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MASTER THESIS

The role of city-networks in electric mobility implementation in European cities.

How does participation in city-networks as intermediaries induce cities to adopt electric mobility?

The case of the POLIS network, and four small and medium-sized European cities.

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ABSTRACT

Climate change has become the main challenge of the 21st century in particular due to pollutant emissions. Among other factors, the increase of pollutants emissions is related to the soaring number of vehicles powered through fossil fuel combustion. Mainly concentrated in cities, impoverished air quality has been associated with major health issues. In this context, electric mobility has been identified among other measures as an appropriate initiative to adopt in order to reduce pollutant emissions. However, cities are the ones representing both the production sites of air pollution and the places where it is crucial to take action in order to fight poor air quality. Since cities vary in size and characteristics, it remains difficult to find the most adequate solution to comply with European supranational directives set out by the European Commission. Joining transnational municipal networks is supposed to help cities exchange information and practices with other cities experiencing similar challenges to identify the most suitable measures to implement locally. Most of the literature agrees on the promising benefits of joining such networks, however little is known about effective policy implementation. In addition, most of the research focused on large networks and big cities of Northern and Central Europe; whereas Southern European small and medium-sized cities have been neglected so far. This research aims at investigating electric mobility policy implementation in four cities located in Southern Europe that represent both small and medium sized cities, namely Alicante (Spain), Bilbao (Spain), Perugia (Italy) and Reggio Emilia (Italy). The study focuses on the difference of policy implementation regarding the participation of the city in the POLIS network or not. The POLIS network is a European specialized city-network in the field of innovative mobility. Bilbao and Perugia are POLIS' members, whereas Alicante and Reggio Emilia are not. At first, the study suggests that the participation in the city network POLIS does not make the difference in electric mobility implementation. Indeed all four cities have at least one measure in place regardless of their participation or non-participation in the network. However, major differences have been observed, in particular among the cities that do not participate in the network. While Alicante did not extensively implement electric mobility, Reggio Emilia was very dynamic on the matter. On the other hand, member cities

have common electric mobility policies in place. However, alternative factors may explain the homogeneity in electric mobility implementation in European small and medium sized city. Further studies should investigate the role of smaller city networks that might be more suitable to guide sustainable policy implementation in small and medium-sized cities.

Key words: city-networks, intermediaries, policy implementation, European cities, electric mobility.

INTRODUCTION

The urban transport sector is responsible for 25% of transport related emissions (EEA, 2020a). These are mainly composed of carbon (CO), nitrogen oxide (NOx), and particulate matter (PM10, PM2.5) emission that are one of the main causes for climate change and health problems. The difference between PM10 and PM2.5 is the size of the particulate matter. PM10 have a size of maximum 10 micrometres, whereas PM2.5 are even smaller, 2.5 micrometres (EEA, 2020a). Most of the emissions are concentrated in and around urbanized areas due to the density of individuals and activities, source of fossil fuel combustion that vehicles produce (EEA, 2020a). The European Environment Agency (EEA) revealed that they are the cause of thousands of premature deaths in urban areas. 8% of the European urban dwellers are exposed to concentrations that exceed European 25 $\mu g/m^3$ limit value, and 77% were exposed to concentrations higher than the World Health Organization (10 $\mu g/m^3$), (EEA, 2020a). Actions on transport emission appeared to be fundamental in improving air quality. Therefore, the European Commission set important objectives to improve air quality by 2050 relative to pollutants levels of 2000 (European Commission, 2011). The EEA revealed that although the number of passengers and goods transported increased between 2000 and 2008, the percentage of pollutants decreased. The measures put in place seem to be efficient, and academia widely studied empirical cases, such as De Gennaro et al.'s (2014, 2016) in which instruments and innovative solutions have been implemented in the attempt to reduce air pollution. One of the main tools to address these challenges is the use of new technologies for vehicles to reduce emissions, such as electric mobility. Electric mobility embodies policies and public-private partnerships contributing to low-carbon mobility and carbon emission reduction (De Gennaro et al., 2014, 2016). However, in the European context, specific governmental bodies such as local and regional authorities struggle in complying with the European Commission directives. This is due to a lack of organizational capacity, expertise, experience and resources (Abbott et al., 2016; Steunenberg, 2007). Although European air quality thresholds are particularly large (25 $\mu g/m^3$ for PM2.5 and 50 $\mu g/m^3$ for PM10), and Member-States set higher values as thresholds, some cities easily exceed annually (ISPRA, 2014; EEA, 2020c). Furthermore, national limit

values vary across countries, which may result difficult in the process of data harmonization. For instance, the Italian limit value for PM10 is 50 µg/m^3, whereas in Spain it is 40 µg/m^3 (Ayuntamento de Alicante, 2013; ISPRA, 2014). In a regulatory setting, academic work identified three main categories of actors: regulators, intermediaries and targets (Abbott et al., 2016). Regulators are rule-makers, such as the European Commission. Targets are rule-takers such as cities. And finally intermediaries encompass a variety of actors intervening between the regulators and the targets to facilitate the adoption of the rule. Among these mediators, the academia that studies intermediaries identified transnational municipal networks as a helpful actor to support municipalities in policy implementation (Abbott et al., 2016; Jordana, 2017). Most of the literature agrees on the promising benefits of joining such networks, however little is known about effective policy implementation (Bulkeley et al., 2018b). In addition, most of the research focused on large networks like C40Cities or ICLEI and big cities of Northern and Central Europe such as Rotterdam or Paris, whereas Southern European small and medium-sized cities have been neglected (Dolsak and Prakash, 2017; Kern, 2009, 2019). Cities are the lowest administrative unit. Cities are the living environment of 55% of people in the world (UN, 2018). The number of inhabitants defines their size. In Europe, 41,7% of the population lives in cities and 31% in towns and suburbs (Eurostat, 2017). Since statistical trends predict that even more people will live in cities in the forthcoming years, it justifies the pertinence of studying air quality in urban environments (Eurostat, 2017; UN, 2018). The aim of this research project is to contribute to the research on transnational municipal networks by studying the role of intermediaries in effective policy implementation tackling air pollution in small and medium-sized cities. It focuses on the potential differences that the membership in a city network has on electric mobility implementation in four European cities located in Spain (Bilbao and Alicante) and Italy (Perugia and Reggio Emilia).

The structure of the research project

Firstly, this thesis explores and synthetises the existing academic work with a literature review that defines the theoretical framework of this research project. The focus is on two major aspects: efficient sustainable policies in the field of electric

mobility to improve air quality in urban areas, and the role of transnational municipal networks as intermediaries in soft regulation processes. This step is crucial for the understanding of the place of this research project in the scientific realm and to identify the existing inconsistencies in the existent literature. In particular, this chapter demonstrates that Southern and Eastern Europe small and medium-sized cities are not extensively studied in the context of city network participation, and that effective contribution of city networks in sustainable policy implementation is relatively absent from the academic landscape. A brief summary at the end of this chapter helps to present the hypotheses retained for the study.

Secondly, the project presents the methodological setting that is the research design to explain the choices and the limits of the study. This section presents in detail the concepts and their operationalization, as well as the variables retained (control, confounding, independent and dependent variables).

Following this, the case description illustrates the different electric mobility policies that have been implemented in Bilbao, Alicante, Perugia and Reggio Emilia. It shows that all four cities have implemented electric mobility policies. For the member cities it highlights the similarities in policy implementation and the different benefits received from the participation in the network. This section also brings to light the differences in electric mobility implementation among the non-member cities.

The fourth section discusses the results, the limitations and some suggestions to contribute to the research on transnational networks. The results of this research project not only provide answers to the research question and the derived hypotheses, but also to points out some alternative explanations in the different outcomes.

Finally, the research project concludes that at first sight the participation in the network POLIS does not seem to be relevant for electric mobility implementation. However, it reveals that the city network still plays a role in access to funding for the member cities. The particular research design also suggests further lines of research.

CHAPTER I: THEORETICAL FRAMEWORK

A wide range of theories have been proposed to explain how international relations occur and their complexities, especially in the context of climate change or environmental matters. Although academia covered a wide range of theories and empirical cases, the following literature review focuses on trans-governmental networks on the organizational level of cities. These trans-governmental networks act as intermediaries in soft regulation processes to address efficient policy adoption and implementation to improve air quality through electric mobility actions.

From sustainable policy to electric mobility policy implementation

Most of the academic work generally focuses on local climate actions such as actions on energy transition, and renewable energy that local governments undertake to mitigate climate change (Hoppe et al., 2016; Zeppel, 2012). However, according to Bulkeley et al. (2018) there are four main areas of action in fighting climate change: clean energy, carbon markets, fossil fuel divestment and infrastructure. This is in line with Petrauskiene et al. (2020) who state that renewable energies, coupled with electric vehicles are the two main areas of action to mitigate climate change. Yet only the three first received major attention concerning effectiveness of transnational governance, especially since the 21st World Climate Summit of 2015 held in Paris, also known as COP21 (Bulkeley et al., 2014a).

Although "[transport] infrastructure systems has *(sic!)* come to be regarded as an important space for policy intervention in response to climate change", actions on infrastructures that encompass transportation are not extensively studied in city-network contexts (Bulkeley et al., 2014a, p. 66 and 70; Pflieger, 2014). Scholars explain that the transport infrastructure sector, as important as it is suffers from administrative difficulties, which make it arduous to tackle the issue. Nevertheless, multiple initiatives emerged to pursue improvements in the transport sector. Indeed, state actors at different governance levels need to reduce their transport-related carbon emissions to comply with regulations coming from the European Commission,

national governments, and also take civil society's demands into account (Bulkeley et al., 2014; Dolsak and Prakash, 2017). Likewise, multiple studies on electric mobility for decarbonisation have been conducted on both motorized vehicles like cars and buses (Carteni et al., 2020; Castillo et al., 2020; De Gennaro et al., 2014, 2016; Gomez Vilchez et al., 2019; Knez et al., 2020; Mao et al., 2020; Petrauskiene et al., 2020; and Viesi et al., 2020), and non-motorized vehicles, such as bikes (Behrendt, 2018 ; Dill and Geoffrey, 2012). Electric mobility appears to be one of the solutions to jointly address sustainability and mobility needs (Carteni, 2020). In particular, academia highlights two aspects in the adoption of electric mobility policies. The first one is the transition of the traditional fuel combustion public transport vehicles towards electric vehicles (Carteni et al., 2020; Grijalva and Lopez-Martinez, 2019). The second one is the advantages that urban areas, in particular urban areas of small and medium-sized cities gain from the use of electric vehicles fleets, such as the significant decline of air pollution (Castillo, 2020; De Gennaro et al., 2014; 2016; Knez, 2020). However, the transition towards electric vehicles requires some investments from the municipalities, as those are the authorities that need to implement these kinds of policies.

In a hierarchical regulatory setting, hard rules are the mandatory guidelines applicable to all participants of the regulatory process, which applied in a top-down manner (Abbott et al., 2016; Eberlein and Newman, 2008). On the other hand, soft rules embed the idea of voluntary compliance with non-binding regulations. Participants spontaneously join the regulatory process, and thus, this follows a bottom-up logic (Abbott et al., 2016; Blauberger and Rittberger, 2015; Eberlein and Newman, 2008). In both cases, targets that need to implement rules may lack the operational capacities or expertise to do so. They may require intermediaries to be able to achieve regulatory demands (Abbott et al., 2016; Dimitrova and Steunenberg, 2016; Eberlein and Newman, 2008; Steunenberg, 2007).

The role of intermediaries for policy implementation

In the RIT model developed by Abbott and colleagues (2016), intermediaries intervene between regulators and targets to facilitate rule implementation. The RIT model is the conceptualized relationships between the regulator, also known as rule-

maker (R), the intermediary or mediator (I), and the rule-taker, namely the target of a given regulation (T). It reflects an indirect mode of governance as the relationships between the regulator and the target is mediated through the intermediary. Intermediaries can intervene either on behalf of the regulator or on behalf of the target (Abbott et al., 2016; Blauberger and Rittberger, 2015; Eberlein and Newman, 2008; Jordana, 2017; Steunenberg, 2007).

Abbott et al. (2016) present four main characteristics that make intermediaries relevant actors in regulatory governance, namely their operational capacities, expertise, independence and legitimacy (Abbott et al., 2016). The first characteristic intermediaries need to possess is operational capacity. Such operational capacity depends on the organization's practical experience, and denotes the services and activities that it is able to provide. Operational capacity defines the organizational missions (Abbott et al., 2016). The second characteristic is expertise. Expertise embodies the qualifications of the organization's staff. As an example, intermediaries can be specialized in a policy area, and therefore have qualified administrative staff (i.e. lawyers, economists, public officials) to execute the mission they are asked (Christensen and Yesilkagit, 2019; Littoz-Monet, 2017; Provan and Kenis, 2007). Thirdly, independence is necessary to ensure credibility, particularly in the eyes of targets (Abbott et al., 2016). Independence can be determined by funding in the sense that if the intermediary is funded by the regulator this can negatively affect its autonomy and objectivity due to conflicting interests (Abbott et al., 2016; Bauer and Ege, 2016). Finally, the last necessary feature of intermediaries is their legitimacy, which depends on large part on the characteristics previously mentioned. Indeed, input legitimacy, such as a mandate from a regulator or a target, relies on both independence and expertise, while output legitimacy, such as public policies implementation depends on the organizational operational capabilities and how effective they are bringing about satisfactory policy outcomes (Abbott et al., 2016; Beal and Pinson, 2014; Tallberg, and Zürn, 2019). Legitimacy is crucial for intermediaries because it ensures continuing trust from both regulators and targets' standpoint (Abbott et al., 2016). According to the structure of the organization, legitimacy needs to be addressed both inside (memberships) and outside (stakeholders) the administration since it is a pillar of organizations' stability (Abbott et al., 2016; Provan and Kenis, 2007).

Intermediaries, as organizations have their own administrative objectives to achieve. From seeking economic resources to respond to social or environmental ethics, intermediaries can intervene to accomplish them, both for their mandate and themselves (Abbott et al., 2016).

Although, intermediaries can be engaged in policy agenda-setting, monitoring and enforcement, they are often involved in the implementation stage of policy-making (Abbott et al., 2016; Jordana, 2017). Their first role is to translate the rules that the regulator may impose to the target in a more clear way in order to help in the implementation phase. Regulators or targets may not possess the appropriate competences to oversee or to put in place the regulation at stake (Abbott et al., 2016; Dimitrova and Steunenberg, 2016). In the European context, the necessity for intermediaries arises from the fact that there is a void created between the rule makers, usually the European Commission, and the rule takers, such as local governments (Blauberger & Ritteberger 2015; Steunenberg, 2007). This gap may come from the ambiguity or vagueness of the rules or on the contrary rules may be formulated in a highly technical manner that makes them difficult to understand (Abbott et al., 2016; Steunenberg, 2007). Intermediaries need to explain potential confusion and "ensure consistent and effective application of EU regulation" at the local scale (Blauberger & Ritteberger 2015, p.369).

Secondly, intermediaries can also provide consulting services and guidance on rules implementation through specialized and professional support. These activities may include workshops, conferences or trainings (Abbott et al., 2016). They are in charge of appraising the costs and potential impacts of both the policy proposal as well as its alternatives. In other words, they support regulators and targets to seek for the most efficient ways of achieving regulatory goals (Abbott et al., 2016; Jordana, 2017).

Therefore, intermediary's intervention for rules implementation depends on its characteristics. Operational capacity, expertise, legitimacy and independence are thereby crucial for the intermediary to take part in the regulatory governance.

The types of intermediaries

Intermediaries can be organizations as private sector actors, such as businesses. They can also be civil society groups, or public actors, such as states, governmental bodies, as well as transnational governmental networks (Abbott et al., 2016; Jordana, 2017).
For this research project, the focus is on non-governmental organizations (NGO) as intermediaries. The literature review helps to narrow down to the specific forms of NGO at the organizational level of cities of intervening as intermediaries.

I. From non-governmental organizations to trans-governmental networks as intermediaries

Among the multiple types of intermediaries, Levi-Faur (2011) distinguishes three types of non-governmental organizations (NGOs) that may possess regulatory competencies: market related NGOs (MaNGO), civil society related NGOs (CiNGO) and governmental related NGOs (GoNGO). All of these can play the role of intermediaries in regulatory governance.
The first one, MaNGOs (market-NGOs) are NGOs mainly controlled by private sector actors that operate in markets. Unlike traditional NGOs, business matters for this type of NGO (Levi-Faur, 2011). Secondly, CiNGOs are NGOs in which civil society actors prevail. While they correspond to the traditional image of NGOs, they also have a role to play as alternatives to nation-states, and often act complementary to the actions of the regulatory states (Levi-Faur, 2011). Finally, the GoNGOs are NGOs completely administered by states and governmental actors (Levi-Faur, 2011). For instance, governmental bodies that create and use GoNGOs could be municipalities or regional authorities (Payre, 2010). Thus, we can distinguish for-profit actors, non for-profit actors and governmental actors in both Levi-Faur's (2011) and Abbott et al.'s (2016) works.
GoNGO are particular forms of trans-governmental networks (TGN), which as a specific form of transnational networks can play the role of regulatory intermediaries (Jordana, 2017). They connect public bodies operating on different territorial levels, such as subnational units on the regional or municipal level, in charge of similar tasks in different countries. Because these entities have similar objectives, they can benefit

from joining TGNs, which aim to create horizontal relationships that facilitate cooperation and exchange among members on rule implementation and policy practices (Eberlein and Newman 2008; Jordana, 2017; Kern, 2009). As an illustration, international activities such as study trips or conferences allow public officials to meet and exchange ideas with their foreign equivalents on the best or most suitable policy practices (Baycan-Levent et al., 2010; Beal & Pinson, 2013). Therefore, network participants may be able to more easily identify suitable policies for their own jurisdiction, as well as potential partners to compete for funds in specific programmes (Baycan-Levent et al., 2010; Pflieger, 2014). Additionally, as intermediaries, TGN possess specialized knowledge, expertise and the necessary regulatory authority to formulate rules or advice on rules and to take part in or promote collective action and ensure effectiveness (Bulkeley and Betsill, 2004; Eberlein and Newman 2008; Jordana, 2017). Networks are thereby suitable venues for the diffusion of policy experimentations, which encourages members to compete to become an example on a specific issue, or to create partnerships to obtain funds for policy implementation (Cao, 2010; Kern, 2019). A particular aspect of TGNs is that members do not control and therefore cannot assign the collective resources and tools, which hinders the network's capacities, and limits the organizational expenditures (Jordana, 2017). However, networks that receive funds from supranational institutions can be appointed as accountable for properly allocating resources and ensuring the correct advancement and supervision of the projects borne (Bulkeley and Betsill, 2004).

Likewise, TGNs benefit from greater flexibility in their structures that enhance the speed of their response to stakeholders (Provan and Kenis, 2007; Eberlein and Newman 2008). Indeed, the flexibility of networks' structures relies on participants' liberty to join, or leave, the network (Kern, 2009; Rashidi and Patt, 2018). This aspect might affect the network' stability, however it reveals the necessity for members of having non-constraining venues as well (Beal and Pinson, 2014; Provan and Kenis, 2007). More precisely, academia presents three groups of organization for transnational networks as intermediaries. The first group of intermediaries as transnational networks is the "participant-governed networks" or "participant governance form" (Provan and Kenis, 2007, p. 234; Jordana, 2017, p. 249). This mode implies direct participation of members without any specialized governance

structure. Members share both the administrative and the management tasks of the network.

Secondly, the "lead organization governance" is a network in which one member operates as the leader (Jordana, 2017, p.249; Provan and Kenis, 2007). This member could be a city (i.e. the mayor and her executive staff) that administers the network and supports other members in their efforts to pursue the network goals (Jordana, 2017).

Finally, the "network administrative organization form" (NAO) is a network that is governed or administered by an external body or has a separate administrative entity in charge of the network's activities (Jordana, 2017, p.249). This form avoids dealing with the difficulties of "shared governance" that is the cornerstone of the participant governance's model (Provan and Kenis, 2007, p.234). Indeed executive staff is in charge of administrative tasks that would often represent an overload of work for organizational members' staff (Provan and Kenis, 2007). Scholars find that the NAO model is the most suitable to address network governance challenges. Indeed, although it benefits efficiency, this mode tries to balance the network's efficiency in achieving its goals, with the need to include and involve its participants and potential new members (Provan and Kenis, 2007). Authors also find that the NAO form tackles tensions concerning legitimacy, both inside and outside the network. Internal legitimacy means that it is important to develop interactions, and hopefully partnerships among the network's members to compete for funds for instance (Provan and Kenis, 2007; Pflieger, 2014). External legitimacy is important to attract new participants, but also appeal to major institutions, such as the European Commission, that distribute funds (Provan and Kenis, 2007; Pflieger, 2014). Finally, the NAO form is able to balance flexibility and stability. Flexibility is what makes networks innovative, while stability makes them legitimate (Provan and Kenis, 2007).

II. From trans-governmental networks to city-networks as intermediaries

The importance of focusing on environment-related transnational networks at the organizational scale of cities arises from two facts observed in the literature. The first one is that even though states are important, they are neither suitable nor the strongest actor to tackle environmental issues, especially those related to climate change at the

international level (Barber, 2013; Bulkeley and Betsill, 2003; Curtis and Acuto, 2018; Hovi et al., 2014; Payre, 2010; Rodrik, 2012). Indeed, both theories of realism and neoliberal institutionalism agree that states, as primary actors of international relations, take actions and make decision based on their national interests, such as sovereignty, rather than pursuing collective action, such as reducing carbon emission to fight climate change (Barber, 2013; Bulkeley and Betsill, 2004; Hovi et al., 2014; Wolforth, 2008).

Secondly, this explains the emergence of networks at the subnational level, and particularly networks between municipalities, which tend to start out as informal organizations and then become more and more institutionalized settings (Payre, 2010). Literature on transnational networks emphasizes the role of cities in creating their own networks, especially on issues concerning environmental matters or climate change, which reflects the bottom-up logic of soft regulation (Bulkeley et al., 2014b; Eberlein and Newman, 2008; Keiner and Kim, 2007; Kern, 2019). It is at the local level that carbon emissions are produced; local administrations are thereby the ones dealing with the pollution and its consequences. Therefore, they need to implement solutions and hence, they are the one tackling climate change directly where it occurs (Bulkeley and Betsill, 2004; European Commission, 2015; Hoppe et al., 2016). In this context, trans-governmental networks represent a solid, flexible and efficient option for municipalities to address complex issues and deal with them at the international scale (Eberlein and Newman, 2008). Additionally, TGN intermediaries benefit to both "local" and "global regulators" (Jordana, 2017, p. 245). Global regulators are supranational or national authorities formulating policies that local regulators, such as municipalities, need to put into practice. Global regulators use TGN to propagate policies, practices or rules, while local regulators benefit from the TGN influence, and expertise capacities to put in place those rules (Jordana, 2017). Accordingly, Kern (2009) defines transnational municipal networks (TMN) as a form of European governance process in which local governments are "autonomous" members, and in which horizontal relationships among members ensure the "self-governance" of the network (Kern, 2009, p. 309). In a more extensive definition, Van der Heiden (2010) defines city-networks as a venue in which dynamics occur both horizontally and vertically. This belief is proved by the fact that on one hand local authorities may join the network for both policies exchange and funding. On the other hand, city-networks represent venues for the European institutions to allocate funds (Baycan-Levent, et

al., 2010; Van der Heiden, 2010). However city-networks mostly encompass horizontal cooperation. Academia agrees on this dimension that qualifies the internal dynamics of city-networks (Kern, 2009; Van der Heiden, 2010).

From a bottom-down perspective, cities participate in or join networks for two reasons. The first one is to "lobby jointly at the EU" to access information on potential urban-related policies and regulations (Van der Heiden, 2010, p.3). The second reason is to impede the implementation of rules that could possibly be disadvantageous for them (Van der Heiden, 2010). From a top down standpoint, it is in the European Commission's interest to have self-organized networks in order to allocate financial resources for establishing regulations and to supporting projects (Baycan-Levent, et al., 2010; Van der Heiden, 2010). Indeed, the Commission believes that networks ensure the diffusion of methods among municipalities, and therefore ensure compliance to its directives as well as contribute to European integration (Baycan-Levent, et al., 2010; Dimitrova and Steunenberg, 2016; Van der Heiden, 2010).

To sum up the different concepts and narrow down the definition, scholars agree on the definition of network as a web composed of nodes and linkages between the nodes (Baycan-Levant et al., 2010; Keiner and Kim, 2007). At the organizational level of municipalities, city-networks more particularly are webs of connections between participating actors that are the nodes. Theses participating actors could be local and regional authorities, non-governmental organizations, businesses, or private actors looking for partnership opportunities with the public sector (Baycan-Levant et al., 2010; Bulkeley et al., 2014b; Keiner and Kim, 2007; Van der Heiden, 2010). For this research project, the notions of trans-governmental networks, transnational municipal networks and city-networks will be used interchangeably. Therefore, based on insights derived from existing academic scholarship, municipalities form or join city-networks schemes able to act as intermediaries on the local level (Jordana, 2017; Pflieger, 2014; Van der Heiden, 2010). Accordingly, participation in city-networks benefits members in two ways: it increases their ability to influence the European institutions in granting budgets for policymaking, and their participation in the networks facilitates cities to compete for funds through city-to-city partnerships (Baycan-Levant et al., 2010; Pflieger, 2014; Van der Heiden, 2010). Networks go beyond the traditional form of partnership between cities, like twinning cities, because

partnerships are created in a policy-oriented mind set and with the objective to gain European funds for urban projects needed to mitigate climate change (Pflieger, 2014).

Purposes of city-networks

The existing literature mainly focused on the reasons of the emergence of transnational or trans-governmental networks, and their "potential contributions" to their members rather than on their effectiveness (Bulkeley et al., 2014b, p.66). Authors state that in relation to climate change governance, municipal transnational networks received relatively little consideration (Bulkeley et al., 2014b). Keiner and Kim (2007) concentrated on the rise of networks that focus on sustainability at the core of their actions. They list the (multiple) areas of specialization of each network, providing an overview of the fields of action to contribute to more sustainable policies in cities. A complementary list of city-networks' categorization and activities can also be found in Van der Heiden's (2010) work on analysing cities international activities. These complementary works give an overview of the landscape of the existing networks and their areas of action. Some city-networks appear to be specialized on one specific field, whereas other may have an extended scope of operation. These complementary works display that among the multiple existing city-networks only the POLIS network is specialized in mobility solutions aiming at reducing carbon emissions to mitigate climate change. Other city-networks operate in different areas such as promoting biodiversity, sustainable mobility and energy transition with the same objective of fighting climate change, but covering the different fields simultaneously. POLIS is the one focusing on transportation and mobility practices throughout Europe (Keiner and Kim, 2007; Van der Heiden, 2010).

Moreover, Payre (2010) conducted an interesting study that traces the history of city-networks emergence, with a particular focus on the case of Eurocities. This network created the opportunity to commit the European Union to support urban networks as "intermediaries in achieving EU's political objectives and programmes" (Payre, 2010, p. 269). The literature seems to foster the idea that participation in transnational networks allows rule-takers to access well-informed policy consultants and policy implementation instruments (Cao, 2010; Eberlein and Newman 2008; Jordana, 2017; Kern, 2019). However, Bulkeley and Betsill (2004) found that network participants are

more motivated to participate in a policymaking process because of the "financial and political resources" the network provides than the actual specialized knowledge that could be accessed through network participation (Bulkeley and Betsill, 2004, p.472). In line with Payre's finding, the salience of access European funding appears to be relevant to inspect.

In addition, among many factors inducing cities to join such networks, Beal and Pinson (2013) analysed the role of the mayor's vision in developing international activities, and therefore as a factor encouraging cities to join city-networks. These activities include study trips, or conferences allow public officials to meet and exchange with their foreign equivalents on best or suitable practices (Baycan-Levent et al., 2010; Beal & Pinson, 2013). The difference in mayor's vision can simply rely on their political affiliation. In the study case of Beal and Pinson's (2013) study one mayor belonged to a centre-right party whereas his successor was part of a more left-winged party.

Rashidi and Patt (2018) contribute to the research with the study of participation in networks effectiveness by studying two networks, namely International Council for Local Environmental Issues (ICLEI), also known as Local Governments for Sustainability, and C40Cities Leadership Group (C40Cities) and their influence on major cities like Rotterdam or New York. Additionally, Krause's research (2012) aimed to evaluate US cities participation in the ICLEI network and in the Mayors Climate Protection Agreement (MCPA), whereas Lee & Koski (2014) conducted a study on the influence of participating in one network, or in two, on policy adoption. They showed that cities participating in the two networks are more likely to adopt a certain policy (in Rashidi and Patt, 2018). Thus, the literature shows a major focus on great international networks covering multiple countries or even continents, such as the C40, or the ICLEI, and their influence on big cities, such as New York, London, Paris, and on "second cities" like Barcelona or Rotterdam (Kern, 2019; Lin, 2018; Payre, 2010, p.262; Rashidi and Patt, 2018; Van der Heiden, 2010). Authors witness that little attention is given to small and medium-sized cities (SMC), which often do not take advantages of these city networks (Hoppe et al., 2016; Kern, 2019; Zeppel, 2012). Hoppe and colleagues (2016) give population thresholds to define the size of a city. Big cities register more than 500 000 inhabitants; medium cities have a population ranging from 300 000 to 500 000 inhabitants; and small cities record less than 300 000 but higher than 100 000 dwellers (Hoppe et al., 2016). In particular,

Keiner and Kim (2007) pointed out that in Europe, despite the fact that capitals are the most populous cities, they are not the most active actors regarding sustainability-related networking. Furthermore, in the European context, it appears that Southern and Eastern small and medium-sized cities are particularly shy in joining networks. They are difficult cases and new to academic studies. Still, they are the places where most of the European population lives (Dolsak and Prakash, 2017; Kern, 2009, 2019). Academia points out the relevance of studying both SMC, and European and national networks since city-networks emerged in Europe already almost 30 years ago, and because important leading cities, such as Freiburg, are situated in Europe (Kern, 2019). These elements could support the assumption that cities without major administrative functions represent dynamic actors in environmental innovations pertinent to investigate.

Theory and added value of the proposal

The literature review revealed that city-networks, as intermediaries in a regulatory process could be helpful actors for both the regulators and the targets. On one hand, these organizations theoretically possess the expertise and organizational capacity to accompany municipalities to achieve the objectives that regulators imposed on them. On the other hand, city-networks are suitable venues for European funds. This research project falls under the European context in which directives to improve air quality that arise from the European Commission are then transposed by the nation-state. This regulator imposes air quality goals on municipalities, which are the governing authorities dealing with both the sources and the consequences of air pollution. Therefore, cities are the targets of the regulation process. Because cities vary in size, financial resources and other characteristics, they are not always prepared to deal with problem solving alone. This leads them to make use or create transnational municipal networks, which have the expertise and organizational capacity to help cities in implementing adapted measures to comply with top-down instructions. In addition, the difference in size and in budget capacities among municipalities may explain why network might represent interesting financial pools. Scholars highlighted the potential contribution of transnational networks to policy implementation (exchange of knowledge, access to funds), but it is in the interest of this research

project to study their effectiveness. In the context of climate change and air pollution due to transportation the necessity of innovative mobility solutions such as electric mobility is crucial. Do municipalities actually put in place sustainable mobility policies when they participate in city-networks? Does the specialization of the city-network facilitate electric mobility implementation? Does the participation in a city network make the difference in sustainable policy implementation? The research question for this study hence investigates how does the participation in a sector-oriented city-network, namely POLIS in the field of sustainable urban transportation, induce small and medium-sized cities to implement sustainable mobility policies, and more precisely electric mobility measures. Accordingly, the main hypothesis of this research project explores whether the access to resources when participating in a trans-municipal network stimulates small and medium-sized cities to implement sustainable transport policy. Based on the theoretical framework there is reason to believe that the participation in city-networks not only allows cities to access funds that incentivize them to implementing electric mobility measures, but also provides participating cities the access to funds that can be used to implement electric mobility measures.

CHAPTER II: RESEARCH DESIGN

Goal of the research

The focus on transnational municipal networks is necessary to evaluate their role in helping local administrations to implement rules that global institutions impose. The literature showed that both municipalities and European or national bodies need transnational organizations such as city-networks since they possess the necessary characteristics for effective policy implementation. This research project aims at completing the research on municipal transnational networks and their role in helping municipalities to comply with top-down regulations. The purpose of this research is to focus on sustainable transport policies in particular electric mobility, as a specific climate action to put into place in small and medium-sized cities that take part (or not) in a European task-oriented city-network. The objective is to study the influence of participating in the network for policy implementation. The policy implementation will be studied through data on the transition from fuel combustion vehicles towards electric ones (for both public and private vehicles); other electric bikes or cars initiatives, and the benefits of promoting electric mobility among citizens through grants.

An observational design, based on a retrospective approach, will support the explanatory goal of the research. The objective is to point out the causal mechanism that connects the effect of participation in a city-network (cause) to electric mobility establishment (consequence). The empirical observation relies on an outcome that already took place, which justifies the retrospective approach (Toshkov, 2016). Therefore, the research is focused on the difference that X as the cause, makes on Y as the consequence (Blatter and Haverland, 2014). In other words, whether networks participation (X) has an impact on sustainable policies adoption (Y) for the transport sector.

Concepts and operationalization

The main concepts of this research project are sustainable mobility policy with a focus on electric mobility, city-network and the participation in it, small and medium-sized cities, population weight, and mayors' vision. In addition, table 1 gives the complete overview of the concepts, their operationalization. It also informs on the dependent, independent, control and confounding variables selected for this research project.

Sustainable mobility policies are public policies put in place to reduce polluting emissions due to vehicles combustion. Their objective is to improve the quality of the air (De Gennaro et al., 2014). Many pollutants are emitted with the combustion produced by classic fuel vehicles. These pollutants are particles such as NOx, PM10, PM2.5 (EEA, 2020a). Sustainable mobility policies also aim at reducing noise that is another source of pollution, especially for residents of city centres (EEA, 2020a). Academia agrees that electric mobility embodies electric private and public cars, or shared mobility (scooters, cars or bikes), parking fares, and electric local public transportation. Scholars showed that electric mobility is effective to improve air quality (De Gennaro et al., 2016; Pflieger, 2014).

City-networks are a specific form of organizations that act as intermediaries in the policy implementation process (Jordana, 2017; Kern, 2009; 2019). City-networks aim at creating horizontal relationships between local governments (Van der Heiden, 2010). Networks also include businesses or private actors looking for partnership opportunities with the public sector (Bulkeley et al., 2014b). City-networks facilitate the formation of partnerships for specific policy processes to gain funds for urban projects to mitigate climate change (Pflieger, 2014). City-networks members are allowed to participate in multiple networks. Multiple different city-networks exist, and each of them has specific objectives (local, energetic, transnational etc), (Keiner and Kim, 2007; Van der Heiden, 2010). The participation in a network is defined by the payment of the annual subscription. The proof is that the name of the city appears in the members section on the networks' website.

Small and medium-sized cities are administrative units, or municipalities organizing a specific concentration of people and their activities on their territory (Cambridge Dictionary, 2020). Cities are the first layer of territorial administration. They are the local administrative unit (LAU) with an urban core of a population of at least 50 000 inhabitants on a limited surface area that results in a population density of minimum 1 500 inhabitants per km² (Eurostat, 2019). The size of a city is defined among other factors by its population weight that is the number of inhabitants on the city territory. Scholars as well as the memberships conditions of city-networks agree on different thresholds. Globally small and medium-sized cities are cities with more than 100 000 inhabitants but less than 500 000 inhabitants. Within the category of small and medium-sized cities, small cities are characterized with a population ranging from 100 000 to 300 000, and medium cities with a population above 300 000 inhabitants (Hoppe et al. 2016; Polis, 2020a).

The mayors' vision encompasses a wide range of elements. Each mayor has her own perception, conception and understanding of her mandate. The vision of the mayor encompasses the strategies adopted to improve the citizens' life conditions in the city (Beal and Pinson, 2013). In Beal and Pinson's article (2013) the main difference between the two municipal mandates studied is indeed the mayors' affiliation. For this research project the mayor's affiliation is used as an indicator of the mayor's vision. Indeed, in Beal and Pinson' (2013) one mayor belonged to a centre-right party whereas his successor was part of a more left-winged party. The political party usually gathers a large set of values, beliefs and ideas that can be grasped more easily and give the main strategy considered to improve inhabitants' life conditions (Beal and Pinson, 2013). Academia studied the international activities of cities according to the mayor's. The use of this variable seems relevant for this research project since it might affect the implementation of sustainable mobility policies as a specific strategy to boost the city's quality of life (Beal and Pinson, 2013). The mayor's affiliation is regarded with respect to the year of the city joining the network. In order to create more homogeneity among cities, within a pair of cities from the same country, for the non-member cities, the mayor's affiliation will be the one of the mayor elected at the same time of the mayor elected for the participating city.

Variables/ Concepts	Definition (Theory)	Indicators	Data sources
Dependent variable			
Electric mobility policies implementation	Policies and public-privates partnerships contributing to low-carbon mobility and carbon emission reduction (De Gennaro et al., 2014, 2016)	Presence/absence of specific transport policies: Number of electric vehicles; type of electric vehicles; e-vehicles sharing or rental initiatives; grants or award for purchasing an electric vehicle	Cities' SUMP; information from mobility and transport department of the municipalities; EU programmes reports
Control variables			
Population weight	Number of inhabitants of the city (Hoppe et al. 2016)	Small: 100 000 – 300 000 inhabitants Medium: 300 000 - 500 000 inhabitants	Eurostat, 2017; Polis, 2020
Localisation in Southern or Eastern Europe	Dolsak and Prakash, 2017; Kern, 2009, 2019	The city is located in a country of the South of Europe (Portugal, Spain, Italy, Greece).	Cities' websites; Eurostat, 2019
Confounding variables			
Mayor's vision	Strategies aiming to improve inhabitants' quality of life within the city (Beal & Pinson, 2013);	Mayor's affiliation: Defined whether the mayor is left or right-winged based on its political party membership. In this case, the variable is blocked to left-winged parties (one exception), as they are more incline to environmental-related matters (see common threats to interference).	Websites of the political parties: People's party PSOE, BNP, Daisy, Italian Democratic Party, Democrats of the Left.
Non-participation in another network	Membership fees in a network other than Polis (Lee & Koski, 2014)	Participation/ non-participation in 1 or more networks For this research we consider a city as a member if it appear on	Cities' websites; C40cities' website, ICLEI' website

		the network' website under the "members" section	
Independent variable			
Participation in the city-network POLIS	Non-hierarchical relationships among cities taking part in the same network. These relationships go beyond national borders, and are policy-oriented. Cities exchange, compete and become partners to gain EU funds (Heiden, 2010; Pflieger, 2014).	Participation/ non-participation; For this research we consider a city as a member if it appears on the network' website under "members" section; Activity of the cities (projects funded with the help of POLIS)	Polis, 2020; Public officials' reports; SUMP of the cities

Table 1. Concepts and operationalization table

Causal mechanism

The causal mechanism studied is the influence of participation in networks (cause) on policy adoption (effect). According to the theoretical literature, participation in a city-network is advantageous for its members. However, this research seeks demonstrate whether the policy adoption is completed when a city participates (or not) in the network.

To demonstrate the causal relationships between the independent (explanatory) variable, namely participation or non-participation in a network, and the dependent variable, or outcome, namely sustainable policy implementation such as electric mobility, two events need to be studied. The first one is the participation in the network (X_1) and its consequences (Y_1); the second one is the non-participation in the network (X_2) and its consequences (Y_2).

Research approach and design

I. Mode of comparison

This research project is based on an observational design since the researcher does not use random assignment, or experimental control on both the population studied, and on the group receiving the treatment. This procedure focuses on the causal relationship formulated in the main hypothesis. It concentrates on the variation that X makes on Y, where X is the independent variable and Y the dependent variable. The explanatory variable (X), namely the participation in city-network, is the only one that changes its value (Blatter and Haverland, 2014; Toshkov, 2016).

In addition, the research process requires the use of the strategy of conditioning via blocking to ensure the causal inference (Toshkov, 2016). This procedure aims at examining the influence that a variable has on another. To exclude the potential interference of other factors in the causal mechanism, the strategy of conditioning keeps stable as much as possible control and confounding variables, whereas the main variable (participation in the network) varies across the selected cases (Toshkov, 2016). These variables are factors that could influence the outcome other than the main variable. The confounding variables are factors that are related to both the independent and dependent variables. These are other potential variables that could interfere with the causal mechanism (Toshkov, 2016).

II. Most Similar System Design (MSSD I)

Consequently, this research project will use the most similar systems design I (MSSD I). This design consists of blocking, or keeping steady all variables other than the principal one that is hypothesised to influence the outcome (Toshkov, 2016). This system is appropriate to test a theory; it concentrates on the main hypothesis, potential discrepancies only concern the independent variable, other variables are blocked, and the outcome will be known once the research will be completed (Toshkov, 2016).

The research project is based on a comparative analysis among a small number of cases (four cases are selected). The selection of the cases relies on similar characteristics between the cities, according to the most similar system design I

(MSSD I). These similarities will be true for both the control and the confounding variables (see Table 1). For this research project, two variables among others are chosen as control variables (i.e., population size, and the localisation in Southern Europe), and two are chosen as confounding variables (i.e. mayor's vision and affiliation, non-participation in another network). These variables may have an effect that could explain the outcomes. Therefore they are as similar as possible so as to isolate the hypothesised causal relationship from other competing influences (Toshkov, 2016).

Unit of analysis, relevant population and case selection

I. Unit of analysis

Although a part of the literature recommends comparative research design among networks as the unit of analysis, the relevant unit of analysis of this research project aims to contribute to another body of the literature. Indeed, the unit of analysis of this research project are small and medium-sized cities (SMC), situated in Southern Europe. The characteristics of SMC are a population that is lower than 500 000 inhabitants and limited municipality' fiscal resources (Hoppe et al., 2016). In particular, small cities are defined as administrative units with a population between 100 000 and 300 000 inhabitants, whereas medium-sized cities have a population between 300 000 and 500 000 inhabitants (Hoppe et al., 2016; Eurostat, 2017, 2019; Polis, 2020a).

II. Case selection process

The selection of the network POLIS derives from the fact that multiple studies have been conducted on large networks. To tackle the major issue of air pollution in Europe due to transport emissions, the selection of a specialized European network in the field seems to be appropriate. POLIS is specialized in the transport area (Keiner & Kim, 2007). Therefore it represents a relevant case to study for the purpose of this research project.

Creating a file with a list of all the European cities was helpful for the case selection. The table comes from the website of Eurostat (2017) on cities demography. The table was then organized it in 9 columns; each corresponds to information useful for screening and therefore selecting the suitable cases for the research. The 9 columns are the code of the city (reference in databases), the name of the city, the country, the population in number of inhabitants (Eurostat, 2017), and accordingly a categorization of the city size (minor, small, medium or big made in accord with Eurostat 2019), the year of the data, the source, the regional localisation (Northern, Southern, Eastern Europe), and major networks in which cities are members (2 columns). These columns correspond to the selection criteria for the study cases. To select the cases for this research project, the criteria are a small or medium size of the population (between 100 000 and 500 000 inhabitants), the localisation (focus on Eastern and Southern cities), non-participation in another network and similar mayor's affiliation. Cases are selected according to the Eurostat 2017 data. If a city is not in the Eurostat database, the city is not part of the selection process.

Above all, the screening revealed that small and medium-sized cities that are located in Southern or Eastern European countries and participate in POLIS are located in three countries: Italy, Spain and Romania. However, due to the use of MSSD I strategy, and linguistic barriers, only Italian and Spanish pairs of cities can be selected. As summarized in table 2, the selection of cities that do not participate in POLIS is based on the same criteria, so as to create a similarity in terms of number of inhabitants, non-participation in another network, geography and culture (Blatter and Haverland, 2014, Toshkov 2016).

III. Relevant population

The relevant population for this research project (see table 2) is composed of two pairs of cities. Among each couple, the selection of the two cities is based on the smallest difference between the number of inhabitants. In each pair, one city belongs to the city-network POLIS, and the second one does not. The cities that are part of POLIS are Bilbao (Spain) and Perugia (Italy). They represent the treated group. The cities that are not members of POLIS are Alicante (Spain) and Reggio nell'Emilia (Italy). They represent the control group.

The Italian pair of cities represents small-sized cities, with a population of more than 100 000 but less than 300 000 dwellers. On the other hand, the Spanish pair of cities represents a couple of medium-sized cities, with a population of less than 500 000 inhabitants but more than 300 000 inhabitants. None of these cities participate in another major network, such as ICLEI or C40cities. The difference within each pair is the value of the explanatory variable (participation or non-participation in the network POLIS). All other potential variables, both control and confounding ones are as similar as possible, according to the MSSD I (see table 2).

Variables	Independent variable	Control variables		Confounding variables		Dependent variable
Cities	**Participation in POLIS**	**Population (number of inhabitants) in 2017 – (size M or S)**	**Localisation in Southern Europe**	**Mayor's vision & affiliation**	**Non-participation in another major city-network (ICLEI, C40Cities)**	Sustainable mobility policies implementation: **Electric mobility**
BILBAO (SP)	YES	345 110 (M)	YES	Basque Nationalist Party *(Partido Nationalista Vasco)*	NO	YES
ALICANTE (SP)	NO	329 988 (M)	YES	People's Party *(Partido Popular)*	NO	YES
PERUGIA (IT)	YES	166 676 (S)	YES	Democrats of the Left *(Democratici di Sinistra)*	NO	YES
REGGIO EMILIA (IT)	NO	171 491 (S)	YES	Democratic Party *(Partito Democratico)*	NO	YES

Table 2. Case selection and variables

Qualitative research methods

I. Research methods

Concerning the choice of documents analysis, from a theoretical standpoint this method is appropriate for this project for several reasons. First, a wide range of types of documents can be used and is accessible on organizations' websites, such as

newspapers, press releases, governmental reports, and articles, among others. So, documents contain a large amount of information about the background and context of an event, which are crucial for collecting sufficient knowledge to conduct the study (Bowen, 2009).

Furthermore, documents are useful for additional evidence or data, and as a trustworthy instrument to trace the evolution of a phenomenon. In addition, the use of multiple documents that remain stable over time allow the researcher to establish connection between different sources (Bowen, 2009).

Academia states that working with documents is an "efficient method", available most of the time, cost-efficient, and somehow transparent (Bowen, 2009, p.31). Moreover, unlike individuals, documents do not risk getting offended or emotional, and they preserve a certain level of exactitude that does not fade with time (Bowen, 2009).

II. Data collection

For this research project, data collection is based on the existing literature on intermediaries, soft regulation, trans-governmental networks, and city networks, as well as documents produced, and available on their website, by the studied actors, such as the POLIS network, the four selected cities, or by the European Commission. Additional documents used are the European institutions websites and reports on projects funds, and presentations during or summaries of the POLIS annual conferences of 2012 and 2019. In particular, the documents used are: the 2011-White Paper, the 2020 report on air quality, the Sustainable Urban Mobility Plan of the four cities, the power point presentation for the candidature of Perugia to POLIS' Presidency (2011); the power point presentation at the annual conference of POLIS held in Perugia in 2012; and the brochure of the CiViTAS RENAISSANCE European programme; the summary of the POLIS annual conference of 2019 held in Bilbao; the presentation of the city of Bilbao during the annual conference in 2019 (see Documents and Reports). Also, for the cities of Perugia and Reggio nell'Emilia decisions of the cities councils were collected, with the approval of budgets for electric mobility investments.

An important limit in the data collection process was the unavailability of a full report on European programmes in which cities participated, or the list of programmes in which cities participated with the support of POLIS. Surprisingly appointed public official were not always in the right position to provide such information.

Common threats to interference

Regarding the qualitative method of the research, as reported by academia, the possible disadvantages of document analysis could be their incomplete or missing detailed information, their inaccessibility or disappearance, and "biased selectivity" (Bowen, 2009, p.32; Thiès, 2002). However, these threats could be avoided with a high level of knowledge of the case studied, critical eye on the selected materials and triangulation between the sources, and with further qualitative interviewing with professionals or public officials (Bowen, 2009; Thiès, 2002).

In addition, the validity of the research project could be compromised if the selected and potential confounding variables, i.e. mayor's vision and the non-participation in another network, are not blocked according to the MSSD I. To reduce the risk of variability they need to be constant as much as possible. For this research project, the mayor's vision is in part defined by the mayor's affiliation. The affiliation of Bilbao's mayor to the Basque Nationalist Party (BNP) might seem compromising. The ideology of the BNP is rooted in demo-Christian and national beliefs. However, the party believes in an integrated European union. As an illustration, the party is part of the larger Christian Democratic European movement. (EAJ PNV, 2020). Additionally, both the actual mayor who is in charge since 1999, and its predecessors since 1979 are all affiliated to the BNP (San Salvador del Valle, et al., 2014). Therefore, the fact that Bilbao's mayors belong to the same party since the end of the 1970's, the variable can be considered as blocked. And this should not represent a source of interference. It also did not impede the city to join the network. However, what can be noted is that it might have delayed the participation in the network.

Furthermore, reversed causality of the causal mechanism studied could undermine the research. This causality would consider that the adoption of sustainable transport policies causes the participation in the network. This means that the policy adoption temporally takes place before the local organization participates in the network

(Toshkov, 2016). This mechanism could be studied as a specific causal relationship, however it is unlikely to occur since policy adoption needs funds, and a city that already adopted a sustainable transport policy is not lacking the necessary resources that the network is able to provide. Still, this can represent a weakness in the research project as cities that already adopted such policies might lack further funds to advance developed initiatives, or are willing to participate to be an example on a specific issue. Therefore they could join the network to access more financial resources and recognition (Bulkeley and Betsill, 2004; Pflieger, 2014).

In addition, the control variable of non-participation in another network only considers large city networks, such as C40cities, or ICLEI that cover cities located both inside and outside Europe. However, smaller, local, national or European networks are not taken into account since academia did not extensively study them, yet. Notwithstanding, cities might have joined them as well and they might explain why a city implemented a certain policy. The reality is that multiple city networks exist and at the moment we are not aware of a usable (under excel format for instance) dataset that comprises all of them, and their member cities.

Finally, projects adopting large-n research design are suitable to use random distribution between the treated group and the controlled group. This is not the case for small-n research designs, which is the approach adopted for this project. Indeed, the distribution of the treatment existed even before the research started, which means that the researcher does not intervene (Toshkov, 2016).

CHAPTER III: CASE DESCRIPTION

This chapter aims at presenting the challenge and the regulatory setting in which the intermediary, the POLIS network needs to intervene. Following, the chapter describes the characteristics of the city-network, and the electric mobility policies adopted by the cities.

The regulatory setting: The 2011 White Paper of the European Commission

The European Commission set the regulatory setting to reduce air pollution in Europe with the White Paper of 2011. The main pollutants related to the road transport sector identified are particulate matter (PM10 and PM2.5), nitrogen dioxide (NOx) and carbon emissions (CO) (EEA, 2020a). In Europe, PM2.5 represent 11% of the air pollutants, PM10 generate 10% of the emissions, NOx emssions account for 39% of air pollutants and carbon emission produce 26% of the emissions (EEA, 2020a). Although the European Environment Agency (EEA) pointed out that only 8% of the European urban dwellers were exposed to concentrations that exceeded the European threshold (25 $\mu g/m^3$), 77% were exposed to the World Health Organization (WHO) limit value (10 $\mu g/m^3$). According to the latest report on air quality, the European population exposed to air pollutants (PM10, PM2.5, O_3, NO_2) decreased between 2008 and 2018 (EEA, 2020a). The EEA highlighted that European cities show high concentration of PM2.5 in the air due to fossil fuels combustion. More precisely, Eastern and Southern European cities suffer from high levels of air pollution. Urban areas concentrate most of the air pollutants because people and their activities converge to cities. This results in high levels of air pollution due to traffic congestion and vehicles' emissions. As a consequence urban transport represents 25% of transport emissions (EEA, 2020a).

The objective set for Europe is "to reduce emission by 80-95%", and to reduce greenhouse gases by at least 60% compared to the 1990's level, by 2050 (European Commission, 2011, p. 3). One of the main tools identified to address such challenges is the use of new technologies for vehicles. The transition towards cleaner vehicles,

including proper infrastructure is necessary to reduce "oil dependence, greenhouse gas emission and local air and noise pollution" (European Commission, 2011, p.8). Among the possibilities considered for cleaner vehicles, the Commission mentions the "use of electric, hydrogen and hybrid technologies" (European Commission, 2011, p.8). These could reduce both carbon emissions and noise. Nonetheless, the transition towards more sustainable vehicles became a bigger "pressure on public resources for infrastructure funding" which creates the necessity for new funding mechanisms (European Commission, 2011, p. 4). To support the transition, the European Commission promised to grant funds for projects. Applicants need to share the White Paper's goals and vision to be eligible. The White Paper stated that to raise funds for the transition towards more sustainable transportation systems, public and private financial sources are necessary. Still, as for private investments, an adequate regulatory framework and advanced funding programmes are required. Private and public partnerships could be funded at different scales through innovative instruments. In addition, the European Commission believes in "better coordination of the Cohesion and Structural Funds with transport policy objectives" (European Commission, 2011, p.14). Within this regulatory setting, it appears to be necessary to make use of intermediaries that could help to facilitate the transition towards electric mobility.

The intermediary: the network POLIS

The network POLIS was created in 1989 as an international non-profit association based in Brussels, Belgium. The status of the network is regulated by the statements of the Title III of the Belgian law of June 1921 on non-profit associations, international non-profit associations and foundations (POLIS, 2019b).

I. POLIS' architecture and characteristics

The network POLIS is composed of its members, a management committee and the executive staff (Polis, 2019a).

Membership is differentiated between Full Members and Associated Members. There is no limit for the number of members, however the minimum number of full

members is six (Polis, 2019a). The POLIS full members are governmental organizations. These are municipalities such as Perugia, or Bilbao, or regional authorities, such as Catalonia. POLIS members are mainly located in Europe, or in the close Middle East, like Jerusalem. The common point of these organizations is the authoritative character they have both on their territory and internationally. Moreover, they rely on democratic elections (Polis, 2019a). Full members take part in the General Assembly, during which they vote for the president, the treasurer and other members of the management committee. Although the members of the management committee are elected for a mandate of three years, the president is elected for one year only (renewable once). Every year, POLIS members vote and approve both the network's strategy, and the budget (Polis, 2019a).

Associated members are non-governmental organization. These are research institutes and universities, like Breda University of Applied Sciences, local or regional transport companies, such as Dublin National Transport Authority (NTA), and public or private organizations, like IFP *Energies nouvelles* (IFPEN). Associated members cannot vote during the General Assembly, and cannot be elected as members of the management committee (Polis, 2019a).

All POLIS members have to pay an annual subscription fee that varies depending on the population size of the organization applying and between full and associated members. This mainly constitutes the budget of POLIS. All members can join or leave the network at their convenience, but they need to inform the management committee that can also decide to exclude a member (Polis, 2019a).

Internally, POLIS has several boards; these are the general assembly, the president, the management committee, the general secretary, and the POLIS office. The general assembly is the reunion of all POLIS' members; during the general assembly, all decisions need a quorum of two thirds (Polis, 2019a).

The second body, the management committee is composed of at least six members, including the president, the vice-president and the treasurer. When the president is elected, he takes both the presidency of POLIS and the chairmanship of the general assembly. Mandates are renewable once, but the renewal needs to be voted, and committee's members can voluntarily resign from their obligations (Polis, 2019a). This board is responsible for the management of POLIS' budget and policies. It also oversees the POLIS office administrative activities; it defines the organizational objectives and how to achieve them together with the general assembly; finally it

supervises the external representation of the network. The management committee can delegate its powers to one or more of its members, or to its staff (Polis, 2019a; 2019b). Finally, the POLIS office is the body in charge of the executive and administrative tasks. The team is composed of 20 agents including the Secretary General, the Director of policy & projects, the Director of membership & finance, senior project and policy managers, project managers or officers, communication and events managers, interns, and the human resources and finance managers (Polis, 2019a).

II. Missions

POLIS gathers both European municipalities and regions administrations to work on innovation for local transportation systems. The objective is to " promote the integration of sustainable transport" with the development of " innovative solutions for a more sustainable mobility" (Polis, 2020b, p. 10, 2). The network aims to support knowledge and experienced-based exchanges between local and regional European actors. Exchanges take place during workshops or conferences, such as the annual conference held each year by one of the member cities (Polis, 2020c). Other actors such as NGOs, businesses, or research institutes, and other stakeholders are invited to join the network to create relationships with the local and regional authorities to find suitable transport-related solutions and potential partnerships (Polis, 2019a).

POLIS plays the role of the intermediary for local and regional authorities and facilitates their access to European research, innovation and funds with the organization of events (conferences, workshops). The network has the capacity to support partnerships initiation among its members for European projects. Its expertise, knowledge and tools ensure its member to adopt the best and most innovative solutions in terms of sustainable mobility policies (Polis, 2019a).

POLIS can directly or indirectly take on work on its own or cooperate with third parties to accomplish its goals. More precisely, POLIS expands and promotes the performance of research and studies, issue publications and organise activities such as training sessions, seminars and conferences (Polis, 2019a). In summary, it possesses all the intermediaries' theoretical characteristics ascribed to policy intermediaries.

The targets: member and non-member cities

This section describes the main characteristics of the cities that are the targets of European air regulation. Firstly, the section introduces members of the POLIS network, namely Bilbao (Spain) and Perugia (Italy), and their advancement in electric mobility. Following, the chapter presents the non-member cities, i.e. Alicante (Spain) and Reggio nell' Emilia, simply known as Reggio Emilia (Italy).

I. Member cities: Bilbao and Perugia

A. BILBAO

Bilbao is a medium-sized city in the Northern and Atlantic coast of Spain. Although the city has a lower number of cars on its territory compared to other Spanish cities, the municipality believes that a sustainable mobility has to promote the use of non-motorized vehicles in order to reduce energy and space consumption, lower carbon emissions, and noise. Therefore the main challenge for the Sustainable Urban Mobility Plan (SUMP) of Bilbao is the difficulty in reducing the number of private cars that is already low. In this context other measures have been considered and put in place to contribute to improve air quality (Ayuntamento de Bilbao, 2018). The city of Bilbao provides large information about co-financed projects with European Funds. For instance, the European Fund for Cohesion (FC) granted 351 800 million euros for the regional polity of cohesion for 2014-2020. Among these, 63 400 million were intended for the trans-European network of transport and environment (Bilbao, 2020). Bilbao joined the POLIS network in 2012, under Inaki Azkuna's mandate who was a member of the Basque National Party (*Partido Nationalista Vasco, PNV*). The city hosted the POLIS annual conference in 2019. During the annual conference of 2019, the city of Bilbao presented the progresses and initiatives made in terms of electric mobility (City of Bilbao, 2019a, 2019b).

A.1. The urban mobility in Bilbao

The city of Bilbao and its urban area register around 1 400 000 movements per day during a working day. Around 38% of the movements are performed by car, whereas 29% are realized through public transportation. Despite the low number of cars, this mode remains the major one used (Ayuntamento de Bilbao, 2018). Among the mobility flows, the main reason for mobility is related to employment, and represents 80% of the mobility in the urban area of Bilbao. Around 50% of the movements related to work are accomplished with a private vehicle (Ayuntamento de Bilbao, 2018). The main source of noise within the municipality is traffic on roads. However, the population exposed to the noise decreased by 5% during the day, by 4% during the evening, and by 10% at night between 2012 and 2017. In addition, the PM10 emissions related to private vehicles decreased between 2004 and 2016 from 0.59gr/km to 0.051gr/km, which could be related to both the evolution of the population and of the number of vehicles (Ayuntamento de Bilbao, 2018). Regarding public transport, around 195 000 journeys are realized on the territory of Bilbao, and 217 000 are accomplished in the urban area (out of the municipal territory). Several public transportation modes exist: the Metro, the Bilbobus (the city's bus network), the RENFE (the national train network), the Euskotren (the tramway), the Bilbon Bizi (public bikes), and the Bizkaibus (touristic bus network, developed on a more regional scale). Additionally, the introduction of electric bikes in 2018 represented an investment cost of 250 000 euros. This initiative has been recognized as a successful one during the POLIS annual conference of 2019 (City of Bilbao, 2019a).

A.2. The SUMP 2016-2030: towards electric mobility

Among the objectives for the SUMP 2015-2030 of Bilbao, there is the reduction of carbon emission to improve air quality and reduce noise pollution. To do this the SUMP suggests replacing traditional fuelled vehicles with electric ones. This proposal is valid for private vehicles through incentives, but also for buses lines with the introduction of electric buses, and by replacing municipal vehicles. In 2019, six buses were electric (Ayuntamento de Bilbao, 2018; City of Bilbao, 2019b). The SUMP estimated that incentives for electric vehicles will amount up to 2 000 000 euros, and

will be reduced according to the importance of electric cars on the market. In 2017, 66 electric private vehicles were registered in Bilbao. It is expected to have 6 000 electric vehicles by 2025, and 25 000 in 2030. Among the incentives, the city releases a grant of two hours of free parking on municipal parking areas while recharging. The transition of municipal vehicles towards electric ones has an estimated cost of around 2 750 000 euros, financed by the municipality. This measure is supposed to reduce carbon emission by 50% by 2030 (City of Bilbao, 2019b).

Additionally, the SUMP also includes the transition towards electric or clean vehicles for the taxi fleet with grants in order to achieve 100% of electric taxis by 2030. The city grants 10 000 euros per vehicle to incentivise the transition. In 2019, 23 taxis were 100% electric (City of Bilbao, 2019b). To accompany these measures, the city also started to invest in the implementation of recharging stations in the municipal parking areas and electric lines (which relies on electric operators). Since 2014, eight fast charging stations of 50kW have been installed. The number of recharging stations in municipal parking is up to 108 for electric vehicles and 25 for hybrids, and 30 more municipal electric lines are expected to be implemented with respect to 2017 (Ayuntamento de Bilbao, 2018; City of Bilbao, 2019b).

Finally, another proposal is the revision of the special plan for the area of *Casco Viejo*, which is an ancient area of the city centre. This proposal aims at both finding space for loading goods and to promote the use of clean vehicles. The proposal includes the use of electric bikes such as cargo bikes for businesses operating in the area (Ayuntamento de Bilbao, 2018).

The introduction of new mobility measures helped to reduce pollutant emissions by 14% and is expected to further reduce emission by 27%. In the end, by 2030, the emission should be down by 41%. It is therefore necessary that 25% of vehicles that circulate in the territory by 2030 are electric in order to comply with supranational regulations (Ayuntamento de Bilbao, 2018).

B. PERUGIA

Perugia (Italy) is a small city located in Umbria, a central region of Italy. On a daily basis, the city experiences episodes of traffic congestion, and suffers from the derived pollutions especially in the city centre. Indeed, although the level of NOx never exceeded the 40µg/m^3 threshold between 2010 and 2016, 80% of the NOx emissions are related to transportation. Likewise, PM10 emission never reached 35µg/m^3 between 2010 and 2016. However, 15 to 20% of PM10 emissions in Perugia are caused by transport. In 2011, Perugia's inhabitants realized 570 000 displacements per day. Three-quarters of them are performed by car (427 000), 14 200 are made with motorcycle (2.49%). Private transportation represents around 78% of the urban movements of Perugia's urban area. Public transportation accounts fro 14% of the displacements, including internal and external urban buses, *minimetrò* and train. Bike-related journey only account for 0.2% of the movements, and pedestrians represent 10% of the mobility. Like Bilbao, private vehicles are the main used mode of transportation in Perugia. In 2015, only 0.14% of the vehicles are hybrid or electric, whereas diesel fuelled vehicles represent 45.26% of the fleet, and gasoline vehicles stand for 42.33% of the total fleet (Comune di Perugia, 2019a). Therefore the city wishes to reduce, in particular, the use of conventional private cars (Comune di Perugia, 2019).

B. 1. Perugia, POLIS and electric mobility

Perugia joined the POLIS network in 2005, under Renato Locchi's second mandate (2004-2009). Mayor Locchi was affiliated to the party of the Democrats of the Left from 1998 to 2007. The city was part of the Management Committee of POLIS twice, first between 2010 and 2013 during which the city held the presidency in 2012 and 2013, and then between 2014 and 2016. As President of the Management Committee, Perugia also hosted the Annual Conference of POLIS in 2012. The particularly active role of Perugia with POLIS allowed the city to access, among others, a main European programme known as CiViTAS RENAISSANCE (City of Perugia, 2011). The CiViTAS programme was designed for the development of clean transport in

cities with an important heritage also combined with both environmental and mobility concerns to economic development (Civitas Renaissance, 2013). Participating in the CiViTAS project RENAISSANCE helped among different actions that were identified as strategic means in the SUMP. These measures aim at replacing 33 municipal vehicles, awarding 35 citizens to retrofit their car, and replacing 20 buses (out of 123) with cleaner and dual fuel technology vehicles. One of the strategies of the SUMP is the introduction of electric buses for lines circulating within the historical city-centre, and a progressive adoption of low emission buses for other lines. For the city centre, the SUMP expects two lines of shuffle electric buses, whereas the other lines will benefit from low emission vehicles such as Euro 6, hydrogen, hybrid, and electric with the possibility to charge at bus stops (Comune di Perugia, 2019b). The programme CiViTAS Renaissance helped the "multi-modal enhancement interchange at the Mini-Metro stations" (Civitas Renaissance, 2013, p.8). Indeed the *minimetro* project is presented as the major transport innovation for the city of Perugia. Opened in 2008 it is a suitable connection between the suburbs and city centre. Finally, the RENAISSANCE programme supported the "feasibility study for car sharing" with electric cars, a necessary and complementary initiative considered in the SUMP to reduce carbon emission (Civitas Renaissance, 2013, p.8; Comune di Perugia, 2019b).

The municipality of Perugia accessed four European programmes through POLIS' support, namely CiViTAS (Renaissance), LIFE+ (H2POWER_Hydrogen in fuel gas), Med (LiMIT4WeDA), and Elisa (Concerto & Infocity), (Comune di Perugia, 2019b). However only one, which is CiViTAS Renaissance helped to implement electric mobility. Sadly, little information was available on the Med programme (2014-2020) addressed to areas with little public transport demand. The programme aimed at providing "light mobility and information technologies" solutions for low-density areas (Comune di Perugia, 2019a).

II. The non-member cities: Alicante and Reggio Emilia

A. ALICANTE

The municipality of Alicante is located on the South-eastern coast of Spain, on the Mediterranean Sea. The city registers 329 988 inhabitants (Eurostat, 2017). Around 20% of the population is exposed to good noise levels recommended by legislation. Municipal plans identify traffic on road as the major source of noise for the city and its inhabitants. In terms of air quality, the level of PM10 is around 67 $\mu g/m_3$ and 64 $\mu g/m_3$ in two of the stations, which is above the annual national threshold of 40 $\mu g/m_3$, and the level of PM2.5 is slightly under the threshold (29 $\mu g/m_3$) at 24 $\mu g/m_3$. The transport sector causes 25% of the municipality carbon emissions (Ayuntamento de Alicante, 2013). The most recent Sustainable Urban Mobility Plan of the municipality of Alicante was approved in 2013. It presents the strategy for the development of the mobility and transport on the municipal territory with the horizon 2030.

A.1. A light offer of electric mobility in Alicante

The coordinated system of public transport of the metropolitan area of Alicante, known as TAM (*Transporte Alicante Metropolitano*) was created in 1999. It encompasses internal and external bus lines, and the tramway. Three companies manage the public transport system: Masatusa (internal bus lines, within the municipal territory), Alcoyana (external bus lines, between Alicante and surrounding urban area). Both companies are part of the group Subús. Finally, the FGV (*Ferrocarrile de la Generalitat Valenciana*) is in charge of the existing lines of the tramway.

Masatusa is in charge of the urban buses since 2013. The company manages 16 lines. Alcoyana is the company operating in the urban area and ensures connections with Alicante and other small municipalities surrounding Alicante. The company manages 24 lines (2013), with 56 vehicles among which one is hybrid (diesel and electric). Finally the first line of FGV was created in 2003. The actual network was completed in 2007 and is composed of 4 lines. The public transport system is also completed

with the RENFE (the national railway company) that ensures connections between Alicante and more or less distant destinations. The RENFE has two lines on the territory. The first one, C-1 is not electric whereas the second one, C-3 is (Ayuntamento de Alicante, 2013).

In 2013, 715 711 displacements per day are realized in the city of Alicante (for an average of 1.03 movements per person per day). The difference of calculus between the previous census (1999) and the most recent one (2013) points out that there is an overall decrease of the number of movements on the territory, from 2.3 to 2.1 (Ayuntamento de Alicante, 2013). Among these journeys, most of them (81.7%) are realized on the municipal territory only (internal), whereas 17.96% are external, which means that people might come or go outside the municipal territory. However, the decline of the number of movements might also be related to the economic situation that Spain experienced during the past years and since the 2008-crisis (Ayuntamento de Alicante, 2013). In 2013, most of the movements are achieved during the day (91.57%), whereas during the evening only 5.66% of the displacements is done, and only 2.77% of them at night (Ayuntamento de Alicante, 2013). The two main modes of transportation are private vehicles, embodying both cars and motorbikes (45%) and feet (41%), whereas the public transport system and the bicycle are only representing 12% and 2% of the movements. Private vehicles are mainly used for journeys concerning work, whereas leisure or groceries displacements are done mainly by foot. The use of cars slightly decreased between 1999 and 2013, whereas the use of bikes as well as walking slightly increased. In 2010, the bike sharing system, Alabici, was inaugurated with 12 stations and 140 bikes. In 2012, studies highlighted the soaring increase of the use of bikes in the city as a daily mode of transportation, relative to 2010. Journeys increased by 51.27%, in particular in the central area of the city (Ayuntamento de Alicante, 2013).

B. REGGIO EMILIA

Reggio nell'Emilia more commonly know as Reggio Emilia is a small Italian city located on the major axis E35 between Bologna and Milan in the North of Italy. In 2008 the municipality of Reggio Emilia approved the first SUMP. This was subsequently updated in December 2016 with a document that identifies the

guidelines to addressing the new challenges of the city from 2017 onwards. Combining both internal and external flows, the city knows 33 000 daily movements. Among these, 74% are achieved with a private vehicle (car or motorbike), 10% are realized through public transport (bus, tram or train), and 16% are accomplished by bike or walking (Comune di Reggio Emilia, 2008). According to the SUMP (2016), between 2009 and 2014, public funds for public transportation experienced an overall decline of 12%, and the number of buses for urban service dropped out 47 units (32%), including the complete elimination of hybrid vehicles. However, in the city centre the *Minibù*, which stands for mini bus and that is a special public transportation line of buses, attracted an increasing number of passengers (+11%). This was in particular due to the effective role of the inter-modality between parking areas outside the city centre and these lines that connect to the city centre to avoid traffic congestion (Comune di Reggio nell'Emilia, 2016).

B. 1. Reggio Emilia, 1st European city for electric mobility

Regarding electric mobility, after a decree of 1998, the municipality started to invest in the conversion of traditional fuelled fleets into more sustainable-fuelled fleets, and in particular electric powered mobility. Since 1999 the TIL *(Trasporti Integrati e Logistica)* is the active organization that manages and incentivizes the use of electric vehicles in Reggio Emilia. It acts in both private and public services of electric mobility. For instance, a main project is an ecological rental service that aims to promote the use of electric vehicles on the territory. Internally, the organization developed *Ariamia* a public-private partnership to encourage businesses to use electric vehicles. The project aimed to rent out vehicles on a long-term basis, in particular to access the city centre. The project was then extended in 2005 to all citizens (Comune di Reggio nell'Emilia, 2016). In 2015, the Italian Minister for Infrastructures launched a national programme to finance the promotion of electric mobility, namely the National Infrastructure Plan for the Recharging of electric powered vehicles (*Piano Nazionale Infrastrutturale per la Ricarica dei veicoli alimentati ad energia Elettrica*), (PNire, 2016). The Region of Emilia Romagna where Reggio Emilia is located, had participated with the project *Mi Muovo Elettrico* and the city presented the request to financing 36 recharging stations and 10 "box

station" that could be used for private cars (Comune di Reggio nell'Emilia, 2016). In 2017, 323 electric vehicles were circulating in the municipality area (TIL, 2017). The successful development of electric mobility is possible with both the appropriate infrastructures such as recharging station, and through participating in regional and national policies promoting and diffusing electric mobility. In addition, the participation of companies like ENEL (the Italian distributor of electricity and gas) and pilot projects between cities helped to increase the electric fleet available as well as the usable recharging station (Comune di Reggio nell'Emilia, 2016). During the same year, the city launched *Reggio Respira* that is a programme of coordinated actions to improve air quality. The actions included facilitating the release of 24 new taxi licenses conditional on the use of an electric vehicle, and a feasibility study for the purchase of 25 electric buses for the *Minibù*. In addition the actions included the strategic implementation of recharging stations for electric vehicles, the development of a bike sharing system, and the update of the feasibility study and launch of the project of tram in 2019, including the research of channels for financing the project. These mid-term perspective projects however, required regional, national and European resources (Comune di Reggio nell'Emilia, 2016).

The city received several awards for being such an active actor in electric mobility solutions. Among the awards, the city won in 2003 "Global E-Visionary Award" given by WEVA (World Electric Vehicle Association) for being the number one European city for the use and diffusion of electric mobility. In 2005, the city was awarded by the IEA (International Agency for Electric and Hybrid Vehicles) with the "Best Practice Award" for being the number one city of Europe for the project of sustainable mobility realized in urban environment with electric vehicles. Finally, in 2011, the city won the "Prize Electric City" given by the Italian Commission Electric Vehicles for implementing an overall plan of organic actions aiming at promoting the diffusion of city mobility based on the use of electric vehicles of the TIL fleet (Merigo, 2020).

B. 2. Benefits from electric mobility for Reggio Emilia

Between 2008 and 2015 the local trend of PM10 in the city shows a decline of the quantity of PM10 in the air. However, data shows that between 2008 and 2012 both

stations detected more than 50 days in which data exceeded 35µg/m^3. From 2012 onwards, the number of days decreased significantly. Therefore, the city benefited from the aforementioned initiatives with a reduction of pollutants emission, decline of noise in the central area and economical savings on fuel for the inhabitants (Comune di Reggio nell'Emilia, 2016).

The recently approved SUMP considers further measures to advocate clean mobility, such as the development of innovative projects aiming at promoting low emission mobility. Other measures include facilitating the diffusion of low emission vehicles through traffic control and monitoring instruments, incentivising forms of shared mobility permissible through new technologies and new technologies of communication. But also, identifying transport modalities and organizational systems that help to satisfy the necessity of goods distribution in the central areas of the city, and that are socially and environmentally sustainable (Comune di Reggio nell'Emilia, 2016).

CHAPTER IV: CASE ANALYSIS & DISCUSSION

Results

In the context of climate change that the 21st Century is experiencing, the European Union aims at mitigating polluting emissions to contribute to improving air quality. Cities are the principal targets of new regulations, and they voluntarily use transnational municipal networks to help each other's in finding innovative solutions, including knowledge exchange and funds to achieve their goals. This research project focuses on the effectiveness of a city-network in assisting cities to adopt sustainable policies. The case description mapped out what have been implemented in the past years to improve air quality through electric mobility initiatives in Bilbao and Perugia with regard to POLIS participation, and what Alicante and Reggio Emilia implemented without participating in the network (see table 3).

	MEMBER CITIES		NON-MEMBER CITIES	
	BILBAO (SP)	**PERUGIA (IT)**	**ALICANTE (SP)**	**REGGIO EMILIA (IT)**
Electric transition of municipal fleet		X		X
Electric public transport	X	X	X	
Grants or awards for citizens for replacing their vehicles with electric vehicle	X	X		
Electric taxi	X			X
Recharging stations implemented				
E-public bikes	X			

E-vehicles rental service				X
Feasibility studies for further electric measures				X

Table 3. Electric mobility measures implemented in the four cities

First of all, according to academia, the administrative architecture of the POLIS network could correspond to the model of network administrative organization (NAO) that Jordan (2017) presented. This type of intermediary facilitates and optimizes members' activities with the help and support of an executive team (Provan and Kenis, 2007; Jordana, 2017). As illustrated, the POLIS office is composed of highly skilled civil servants, such as senior project and policy managers (Polis, 2019a). In addition, the presence of governmental organizations, research institutes, local or regional transport companies and public or private organizations contribute to connect different actors with different capitals of knowledge, which enhances potential expertise (Provan and Kenis, 2007). Both the executive staff and members contribute to the expertise of the network. The annual subscription fees that constitute POLIS own budget capacities, and the management committee, which is the responsible of the organizational objectives, ensure the independence of POLIS. In addition to the management committee, the office also contributes to the operational capacities as the body executing the tasks to achieve the organizational objectives (Abbott et al., 2016).

Concerning the cities, as reported by the information presented in the case description section, eight main actions contribute to the development of electric mobility regardless participating in POLIS (see table 3). These actions include the transition of the municipal fleet towards electric vehicles, the purchase of electric vehicles for public transportation, grants or awards for citizens replacing their vehicle with an electric one, and taxi licenses released on conditional use of electric vehicle. They also include the implementation of recharging stations; electric vehicle fleets for rental or sharing, electric bike sharing initiatives, and the feasibility study for the

purchase of further electric vehicles or measures to implement. These eight measures identified and implemented mainly correspond to what has been found by the academia to be successful actions. Concerning the decarbonisation of motorized vehicles Carteni et al., (2020) and Grijalva and Lopez-Martinez (2019) worked on the electric transition of public transport. On one hand Carteni et al., (2020) concentrated on an Italian case, on the other hand, Grijalva and Lopez-Martinez (2019) applied their research to a Spanish empirical case. Castillo et al. (2020), De Gennaro et al. (2014, 2016) and Knez et al. (2020) focused on the use of electric private vehicles. This category includes individual private vehicles, taxis and shared mobility services (cars). While Castillo and colleagues (2020) drew the profile and conditions for electric vehicles purchase, De Gennaro and his colleagues (2014; 2016) looked into the efficiency and benefits of electric vehicles fleets in small Italian cities. In terms of non-motorized vehicles, cities are looking for e-bike sharing services, initiatives studied for instance by Behrendt (2018), and Dill and Geoffrey (2012).

From the data collected, when comparing the Italian pair of cities, both have realized the transition of the municipal fleet into electric vehicles. Perugia registers 33 municipal electric vehicles, and Reggio Emilia registers 55 of them. Moreover, Italian cities experienced a reduction of public investments; funds for public transport in Reggio Emilia have been cut by 12%, whereas Perugia was not expecting to invest in the renewal of the rolling stock circulating on the former regional railway network (Comune di Perugia, 2019b; Comune di Reggio nell'Emilia, 2016).

On the other hand, the Spanish cities only have electric public transportation measures in common. Bilbao has six electric buses, while Alicante has one hybrid and one electric train line.

Moving forward on the analysis, the two cities participating in POLIS share two similar policies: electric public transport and grants or awards for citizens to purchase an electric vehicle. On one hand the CiViTAS programme clearly helped to award 35 citizens of Perugia. On the other hand, the city of Bilbao presented this action at the annual POLIS conference of 2019, but it is not clear whether the tool was granted with the help of POLIS or not. However, Bilbao registers 66 private electric vehicles. As for public transportation, Perugia has 20 low emission buses (that encompass both electric and other technologies) obtained through CiViTAS, and Bilbao only has six electric buses.

Finally, the study demonstrates that among the two cities that do not participate in POLIS, Alicante has only the aforementioned electric public transports, whereas Reggio Emilia has its full municipal fleet electric, released 24 licenses for electric taxis, implemented recharging stations on the territory, in particular in the city centre. The city also developed and supported an electric vehicle long-term rental service, and financed feasibility studies for further electric mobility measures that include the purchase and implementation of 25 electric buses.

Discussion: effective contribution to policy implementation ?

The following section aims at interpreting and discussing the results of the analysis of the implementation of electric mobility policies of the four studied cities.

Firstly, the similarities among cities from the same country may suggest national preferences in implementing particular electric mobility measures. Besides, they confirm previous studies findings. Concerning the Italian cities, the implementation of municipal electric fleets confirms De Gennaro et al.'s (2014; 2016) researches that electric vehicles fleets are an appropriate measure in small Italian cities. Moreover, the lack of public funds for public transport for the Italian cities may explain why the city of Perugia joined POLIS. The participation of Perugia in European programmes with the help of POLIS suggests that POLIS represented a channel to find funds.

As for the Spanish cities, the transition of the public transport towards electric vehicles reflects Grijalva and Lopez Martinez's (2019) study. They studied the benefits of replacing traditional fuelled public transports such as buses in Spain. The use of electric buses may help to reduce air pollution by 92,6% in ten years in the country. With reference to the case description, the transition towards electric public transportation in the city of Bilbao contributed to reduce air pollution, but further improvements are still expected.

Secondly, the similarities among the member cities, namely electric public transport and grants or awards for citizens to purchase an electric vehicle, confirms the general idea that networks ensure information and knowledge exchange in terms of policy practices. For instance, public officials of the city of Bilbao presented the successful electric mobility measures implemented in the city in 2019 (City of Bilbao, 2019b).

Few years earlier, the city of Perugia did the same during its presentation for the presidency of the network. The public official presented in particular objectives achieved with the help of POLIS, such as the participation in the European programme CiViTAS Renaissance (City of Perugia, 2011). This could suggests that the two complementary hypotheses, namely that participating in POLIS allows cities to access funds that incentivize them to implement electric mobility measures, and that participating in POLIS allows cities to access funds as means to implement electric mobility measures are confirmed. Thus, this finding provides a partial answer to Bulkeley et al.'s (2014b) claim by showing the actual contribution of city-networks in supporting cities to implement sustainable policies, which is to facilitate their access to European funds for electric mobility implementation.

Notwithstanding, the results prove that both the member cities and the non-member cities, in particular Reggio Emilia, implemented electric mobility measures. On one hand, the member cities share similar electric mobility initiatives. On the other hand, Bilbao as member city of POLIS and Reggio Emilia that is not a POLIS member share similar electric mobility measures, namely the release of taxi license limited to the use of electric vehicles, and the implementation of recharging stations. The two cities released a similar number of taxi licenses, respectively 23 in Bilbao and 24 in Reggio Emilia. Both Bilbao as a medium-sized city, and Reggio Emilia, a small-sized city implemented five electric mobility measures. Reggio Emilia implemented more sustainable mobility actions than its Italian equivalent, and the fact that it was recognized as a model in electric mobility suggests that POLIS itself does not make the difference in both funds access and funds as a means for electric mobility policies implementation. The city demonstrated its capacity in fund searching and investment. These findings could be significant to reject both complementary hypotheses. However, an additional investigating questioning why the non-member cities achieved such different results might be sufficient to affirm that city networks are still crucial instruments for cities to access funds. Indeed, among the two non-member cities, Alicante did not implement extensive or intensive electric mobility measures, whereas Reggio Emilia proved itself as a pioneer in urban electric mobility.

Few elements remain unclear and cannot prove the validity of the hypotheses. First, it is not apparent how POLIS actually contributed except for organizing events such as conferences or workshops. Regarding the city of Bilbao, the municipality only provides large information about co-financed projects with European Funds but does

not indicate how funds were used and how POLIS helped (Bilbao, 2020). As for Perugia, only information about the European programme CiViTAS was available. Data on results achieved through this programme suggest that POLIS helped in accessing the funds for mobility innovation. Collected data show that the particularly active period of the city of Perugia between 2010 and 2016 corresponds with the results achieved through the programme CiViTAS Renaissance.

Secondly, the participation in POLIS does not explain why the two member cities did not participate in similar European programmes. The city of Perugia with the help of POLIS participated in three programmes, but only one was useful for electric mobility. As for Bilbao, no information on this aspect could be accessed. We do not know to which European funding programmes the city applied to with the help of POLIS. The analysis points out that although both Bilbao and Perugia participate in POLIS, the role of the intermediary is not straightforward in the two cases. Therefore, the hypothesis that participating in POLIS influences cities to adopt sustainable policies could be rejected.

To conclude, the condition of participating in the city-network POLIS seems to be causally sufficient for electric mobility implementation but not necessary. As Toshkov stated, "for a condition to be causally sufficient for an outcome, the outcome must always occur when the condition is present" (Toshkov, 2016, p. 270). The present comparative analysis indicates that in both member cities, electric mobility is implemented. The limitation in the findings is that electric mobility implementation in cities that do not participate in POLIS cannot be explained under this specific causal mechanism. There should be other explanations to unravel the puzzle of electric mobility implementation when not participating in a city-network.

Alternative factors

Since the four cities implemented electric mobility measures, with different degrees of extension, and regardless of their participation in the network POLIS, there might be alternative factors that contribute to the (non)-relationship between electric mobility implementation and participation in POLIS.

In line with small-n comparative research theories, this section presents other potential explanations (Toshkov, 2016).

Firstly, as cities share similar challenges such as air pollution, they may create small networks rather than joining major ones. As shown by the academia multiple networks exist, even within the category of those focusing on environmental issues (Keiner and Kim, 2007; Van der Heiden, 2010). For this research project, the control variable was considering large city-networks only. The small, local, national or European networks were not taken into account, but the non-member cities of POLIS demonstrated divergent outcomes in electric mobility implementation. A potential hypothesis to explain this outcome could be that smaller local, national or European networks, other than the famous ICLEI or C40cities, may contribute to cities' awareness to environmental issues. Therefore, cities might be members of smaller networks that induce them to implement electric mobility policies. However, as Barber pointed out "plurality of ecological networks is a blessing for civil society [but] may undermine common policy" (Barber, 2013, p. 135). As a consequence, on one hand cities might not know which network they should join or cities may join a network that is too large (both in terms of membership and on issue coverage), which could explain why cities did not implement electric mobility extensively, such as Alicante. On the other hand, cities might participate in smaller European networks composed of small cities, which could facilitate the exchange on adequate practices and their implementation. This aspect could justify the successful electric mobility implementation in Reggio Emilia.

Secondly, as mentioned earlier, the active role of Perugia in the network between 2010 and 2016 and the active role of Bilbao between 2012 and 2019 might be one alternative factor that explains electric mobility implementation. This idea would be in line with Böhmelt and colleagues's (2014) idea of the "contagion effect" (Böhmelt et al., 2014, p. 23). Although this concept is applied to states and civil society involvement, it could be interesting to use the theory in the field of transnational municipal networks, and their influence on their members. According to Böhmelt et al. (2014), the more the state has a central position in the network, the more it is "likely to be influenced by the practices of other governments" (Böhmelt et al, 2014, p.19). Therefore, it is not only participating in the network that may induce members to select certain policy, but the position in the network that a government has that makes the difference in adopting suitable policies. The hypothesis applying to the case of transnational municipal networks could be that the more central position the

municipality has in the network, the more it possesses information and is influenced by other member cities. With reference to Perugia's noticeable active role between 2010 and 2016, the "contagion effect" could explain the successful implementation of electric mobility measures in the city. In addition, considering the previous alternative explanation that Reggio Emilia is part of smaller city-networks and considering its potential active role as a member, it could also explain its success of electric mobility implementation.

A third alternative explanation to the weak causal mechanism that embodies participation in POLIS and electric mobility implementation could be the salience of dealing with environmental matters (Barber, 2013; UN Habitat, 2020). The vital dimension of environmental concerns is directly linked to the right of life, which is the very pillar stone of democracies (Barber, 2013). As Europe is the basin of democracy, and as cities are " democracy's original incubator" (Barber, 2013, p.3), European cities may be particularly aware of implementing sustainable policies to ensure breathable air. Consequently, since states are failing in addressing environmental challenges, cities need to take action regardless of either formal top-down or horizontal cooperation. Mayors and city councils serve their communities to address "both the urban consequences of climate change and the underlying causes" (Barber, 2013, p.131). Environment is gaining security relevance; as pollution affects human health and biodiversity, states need to ensure citizens healthy and safely places. These places are the cities that are the closest administrative units to citizens (Barber, 2013; Bulkeley and Betsill, 2004; Hovi et al., 2014; Wolforth, 2008). Therefore it is the power and duty of cities to act, as they are population centres, they need to protect their inhabitants (Barber, 2013). Therefore, an explicative reason that unfolds the successful electric mobility implementation without the help of POLIS like in Reggio Emilia could be the particular salient nature of environmental matters combined with the constitutional right to life that municipalities have at heart.

Finally, the successful implementation of electric mobility needs to be accompanied with the implementation of charging stations on the territory (Comodi et al., 2016). As part of electric mobility initiatives, charging stations need to be available and distributed on the territory. Indeed scholars pointed out the necessity of planning the distribution and implementation of such infrastructure in public policies such as in the

city's SUMP, which is what the city of Bilbao highlighted in the strategies of its municipal SUMP (Ayuntamento de Bilbao, 2018; City of Bilbao, 2019b; Martinez-Lao et al., 2017). Authors proved that this infrastructure does not necessarily need financial subsidies, and could be profitable around four or five years after being implemented (Comodi et al. 2016). The absence of charging systems planning in the SUMP of Alicante may explain why the city is behind in terms of electric mobility implementation. However, the city of Perugia should further develop and plan the implementation of urban charging system infrastructure to be able to keep up with the demand of electric vehicles on the territory (Comodi et al., 2016; Martinez-Lao et al., 2017). Accordingly, the fruitful character of charging station implementation may explain the development of electric mobility without the help of POLIS in Reggio Emilia (Comodi et al. 2016).

Limitations and further research

First of all, due to some difficulties in accessing European programmes reports for the municipality of Perugia, or information on which programmes the city of Bilbao adhered to with the help of POLIS, the results only show a piece of the achievements realized through the POLIS network. In both cities the participation in POLIS may have been more important than what has been demonstrated in this research project. This was one of the limits packed with documents analysis (Bowen, 2009). A deeper investigation of the cases and triangulation between the sources, including qualitative interviewing with professionals or public officials may provide more insights on the effective role of POLIS in helping cities (Bowen, 2009; Thiès, 2002).

Secondly, one of the confounding variables was the non-participation in another network, which meant any major network studied in the literature such as C40Cities, ICLEI (Rashidi and Patt, 2018). However, as shown by Keiner & Kim (2007) and Van der Heiden (2010), many different city networks exist at different scales, even very small ones that might make the difference in sustainable policy adoption. For this research project these small, local, national or European networks were falling outside of the scope of the study. As suggested by Kern (2019), more empirical cases on smaller city networks such as national or European ones, could be useful to demonstrate their role in helping small cities in policy implementation. This step

could help to realise Blauberger & Ritteberger (2015) suggestion to conduct large-n design for city networks research projects.

Thirdly, accordingly with the retrospective approach of this research project, only electric mobility measures put in place have been considered. Still, for the four cities, the SUMP identified further electric mobility measures that could be implemented within the time validity of the plan, which is set around 2030 for the four of them. This research project should be brought up to date in few years.

Finally, this research project confirms what De Gennaro et al. (2016) found. They offer the opportunity to use their model based on big data to implement electric vehicles in small and medium-sized cities. They demonstrated that electric vehicles are particularly suitable in such cities, precisely in Italy. The present research project adds to De Gennaro et al. (2016) the recognition that both small and medium-sized cities undertook electric mobility strategies to improve air quality. It would be insightful to test the use of big data in electric mobility initiatives to promote the use of electric vehicles in Spanish small or medium-sized cities, such as in Bilbao and Alicante, and examine the benefits from the implementation of these actions. Besides, as demonstrated by Dolsak and Prakash (2017) and Kern (2009, 2019), more studies involving Eastern European cities could notably contribute to the research in the field. This research project only focused on Southern European cities due to linguistic barriers.

CONCLUSION

To improve air quality cities identified electric mobility as a tool to reduce emissions coming from fossil fuel combustion. Nonetheless, all the cities are not equally capable of purchasing and identifying which electric mobility solutions are the most appropriate for their territory. This research project aimed at examining the effective role of transnational municipal networks as intermediaries to support cities in complying with supranational decisions to reduce air pollution. The research questions the effective role of the network POLIS in electric mobility implementation for its member cities. The study relied on a comparison between a pair of cities that are members of the network (Bilbao and Perugia) and a pair of cities that do not participate in POLIS (Alicante and Reggio Emilia).

The case description section and the discussion section uncovered two major findings. Firstly, participation in POLIS does not seem to make a significant difference for electric mobility policies implementation. Both Alicante and Reggio Emilia are not member cities of POLIS, but have implemented electric mobility measures. The research showed that Reggio Emilia is particularly advanced in terms of electric mobility, even compared to the POLIS' member cities. Together with Bilbao, the city has the highest number of electric mobility measures. However, the analysis pointed out that the POLIS network supported the member cities in accessing funds for similar electric mobility measures (i.e. the transition of public transports (buses) towards electric vehicles, and grants or awards for citizens to replace their vehicle with an electric one).

In order to better understand the causal mechanism, alternative variables raise areas of explanation that could justify why POLIS non-member cities implemented electric mobility. Among these alternative factors, we identified the existence of a wide range of city-networks in Europe, and therefore the possibility that cities may subscribe to one or more city-networks and benefit from multiple sources of information. In addition, the role that cities play in city-networks may also reveal their success in policy implementation. Finally, the increasing security dimension that environmental

matters gained, and the particularly easy character of some electric mobility measures may give a reason for policy implementation regardless the help of POLIS.

Furthermore, the analysis is based on two sets of two cities. The first set is composed of small cities (Italy), and the second set is composed of medium-sized cities (Spain). These two pairs of cities may both account for small and medium-sized cities in Southern Europe, but more specifically for Spanish and Italian cities. A cautious generalization statement could be that small and medium-sized cities in Southern Europe already started the transition towards electric mobility. More precisely, Italian cities demonstrated a particular interest for electric vehicles (municipal fleet), whereas Spanish cities depict a trend for electric public transportation. Nevertheless, there is room to encourage the improvement, which confirms previous studies on the use of electric vehicles in such cities.

Further or complementary research could continue to investigate on small and medium-sized European cities. Additionally, empirical cases on cities located in Eastern Europe could be relevant since they result to be neglected in the literature. As suggested, case studies on smaller city-networks as well as the position in city-networks could be useful to study their effective role in sustainable policy implementation.

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Ayuntamento de Bilbao	2018	Plan de Movilidad Sostenible 2015-2030 de la Villa de Bilbao	https://pmus.bilbao.eus/wp-content/uploads/2016/10/PMUS-Plan-de-Movilidad-Urbana-Sostenible-de-Bilbao.pdf
Bilbao.eus	2020	Proyectos cofinanciados	https://www.bilbao.eus/cs/Satellite?c=Page&cid=1272997877460&language=en&pageid=1272997877460&pagename=Bilbaonet%2FPage%2FBIO_contenidoFinal.
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