and exploring the intricate representations of actors. The software can determine the p-value, which indicates the level of confidence or uncertainty associated with a statistical statement or conclusion. When p-value is less than 0.05 (by convention), the claim is considered plausible.

4.4 Logic of Belonging and Social Network Analysis

Graph theory and network analysis provide several tools to understand the logic of belonging of organised proximity, by enabling the assessment of the degree to which actors belong to a relational network. Various existing indicators are proposed to comprehend the integration of actors into the same network.

4.4.1 Distance in a Social Network

In a social network, distance refers to the length of the shortest path between two nodes. In the professional context of logistics, it describes the number of intermediary actors required for two actors to exchange information or meet.

4.4.2 Closeness centrality

Closeness centrality C(x) corresponds to the inverse of the sum of the distances to all other nodes.

$$C(x) = \frac{1}{\sum_y d(y,x)}.$$

Actors with a high degree of closeness centrality are "closer" to all other actors in the network (or more central within the network). They are therefore more likely to establish contact (Jambou et al., 2022; Niang et al., 2022; Pachoud et al., 2019; Torre et al., 2024).

4.4.3 Modularity (Louvain method)

The Louvain method for community detection directly evaluates the logic of belonging of organised proximity - defined by the density and intensity of relational ties - by minimising intra-community variance in relational ties (Blondel et al., 2008). It identifies cohesive groups of actors whose internal connections are significantly denser than external ones, thereby quantifying the strength of their mutual embeddedness within the cluster's social fabric.

The method operates in two iterative phases:

- 1) identification of locally optimal small communities by greedily assigning each node to the community that maximises the global modularity Q, defined as:

$$Q = \frac{1}{2m} \sum_{i,j} \left[A_{ij} - \frac{k_i k_j}{2m} \right] \delta(c_i, c_j)$$

Where Aij represents the weight of the edge between i and j; ki = ∑j Aij the sum of the weights of the edges attached to node i; ci the community to which node i is assigned; the δ function δ(u, v) is 1 if u = v and 0 otherwise (The difference is only considered if i and j are in the same community).

- 2) aggregation of each detected community into a single super-node and repetition of the process on the condensed graph, thereby revealing a multi-scale community structure.

5. Results: despite physical distance, a persistence of organised proximities

The protagonists of the logistics sector in the Occitania region tend to be geographically dispersed. This raises questions about the effectiveness of their relationships and their commitment to the cluster's objectives. One can wonder about the strength of their links of organised proximity, given that they often maintain rather weak geographical proximity relationships.

We apply the approaches described in the previous section to the logistics network of the Occitania Region, i.e., cluster members and non-members. This multi-scale research strategy serves a dual purpose: to evaluate organised proximities within the cluster and to assess the cluster's integration within a broader network of actors. We successively study the logics of belonging and similarity, and then general organised proximity. Textometry and social network analysis reveal a homogeneous cluster: the system maintains a high level of organised proximity among its members, compared to other non-cluster respondents.

5.1 Logic of similarity: convergent representations despite physical distance

5.1.1 Labbé intertextual distances

This analysis enables the identification of convergences and share interests among cluster members, based on the transcription of interviews and the resulting texts (Fig. 5). It makes it possible to identify the persistence of a strong similarity logic, which remains stable between 2021 and 2025.

Intertextual distance measures the difference between standardized-size texts and, consequently, between different groups: the more varied the lemmas used, and in large proportions, the higher this indicator. In 2021, intertextual distances were smaller among cluster members compared to non-members: 12 members had a sum of intertextual distances below the median of 21,478, while only 4 were above. This result underscores a strong logic of similarity among cluster members, despite increased geographical distances from 2016 to 2021. In 2025, the distribution between members and non-members remains similar; 14 members have a sum of intertextual distances below the median of 25,89, and only 5 are above.

Within the members, the "facilitators," whose role is to build connections in the cluster and, through mediation, enhance the logic of similarity, minimise intertextual distance with public officers (Fig. 5). They navigate and utilise various lexical fields from different actor spheres, and possess a broad range of interests. For example, the first "cluster facilitator" mentioned logistics related to road, port, rail, training and organization in the sector, economic constraints, territorial planning, and more.

The slightly greater distance between the discourses of the "public officials" and "logistics staff" groups (managers and logistics operators) can be attributed to differing interests. While public officials are particularly focused on territorial planning, field actors are primarily interested in implementing innovations, often related to the ecological transition, in their companies. Nonetheless, all the actors operate within similar discourse registers, maintaining a strong logic of similarity (see 5.1.2). For example, "public officials" are interested in implementing aid for the transition of the truck fleet,

while logistics staff focus on implementing field rounds with these so-called decarbonised vehicles.

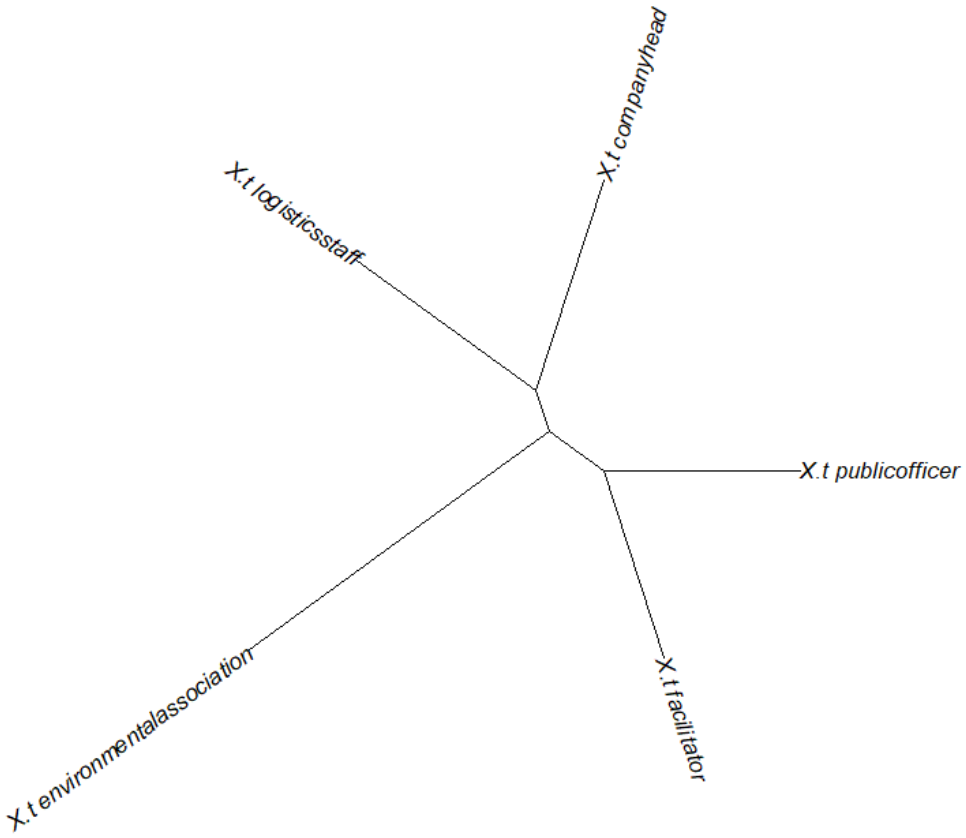


Figure 5: Labbé intertextual distance between types of cluster members in 2025 (in the tree, close categories minimize Labbé's distance)

Source: Authors (28/05/2025, active forms, minimum frequency 1)

5.1.2 Reinert method

The analysis of lexical worlds using the Reinert method (Fig. 6) reveals patterns of organized proximity among cluster actors. This method automatically classifies recurrent text segments, providing insights into the main themes of interest, namely energy transition (class 2), public action (class 3 and 4), change management and the needs of the logistics sector (class 5) within the cluster.

The lexical worlds corresponding to classes 3, 4 and 5 are close. The dendrogram below illustrates only the lemmas most specific to each class, yet they share a large number of lemmas: the more occurrences they have in common, the closer the lexical worlds. The actors associated with class 5 expect the cluster to be a catalyst for change, particularly through training, information, and awareness-raising initiatives. A class 5-participant states that the role of the cluster is to *"reflect on the future of our professions, collectively on the themes I have just mentioned, information, participation in major trade fairs [...] of*

awareness, of regional or even national power" (I10). Thus, the cluster is positioned as a tool for fostering proximity, especially between the logistics sector and public action, with the aim of political transformation.

However, these lexical worlds reveal some ambiguity regarding the nature of the change: does it pertain to public action, the engines of heavy goods vehicles and commercial vehicles, modal shift, or competitiveness? Although they share a common foundation of representations and systems of ideas related to the cluster, each actor develops specific themes to which they are particularly sensitive. Consequently, some lexical worlds are specific to certain categories of actors (class 2 is specific to "company heads," class 5 to "cluster facilitators," and class 4 is very specific to "public officials"), while others encompass two categories of actors: this is the case for classes 2 ("logistic staff and company head") and 3 ("cluster facilitators" and "company heads").

"*I work a lot on hydrogen, on NGV, because I was a pioneer in NGV too* " (I5)

"*Now I enter the region through the cluster, in the cluster, I see other things, I learn other things*" (I5)

Importantly, these lexical patterns **persist over time**: the main lexical worlds identified in 2021 largely reappear in 2025, even as new actors are interviewed. This persistence suggests a **stable logic of similarity** within the cluster, where actors converge around common themes and vocabulary, reflecting an ongoing organized proximity that structures interactions and shared expectations. The cluster thus functions as a tool not only for bridging different categories of actors but also for maintaining continuity in the cluster's collective representations and priorities.

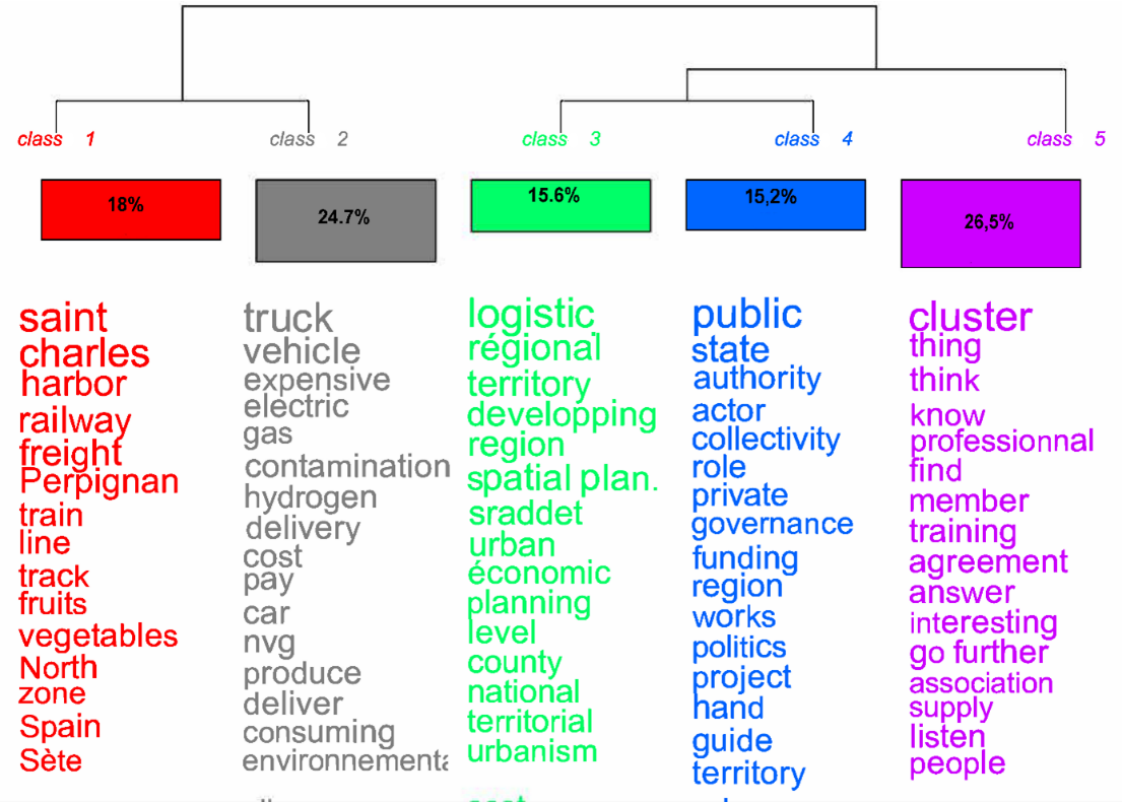


Figure 6: Towards the sharing of a lexical world in common? Reinert method

Source: Authors (2025-05-28, phase1 classes: 20, 92% of classified text segments, translated from French words)

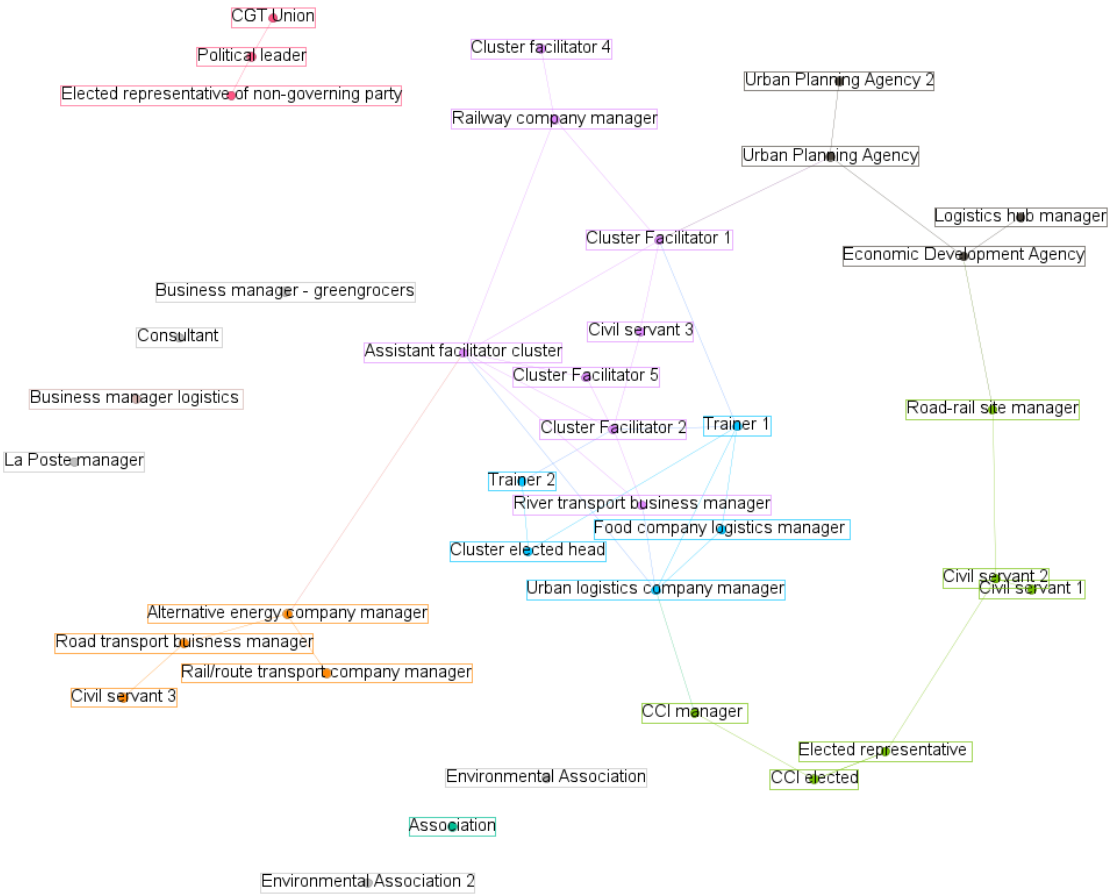
5.2 Logic of belonging and social networks: a dense cluster, at the junction between logistics and public action

5.2.1 Closeness centrality in a Network of Actors

Figure 7 illustrates the network of regional logistics actors, from which we calculated the centrality of proximity to identify the most influential individuals, within and outside the cluster. This graph is undirected: we have assumed that if actor A knows actor B, the reverse is true, which is almost always the case in professional logistics networks. The surveys were conducted based on mutual knowledge through the themes addressed (personal and professional background of the respondent, social and environmental issues of logistics governance, cluster, innovation, logistics geography, etc.). If these references did not allow exploring the actor's professional links, we asked a specific question: "Which actors are you in regular contact with?"

The representation of the graph used Gephi software, with the Force Atlas 2 gravity placement algorithm (Jacomy et al., 2014). Whenever an actor mentions another known actor with whom they interact (during the preliminary or the dedicated questions), a link is drawn (The actors not interviewed but who appeared in several discussions are indicated). In 2021, central positions were mainly held by cluster facilitators (C=0.41 for

the deputy cluster facilitator), company heads seeking to expand their business through networking, and some logistics staff who also act as trainers. Public officials and logistics staff not directly involved in the cluster occupied more peripheral positions (C=0.18 for I1). By 2025, the network had broadened due to interviews with more peripheral actors, leading to some changes: some actors maintained central positions, such as cluster facilitators, while others fainted and new actors emerged. Notably, public actors gained prominence, with civil servants (C=0.40 for civil servant 5) now playing a key role, reflecting a shift in the cluster's relational dynamics.



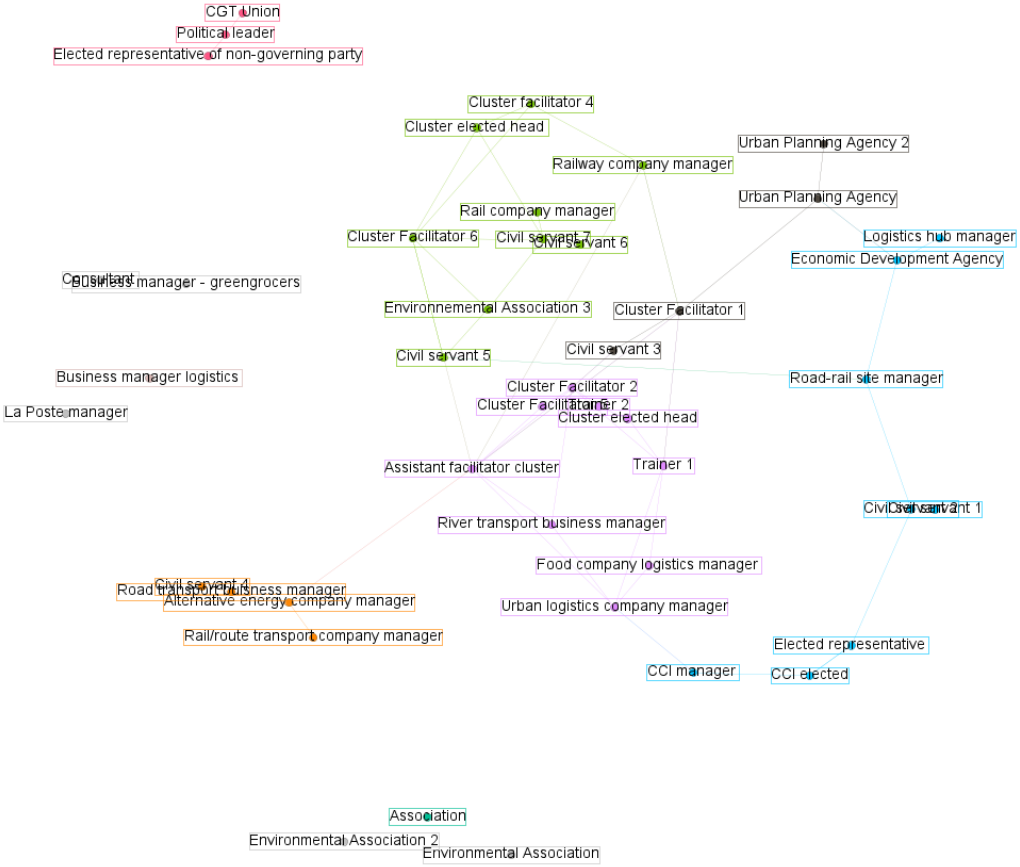


Figure 7: Networks of actors, inside and outside the cluster in 2021 (top) and 2025 (bottom). Each colour corresponds to a community detected by the Louvain algorithm, i.e. a group of actors more densely connected internally than externally.

Source: Force Atlas 2 Placement Algorithm, authors 30/04/2021 and 22/11/2025

5.2.2 A well-identified cluster core

Centrality analyses confirm that the logic of belonging is more pronounced at the core of the cluster than at its periphery: the actors are well acquainted with one another and maintain regular connections. In 2021, this core consisted of (1) road transport companies, (2) trainers and facilitators, and (3) some public actors (4). However, related actors were underrepresented, such as warehousing and storage companies, logistics information systems management, and rail actors. Similarly, staff representatives or environmental associations were not part of this system. In 2025, the core is slightly modified, with the presence of public actors (1), cluster facilitator (2), rail transport actor (3). urban road transport (4). In 2021 (Fig 7), the Louvain community detection identifies five groups. The green community corresponds mainly to cluster facilitators located at the very heart of the network (with the exception of the CEO of a rail transport company), while the purple community brings together private actors who also occupy central positions, the orange community groups private actors and more peripheral. 2 last communities are composed of public or semi-public actors that are more loosely connected to TENLOG .In

2025, this overall structure remains largely stable, but public actors gain in importance and now constitute the majority of the green subgroup (which corresponds to the pink community in 2021). The actor network is thus characterised by a stable, resilient core, within which the relative importance of public actors increases over time.

The logic of belonging (Figures 7), can vary in importance depending on the position in the network, as indicated by different metrics (we have focused on closeness centrality).

- Most cluster members belong to the main network (C>0).
- Excluding members disconnected from the main network, only 5 have closeness centrality below the median in 2021 and 7 in 2025.
- A more qualitative analysis reveals numerous connections between cluster members, whereas external actors sometimes do not even mention their professional network.
- The TENLOG cluster core remained stable and resilient between 2021 and 2025, despite the lack of geographical proximity between its members

The actors connect within the cluster, but the logic of belonging also extends to the interface with its environment, with complex and evolving links. For example, " versatile " actors in the cluster may also be involved in environmental associations (I17), local administration (I20), or participate in training at local universities. This interconnection demonstrates an ability to expand the network, even at its margins. The last general assembly (June 2025) formalised this expansion through the concept of "partner," an intermediate status that does not require membership but allows for the co-construction of events. This highlights the structuring role played by the logistics cluster in organising the whole regional logistics relationships, extending well beyond its formal members.

Opening up the cluster leads to a paradoxical situation: in 2025, the members are slightly less central to the professional logistics network than in 2021. Conversely, the actors surveyed in 2025 form a community identified by the algorithm (shown in green), which maintains links, particularly through their proximity to one another within public structures, like decentralised government services and local authorities. Furthermore, the cluster's financing difficulties (I37) limit its scope and capacity for action, particularly due to its small number of employees. For example, the equivalent logistics cluster in Brittany has over five employees, whereas TENLOG has only one administrative manager.

6. Discussion

Our study has demonstrated that the TENLOG cluster was capable of maintaining significant and diverse organised proximity links, thereby facilitating numerous

exchanges and opportunities for synergy among its members. This internal coherence remained strong, despite the geographical distance of some participants and the ongoing restructuring.

6.1 Challenges of remote clustering erased by organized proximity relations

The shift from a previous perimeter centred on Montpellier to a geographically broader structure of the TENLOG cluster could have potentially presented challenges in terms of regular participation and adherence to shared values or principles. The cost and time associated with transport could indeed deter certain actors, located at the opposite end of the Region, with constrained schedules, leading them to disengage from collective dynamics, as some actors have noted.

"As much as when it was Languedoc-Roussillon, it was in Montpellier, I had the time to be able to do it. Now, keeping busy, following up being active in the cluster which is more in Perpignan or Toulouse is much more difficult and I have a problem with travel" (I10)

However, our study indicates that geographical distance is not an insurmountable obstacle for cluster members. The location of the largest concentration of members has shifted: the number of members in Montpellier has decreased over time, while that in Toulouse has increased significantly due to successive mergers. The location of the cluster's facilitators and offices plays a crucial role for actors with strong territorial roots. Nevertheless, some leaders view mobility as a "natural" investment; they internalize the constraint and maintain visibility within the cluster, thereby mitigating the distancing effect.

"*I've always done a lot of kilometres, I've been doing a lot of kilometres for a very long time. No, it doesn't give me any difficulties* " (I24).

Additionally, logistics and software solution providers, who are frequently required to travel, do not necessarily perceive distance constraints in the same way. It becomes even more relevant for such new players to join a regional logistics cluster to collect information, even if they may appear distant from the barycenter of the cluster.

6.2 Relational continuities: the strength of organised proximity

The institutional framework of previous clusters was initially reused almost entirely in TENLOG: the same animation team, codes, and locations were maintained. This path dependency has contributed to the continuity of internal organised proximity links. It facilitates the adoption of certain codes and procedures during meetings and also fosters the development of proximities outside the cluster system. Although the COVID crisis temporarily halted the initial momentum, the resumption of networks of actors and

locations has enabled quick operationality, the participation of a sufficient number of members, the addressing of devoted topics (ecological transition and road freight transport), and the presence of facilitators already trained in the procedures.

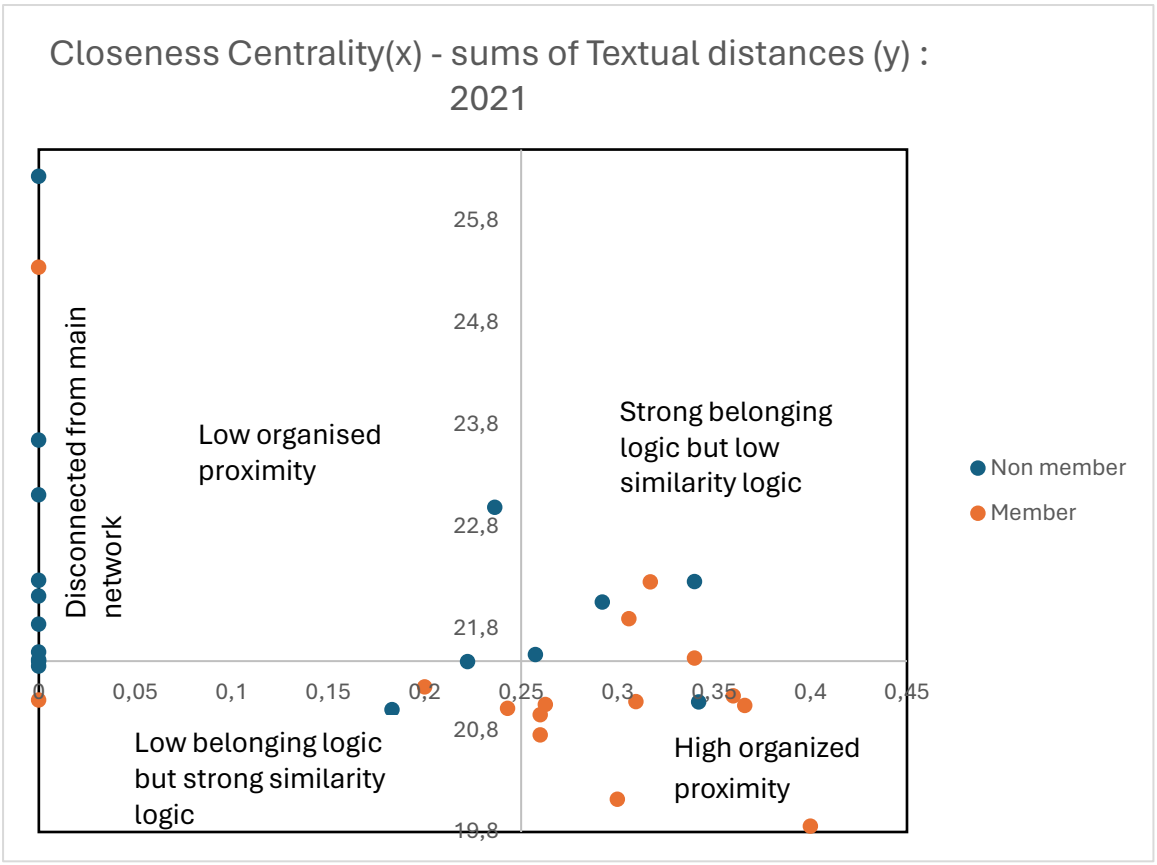
However, this continuity, which was crucial for the initial setup, also acts as a barrier that slows the entry of new territories, or rail transport players into the cluster. The overly strong organised proximity among cluster members could thus pose a challenge to its future development.

"These are companies, which are used to working together so they know each other, so the fact that they have been put in a cluster may not have changed their relationship much" (I17)

More precisely, a simplistic vision of relationships might suggest that actors close within a network share similar lexical worlds, as observed in online discussion spaces (Smyrnaios & Ratinaud, 2014). However, belonging to the same organisation does not necessarily imply having a common lexical world. This is shown in Fig. 8, where actors with significant closeness and proximity centrality are not necessarily central to discourse analysis. Cross-analysis of the two logics of belonging (relational network) and similarity (here measured by Labbé textual distance) identifies four profiles for professionals in the logistics sector.

- Weak similarity logic and weak belonging logic: Peripheral actors weakly connected, thematically distant and hard to integrate.
- Weak similarity logic and strong belonging logic: well-networked actors who introduce new discourses, potentially mobilisable if not yet included.
- Strong similarity logic and weak belonging logic: relationally distant actors sharing the same language, who could be easily integrated.
- Strong organised proximity in both logics: the historical core of the cluster, with strong ties and shared lexical worlds between central and interconnected, actors.

Belonging to the same network does not imply sharing the same logic of similarity. Different people can maintain very strong relationships, and this is often the purpose of maintaining exchanges that promote complementarities. This explains why actors using a specific lexical field do not necessarily occupy a peripheral position within the cluster's network. Having a variety of discourses within an organisation can be beneficial, particularly for a logistics cluster that aims to foster interactions between different groups of actors, if they share the same goals. This is one of the keys to the TENLOG cluster's success and resilience, despite significant geographical distances. The persistence of these four profiles between 2021 and 2025 reflects organisational and thematic stability, confirming the cluster’s balanced structure and its combination of relational cohesion and discursive diversity as key drivers of success.



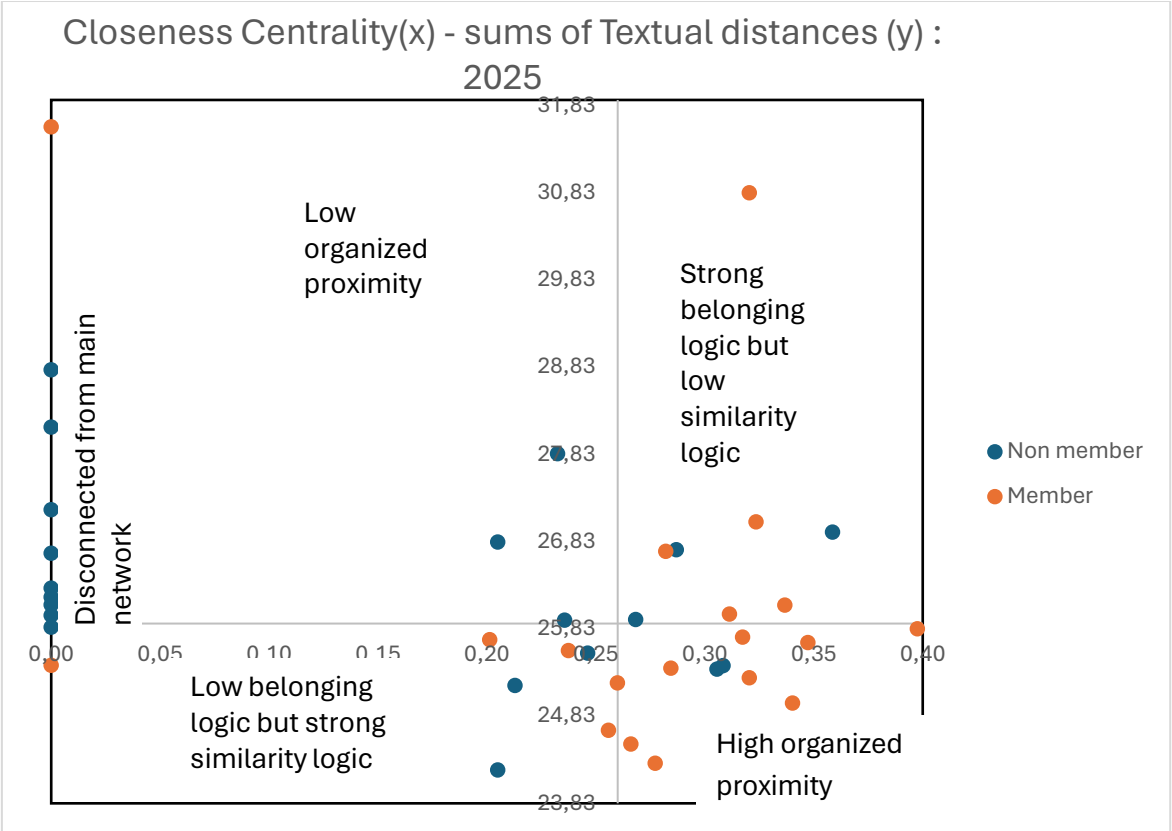


Figure 8: Sum of the mean Labbé distances and closeness centrality by actor

6.3 Contradictions between growth and cohesion

One of the challenges facing the cluster is to integrate new members, who bring new paradigms, ideas or innovations and are sometimes geographically distant, without disrupting the existing network and losing the similarities in terms of discourse and objectives. In other words, to achieve development without significantly undermining organised proximity links.

Indeed, the diversity of territories, systems of ideas, and skills is essential for advancing a logistics sector that is continually seeking innovation, and:

- Which relies on intermodality in its daily operations, with highly varied professional cultures depending on the modes of transport (maritime, rail, river, road, etc.).

"It's complicated to bring together under a single banner logistics that are extremely different" (I23)

- Which is often marked by internal contradictions between environmental preservation, performance (Liu et al., 2018), and different energy transition models.

"I was caught by activists, I had a bad moment [...] I thought I had everything right, when they told me, where do your batteries come from? Where do your rare metals come from?" (I5)

The participation of environmental associations in the governance of the logistics sector is a factor of division between cluster's members. They are both perceived as a source of conflict and fragmentation and a means of accelerating the ecological transition of the sector.

"Everything that is associations or individuals... No, I think it's a very directed. And I can't see the point of it" (I22)

It is interesting to note that the newcomers are more in favour of including additional new players. Maybe because their organised proximity with other members is weaker, or that they seek to recruit members closer to their own conceptions, thereby loosening the constraints of organised proximity that are sources of internal blockage or a tendency towards conformism.

6.4 Operational lessons for clusters dynamics

These results allow us to draw three lessons.

1. Maintain a "reasonable" level of organised proximity

A cluster without variety, characterised by a generalised and maximum organised proximity, would be ineffective: each actor would already know all the others (logic of belonging), and all would use the same lemmas in the same proportions (logic of similarity), which would undermine the system's dynamics and its ability to generate new

ideas. Conversely, a very low level of organised proximity would result in poorly connected actors, with their ideas and representations being lost due to a lack of channels and networks to convey their visions. For the TENLOG cluster, it is therefore crucial to maintain an intermediate state of organised proximity to preserve both the cohesion and dynamism of internal relations. A solution could lie in a model of gradual opening in concentric circles, starting from the core of road carriers, moving to local authorities, training organisations, and other modes of transport (rail and maritime in particular), then to related players (IT, e-commerce, insurance, relay points, etc.), and finally to new players in the logistics territory (civil society, environmental and consumer associations).

2. Identify the "gatekeepers"

In TENLOG, the sustainability of the "road core" creates strong cohesion but also induces a risk of lock-in: for example, the road freight transport players who made up the bulk of Translog's workforce still represent half of the directors of "logistic providers" college. Trained gatekeepers (Rychen & Zimmermann, 2008) could act as a transmission belt, at the hinge between several spheres of actors. Even if they do not systematically master all the working vocabularies, networks, and expectations of new logistics players (alternative energies, digital, river logistics, etc.), they can appropriate professional cultures and translate expectations to more established members, thereby creating bridges between groups with different similarities. The use of lexical worlds and structure of the network helps to identify these gatekeepers. For example, the I20 player is involved in the Chamber of Commerce and Industry (CCI), in a project led by the electricity network manager, in the Regional Transport Observatory, and in several companies, particularly related to the railways, etc. On Figure 7, he is located at the border between the Regional Council and the Cluster.

3. Manage Distance and Face-to-face Interactions, the Return to Geographical Proximity

Varying the places of face-to-face meetings to maintain territorial equity and recreate temporary geographical proximity (Torre, 2008) would address the criticism of a cluster that is too focused on a territory geographically distant from many actors. Additionally, a visit to an emblematic site (combined terminal, robotic warehouse, river site…) can foster the attention of participants coming from various places.: actors can meet in a less formal setting than a meeting room, which facilitates the circulation of ideas on particular topics.

7. Conclusions

We studied the TENLOG logistics cluster in Occitania, where the remoteness and weak geographical proximity links between some actors initially raised concerns about coordination difficulties and the lack of strong synergies among members. However, our findings indicate that these concerns were unfounded. The use of social network analysis

and textometry has demonstrated the existence of strong organised proximities relations (driven by the cluster core), even in a context of geographical dispersion. This situation is particularly robust despite obstacles such as a lack of facilitators due to financial constraints, or limited commitment from logistics actors.

For the analysis of the logic of similarity, we employed various textometric analysis methods, which offer advantages but present a few limits and open ways for future improvements. Reinert method automatically detects coherent discourse registers, with an open source and thoroughly algorithm. Labbé's intertextual distances directly measure the "proximity" between two texts while normalising their size. Textual statistics are beneficial for detecting themes and contrasts in texts or groups of texts, but they do not account for sentence structure, which can lead to erroneous interpretations.

To study the logic of belonging, we used social network analysis. The closeness centrality precisely describes an actor's position in the network (centre or periphery). The distance between two actors can provide complementary information on the likelihood of information dissemination or encounters, but it requires the construction of complex matrices for electronic processing.

To deepen this study, it would be beneficial to establish sociograms with oriented graphs and a qualification of the intensity of the links, allowing for a more refined and complex description of the social network. By extending the study beyond the interviews focused on the territorial governance of the logistics sector, we could gain a more in-depth understanding of the situation, with cliques, new groups, influences, and centralities emerging outside the cluster. Nevertheless, the current network remains manageable and simple, with affordable computation times and the possibility of studying each actor individually.

Finally, it would be possible to deepen the links between textometry and spatial analysis to evaluate the effects of the diffusion of discourse registers in space. Geographic information systems such as QGIS allow the integration of modules developed in Python, which could superimpose words, co-occurrences, and lexical worlds on a map to analyse representations of space. The logistics sector, its interdependencies with other sectors, and its spatial distribution would then constitute a relevant case for analysis.

ANNEX 1: the categories of proximity used

We are referring here to the classic distinction between two main categories of proximity (Torre and Gallaud, 2022): geographical proximity and organised proximity.

Geographical proximity refers to the distance between two places, weighted by the type and cost of transport. It can be sought by the actors, in the context of a location in a cluster for example, or suffered, in the case of a neighbourhood conflict or diffuse pollution. It can be permanent, in the context of a location, or temporary, in the case of a trip or a business trip, for example.

Organised proximity is non-spatial in nature. It refers either to the more or less close relationships between actors, for example within a network (logic of belonging), or to the sharing of common norms and values between actors (logic of similarity).

	Geographical proximity	Organised proximity
Permanent		
Temporary		
Sought		
Suffered		
Logic of belonging		
Logic of similarity		

ANNEX 2: Interviews conducted

Function of the interviewee	Type of interviews	Time	Identifier
Territorial civil servant 1	Exploratory semi-structured	1 hour 45 minutes	I1
Territorial civil servant 2	Exploratory semi-structured	1 hour 30 minutes	I2
Cluster Facilitator 1	Semi-directive	1 hour	I3
Member of an association	Exploratory semi-structured	1 hour	I4
Urban logistics company manager	Semi-directive	1 hour 30 minutes	I5
Elected representative of a local authority	Exploratory semi-structured	1 hour	I6
Business manager logistics innovation	Semi- structured	45 min	I7
Urban Planning Agency	Semi- structured	1 hour 30 minutes	I8
Economic Development Agency	Semi- structured	1 hour	I9
Rail/route transport company manager	Semi- structured	1 hour	I10
Territorial civil servant 3	Semi- structured	1 hour	I11
Urban Planning Agency 2	Semi- structured	1 hour	I12
Business manager - greengrocers	Semi- structured	15 min	I13
Cluster Facilitator 2	Semi- structured	1 hour	I14
CGT union	Semi- structured	1 hour	I15
Alternative energy company manager	Semi- structured	1 hour	I16
River transport business manager	Semi- structured	45 min	I17
La Poste manager	Semi- structured	1 hour 15 minutes	I18
Food company logistics manager	Semi- structured	1 hour	I19
CCI elected	Semi- structured	1 hour 15 minutes	I20
Cluster Facilitator 3	Semi- structured	15 min	I21

Trainer 1	Semi- structured	1 hour	I22
Trainer 2	Semi- structured	1 hour	I23
Consultant	Semi- structured	45 min	I24
Territorial civil servant 4	Semi- structured	1 hour	I25
CCI manager	Semi- structured	2 hours	I26
Cluster Facilitator 4	Semi- structured	1 hour	I27
Environmental Association	Semi- structured	30 min	I28
Political leader	Semi- structured	1 hour 15 minutes	I29
Environmental Association 2	Semi- structured	1 hour 15 minutes	I30
Elected representative of non-governing party	Semi- structured	1 hour 15 minutes	I31
Railway company manager	Semi- structured	1 hour	I32
Cluster Facilitator 5	Semi- structured	50 min	I33
Cluster Facilitator 6	Semi- structured	1 hour 15 min	I34
State civil servant 5	Semi-Structured	1 hour 15 min	I35
Environnemental Association 3	Semi-Structured	1 hour 15 min	I36
Rail company manager	Semi-Structured	1 hour 15 minutes	I37
Territorial civil servant 6	Semi-structured	1 hour	I38
Cluster elected head	Semi-structured	1 hour	I39
State civil servant 7	Semi-structured	1 hour	I40
Cluster Facilitator - Britain	Semi-structured, not transcribed	1 hour	IC
Official	Phone call, not transcribed	1 hour	IA
Territorial civil servant 8	Phone call, not transcribed	2 hours	IB

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