Local policymakers' attitudes towards climate change: A multi-method case study

Abstract
Local authorities play a key role in tackling climate change by implementing targeted adaptation and mitigation measures. The specific implementation of a mix of adaptation and mitigation strategies is the outcome of the interaction of policymakers through a political debate and their attitudes towards climate change. By concentrating on the political discourses occurring in the Assembly of an Italian region (Emilia-Romagna), we use a multi-method approach of Discourse Network Analysis and Concept Mapping to investigate local policymakers' positioning. Our investigation shows that actors are grouped not only according to their political affiliation, but also to the debated topics, and this relates to the preference for supporting adaptation or mitigation measures, which characterizes the local policy debate.

Keywords
Climate change; Political debate; Multi-method; Local policymaker

1. Introduction

According to the Intergovernmental Panel on Climate Change (IPCC, 2018), climate change is one of the main challenges for human society, since the practical implications of a global temperature increase will result in lower crop yields, problems affecting coastal and ocean ecosystems, and higher risks for human health. The scientific community suggests that we have entered a new geological epoch, the so-called Anthropocene (Crutzen and Stoermer, 2000), because of the growing impacts of anthropogenic activities on the environment and the central role of mankind in this current geological epoch.

In order to tackle climate change, the main strategies introduced since the late '1980s at global level consisted in adaptation and mitigation measures, i.e. measures for adjusting to the negative effects of climate change and measures for reducing the emission of GHG, respectively (Gupta, 2010). However, despite the relevance of climate change in the political arena, the implementation of these measures has been somehow limited by the divisions amongst international and national policymakers (Kukkonen et al., 2018). International cooperation strategies, as those discussed during the yearly United Nations Climate Change Conferences, contribute to searching for shared approaches, as in the case of the 2015 Paris Agreement, when 195 countries signed a treaty to limit the increase of global temperature for this century to 1.5 °C. However, the achievement of national policy objectives is affected by sub national (local) authorities responsible for their implementation (see Rabe (2006) and Carlarne (2010) for the US case; see Juhola et al. (2012) for the European Union case), because local territories can be differently affected by climate change (Ostrom, 2014), and different measures and local targets must therefore be adopted. Gallaraga et al. (2011) pointed out that local policymakers play an important role in the implementation of climate change policies targeted to the special needs of the territory. In this vein, the local policymaking process is marked by a special focus for implementing tailored measures for addressing the climate change problem, rather than focusing on its general aspects; as described by

Gremillion (2011, p. 1234), countries might be able to establish national plans for being prepared to natural disasters, but "their resolution and management will depend to a great extent on local government".

Divisions mainly occur between policymakers when they do not agree about the measures that must be implemented for tackling the climate change problem (Nilsson and Nilsson, 2005; Schmidt and Fleig, 2018). Policymakers at the local level, similarly to national and international ones, some conflicts in their preference for investing on adaptation rather than mitigation measures (probably also because of the important role played by local civic groups when it comes to local elections; see Reusswig et al., 2016), and these conflicts are visible when analysing the political debate. The political debate provides information about the presence of contrasting or shared viewpoints. In this sense, the way policymakers express ideas and solutions for tackling climate change can be seen as a network phenomenon, where actors are related when they share the same opinion on a specific measure, or multiple measures, and patterns of concepts are defined by their presence in policymakers' statements. Yet, there is a lack of climate change studies focusing on how local policymakers interact in the political arena to support different adaptation and mitigation measures, and how political differences influences their positioning toward certain topics and the emergence of patterns of interrelated topics as well.

In this work, we focus on the Emilia-Romagna Region (Italy) as a case study to address the above research gap. By using a multi-method approach including Discourse Network Analysis (DNA) and Concept Mapping with the Leximancer system, we investigate which climate change-related policy measures emerge in the political debate and how coalitions of local policymakers support these measures.

This paper is organized as follows. Section 2 describes how the climate change issue is addressed in the local policymaking process. Section 3 presents our case study, data, and methods. Section 4 illustrates the results from the multi-method approach, while section 5 discusses these results and concludes.

2. Climate change and policymaking at local level

Climate change is considered one of the main issues for human society, and the search for solutions to limit its negative effects has become predominant in the political debate. However, despite the wide scientific consensus, at political level the debate on this topic continues to be polarized (Jasny et al., 2015). The communication channels between scientists and policymakers are not always efficient, and the latter are not able to use the scientific information to design and implement adequate measures (Wagner et al., forthcoming). Indeed, policymakers are divided into factions: those who believe that human activities have an impact on the climate against those who deny this assumption; and, within the former group, those who sustain certain strategies against those who support others. The implementation of climate change-related policies is influenced by these divisions, as well as the lack of clear and shared strategies at global and local level (e.g. Biesbroek et al., 2010; de Koning et al., 2014).

Since climate is a global issue, international decisions and agreements between countries are particularly important for addressing this challenge. The United Nations Climate Change Conferences are dedicated to fostering collaboration between countries and international organizations for developing global strategies. However, even when international treaties become operative (see, for example, the 1997 Tokyo Protocol, signed by 84 countries), their application at local level, and the translation of general targets into operative measures, is not immediate and it suffers from several problems (Landauer et al., 2019). The 2015 Paris Agreement remarks that "(…) adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems (…)" (UN, 2015, p. 9).

According to Ostrom (2014), the impact of climate change on local territories is not homogeneous, since it depends by multiple factors such as geographical location and socio-economic and environmental conditions. Thus, local authorities need to adhere to international standards while, at the same time, considering their own context and implementing local policies capable of achieving predetermined environmental goals. As illustrated by Rabe (2006) and Carlarne (2010), US local authorities adopted a bottom-up approach by establishing formal and informal environmental initiatives, while the federal legislation was lacking in implementing environmental policies related to climate change. In the European Union, while each country has been able to develop its own national strategy, regions (i.e. NUTS 2 level territories) need to define and implement local policies, because not all the national strategies had specific indications (Biesbroek et al., 2010). Juhola et al. (2012) underline that the ability of a local authority to implement climate change policies depends on its own capacity and the commitment of local policymakers.

Since the establishment of the IPCC during the late '80s, two main strategies have been identified to tackle climate change: adaptation and mitigation (Gupta, 2010). Mitigation measures are defined as "technologies, processes or practices that contribute to mitigation, for example, renewable energy (RE) technologies, waste minimization processes and public transport commuting practices", while adaptation measures are "actions that can be categorized as structural, institutional, ecological or behavioural" for facilitating the adjustment to expected climate and its effects (IPCC, 2018, p. 541). The prevalence of one set of measures over the others has always been an issue for policymakers. Initially, mitigation measures were perceived as the only effective measures for addressing climate change; still in the late '90s, during the international debate concerning the adoption of the Kyoto Protocol, adaptation measures were not considered as effective as mitigation measures (Tobin et al., 2018). As reported by Javeline (2014, p. 423), "just a few years ago, policymakers, environmentalists, and even scientists avoided talking about adaptation and focused exclusively on mitigation. The concern was that such discussions seemed defeatist or accepting of climate change [...] Perhaps, too, adaptation discussions might give the false impression that adaptation is easily attainable". This discrepancy is visible when looking at the strategies and plans for climate actions in European cities (Heidrich et al., 2016): in 2013, most of these strategies and plans were mainly focusing on mitigation measures, while adaptation measures were considered less relevant or not considered at all.

In the last years, both scientists and policymakers started to pay more attention to adaptation measures: since climate change has been perceived as unavoidable, societies need to be prepared for adapting to more frequent extreme natural events (Javeline, 2014). Indeed, the policymaking process at local level has rapidly assimilated these indications and climate change adaptation measures have become highly relevant for local governments, who have tried to integrate adaptation with mitigation measures. Galarraga et al. (2011) discuss the importance of local institutions concerning the implementation of these measures; they point out that local institutions have the power to make operative the global agreements on climate change, in particular with regard to adaptation measures. Hjerpe et al. (2015) stress the importance of local governments for implementing adaptation measures. In their study on Swedish regions, they find that climate change is perceived as a great challenge by local policymakers but the implementation of these measures is considered as a technical matter, and the lack of clear national guidelines can prevent the definition of local adaptation goals. The lack of coordination and national guidance has been reported also by Biesbroek et al. (2013) as a barrier for climate change adaptation.

Hence, public authorities have been particularly active in focusing on adaptation measures while, at the same time, not abandoning the mitigation approach (Galarraga et al., 2011). However, local policymakers are not necessarily aligned on the strategies to adopt and they can express different preferences for adaptation and mitigation measures. Their political affiliation and ideology can play a role in their stated preferences, as well as the search for the political consensus. In their work on climate

change scepticism, Rossen et al. (2015) found that in western countries political ideology is able to influence politicians' decisions; they distinguished between the behavioural pattern observed in political left groups, which are generally compliant with the scientific narrative and calls for strong actions, and the behaviour of individuals belonging to right-wing parties, which often question the credibility of climate change. Other studies found similar results in the USA and Australia, confirming the idea that political affiliation matters when it comes to define and implement national and local climate policies (e.g. Fielding et al., 2012; Dunlap, 2014). However, especially in European countries, this distinction has become more blurred in the last years, and there are some elements emerging from the climate change literature which are suggesting that this argument, i.e. the influence of political affiliation, cannot be considered conclusive. Some authors suggest that at local level the political affiliation becomes less relevant compared to the national level, because policymakers must have a pragmatic approach when considering what is the potential impact of a policy on the territory (e.g. Orderud and Kelman, 2011). Moreover, when the focus of the political debate is on topics of primary importance for the country, or the territory, political differences are somehow reduced, or they even disappear. Marcinkiewicz and Tosun (2015) show that Polish national deputies are not divided when debating about climate change, mainly because most of them have a negative perception of the economic costs that are necessary to implement climate change policies. Since Poland is the largest producer of hard coal in the EU, climate change is considered as a secondary issue in relation to economic growth, an aspect that is linked to the search for political consensus. Consistently with this study, Little (2017) found that during the 2016 Irish national elections, when environment, climate, and energy became relevant topics for electors, the leaders of the three main parties agreed on a common policy path towards emission reduction, pointing out that the agricultural sector – which is economically and politically relevant in Ireland – would have not been limited by climate change policies for achieving the 2030 emission targets. Eventually, strategic economic interests were able to overcome political ideology. These studies focused on policymakers operating at the national level, but the same applies to local policymakers. Finally, there is also a contradiction in the literature about the orientation towards climate change amongst political parties, distinguished according to the traditional left-right political spectrum. According to some authors (Hoff and Strobel, 2013; Rossen et al., 2015), both at national and local level centre-left parties are more sensible to the climate change issue than centre-right parties; however, other authors (Orderud and Kelman, 2011; Carter et al., 2014; Ortega Díaz and Gutiérrez, 2018) claim that traditional centre-left and centre-right parties, with their industrialist and productivism culture, somehow agree on multiple aspects related to climate change policies, and therefore the categories indentified through the above spectrum get more blurred.

The examples provided highlight how the political decisions around climate change are part of a broader discourses which are "mutually constituted through public criticism and support" (Uitermark et al, 2016, p. 108). This paper builds on such consideration and employs a relational perspective – focusing on policymakers' debates and the main topics of these debates – to investigate climate change measures discussed in this political arena. In this research, we argue that the issue of party affiliation influencing the policymaking process must be considered in combination with the type of policies that are intended to be discussed in the political arena; in this vein, we aim to unveil if the main conflicts arising at national level are somehow 'mitigated' in the local debate, or they still persist.

Hence, our research question is the following: at the sub-national level, to what extent does political affiliation relate to policy networks with respect to adaptation and mitigation strategies?

3. Case study and methods

3.1 Context

We address our research question by focusing on an empirical case study: the Emilia-Romagna region, one of the northern Italian NUTS2 regions (Eurostat, 2019). This context is suitable for our analysis because of the following reasons. First, in 2001 a national constitutional referendum gave more legislative power to the Italian regions, starting a decentralizing process which led to increasing their authority on issues such as agriculture and environment, education, and healthcare. Second, Emilia-Romagna has leveraged this opportunity for developing "mitigation and adaptation plans going far beyond national plans" (Fisher et al., 2018, p. 19), becoming one of the first Italian regions supporting initiatives for tackling climate change (De Gregorio Hurtado et al., 2014).
In 2015, the Emilia-Romagna region adhered to the "Under2 Coalition" (a global community of State and Regional governments which support climate actions in line with the Paris Agreement) and the following resolution of the Regional Government ("*Delibera di Giunta GPG/2015/2340*") committed the Emilia-Romagna region to cut off 80% of the GHG emissions (baseline=1990) within 2050. In 2018, the regional strategy for mitigation and adaptation to climate change ("*Strategia di mitigazione e adattamento per i cambiamenti climatici della Regione Emilia-Romagna*", regional resolution n. 187/2018) was approved by the Legislative Assembly: this document provides the political guidelines to follow for regional policies and a general legislative framework for provinces, municipalities, and stakeholders whose actions impact directly or indirectly on climate change.

3.2 Data

Our database has been created by using the climate change-related speeches made by the regional councilors and the members of the Regional Government of the 10th Legislative Assembly of Emilia-Romagna (December 2014 - February 2020). We have searched for these speeches in the 277 verbatim reports available on the website of the Emilia-Romagna region, by using the following keywords to identify those relating to climate change: "climate change" ("*cambiamento climatico*", in Italian); "climate" ("*clima*", in Italian). Since "*clima*" has different meanings in Italian, we have manually checked for the congruence of the statements including this word, removing those that were not related to climate change.

[Table 1]

In total, we have collected 168 speeches about climate change from 35 policymakers affiliated to 6 political parties and the Regional Government. Table 1 shows the number of speeches by political parties: most of them have been made by the representatives of the *Partito Democratico*, the majority party of the Assembly, followed by the members of the Regional Government and the *Movimento 5 Stelle* councilors. Nevertheless, these numbers are influenced by the numerical composition of the Assembly. The centre-left wing *Partito Democratico* had 29 regional councilors. The main opposition party was the *Lega Nord*, a right wing party who obtained 8 regional councilors at the 2014 regional elections. *Forza Italia*, a centre-right opposition party, had 2 regional councilors; *Fratelli d'Italia*, a right wing opposition party, had 2 regional councilors; *L'Altra Emilia-Romagna*, a left wing opposition party, had one regional councilor; the *Movimento 5 Stelle* (a protest party opposing both left and right wing parties) had 5 regional councilors; *Sinistra Ecologia Libertà*, a left wing party supporting the Regional Government, had 2 regional councilors.

3.3 Methods

The analysis is carried out by using a multi-method approach, combining DNA and Concept Mapping with the Leximancer system. This approach allows a deeper understanding of the research topic under investigation and a more comprehensive way to analyse the data, without being restricted to the

combination and full integration of qualitative and qualitative data or methods (Anguera et al., 2018; Morse, 2003; Tashakkori and Teddlie, 2010); moreover, the importance of using multiple methods in climate changes studies has been recently emphasized in the literature (e.g. Stoddart et al., 2020), in order to address the complexity of this topic. In particular, while the DNA depicts patterns between local policymakers who share the same position on specific policy measures, Leximancer provides an in-depth knowledge of the content of policymakers' statements, by analysing the semantic concepts they express when supporting specific climate change measures. Both methods are based on qualitative content analysis. However, the DNA combines content analysis with techniques from Social Network Analysis (SNA), focusing on network actors and their relationships because of sharing similar (or dissimilar) policy positions; on the other hand, Leximancer focuses on concepts and their implicit relationships, mapping themes that emerge from concepts co-occurrence and recursive patterns (Smith and Humphreys, 2006). Hence, we have used these two methods for analysing the same dataset and cross-validating their results to achieve a better understanding of the phenomenon (Wald, 2014).

DNA is a method for investigating policy discourse networks using text sources for understanding policymakers' positioning about specific topics, where text data are coded using a category-based scheme that enables the application of SNA (Leifeld, 2010, 2017, 2020). This method has been used in previous studies on the analysis of policymaker and other stakeholder discourses about climate change in different countries (Fisher and Leifeld, 2019; Ghinoi and Steiner, 2020; Ylä-Anttila et al., 2018). In their cross-country comparison, Ylä-Anttila et al. (2018) found that when policymakers and the media are accepting climate science directives, mitigation policies are more easily implemented. In their studies at national level on the US and Italy, respectively, Fisher and Leifeld (2019) and Ghinoi and Steiner (2020) point out that policymakers develop their positioning on climate change measures not just because of their political affiliation – which has still its importance – but also because of other factors, such as the influence exerted by other actors operating at different institutional levels or the measures discussed in the debate.

Coalitions of actors emerge in political debates because individuals share, or compete on, similar policy beliefs; according to Sabatier (1988, p. 131), belief systems can be conceptualized as "sets of value priorities and causal assumptions about how to realize them", and coalitions can be perceived as an expression of clusters of actors around the same statement (Leifeld, 2017). Statements made by individuals on one or more topics can be found in text sources such as textual documents such as newspapers, policy briefs, political manifesto, and any other public document. These statements can be characterized by a positive or negative meaning: for example, an actor can oppose the adoption of carbon tariffs (negative statement), while another might support this policy tool (positive statement). Hence, statements are text portions including three elements: actors, topics, and the information about the agreement (or the disagreement) of actors about topics (Leifeld, 2013).

Through DNA, it is possible to create two-mode and one-mode networks from unstructured textual documents. Two-mode networks, or affiliation networks, are defined by a set of actors $A = \{a_1, a_2,...a_n\}$, a set of topics $B = \{b_1, b_2,...b_n\}$, and the set of relations between actors and topics described by $R = \{r_1, r_2\}$, where r_1 indicates the presence of an agreement, while r_2 indicates the presence of a disagreement about a topic. The relations are modelled as edges of a bipartite graph where actors and topics are considered as vertices of the graph. On the other hand, one-mode networks are made only by actors: two actors are connected if they have referred to the same topic(s) in their statements.

In our study, the set of actors includes those policymakers who expressed statements about climate change, while the set of topics includes adaptation and mitigation policy measures discussed in the Assembly. Two expert coders have independently double-checked these statements for confirming the presence of agreement or disagreement with measures of adaptation and mitigation. The regional strategy for mitigation and adaptation to climate change ("*Strategia di mitigazione e adattamento per i cambiamenti climatici della Regione Emilia-Romagna*") has been used in the coding process. This

document includes all the possible measures applicable to the regional territory, and we have found that no measures other than those listed in the regional strategy have been discussed in the Assembly debates. Table 2 illustrates which adaptation and mitigation measures have been detected in the verbatim reports.

[Table 2]

The following procedure for the DNA has been borrowed from Fisher and Leifeld (2019). First, we have considered separately the debates concerning adaptation and mitigation measures, in order to detect coalitions arising for both arguments. Second, we have created the actor-measure two-mode networks where actors (i.e. the regional councilors) are tied to measures if they have expressed a positive or a negative statement about them. These networks highlight on which topics actors are more focused on: for example, if circular economy is supported, or not, by several actors. Third, we have converted the two-mode networks into one-mode actor networks, using two different approaches: the congruence and the conflict network approach (Leifeld, 2013, 2017; Leifeld and Haunss, 2012). The former allows to create networks where two actors have a relationship if they both agree or they both disagree on certain measures; the higher the number of similar statements, the ticker the tie between the two actors. The latter is used for drawing networks where two actors are linked together if they have a different view on climate change measures: the value of the tie weight reflects how many times the actors disagree on these measures. The ties observed in the congruence and the conflict networks have been normalized using the approach suggested by Leifeld (2017), i.e. by computing the average number of climate change measures that two actors tied together have discussed in the Assembly and dividing the tie weight for this value. Fourth, we have subtracted the conflict network from the congruence network for both the networks concerning the adaptation and the mitigation measures: this computation enables to obtain two one-mode networks where positive ties indicate the prevalence of agreements over conflicts, while negative ties indicate the opposite. Finally, we have removed those ties with a normalized weight below 0.33 (in order to keep only strong ties; this threshold has been chosen according to the average values observed for the adaptation and the mitigation networks, between 0.20 and 0.30) and we have applied the Girvan-Newman method for community detection to highlight clusters of actors with a high degree of similarity, in terms of proposals concerning climate change measures; clusters are drawn in the networks by using hyperplanes, which can be obtained through a tool developed for the software *visone* (Baur et al., 2002). Once defined the networks, we have estimated the coreness score (Borgatti and Everett, 1999) for each policymaker and the average score by political party/coalition, since we were interested in carry out a core-periphery analysis. As illustrated in the next section (Figures 3-4), the adaptation and mitigation networks show a core-periphery structure, and therefore we assumed that this score would have been useful for better understanding this structure. This approach has been used by Vesa et al. (2020); other authors concentrated on different centrality measures to analyse discourse networks (Reusswig et al., 2016; Ortega Díaz and Gutiérrez, 2018; Kukkonen and Ylä-Anttila, 2020), but we found the results of these measures' estimation partially overlapping with the coreness score and not really indicative of the level of aggregation towards adaptation and mitigation topics by the local concillors. The *Discourse Network Analyzer* (Leifeld, 2010) and *visone* software (Baur et al., 2002) have been used for the analysis and networks visualization. The same dataset has been analyzed using the Leximancer system for Concept Maping. Specifically, *Leximancer* (Smith and Humphreys, 2006) is employed thanks to its capacity to perform both relational and conceptual content analysis. Conceptual analysis is performed to detect in the speeches of regional councilors and the members of the Regional Government specific keywords associated with mitigation and adaptation strategies. The relational analysis is instead relevant, in the context of this study, to detect co-occurrence of specific concepts and their proximity to different political coalitions. While

Leximancer has been used in the past in research fields such as ecology (Nunez et al., 2016) and sharing economy (Cheng and Edwards, 2017) to discover emerging themes in large bodies of text, in this study, no automatic discovery of concepts is applied. Leximancer can also be used for an expert led concept discovery, allowing to focus on specific themes of interest to the researchers (Smith, 2003; Previte and Robertson, 2019). Specifically, following the approach employed by Herington and van de Fliert (2018), profiling was applied to focus on a set of pre-defined concepts, without any automatic concept identification. As the main interest of the research is to detect the presence of specific concepts already discussed in the relevant literature (Heidrich et al., 2016; IPCC, 2014; Reckien et al., 2014) and explore their association, 77 concepts/keywords were included in Leximancer. Such keywords were categorised as identifying adaptation measures (13), mitigation measures (33), or both (31). Consistently with the view of Laver et al. (2003, p. 330), there was no need to identify relationships (positive or negative) towards different keywords, as individual words, when studying a clearly defined political context, "convey information about policy positions". The complete list of keywords is available in the Appendix.

4. Results

Table 3 describes the data extrapolated from the verbatim reports of the 10th Legislative Assembly of Emilia-Romagna and used for the DNA. As illustrated in section 3.2, we have found 168 speeches concerning climate change from 35 policymakers affiliated to 6 political parties and the Regional Government. A general consensus about climate change has been detected in the Assembly, since only two policymakers over 60 expressed doubts about the existence of a climate emergency. In some cases, policymakers discussed several measures in the same speech, or even made statements about the same measure in different speeches; on the other hand, sometimes those speeches were not intended for discussing a specific measure, but only for highlighting the problems related to climate change hazards. After finishing the coding process, the dataset available for the DNA included 73 statements about adaptation measures and 110 statements about mitigation measures from 168 speeches.

[Table 3]

Figures 1-2 show the two-mode networks concerning the debates about adaptation and mitigation measures, respectively. The policymakers' stances on the different measures are visible in these graphs: when actors (represented by circles of different colours, according to their political affiliation) express statements about certain measures (represented by pink squares), ties are connecting actors and measures. Positive statements are indicated with green ties, while negative statements are indicated with red ties.

[Figure 1]

[Figure 2]

In the adaptation network, ADAT_Land (soil and land conservation), ADAT_Water (water and water infrastructures), ADAT_Inno (innovation and research), and ADAT_Monit (emergence and monitoring) are the main debated measures. Since Italy is a country where, in the last decades, natural calamities have brought out the problems related to an excessive urbanization and the abandoning of rural areas, with the resulting lack of land protection (Haller and Bender, 2018), this issue is particularly important in the political debate. Not surprisingly, water infrastructures, innovation and research, and monitoring are among the second discussed measures. These measures are strongly related: the regional

policymakers identify research and development activities, and in particular the development of new technologies such as those for tackling water shortage issues and weather forecasting, as important drivers for enhancing adaptation. In the mitigation network, three measures arise as highly relevant: MIT_ReduceGHG (reduction of GHG emissions); MIT_Circular (circular economy and waste); and MIT_Mobility (mobility). Not unexpectedly, the general objective of reducing emissions is supported by several individuals. The mobility issue is directly related to the reduction of GHG emissions, therefore it is not surprising also to see how many policymakers have discussed mobility-related measures in the Assembly. Regarding circular economy, in the last years this topic has gained attention from the European policymakers (Korhonen et al., 2018) and Emilia-Romagna has been the first Italian region to introduce a special regulation concerning it (Regione Emilia-Romagna, 2015).

The two-mode networks do not present particularly divisive topics, i.e. measures upon which policymakers express conflictual statements; most of the network ties denote positive statements. In the adaptation network, negative statements are rare; in the mitigation network, there are more conflicts, but they are limited to a small set of measures: MIT_Greeneco (green economy), opposed by members of centre-right wing parties; MIT_Oildril (oil drilling), opposed by members of the *Movimento 5 Stelle* and the *Partito Democratico*; MIT_Structure (major infrastructures) opposed by members of the *Movimento 5 Stelle* and the left wing party *Sinistra Ecologia Libertà*; and finally MIT_Methane (biogas and methane exploitation), opposed by members of the *Movimento 5 Stelle*. These are contested issues in the Italian political arena; in particular, the *Movimento 5 Stelle* has set the opposition to the construction of major infrastructures as one of its main political battles, as well as the resistance against drilling activities. On the other hand, green economy is generally accepted by policymakers from different political parties; however, measures linked to the green economy have been contested by centre-right policymakers because of two main reasons: the lack of evidence of creating more jobs through the green economy; and the lack of support, from the Regional Government, to other local manufacturing industries. The economy of the Emilia-Romagna region is supported by a number of small and medium enterprises belonging to traditional manufacturing sectors, which sometimes find it difficult to implement green investments and ecoinnovations (Marin et al., 2015).

[Figure 3]

[Figure 4]

The one-mode networks (Figures 3-4) for adaptation and mitigation measures illustrate the presence of groups of policymakers, or modules, that are not totally aligned with the grouping system derived from the political affiliation. However, the differences observed in the relational patterns expressed by the local policymakers can be related, in some way, to the program of the political parties.

Since we have imposed a threshold for considering only those ties with a normalized weight of 0.33, these networks show relationships that are characterized by the sharing of a number of statements on different measures. In the adaptation network, five main modules emerge. One core module including most of the members of the Regional Government, the representatives of the ruling parties (*Partito Democratico* and *Sinistra Ecologia Libertà*) and two members of the centre-right opposition; three peripheral modules made by councilors belonging to both the majority and the opposition parties; and finally a module that includes those councilors with no relevant relationships with others. In the mitigation network, we observe almost the same number of modules, but their composition is varying compared to the adaptation network. First, the members of the *Movimento 5 Stelle* are more embedded in the core module, while in the adaptation network they are more peripheral. This finding is also supported by the estimated results for the policymakers' degree of coreness. As illustrated in Table 4, the members of the *Movimento 5 Stelle* have the lowest average coreness score in the adaptation network

but the highest in the mitigation network. Indeed, since their political program is strongly oriented towards environmental issues (Mosca, 2014; Tronconi, 2015), it is not surprising that they mainly concentrated on supporting mitigation measures. On the other hand, the centre-right and the centre-left political coalitions, as well as the Regional Government, show higher scores of coreness in the adaptation network. However, the coalition sustaining the Regional Government, made by the *Partito Democratico* and *Sinistra Ecologia Libertà* has slightly similar scores in the two networks: it is possible that, differently from the members of the Regional Government, the councilors affiliated to these parties feel free to support different sets of measures, while the Regional Government intervene in the debate presenting a cohesive view on the adaptation measures. Regarding the policymakers of the centre-right coalition, they appear as mainly peripheral; this is true in particular for the mitigation network, where no members of *Forza Italia*, *Fratelli d'Italia*, and the *Lega Nord* are embedded in the core module.

[Table 4]

Nonetheless, there are two cases of right/centre-right coalition members sharing similar positions with the ruling coalition members. Both policymakers agreed with the Regional government about the opportunity to invest in adaption measures related to land conservation and protection, and water infrastructures – one of them quoting his former experience as a mayor of a municipality strongly affected by climate events. On one hand, this confirms the wider room for convergence between majority and opposition represented by adaption measures, typically asking for additive investments rather than for changes in economic paradigms and patterns, the latter more associated with mitigation. On the other hand, it corroborates the idea that local political debates are affected by territorial issues (see Orderud and Kelman, 2011), so that it is easier to achieve transversal support for a specific policy when potentially benefiting the (geographically limited) constituency of a counselor.

[Figure 5]

These findings are corroborated by the analysis of the text of the local councilors' speeches. Figure 5 maps the political groups in the concept cloud including the keywords characterising the climate change policy debate. The map is produced by Leximancer using relative co-occurrence frequency to capture co-occurrence between concepts, especially for its capacity to measure incidental interaction (Smith and Humphreys, 2006). Differently than other studies leveraging co-occurrence (e.g. Rule et al., 2015), no specific threshold value is required to define edges. The use of file tags in Leximancer allows for the positioning of the political parties in close proximity to the concepts more often used by their representatives. Concepts are linked and positioned according to their co-occurrence in text; furthermore, those concepts associated specifically with mitigation measure are identified with a dotted circle, while a circle with a continuous line denotes adaptation related concepts. The map, in addition to highlighting the relative position of different political groups, highlights the proximity of the *Movimento 5 Stelle*, the protest party, to concepts associated with mitigation intervention and actions associated with the construction of infrastructure and the extraction of resources (which are opposed by this party; see Figure 2). The unique positioning of the *Movimento 5 Stelle* is clear when analysing the most related concepts through Leximancer. Among the top 11 most related concepts to the *Movimento 5 Stelle* speeches, 7 are associated with mitigation, 2 to adaptation, and 2 with both strategies. The same analysis for the left/centre-left coalition, instead identifies a more balanced profile: 4 concepts associated with mitigation, 2 with adaptation and 5 with both. A similar profile also characterises the Regional Government, while the right/centre-right coalition mainly concentrate on concepts that are identified with both measures. The traditional left/centre-left and right /centre-right parties are close to themes that reveal the presence of an industrialist pattern: the former are associated to a cloud of

concepts developed around the keyword "Work", which relates to "Development", "Innovation", and "Production", while the latter are linked to "Agriculture" and "Drought", which are linked with "Emissions" and "Greenhouse Gas" – indicating an interest for intervening on regulatory aspects for supporting the local productive system. On the other hand, some of the concepts associated with the Regional Government do not show linkages with other concepts on the map: sometimes because of their peculiarity (e.g. "Fracking"), but in other cases it seems that the Regional Government and the left/centre-left ruling coalition decided to concentrate on the same themes under different perspectives. For example, the dyad "Motorways" and "Bike Paths" is not linked to "Public Transport", and "Wood", "Forests", and "Parks" are not interrelated as it should be expected.

Discussion and conclusions

This work investigates to what extent sub-national governmental institutions are involved in the climate change debate and local policymakers are willing to support adaptation or mitigation measures. Our objective is to understand if coalitions of policymakers exist around specific measures, by looking at patterns of similarities in the political debates and the concepts expressed by the regional councilors and the members of the Regional Government of the Emilia-Romagna region between 2014 and 2020. To address this issue, we have used a multi-method approach that enabled us to detect policymakers coalitions and to map theme patterns characterizing the policy debate on climate change. Compared to previous studies on climate change policymaking, the novelty of this paper lies in its local focus and an analytical approach that distinguishes between adaptation and mitigation measures, by taking into account that conflicts between local policymakers are often driven by elements other than the simple political ideology. Moreover, our case study is analysed by employing a multi-method approach, which allows us to gain a deeper understanding of the policy networks developed in the political arena by cross-referencing similarities among policymakers' statements and the concepts they use to express their ideas.

The Emilia-Romagna region introduced a range of climate change-related policies in the last years, starting from the direction of agricultural, industrial, energy and development policies to cope with the climate change issue and culminating with the 2018 dedicated regional strategy for mitigation and adaptation to climate change. Italian regional governments have the legislative power to define and implement environmental policies, and the Emilia-Romagna region used this power for strengthening adaptation and mitigation actions at regional level, adopting a multilevel governance for the coordination and the support of local plans, the monitoring of local actions from municipalities, and for mapping territorial vulnerabilities. Our findings show that, coherently with their national political platform, a protest party with a declared sensitivity to environmental issues and a strong linkage with environmental nonprofits organizations and activists (Mosca, 2014), such as the *Movimento 5 Stelle*, is more active in the Regional Assembly debate on mitigation policies. On the other hand, right-wing opposition parties are less involved and mostly focused on adaptation measures, showing a more pro-economy (as illustrated in Ingold, 2011) and sceptical vision with respect to climate change[1]. A positive attitude towards adaptation measures is registered even for the Regional Government and the supporting majority parties, highlighted by the value of the pertinent coreness scores. This phenomenon is probably due to the need of making compatible the implementation of climate change policies together with the support of the regional economic activities. Another interesting finding relates to the Concept Map: the network of concepts expanding from the left/centre-left and right /centre-right coalitions denotes an

[1] In the recent debate on climate change, 508 scientists and practitioners signed an open letter addressed to the UN General Secretary Antonio Guterres and to the UNFCC Secretary Patricia Espinosa, claiming that "(…) politics should focus on minimizing potential climate damage by prioritizing adaptation strategies (..)". See "There is no Climate Emergency", European Climate Declaration, September 26, 2019.

industrialist and productivism culture for both of them (e.g. Orderud and Kelman, 2011; Carter et al., 2014): this indicates a bond with the national political directives, or at least an alignment with a specific national political ideology, but at the same the concepts they used in the political debates do not overlap, and this is partially contradicting the view of Orderud and Kelman (2011) that at local level what really matters is a pragmatic policy approach.

These results confirm the findings from Ylä-Anttila et al. (2018) and Fisher and Leifeld (2019) about the importance of the linkage between policymakers and other stakeholders supporting a specific view on climate change. Indeed, the *Movimento 5 Stelle* has brought the policy beliefs of environmental activists in the political arena, formalizing their expectations and requests in its political manifesto (Mosca, 2014). This aspect supports the idea of Rossen et al. (2015) about the importance of political ideology, and therefore political affiliation, in the policymaking process; the councilors of the *Movimento 5 Stelle* are strongly focusing on mitigation measures, denoting a sort of party discipline. The same feature emerges when considering those councilors affiliated to centre-right and right wing parties: when the debate concentrates on mitigation measures, their position is peripheral in the network. This phenomenon can be better described by looking at the results produced with Leximancer. If we look at Figure 5, these parties are focused on economic factors expressed by keywords such as "agriculture", and they support a political view on climate change that is intended to support the local productive system with measures that do not penalize the local businesses, in line with the conclusions of Marcinkiewicz and Tosun (2015) and Little (2017) for Poland and Ireland at national level – even if we found that this is valid only for some of the parties of the political spectrum, and not for all parties as illustrated in these studies.

This study shows that party affiliation is a driver for defining councilors' position on climate change issues discussed in the regional Assembly, but in some cases local politicians from opposite parties find a common ground with respect to single policies and measures. This convergence happens more frequently in the discussion of adaptation measures related to land management, while the contrast seems to be stronger with respect to mitigation measures, since the latter emerge as a change in classic cleavage structures *à la* Lipset and Rokkan (1967), introducing new form of cleavage that drive citizens' demand (Kriesi, 2010; Maor et al., 2017), while the former is an eligible area for contrasting frames' alignment (Snow et al., 2014). The emphasis on ex-post "adaptation" investments to reduce the negative consequences of climate change allows the conjunction of the frame of intervention attitude requested to a capable government, the frame of productivism related to liberal and market-oriented political parties, and the frame of concerning for climate issues identified with left/centre-left parties. Not surprisingly, it fits less with the ideological frames of a protest party such as the *Movimento 5 Stelle*.

Indeed, our findings go beyond this rather simplistic view of a left-right conflict on climate change and its consequences, and they point out another relevant aspect of this topic: distinguishing between adaptation and mitigation measures. In this vein, we are aligned with the work of Ghinoi and Steiner (2020) about the importance of considering the content of those measures discussed by policymakers, which leads to re-configuring policy coalitions that do not (completely) overlap with the councilors' affiliation to their political parties. However, our results slightly differ from theirs regarding the role of the ruling parties: while Ghinoi and Steiner (2020) found that, at national level, the ruling parties are central and show high internal cohesion when debating climate change measures, in this case study the ruling parties (the *Partito Democratico* and *Sinistra Ecologia Libertà*) are always at the core of the network – the *Movimento 5 Stelle* has the highest average coreness score in the mitigation network, but the members of the ruling parties have a high score in this network too. This is probably due to the specific characteristics of the Italian sub-national political arena, where ruling parties have a large majority in the Regional Assemblies because of the election system introduced by the Italian National Law n. 43 of the 23 February 1995, and therefore their members have a higher probability of being more present in the debates and, probably, they feel freer to support different sets of measures according

to their personal views. The main findings from our multi-method approach are also confirming what has been found by Martin and Rice (2014) in their study on a sample of blog comments in the USA. Despite their work focuses on electors, and not policymakers, it highlights the concern of US electors for policy measures that do not consider electors' broader life context, balancing environmental and economic aspects. This emerges from the concept maps based on their sample, and this is something that we have observed also in the Emilia-Romagna context. An aspect that is missing in our work compared to other studies using content analysis – employing DNA or Concept Mapping with Leximancer – is the scepticism for science-based evidence (Martin and Rice, 2014; Van Rensburg and Head, 2017; Ylä-Anttila et al., 2018). While the conflict between science and politics has sometimes been translated into a conflict between political parties (where left wing parties are more prone to listen to the warning from the scientific community, while right wing parties are more skeptical about the effects of human activities on the climate; see Rossen et al., 2015), we cannot confirm its presence in the political arena; local policymakers do not conflict with each other because they accept or reject science-based evidence, but because their arguments concentrate on different topics.

This work, while offering important contributions to research in the field of policymaking in relation to climate change, cannot explore any causality effect between the presence of policy coalitions (around policy measures of adaptation and mitigation) in the Assembly and the implementation of regional laws concerning the topics discussed by the policymakers. In this process, the role of the regional administrative offices is particularly relevant, since they are in charge of defining the technical aspects of the regional policies. Future studies should aim at including these issues to further advance the academic debate. Furthermore, additional research could explore how policymakers adopt ideas from others, being influenced by new arguments over time; hence, a longitudinal study will be able to detect how policy measures gain relevance, or not, in local policy making.

References

Anguera, M.T., Blanco-Villaseñor, A., Losada, J.L., Sánchez-Algarra, P., Onwuegbuzie, A.J., 2018. Revisiting the difference between mixed methods and multimethods: Is it all in the name? Quality and Quantity 52(6), 2757-2770.

Baur, M., Benkert, M., Brandes, U., Cornelsen, S., Gaertler, M., Köpf, B., Lerner, J., Wagner, D., 2002. Visone Software for Visual Social Network Analysis. In: Mutzel P., Jünger M., Leipert S. (eds) Graph Drawing. GD 2001. Lecture Notes in Computer Science, vol 2265. Springer, Berlin, Heidelberg.

Biesbroek, G.R., Swart, R.J., Carter, T.R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M.D., Rey, D., 2010. Europe adapts to climate change: comparing national adaptation strategies. Global Environmental Change 20(3), 440-450.

Biesbroek, G.R., Klostermann, J.E.M., Termeer, C.J.A.M., Kabat, P., 2013. On the nature of barriers to climate change adaptation. Regional Environmental Change 13(5), 1119-1129.

Borgatti, S.P., Everett, M.G., 1999. Models of core/periphery structures. Social Networks 21, 375-395.

Capstick, S., Whitmarsh, L., Poortinga, W., Pidgeon, N., Upham, P., 2015. International trends in public perceptions of climate change over the past quarter century. Wiley Interdisciplinary Reviews: Climate Change 6(1), 35-61.

Carlarne, C.P., 2010. Climate Change Law and Policy: EU and US Approaches. Oxford University Press, Oxford.

Carter, N., Ladrech, R., Little, C., 2014. Political parties' climate policies in the UK, Italy and Denmark. Paper presented at the ECPR General Conference 2014, Glasgow. Retrieved from https://ecpr.eu/Filestore/PaperProposal/f51e32ac-9212-4623-813f-2fc6a4040668.pdf.

Cheng, M., Edwards, D., 2017. A comparative automated content analysis approach on the review of the sharing economy discourse in tourism and hospitality. Current Issues in Tourism 22, 35-49.

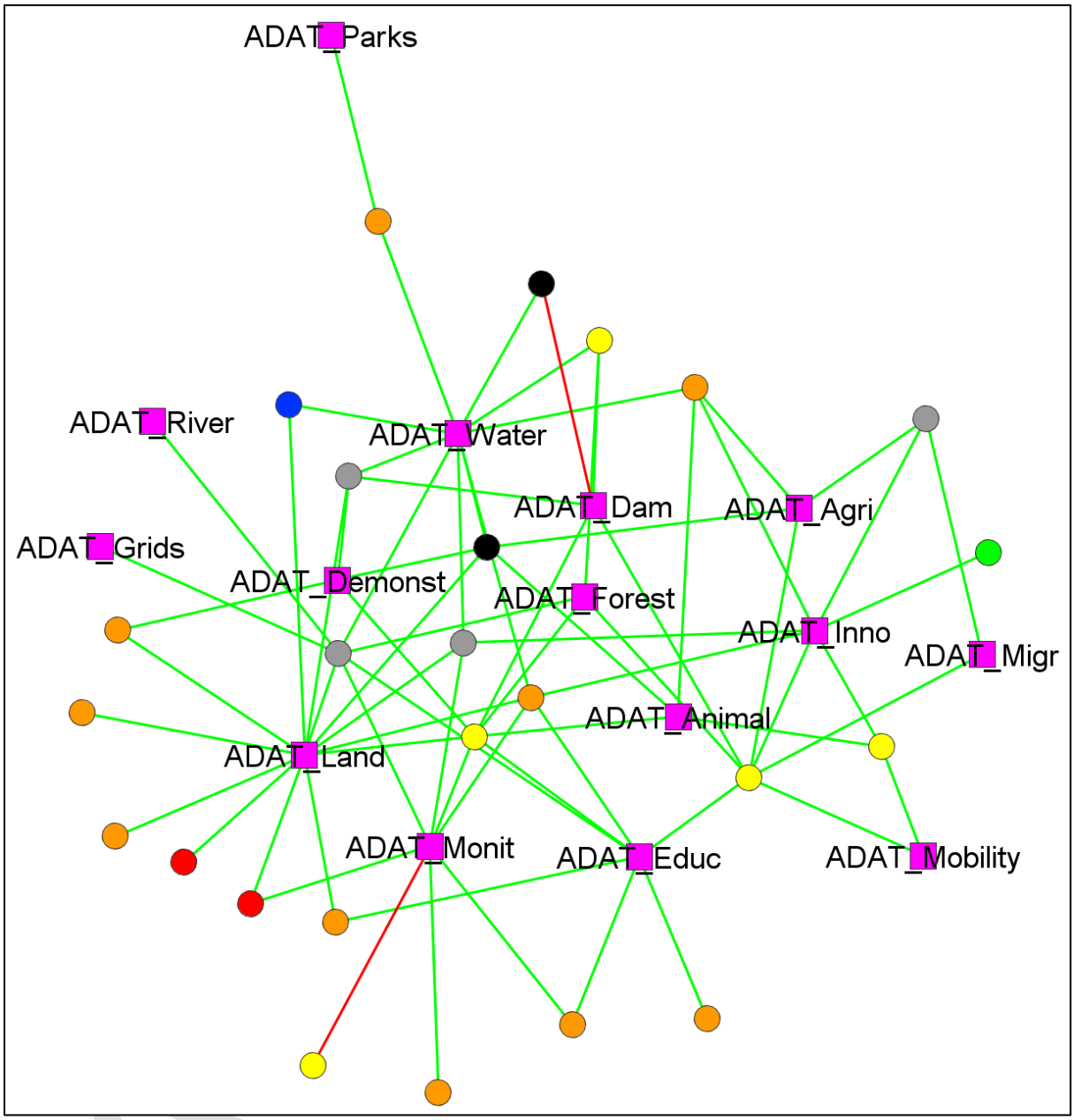
Crutzen, P.J., Stoermer, E.F., 2000. The "Anthropocene". IGBP Newsletter, 41. Available at: http://www.igbp.net/download/18.316f18321323470177580001401/1376383088452/NL41.pdf.
De Gregorio Hurtado, S., Olazabal, M., Salvia, M., Pietrapertosa, F., Olazabal, E., Geneletti, D., D'Alonzo, V., Feliú, E., Di Leo, S., Reckien, D., 2014. Implications of governance structures on urban climate action: evidence from Italy and Spain. BC3 Working Paper Series, 2014-02.
de Koning, J., Winkel, G., Sotirov, M., Blondet, M., Borras, L., Ferranti, F., Geitzenauer, M., 2014. Natura 2000 and climate change-Polarisation, uncertainty, and pragmatism in discourses on forest conservation and management in Europe. Environmental Science and Policy 39, 129-138.
Dunlap, R.E., 2014. Clarifying anti-reflexivity: Conservative opposition to impact science and scientific evidence. Environmental Research Letters 9(2), 021001.
Eurostat, 2019. Methodological manual on territorial typologies: 2018 edition. Luxembourg: Publications Office of the European Union. doi: 10.2785/930137.
Fielding, K., Head, B., Laffan, W., Western, M., Hoegh-Guldberg, O., 2012. Australian politicians' beliefs about climate change: political partisanship and political ideology. Environmental Politics 21(5), 712-733.
Fisher, L., Marchand, T.M., Tomlinson, S., 2018. Italy's role in the European Low Carbon Transition: A Political Economy Assessment. E3G Report. Available at:https://www.e3g.org/docs/E3G_Italys_role_in_the_European_low_carbon_transition_January17.pdf.
Fisher, D.R., Leifeld, P., 2019. The polycentricity of climate policy blockage. Climatic Change 155, 469-487.
Galarraga, I., Gonzalez-Eguino, M., Markandya, A., 2011. The role of regional governments in climate change policy. Environmental Policy and Governance 21(3), 164-182.
Ghinoi, S., Steiner, B., 2020. The political debate on climate change in Italy: A Discourse Network Analysis. Politics and Governance 8(2). doi: 10.17645/pag.v8i2.2577.
Gremellion, T.M., 2011. Setting the Foundation: Climate Change Adaptation at the Local Level. Environmental Law 41(4), 1221-1254.
Gupta, J., 2010. A history of international climate change policy. Wiley Interdisciplinary Reviews: Climate Change 1(5), 636-653.
Haller, A., Bender, O., 2018. Among rewilding mountains: grassland conservation and abandoned settlements in the Northern Apennines. Landscape Research 43(8), 1068-1084.
Heidrich, O., Reckien, D, Olazabal, M., […] Dawson, R.J., 2016. National climate policies across Europe and their impacts on cities strategies. Journal of Environmental Management 168, 36-45.
Herington, M.J., van de Fliert, E., 2018. Positive Deviance in Theory and Practice: A Conceptual Review. Deviant Behavior 39(5), 664-678.
Hjerpe, M., Storbjörk, S., Alberth, J., 2015. "There is nothing political in it": triggers of local political leaders' engagement in climate adaptation. Local Environment 20(8), 855-873.
Hoff, J., Strobel, B.W., 2013. A Municipal 'Climate Revolution'? The Shaping of Municipal Climate Change Policies. Journal of Transdisciplinary Environmental Studies 12(1), 4-16.
Ingold, K., 2011. Network Structures within Policy Processes: Coalitions, Power, and Brokerage in Swiss Climate Policy. Policy Studies Journal 39(3), 435-459.
IPCC, 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland.
IPCC, 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R.

Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.
Jasny, L., Waggle, J., Fisher, D.R., 2015. An empirical examination of echo chambers in US climate policy networks. Nature Climate Change 5(8), 782-786.
Javeline, D., 2014. The Most Important Topic Political Scientists Are Not Studying: Adapting to Climate Change. Perspectives on Politics 12(2), 420-434.
Juhola, S., Haanpää, S., Peltonen, L., 2012. Regional challenges of climate change adaptation in Finland: examining the ability to adapt in the absence of national level steering. Local Environment 17(6-7), 629-639.
Korhonen, J., Honkasalo, A., Seppälä, J., 2018. Circular economy: the concept and its limitations. Ecological Economics 143, 37-46.
Kriesi, H., 2010. Restructuration of partisan politics and the emergence of a new cleavage based on values. West European Politics 33(3), 673-685.
Kukkonen, A., Ylä-Anttila, T., 2020. The science-policy interface as a discourse network: Finland's climate change policy 2002-2015. Politics and Governance 8(2), 200-214.
Kukkonen, A., Ylä-Anttila, T., Swarnakar, P., Broadbent, J., Lahsen, M., Stoddart, M.C.J., 2018. International organizations, advocacy coalitions, and domestication of global norms: Debates on climate change in Canada, the US, Brazil, and India. Environmental Science and Policy 81, 54-62.
Landauer, M., Juhola, S., Klein, J., 2019. The role of scale in integrating climate change adaptation and mitigation in cities. Journal of Environmental Planning and Management 62(5), 741-765.
Laver, M., Benoit, K., Garry, J., 2003. Extracting Policy Positions from Political Texts Using Words as Data. American Political Science Review 97(2), 311-331.
Leifeld, P., 2010. Discourse Network Analyzer (DNA) manual. Available online at: http://www.philipleifeld.de/discourse-network-analyzer-dna/manual/.
Leifeld, P., 2013. Reconceptualizing Major Policy Change in the Advocacy Coalition Framework: A Discourse Network Analysis of German Pension Politics. Policy Studies Journal 41(1), 169-198.
Leifeld, P., 2017. Discourse Network Analysis: Policy Debates as Dynamic Networks. In: Victor, J.N., Montgomery, A.H., Lubell, M. (Eds.), The Oxford Handbook of Political Networks. Oxford University Press, Oxford, pp. 301-326.
Leifeld, P., 2020. Policy Debates and Discourse Network Analysis: A Research Agenda. Politics and Governance 8(2), 180-183.
Leifeld, P., Haunss, S., 2012. Political discourse networks and the conflict over software patents in Europe. European Journal of Political Research 51, 382-409.
Lipset, S.M., Rokkan, S., 1967. Cleavage Structures, Party Systems and Voter Alignments: An Introduction. In Lipset S.M., Rokkan S. (eds.), Party Systems and Voter Alignments: Cross-National Perspectives, Free Press, New York.
Little, C., 2017. Portrait of a laggard? Environmental politics and the Irish general election of February 2016. Environmental Politics 26(1), 183-188.
Maor, M., Tosun, J., Jordan, A., 2017. Proportionate and disproportionate policy responses to climate change: core concepts and empirical applications. Journal of Environmental Policy & Planning 19(6), 599-611.
Marcinkiewicz, K., Tosun, J., 2015. Contesting climate change: mapping the political debate in Poland. East European Politics 31(2), 187-207.
Martin, N., Rice, J., 2014. Rebalancing Climate Change Debate and Policy: An Analysis of Online Discussions. Environmental Policy and Governance 24, 338-350.
Marin, G., Marzucchi, A., Zoboli, R., 2015. SMEs and barriers to Eco-innovation in the EU: exploring different firm profiles. Journal of Evolutionary Economics 25, 671-705.

Morse, J.M., 2003. Principles of mixed methods and multimethod research design. In Tashakkori A., Teddlie C. (eds) Handbook of mixed methods in social and behavioral research, pp. 189-208. SAGE, Thousand Oaks.
Mosca, L. (2014). Il Movimento 5 Stelle e i conflitti locali. Il Mulino, 2, 223-230.
Nilsson, M., Nilsson, L.J., 2005. Towards climate policy integration in the EU: Evolving dilemmas and opportunities. Climate Policy 5(3), 363-376.
Nunez-Mir, G.C., Iannone, B.V., Pijanowski, B.C., Kong, N., Fei, S., 2016. Automated content analysis: addressing the big literature challenge in ecology and evolution. Methods in Ecology and Evolution 7(11), 1262-1272.
Orderud, G.I., Kelman, I., 2011. Norwegian mayoral awareness of and attitudes towards climate change. International Journal of Environmental Studies 68(5), 667-686.
Ortega Díaz, A., Gutiérrez, E.C., 2018. Competing actors in the climate change arena in Mexico: A network analysis. Journal of Environmental Management 215, 239-247.
Ostrom, E., 2014. A polycentric approach for coping with climate change. Annals of Economics and Finance 15(1), 97-134.
Previte, J., Robertson, N., 2019. A continuum of transformative service exchange: insights for service and social marketers. Journal of Services Marketing 33(6), 671-686.
Rabe, B., 2006. Second Generation Climate Policies in the American States: Proliferation, Diffusion, and Regionalization. Issues in Governance Studies 6, 1-9.
Regione Emilia-Romagna, 2015. Disposizioni a sostegno dell'economia circolare, della riduzione della produzione di rifiuti urbani, del riuso dei beni a fine vita, della raccolta differenziata e modifiche alla Legge Regionale 19 Agosto 1996 n. 31 (Disciplina del tributo speciale per il deposito in discarica dei rifiuti solidi). Regional Law n. 16/2015.
Reckien, D., Flacke, J., Dawson, R.J., Heidrich, O., Olazabal, M., Foley, A., Hamann, J.J.-P., Orru, H., Salvia, M., De Gregorio Hurtado, S., Geneletti, D., Pietrapertosa, F., 2014. Climate change response in Europe: what's the reality? Analysis of adaptation and mitigation plans from 200 urban areas in 11 countries. Climatic Change 122, 331-340.
Reusswig, F., Braun, F., Heger, I., Ludewig, T., Eichenauer, E., Lass, W., 2016. Against the wind: Local opposition to the German *Energiewende*. Utilities Policy 41, 214-227.
Rossen, I.L., Dunlop, P.D., Lawrence, C.M., 2015. The desire to maintain the social order and the right to economic freedom: Two distinct moral pathways to climate change scepticism. Journal of Environmental Psychology 42, 42-47.
Rule, A., Cointet, J.-P., Bearman, P.S., 2015. Lexical shifts, substantive changes, and continuity in State of the Union discourse, 1790–2014. Proceedings of the National Academy of Sciences 112(35), 10837-10844.
Sabatier, P.A., 1988. An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein. Policy Sciences 21(2/3), 129-168.
Schmidt, N.M., Fleig, A., 2018. Global patterns of national climate policies: Analyzing 171 country portfolios on climate policy integration. Environmental Science and Policy 84, 177-185.
Schwirplies, C., 2018. Citizens' Acceptance of Climate Change Adaptation and Mitigation: A Survey in China, Germany, and the U.S. Ecological Economics 145, 308-322.
Smith, A.E., 2003. Automatic extraction of semantic networks from text using leximancer. Proceedings of the 2003 Conference of the North American Chapter of the Association for Computational Linguistics on Human Language Technology Demonstrations – NAACL '03. Edmonton, Canada: Association for Computational Linguistics, pp. 23-24.
Smith, A.E., Humphreys, M.S., 2006. Evaluation of Unsupervised Semantic Mapping of Natural Language with Leximancer Concept Mapping. Behavior Research Methods 38(2), 262-279.

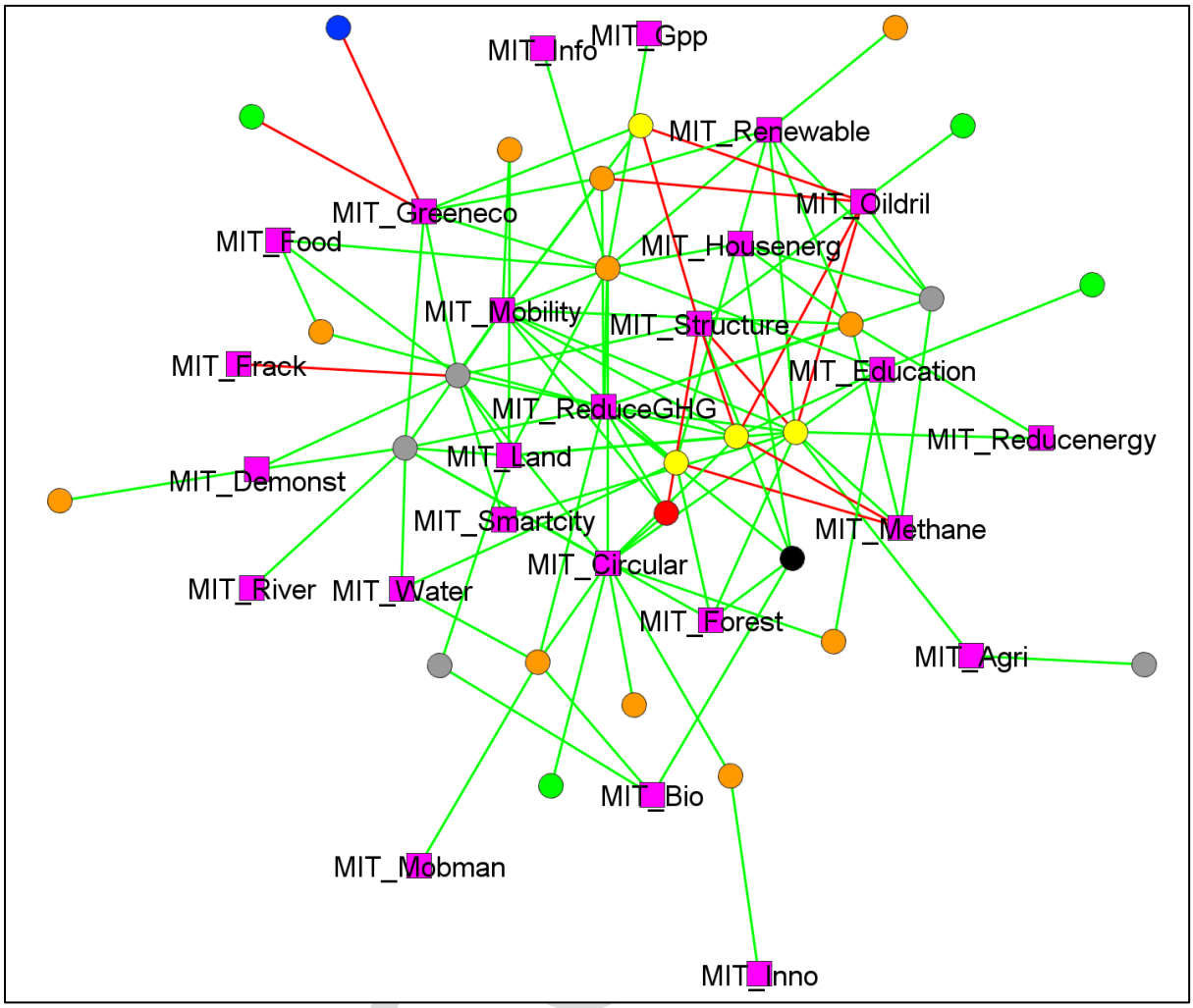
Snow, D., Benford, R.D., McCammon, H.J., Fitzgerald, S.T., 2014. The Emergence, Development, and Future of the Framing Perspective: 25+ Years Since "Frame Alignment". Mobilization: An International Quarterly 19(1), 23-45.
Tashakkori, A., Teddlie, C., 2010. SAGE Handbook of Mixed Methods in Social & Behavioral Research. Thousand Oaks: SAGE Publications.
Stoddart, M.C.J., McLevey, J., Schweizer, V., Wong, C., 2020. Climate Change and Energy Futures - Theoretical Frameworks, Epistemological Issues, and Methodological Perspectives. Society & Natural Resources 33(11), 1331-1338.
Tobin, P., Schmidt, N.M., Tosun, J., Burns, C., 2018. Mapping states' Paris climate pledges: Analysing targets and groups at COP 21. Global Environmental Change 48, 11-21.
Tronconi, F., 2015. Beppe Grillo's Five Star Movement: Organisation, Communication and Ideology. Ashgate.
Uitermark, J., Traag, V.A., Bruggeman, J., 2016. Dissecting discursive contention: A relational analysis of the Dutch debate on minority integration, 1990–2006. Social Networks 47, 107-115.
UN - United Nations, 2015. Paris Agreement. Available at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.
Van Rensburg, W., Head, B.W., 2017. Climate Change Scepticism: Reconsidering How to Respond to Core Criticisms of Climate Science and Policy. SAGE Open, 1-11.
Vesa, J., Gronow, A., Ylä-Anttila, T., 2020. The quiet opposition: How the pro-economy lobby influences climate policy. Global Environmental Change 63, 102117.
Wagner, P.M., Ylä-Anttila, T., Gronow, A., Ocelík, P., Schmidt, L., Delicado, A., forthcoming. Information exchange networks at the climate science-policy interface: Evidence from the Czech Republic, Finland, Ireland, and Portugal. Governance. doi: 10.1111/gove.12484.
Wald, A., 2014. Triangulation and Validity of Network Data. In: Domínguez S., Hollstein B. (eds) Mixed Methods Social Networks Research: Design and Applications. Cambridge University Press, Cambridge.
Ylä-Anttila, T., Gronow, A., Stoddart, M.C.J., Broadbent, J., Schneider, V., Tindall, D.B., 2018. Climate change policy networks: Why and how to compare them across countries. Energy Research and Social Science 45, 258-265.

Figure 1. Two-mode network: policymakers and adaptation measures.



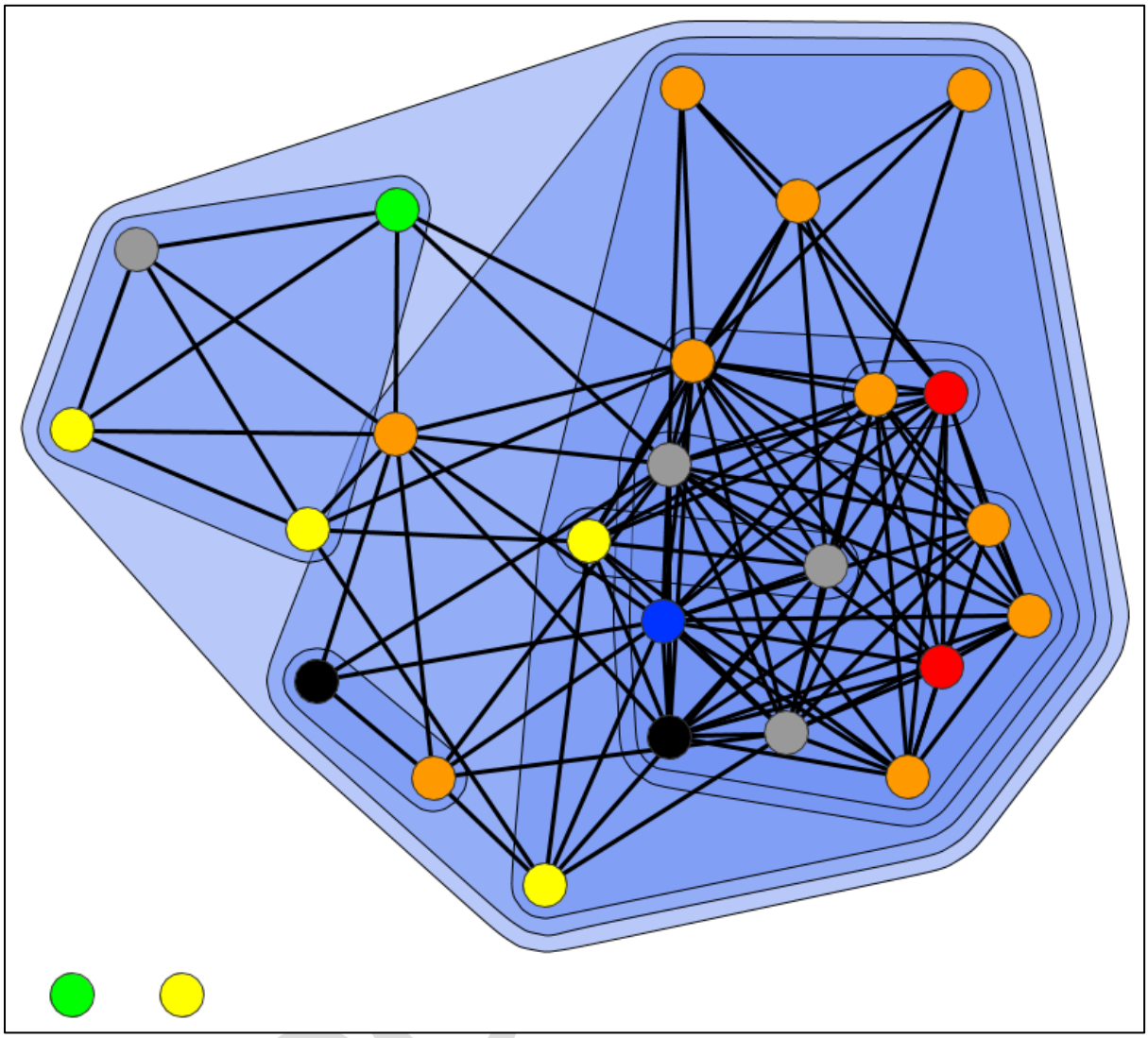
Legend: blue circle nodes = members of *Forza Italia*; black circle nodes = members of *Fratelli d'Italia*; green circle nodes = members of *Lega Nord*; yellow circle nodes = members of *Movimento 5 Stelle*; orange circle nodes = members of *Partito Democratico*; red circle nodes = members of *Sinistra Ecologia Libertà*; grey circle nodes = members of the Regional Government; pink square nodes = adaptation measures.

Figure 2. Two-mode network: policymakers and mitigation measures.



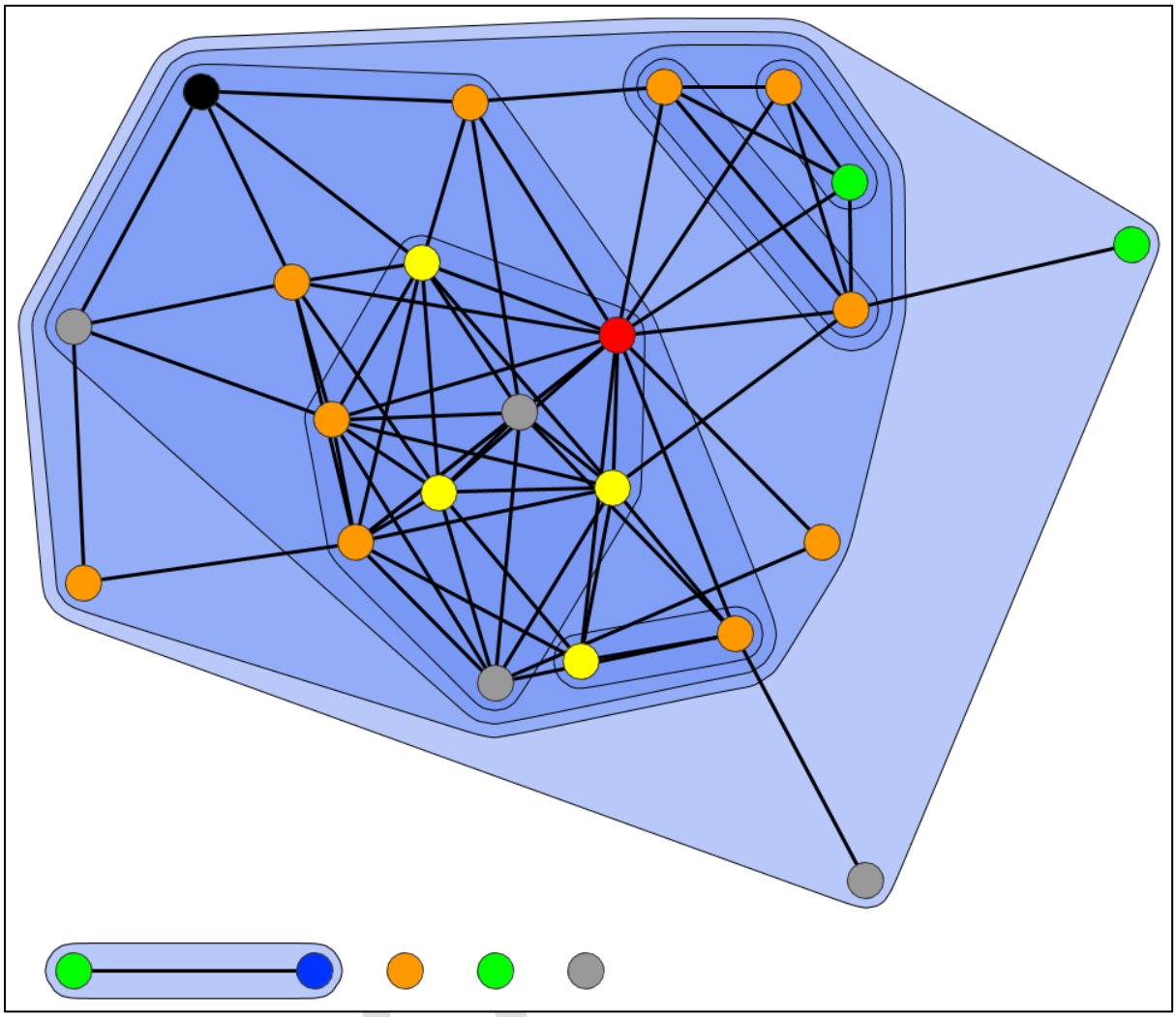
Legend: blue circle nodes = members of *Forza Italia*; black circle nodes = members of *Fratelli d'Italia*; green circle nodes = members of *Lega Nord*; yellow circle nodes = members of *Movimento 5 Stelle*; orange circle nodes = members of *Partito Democratico*; red circle nodes = members of *Sinistra Ecologia Libertà*; grey circle nodes = members of the Regional Government; pink square nodes = mitigation measures.

Figure 3. One-mode network final: adaptation measures.



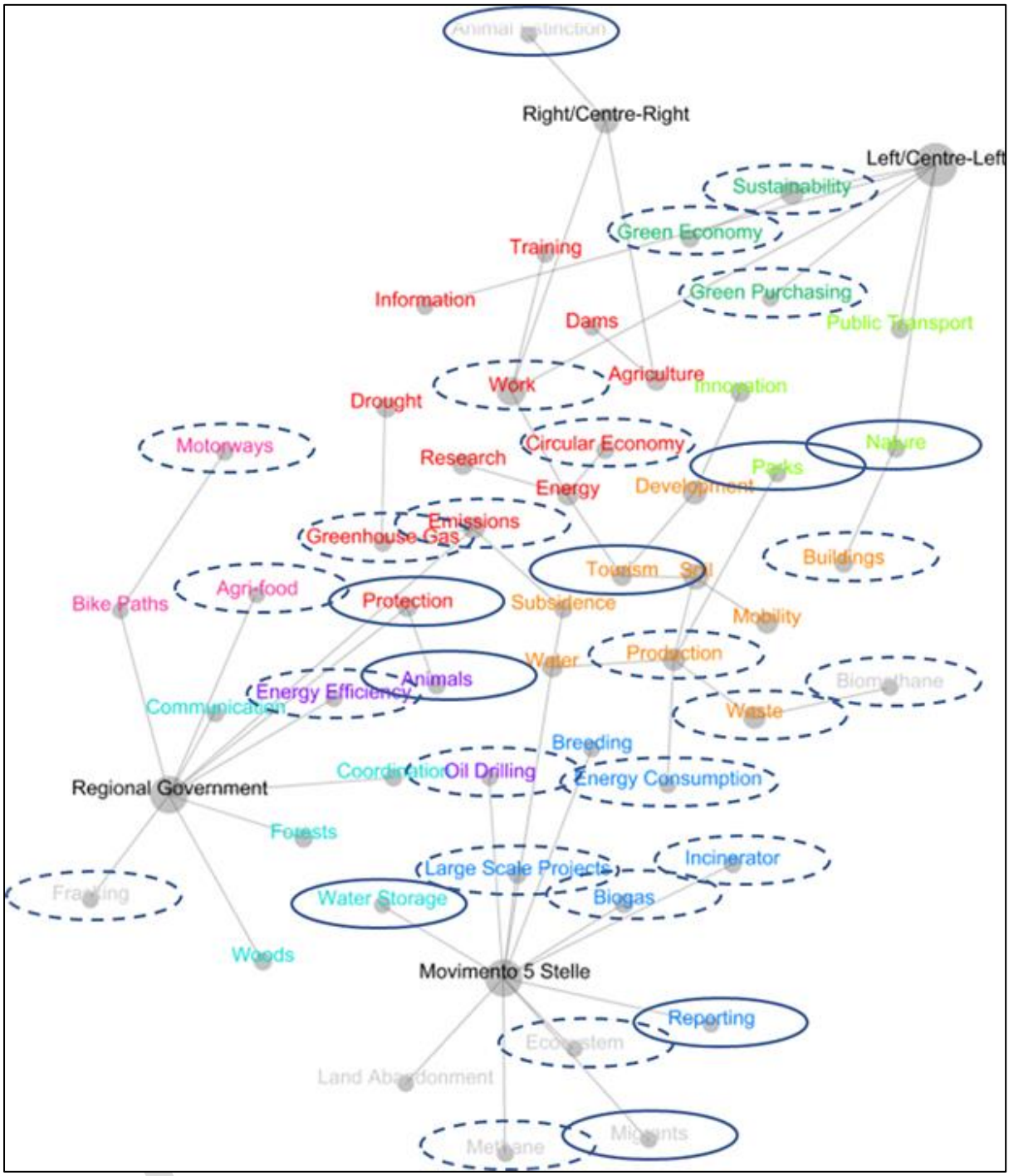
Legend: blue circle nodes = members of *Forza Italia*; black circle nodes = members of *Fratelli d'Italia*; green circle nodes = members of *Lega Nord*; yellow circle nodes = members of *Movimento 5 Stelle*; orange circle nodes = members of *Partito Democratico*; red circle nodes = members of *Sinistra Ecologia Libertà*; grey circle nodes = members of the Regional Government.

Figure 4. One-mode network final: mitigation measures.



Legend: blue circle nodes = members of *Forza Italia*; black circle nodes = members of *Fratelli d'Italia*; green circle nodes = members of *Lega Nord*; yellow circle nodes = members of *Movimento 5 Stelle*; orange circle nodes = members of *Partito Democratico*; red circle nodes = members of *Sinistra Ecologia Libertà*; grey circle nodes = members of the Regional Government.

Figure 5. Concept cloud: the position of political parties.



Appendix. Concepts used in Leximancer.

Adaptation	Mitigation	Both
alert	green purchasing	land abandonment
animals	Adriatic sea	water
animal extinction	agri-food	agriculture
war	motorways	breeding
water storage	biogas	automotive
migrants	biologic	woods
nature	biomethane	river channels
parks	energy consumption	communication
emergency plan	circular economy	river contract
protection	ecosystem	coordination
energy grids	buildings	dams
reporting	efficiency	electric
tourism	energy efficiency	energy
	emissions	soil erosion
	renewable energy	forests
	food chain	training
	food waste	professional training
	fracking	information
	greenhouse gas	irrigation infrastructures
	ghg	innovation
	large scale projects	education
	green economy	mobility
	incinerator	bike paths
	zero kilometer	research
	work	school

methane	drought
mobility management	subsidence
oil	soil
production	development
waste	technology
smart	public transport
sustainability	
oil drilling	