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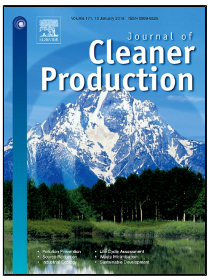

Local government's contribution to low carbon mobility transitions

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Abstract

An important area of urban sustainability planning refers to the reduction of environmental impacts. Transport sector is one of the main contributors of these impacts due to its role in air pollution, greenhouse gases and CO_2 emissions. Effective actions are needed to limit the environmental impacts of transport activities. Transition studies focus on these types of actions and plans. The role of local authorities as the closest level of government to the citizens in managing transition process is highlighted because they can better understand, inform, and guide local inhabitants, businesses and industries for achieving sustainability targets.

The paper aims at assessing the efforts of local public authorities in transition toward low carbon mobility in Italy. To achieve this aim a mixed method analysis was applied. First, the analysis of qualitative data obtained from interviews with urban mobility stakeholders; used to design a framework for evaluating the role of local government in transition process. Then a quantitative analysis conducted on the data gathered through a questionnaire distributed to a sample of mobility managers (or transport responsible) in municipalities. The analyses provided a final framework showing how municipalities influence low carbon mobility transition process in Italy. In conclusion, municipalities' strategies and plans have a direct effect on the final goals. These strategies are influenced by financial support and cooperative activities, while the level of cooperation is dependent on the attitudes of deciding authorities. The paper also discusses the need to identify challenges and impediments for sustainable urban mobility transitions which was highlighted by stakeholders but less valued by local authorities.

Highlights

- The role of municipalities in transition to low carbon urban mobility is investigated.
- Municipalities affect the transition process through their strategic plans.
- The strategies are affected by financial support and cooperative activities.
- The level of cooperation depends on the attitudes and commitment of decision makers.

Keywords:

Transition, low carbon, local government, sustainability, urban mobility, multi-level perspective

1. Introduction

The world is increasingly urban and ever more mobile; urban mobility is acquiring a more and more central role (Jiménez Herrero, 2011). More than 50% of the world's population (World Bank, 2017) and around 75% of Europe's population (EC,' 2012; EEA, 2006) live in urban areas. Cities highly affect the world's sustainability (Wittmayer et al., 2014) and are considered the key context for applying sustainable development and climate change policies and strategies. Many cities recognize the relevance of sustainable development and have adopted ambitious sustainability targets and agendas (**Error! Reference source not found.**).

Transport activities are the main cause of unsustainability patterns especially in urban areas because of their environmental impacts. According to the European Union (2012) report, de-carbonizing targets for transport have not yet been achieved. Guidelines and strategy-framing documents, such as the Transport White paper and the Green paper series[1], are delivered as a framework for strategic actions for a shift from current unsustainable systems toward more sustainable transport systems.

Skippon et al. (2012) studied less carbon-intensive transport systems and argued that it is important to think beyond technological innovation borders and consider other social, cultural and political factors (Skippon et al., 2012). Transition theory is described as a systemic, co-evolutionary processes that involve technological changes, as well as changes in other elements. The concept of "socio-technical transitions" is defined as "a shift from one socio-technical system to another" (Geels and Schot, 2010) ; a radical shift (regarding the scope and not the speed of change) is a long-term process that requires multiple changes involving multiple actors (Grin et al., 2010, p. 11).

The transition literature mainly focused on the ups and downs of "green" niche innovations by analyzing the learning processes, network dynamics and struggles against existing regimes on multiple dimensions (Geels, 2011), but a few authors addressed urban mobility sustainability within the framework of transition theory (Bertolini, 2011; Köhler et al., 2009; Sheller, 2011; Zijlstra and Avelino, 2011).

The governance of a transition process is another field of transition studies mainly followed in the transition management approach. The empirical focus of transition management studies lies in countries such as Netherlands or Germany (Kern and Smith, 2008; Loorbach and Rotmans, 2010) and scholars like Loorbach, (2010a) highlighted the need for applying the approach to other countries and contexts.

This paper aims at shedding light on the role of local governments in managing transition toward low carbon urban mobility in Italy. To fulfill the research objective, two main research questions were developed:

1) What are the variables that affect the transition toward low carbon urban mobility?

[1] Adopted by European commission

2) How do local government control or affect the transition process?

Thus, the first step is to identify the variables that affect low carbon mobility targets and the second step is to discuss how those variables are controlled, affected or managed by local government.

Given the aim of the paper, a study was conducted based on the mixed method approach stemming from the analysis of primary and secondary data in a sequence of qualitative and quantitative approaches. First, an exploratory study was conducted using a qualitative research methodology to present a framework describing the variables that affect low carbon mobility targets and the relations between those variables. Second, a quantitative analysis was performed on the data gathered from a questionnaire; the design of the questionnaire was driven by the results of the exploratory study.

The paper's contribution to transition studies is its presentation of a practical approach to identify variables that affect the achievement of low carbon mobility objectives and its evaluation of Italy's attempts at a local level to achieve low carbon mobility. The results help to increase knowledge of the transition management process in practice and will also help local authorities to identify which factors are neglected in the transition management process.

2. Theoretical background: transition theory

Radical structural changes are necessary in societal systems to achieve sustainable development goals (Kern, 2012). These changes can occur in different ways: incrementally, through a transition or in the form of a transformation (Roggema et al., 2012). Incremental change is a slow process, slightly modifying the landscape; transition is considered a fluent change toward a new future, which is an improved version of the existing landscape; and transformation is seen as a change toward a fundamentally different future[2]. Incremental changes would be a very slow way to achieve sustainable transport goals; radical changes would lead to maximal resistance from the incumbent actors that cannot adjust to the fast pace of radical change; so, the change process should be taken in small steps. Transition theory can be used to solve the paradox of radical changes in incremental steps.

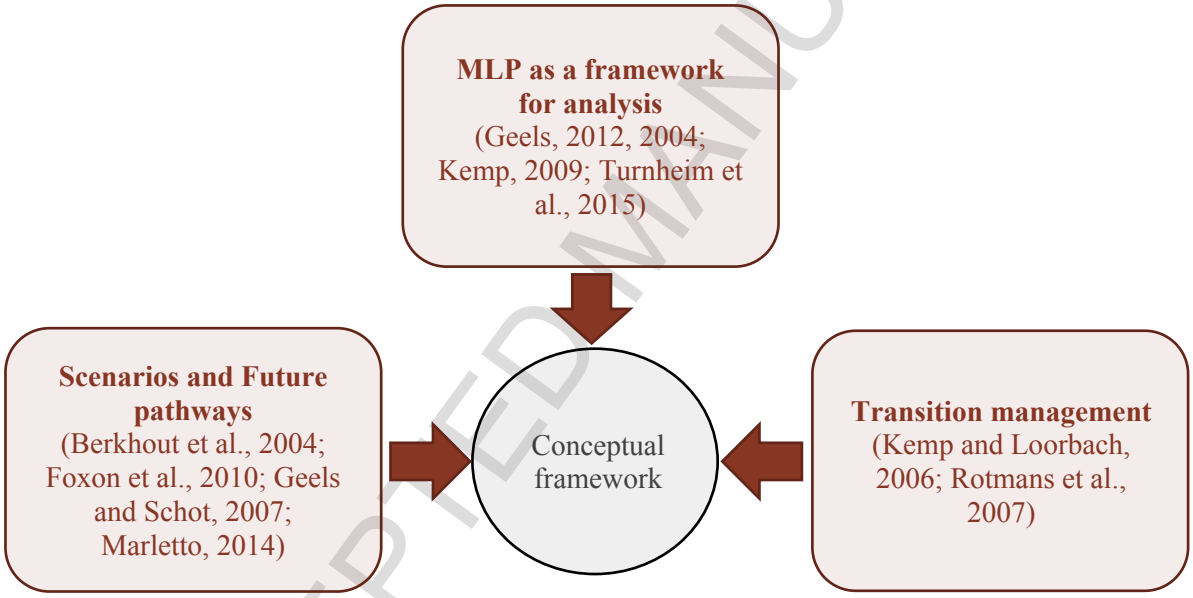
The theoretical concept of transition refers to a transformation process in which society changes in a fundamental way (Geerlings et al., 2012). It involves the development of technical innovations (by scientists or entrepreneurs), their organization (manufacturing, financing), their use (selection, adoption) and broader societal embedding (regulations, markets, infrastructures, cultural symbols). Since several of these societal elements co-evolve, it implies that in a transition, the structures, cultures and practices of a societal system are fundamentally changed (Hans de Haan and Rotmans, 2011). Transition can be understood as a gradual transformation process that is the result of simultaneous development in different societal domains and combined actions of macro, meso and

[2] These changes are fully discussed in the cited reference.

micro level developments (Rotmans, 2003). Studying the transition at these different levels is the concept of multi-level perspective (MLP) theory.

Lachman (2013) believed that the most used transition approaches are: MLP, strategic niche management, transition management, innovation systems, techno–economic paradigm, and socio–metabolic transitions (Lachman, 2013). In this paper, we mainly focus on transition management and MLP approaches plus scenario development based on transition pathways. Transition management was considered because of its ability to enhance managerial efforts that will help society to gain more from existing capabilities in the transition process; MLP was used to consider all macro, meso and micro level variables; and transition scenarios presented by Marletto (2014) were used to link management practice to the most viable transition pathway. Figure 1 shows the architecture of the theoretical framework used to build the conceptual framework.

Figure 1: The architecture of the theoretical framework used to build the conceptual framework



2.1. Multi-level perspective (MLP)

Geels (2011b) introduced MLP as a middle-range theory that conceptualizes overall dynamic patterns in socio-technical transitions. The basic concept of MLP is that there is no single driver of transitions. Instead, MLP views transitions as non-linear processes that result from the interactions of three analytical levels: Socio-technical landscape, which forms an exogenous context.

1) Socio-technical regime level, which refers to the rules that enable and constrain various incumbent actors who reproduce existing systems.
2) Niche level, where radical innovations (novelties) emerge.

Different types of interactions between these levels lead to different transition pathways (Geels, 2002; Geels and Schot, 2007; Rip and Kemp, 1998).

Niches are mainly introduced as novelties and radical innovations in the transition literature. The niche level is the one in which new technologies are initially developed within the old framework (Freeman and Pérez, 1988). Niches are protected, nurtured and empowered to realign the existing regime as initial niches cannot threaten the regime (Smith and Raven, 2012). Niche innovations that are supported by more actors and receive more resources have higher degrees of momentum. Most innovations remain at the "niche" level and do not get enough support to be transferred to an upper level, but some niche innovations grow to become adopted by the regime and the journey from niche to regime starts[3].

Kemp (2009) described socio-technical regimes as the heart of the transition scheme, where the transition process occurs. According to Geels (2004), the regime consists of three interlinked elements: network of actors and social groups, a set of formal and informal rules, and material and technical elements (Geels, 2004).

The "socio-technical landscape" is the environment in which a regime is embedded; landscape characteristics mark broader structuralizing processes that influence niche–regime dynamics (Smith et al., 2005).

The usefulness of MLP has been illustrated by many historical case studies of transitions (Geels, 2011). This paper focused on MLP because:

- MLP is based on co-evolution of technology and society; so social factors are considered in addition to technological innovations.
- MLP is an actor-based approach, in this regard the viewpoints of different groups of stakeholders could be considered.
- MLP covers stability (lock-in and resistance to change) on the one hand and radical change on the other hand.

2.2. Scenarios of change

Berkhout, Hertin and Jordan (2002) described scenarios as "learning machines" that can enable reflection on implications of the views of stakeholders in achieving different possible futures (Berkhout et al., 2002). Here, scenarios are used to explore available pathways for the achievement of future objectives of low carbon urban mobility in Italy.

To focus on the role of local authorities in the transition process, we followed a participatory approach where different stakeholders with varying backgrounds and interests participated (McDowall, 2014) in open and supportive focus group meetings to discuss the role and efforts of local government. In this paper, the scenarios presented by Marletto (2014) were used to depict the future

[3] For more information about niche–regime interaction see Raven and Verbong (2009).

image and role of each stakeholder group in the transition process because they perfectly matched the study context of urban mobility in Italy and the role of local authorities. In addition, these scenarios are compatible with the typology pathways presented by Geels and Schot (2007). The scenarios are described as follows:

- *AUTO-City:* AUTO-City is the result of interventions for the greening of urban mobility but it does not destabilize the dominant position of the "individual car." In this scenario, transport policy is influenced by the car industry and the niches are mainly hybrid and electric cars. This scenario is similar to the "Reconfiguration" pathway (introduced by Geels and Schot, 2007) in which Niche innovations are adopted into existing regime and change the system architecture
- *ECO-City:* A multi-level transport policy is necessary to ease the diffusion of integrated urban transport systems, which results in the emergence of the "ECO-City" scenario where electric cars will play a secondary role. In this scenario, a coalition of new core actors including public transport companies, technology providers, local authorities and NGOs support the new vision of sustainable cities and foster the creation of integrated urban transport systems (Vergragt and Brown, 2007). The important niches are those that are related to New urbanism (dense and multifunctional cities) and "3Bs" (buses, bicycles and batteries). It represents "De-alignment and re-alignment" pathway in the Geels and Schot (2007) typology in which landscape change led to regime breakdown and niches gradually align around winner regime
- *ELECTRI-City:* Certain industrial policies create the conditions for the establishment of this scenario in which the electric car will be an element of an "Energy + Transport" system. In this scenario, transport and energy policies are influenced by the electricity industry and new core actors emerge after a battle with old core actors. The important niches are electric cars and smart grids. This pathway is similar to the Substitution pathway in the Geels and Schot (2007) study in which niche innovation replaces the existing regime through a bottom-up push.

Italy has an urban population of approximately 60% (World Bank, 2017). It has the second highest number of private vehicles registered in Europe (604 vehicles per 1000 inhabitants). These data indicate that despite EU regulations on low carbon mobility, the private car regime is the dominant mobility regime in Italy, as in many other countries, and that obligatory and voluntary plans could not destabilize the current automobility regime; therefore, the current urban mobility system is described by AUTO-City scenario. This system should be changed to ELECTRI-City or ECO-City scenarios. Considering the nurtured niches in Italy and the aims of 2030 targets, a shift to ELECTRI-City scenario seems to be too ambitious to be achieved in the near future as the interests of electricity grid operators are crucial to the integration of smart charging equipment into the electric vehicle (EV) system (Bakker et al., 2014). The aims of transport plans in Italy are mainly focused on limitations for cars, enhancing public transport and shared mobility services instead of providing electric mobility

infrastructure (EC, 2013; Eltis, 2015). This indicates that the ECO-City scenario is the more appropriate scenario because it has more viable objectives. With these considerations, the authors used the ECO-City scenario to map the relations between the identified variables and the viewpoints of stakeholders; the interviewed stakeholders were chosen from the core actors introduced in this scenario.

2.3. Transition management

Transition management is an alternative model of environmental governance concerned with facilitating transitions to more sustainable socio-technical systems. It seeks to guide the gradual, continuous process of transformation of socio-political landscapes, socio-technical practices and "the structural character of society" from one equilibrium to another (Foxon et al., 2010; Meadowcroft, 2009; Rotmans et al., 2001). Kemp and Loorbach (2006) defined transition management as an "attempt at goal-oriented modulation, not an attempt to achieve predefined outcomes through planning and control". Transition management was placed more precisely in the middle ground between planning and incrementalism (Rotmans et al., 2007).

Different types of governance activities are introduced in the transition management process (Loorbach, 2007):

- *Strategic activities* are long-term activities (on a scale of 30 years) that lead to changes in the "culture" of the societal system at the landscape level. Strategic activities include the process of vision development; the collective action of goal and norm settings.
- *Tactical activities* relate to the interaction between actors at the landscape level and socio-technical structures at the regime level. In this process, the regime is aligned with the long-term goals, and transition is conducted in a certain direction (Rotmans and Loorbach, 2009).
- *Operational activities:* Actions have a short-term horizon and are often carried out in the context of innovations (Loorbach, 2007) that often emerge at niche level and are driven by individual ambitions, entrepreneurial skills or promising innovations (Loorbach, 2010b).

Later, Loorbach, (2010a) added another level of activities to the previous framework, named "*Reflexive activities*". Reflexive activities are an integrated part of the governance processes that are related to all other types of governance activities mentioned above. Reflexive activities relate to monitoring, assessments and evaluation of ongoing policies and ongoing societal change. They are necessary to prevent lock-in and to enable exploration of new ideas and trajectories.

2.3.1. Governance tools

The main conceptual challenge in transition management is to translate the abstract steering principles derived from dynamic complex systems into a practical management framework (Verbong and Loorbach, 2012). To achieve this aim, there is a need to introduce government instruments that are mostly used for translating policy into practical actions. Elzen (2003) introduced governance instruments in a framework of three different governance paradigms (Table 1) that are not only different in their basic philosophy, but also in the instruments:

- Traditional top-down model (also known as classic steering or command and control) considers the central role for (national) government and hierarchical relations;
- Bottom-up or market model gives a large degree of autonomy to local actors;
- Policy network model of shared rule-making and agreements between interdependent actors with diverging values and beliefs (Elzen, 2003).

Table 1: Different governance paradigms

	Classic steering (top down)	**Market model (bottom up)**	**Policy networks (processes and networks)**
Level of analysis	Relationship between principal agents	Relationship between principal and local actors	Network of actors
Perspective	Centralized, hierarchical organization	Local actors	Interactions between actors
Foundational scientific disciplines	Classic political science	Neo-classical economy ("rational economic human")	Sociology, innovation studies, neo-institutional political science ("bounded rationality," uncertainty, learning, interacting)
Governance instruments	Formal rules, regulations and laws	Financial incentives (subsidies, taxes)	Learning processes, network management (e.g. experiments, demonstration projects, vision building at scenario workshops and foresight, network building, public debates)

Adapted from Elzen (2003) based on De Bruijn et al. (1993, p. 22).

2.3.2. The role and contribution of local government

Cities are vibrant, innovative and exciting places to live, but they also experience issues related to urban quality of life, transport and traffic problems, and related consequences such as air pollution, congestion, unplanned urban growth, rising living costs and increasing demands on service delivery. Cities offer the opportunity for decisive local action to address sustainability issues both in terms of policy and societal action (Wittmayer et al., 2014); each city has its own characteristics and needs which require tailored policy responses that can best be designed locally (Bell, 2002; Demerse et al., 2008; Gudmundsson et al., 2015; Nared and Razpotnik Visković, 2012; Rashid and Khan, 2013; Young and Dhanda, 2012). These issues apply pressure to local government. The role of government

in the transition process was highlighted in the work of Rotmans et al. (2001). Governance prescriptions in transition management mainly focus on facilitating an evolution context for niches, especially where incumbent socio-technical regimes are under pressure to change (Smith and Stirling, 2008).

Although different stakeholders of the transport sector should converge and develop close cooperation and partnerships to find solutions to emission reduction targets, many authors highlighted the role and contribution of public authorities. Public authorities contributed to emission reduction plans and policies developed by national and local governments and provided financial and other kind of resources for a transition toward sustainability.

Local government is an important level of government as it is the closest public organization to the citizens; local government is in a unique position to understand, inform, guide and lead local inhabitants, businesses and industries. In most cases, local government is democratically elected and is a level of governance that represents the local community. Furthermore, local government also has an important role in addressing non-technological barriers to support the transition process (Van Staden et al., 2014). With all these considerations, the main aim of this paper is to measure the efforts of local government in the transition management process in Italy.

3. Methodology

The mixed method approach was followed to evaluate the efforts of Italian municipalities (as local authorities) in the transition toward low carbon urban mobility. The study was designed in two separate phases. In the first phase a qualitative method was used to identify the main variables affecting transition management process. The second phase applied the current efforts of local authorities in the transition toward low carbon urban mobility to test the conceptual framework to lead to the final framework of transition management in Italy.

3.1. Data collection methods

To reflect the different aims, methodological approaches and designs in each phase of study, different methods and sources for data collection and analysis were employed. Table 2 summarizes the data collection methods based on the aims and objectives of the research process to enable a complete view of data collection methods and sources.

Table 2: Data collection methods based on aims and objectives of research process

Research process	Aim	Data collection method	
		Primary data	Secondary data
Phase 1	Identifying the variables that affect transition management process	Semi-structured interviews	❖ Literature review ❖ Website analysis (international and national level)

			Document and data analysis (reports, policy guides, etc.)
Phase 2	Evaluating the efforts of municipalities	Questionnaire	❖ Literature review ❖ Website analysis (municipalities at local level) ❖ Document analysis (transport plans, reports) ❖ Attending seminars and workshops

3.1.1. Phase 1 data collection

In the first phase, the contribution of local authorities to the transition process was investigated by interviewing urban mobility stakeholders and secondary data source analyses. Secondary data obtained from literature (including the papers and strategy reports) and websites (like European commission, United nations, ministry of the "Environment and Protection of Land and Sea", ministry of "Infrastructure and transport" in Italy) to get familiar with upstream strategies and required actions. Eleven semi-structured interviews and two focus group discussions were conducted to identify the main variables that affect the transition management process. Interview participants were selected based on purposive sampling, which seeks to maximize the depth and richness of the data to address the research question (Kuzel, 1992). The sampling process involved identifying and selecting individuals or groups of individuals who were especially knowledgeable about or experienced (Creswell and Plano Clark, 2010) in the urban mobility context. In addition to knowledge and experience, their availability, willingness to participate and their ability to communicate experiences and opinions were considered (Bernard, 2002; Spradley, 1979). The 11 interviewees were: decision makers at an international and national level (2), managers of local transport providers (3), head and managers of R&D sector in vehicle manufacturing companies (3), researchers working on sustainable low carbon mobility (2), and a civil society member who was a member of a biking association (1). Interviews were conducted by both researchers at the interviewees' workplace; interviewees were informed about the aim of the interview at least a week in advance. All the interviews were conducted between September 2014 and July 2015. The interviews lasted on average 75 minutes each. Memos were written during and after each interview to be used for developing questions in current or future interviews, as some interviewees pointed out factors that needed to be handled or provided by other stakeholders (usually at higher levels of authority). The recorded interviews were fully rewritten, and transcripts of the interviews were analyzed, coded, categorized and labeled following a qualitative content analysis approach (Mayring, 2010, 2000).

The focus group meetings were organized to discuss the relevant variables detected from our analysis of the individual interviews, and to test and confirm the analytical framework. Two focus groups were conducted with regional and local authorities of the urban mobility system in which the problems and difficulties of the public transport system and clean transport niches were investigated.

One of the focus group meetings was attended by six participants from the administrative regional and local transport authorities; we discussed the main problems of low carbon transport infrastructure development. The researchers asked questions about the main niche developments and the group members discussed their experiences and plans for supporting those niches, including the existing strategies and future plans for nurturing niches and discussing why some niches got less support or if there was a possibility that they will be supported in the future. The conclusions helped to frame transition dynamics and management approach toward them. The second focus group consisted of ten scholars from academia and public authorities at a regional and local level who had experience in sustainable mobility policies and planning context. The results of qualitative data analysis were discussed and the final conclusions helped to frame the conceptual framework that showed how low carbon mobility objectives are influenced by local authorities.

3.1.2. Phase 2 data collection

A questionnaire was designed based on the framework developed in the first phase. Data obtained from analyzing the webpage of municipalities and regional authorities in order to get more information about the actions and plans at local level, helped in getting better knowledge for developing the questionnaire. Mobility managers were asked to answer the questionnaire. Transport authorities in the municipality were selected as the main study population considering that they are local regulatory agents who define transport plans and set the policy goals at an urban level. Moreover, municipalities are engaged in the plans' implementation process, and are more aware than regional and central governmental levels of practical impediments and challenges to the achievement of sustainability targets.

Italy is organized in 8047 municipalities; most of them (70.5%) have less than 5000 inhabitants and are characterized by a weak organizational structure and low ability to participate in the strategic planning process, which is mainly demanded by the provinces[4]. For data collection a sample population of 308 municipalities that each had more than 30,000 inhabitants was selected from which 67 questionnaires returned that shows the response rate of 22%. The reason for choosing municipalities with more than 30,000 inhabitants was because Italian legislation required such municipalities to define and adopt at least one kind of transport plan – Urban Traffic Plan (PUT)[5] – which is an operational urban plan. Furthermore, the target population includes municipalities with more than 100,000 inhabitants; these municipalities are obliged to develop a strategic long-term urban mobility plan (PUM) [6].

[4] Based on a recent national reform dated 2013, the authority of provinces has been withdrawn. Thus, in this transition phase, provinces only manage the ordinary activities and the projects that were already approved. However, they can no longer be considered the coordinators of local government municipalities.
[5] *Piano Urbano del Traffico*/Urban Traffic Plan (PUT).
[6] *Piano Urbano della Mobilita*/Urban Mobility Plan (PUM).

The questionnaire had seven sections: five sections related to the variables that affect low carbon mobility objectives; one section for conceptualizing the perception of success in the respondents; and another section that mainly gathered demographic and general data. The questionnaire was based on close-ended questions (scaled questions using a 7-point Likert scale, nominal and Yes/No questions) in which responses were graded on a continuum, although there were a few open-ended questions to which respondents were asked to write down a few words or numbers (such as the year they started to apply mobility plans).

The questionnaire was tested for comprehension, language used and completeness with three potential responders. Finally, it was posted to the municipalities' population. A pre-stamped envelope for questionnaire return was included.

3.2. Data analysis process

Data analysis started while the research process was still ongoing. As different types of qualitative and quantitative data were used in the research process, the analysis procedures also differed regarding the types of data.

3.2.1. Qualitative data analysis

The process of analyzing qualitative data began with a general reading of the raw data, followed by careful reading and thick description (Spiggle, 1994). The interviews were audio-recorded and labelled with the name of the interviewee and the date of interview. The qualitative data analysis process was done manually following a qualitative content analysis approach. The transcripts of the interviews as well as other text materials were analyzed, coded and categorized using Mayring's (2014) step model of deductive category method.

The coding process started with searching the text material to extract category definitions. Initial and open codes were assigned based on the main concerns that were highlighted by the interviewees. Other codes were also developed through our analysis of secondary data sources including scientific papers, the results of case studies conducted by other scholars, country reports, and regional and local reports. After the initial coding process, categories were built through focused coding and conceptualizing similar contexts. Deductive categories were developed based on the previous knowledge gained through reports of international projects and papers published with a similar scope. After building and labeling the categories, a thematic coding process was followed in which the identified categories were grouped based on the themes to which they related. Table 3 shows how the constructs of the analysis framework were identified through the qualitative data analysis process. These constructs represent the ways in which low carbon mobility objectives are affected by local government.

Table 3**:** Qualitative data analysis process

Initial codes (transcripts of interviews)	Conceptualizing similar context (literature)	Building categories	Deductive categories
Example in current research			
Tax reduction for cleaner vehicles	Motivating and restraining policies	Destabilizing dominant regime of automobility	Strategies and plans
Closing historic city centers for "clean" vehicles			
Limited traffic zones			
Fuel price policies			

3.2.2. *Quantitative data analysis*

In this study, qualitative data was transformed into numerical data because measuring the relationships among factors required some degree of quantification of the data and a subsequent analysis by quantitative methods. Likert scales, which are a common ratings format for surveys, were used in this study. Here, Likert items were used to measure transport managers' responses to questions or statements, although other types of questions (nominal and Yes/No questions) were also used in the analysis.

After quantifying the qualitative data and coding the questionnaire, the data from the returned questionnaires were entered in SPSS software package 18.0 and the following analysis used for evaluating the obtained data:

- Correlation analysis (Pearson correlation, Spearman's and Kendall's rank correlation analysis)
- Path analysis.

The hypotheses that were defined based on quantitative data analysis for describing the relation between variables were tested through correlation analysis. Two kinds of correlations were investigated: relations between dependent and independent variables, and relations between two independent variables. In this study, Spearman's and Kendall's rank correlation coefficients were used to observe nonparametric correlations; rank correlation coefficients measure the extent to which a variable increases as another variable tends to increase, without requiring that changes are represented by a linear relationship.

Path analysis, introduced by Sewall Wright (1918, more extensively described in 1920, 1921 and 1934), is another method used in this study. It helped to identify the indirect effects in addition to direct effects (Habib Pour and Safari, 2009).

4. Results

This section presents the results concerning stakeholders' viewpoints, evidence from the literature about local government's contribution to the transition process and local government's comments on its approach to the transition process in practice. The results of this study are presented in two separate sections: Section 4.1 presents the results of the qualitative study that aimed to identify

the variables that affect low carbon mobility objectives and Section 4.2 evaluates local government's ideas and actions regarding those variables

4.1. Defining conceptual framework: identifying variables and relations among them

In addition to the dynamics of the transition process at different levels of MLP, a set of other factors affects the transition process: governance instruments (see Table 1) that are used by transition managers to affect transition dynamics regarding the selected scenarios of change. In this section the constructs of the conceptual framework are identified and the hypothetical relations between them emerged from our analysis of the interviews and secondary resources. The hypotheses will be tested in the next section.

4.1.1. Dependent variable: success of emission reduction targets

Before searching for variables that affect low carbon mobility objectives, there is a need to have a better definition of those objectives so that we can state what success of emission reduction targets (the dependent variable) is in the study context.

Different aims and issues are considered for low carbon mobility transitions that are mainly related to demand-side management, technology procurement and policy measures. Each country set their own targets to achieve targets defined by EU guidelines. The dependent variable is success in achieving low carbon mobility objectives as defined in Italy. The criteria were identified from the results of a literature review, transport plan analysis and interviews.

Table 4**:** Objectives of low carbon mobility in Italy (based on qualitative data analysis)

Objectives	**Focused on**	**MLP**
Meeting the demands of public transport	Demand management	Landscape
Citizen awareness of emission risks	Public participation	
Increasing share of public transport	Stabilizing alternative regimes	Incumbent regime dynamics
Increasing satisfaction in use of public transport		
Increasing share of non-motorized transport		
Decreasing share of private cars	Destabilizing dominant regime	
Providing enough infrastructure for clean vehicles and fuels	Niche support	Niche
Supporting demand management niches		

4.1.2. Independent variables: framework constructs

The interviewed stakeholders named different variables that influence the successful achievement of low carbon mobility objectives. Constructs of the conceptual framework emerged

from our analysis of the interviews and qualitative data: the successful achievement of low carbon objectives is dependent on the attitudes and commitment of decision makers (visions), strategies and plans, financial support, existing challenges and obstacles (restraining forces), and cooperation between stakeholders.

The effect of each construct on the dependent variable and on other constructs was investigated through qualitative data analysis. The final framework was constructed by putting together all these relations.

Attitude and commitment of decision makers

Local government is a group of decision makers who contribute to the overall objectives of emission reduction and participate in the transition process by applying regulations from higher level authorities. The positive attitudes of local government can help in the pursuance of predefined targets and in this sense could be a driving force in the transition toward low carbon urban mobility, but sometimes managers do not appreciate the change or are not committed enough to specify resources for related plans. This finding was confirmed by "CIVITAS Energy cities" and "TRANSFORM" reports. Reluctance to undergo change is the most influential negative aspect in making innovative changes for the future of mobility (CIVITAS); it affects project financing, where shrinking municipal resources cause city planners to resist change because they are afraid of losing their jobs (Bosetti et al., 2014). However, government's decision to provide funds for a demonstration program enabled the shielding, nurturing and empowering of specific niches (Smith and Raven, 2012) and related strategies. These arguments result in three hypotheses:

H1a: Local government attitudes affect success of emission reduction targets.

H1b: Local government attitudes and viewpoints affect the strategies, plans and actions they follow.

H1c: There is a link between local government attitudes and the funds they provide for low carbon mobility projects.

The attitudes and viewpoints of local government also affect the level of cooperation and stakeholder engagement. Interviewed stakeholders expected local government to take the leading role or to act as the coordinator between stakeholder groups. This finding led to the last hypothesis for this construct:

H1d: Local government attitudes affect the cooperation level between urban mobility stakeholders.

Strategies and plans

The link between strategy and goal achievement is undeniable. Strategy is defined as "A plan of action designed to achieve a long-term or overall aim[7]." Urban mobility strategies help to achieve goals so the first hypothesis is:

H2a: Strategies and action plans affect the success of emission reduction targets.

Strategies include a set of required actions (tactical and operational actions) that should be defined regarding the specific patterns of mobility in each city (Da Silva et al., 2008). It is not possible to develop a universal framework of actions and strategies because each city has its particular mobility structure, problems and needs. The main categories of strategies and related actions that emerged from a review of the literature, mobility plans, country reports and interviews (Table 5) were presented in the questionnaire to see which strategies are mainly used by Italian municipalities.

Table 5**:** Strategies and actions for low carbon mobility based on different levels of MLP (source: qualitative data analysis)

Related level of MLP	**Strategy**	**Actions**
Incumbent regimes (private cars)	Motivation and restriction	Tax reduction for cleaner vehicles Limited traffic zones Fuel price regulations
Incumbent regimes (non-motorized and alternative modes)	Alternative modes	Shifting passenger transport to other modes Shifting freight transport to other modes Promote walking and cycling
Incumbent regimes (public transport efficiency)	Effectiveness of public transport	Car sharing/car pooling Integrated ticketing systems Expanding subway lines Decentralization Parking regulations Technologies for traffic congestion reduction Renovating bus fleet Renovating commercial vehicle fleet
Incumbent regimes (private cars)	Citizen awareness	Public campaigns, special events, interactive information
Niches	Clean vehicles	Expanding infrastructures for electric vehicles, natural gas (liquid propane gas and compressed natural gas), methane, diesel
	Clean fuels	Using clean vehicles in passenger and freight transport
	Information and communication technologies	Using intelligent transport systems and ICT-based innovations (like real-time information, teleworking and teleshopping) in urban transport planning

Cooperation and networking

All interviewees pointed out the importance of stakeholder engagement and cooperation between all stakeholder groups in urban transport planning (this is also predicted in ECO-City scenario).

[7] Oxford Dictionary.

Cooperation with other stakeholders is a driving force in the transition process; cooperation can help to narrow the gap between citizens (or stakeholders) and politicians and it can also lead to better policies and objectives that suit local conditions (OECD, 2011), effective implementation of strategies (Banister, 2008), and access to funds and other resources (Mowery et al., 1996). So:

H3a: There is a link between cooperation level and successful achievement of low carbon mobility goals.

H3b: Effective implementation of strategies depends on cooperation among stakeholders.

H3c: Cooperation affects the amount of funds received for mobility plans.

Financial support

Nearly all interviewed stakeholders complained about lack of funds and believed that financial resources directly affect emission reduction targets. Interviewees from public administration authorities noted that overcoming the challenges and implementation of strategies and plans depended on the availability of resources, among them financial resources were highlighted specifically. Stakeholders from public transport companies highlighted the link between funds and cooperation. The evidence in the literature also confirms that the success of fiscal instruments during a transition process is evaluated in terms of their leveraging ability which depends on cooperative activities and the capacity to generate finance by involving a multiplicity of actors and institutions (Roy et al., 2013). The following hypotheses were formulated to evaluate the arguments:

H4a: Financial resources directly affect emission reduction success.

H4b: Financial resources influence the implementation of strategies and plans.

H4c: Financial resources help in the identification of challenges and obstacles.

Existing challenges and obstacles

Before introducing the challenges and obstacles, we clarify the difference between these two terms. "Obstacle" refers to something which prevents the progress of actions and objectives. "Challenge" is something that is difficult but it can be overcome. Thus challenges are regarded as more positive than obstacles. These two terms are discussed separately:

First, some aspects of urban mobility are naturally challenging areas; this means that it is not easy to change the current trends in those areas. Challenging areas are more related to executive operations; they do not affect goals and strategies, because they are about the implementation of predefined strategies.

Second, there are obstacles to the achievement of low carbon objectives. These impediments can be related to technology and infrastructure, demand management and planning, implementation, expansion and maintenance of public transport service, culture and citizens' behavior, and so on.

Obstacles affect strategies, objectives and cooperation patterns. The challenges and obstacles are summarized in Table 6.

Table 6**:** Existing challenges and obstacles to the achievement of low carbon mobility objectives in the study context (based on qualitative data analysis)

Challenging areas	Obstacles
• Aligning the objectives of transport plans with the issue of environmental sustainability • Providing efficient and adequate public transport services • Providing public parking especially in city centers • Providing adequate infrastructure for clean fuels and fuels with lower carbon content • Regulations and administrative process • Promoting non-motorized transport • Reducing traffic congestion • Changing citizens' behavior toward the use of private vehicles	• Lack of financial resources • Lack of government support • Social responsibilities of public transport • Inefficiency of other transport modes • Cultural barriers • Changes at higher level authorities (political leaders, managers or executives) • High costs of technological innovations • Strict environmental regulations (ambitions, objectives) • Lack of cooperation between transport sector actors

In order to achieve the goals, the patterns of challenges need to be identified and the obstacles overcome. Strategies and transport plans aim to face those challenges and specify goals and objectives for practical actions. In addition, the pattern and type of challenges affect cooperation links and partner stakeholders. So the following hypotheses were formulated:

H5a: Identifying challenges affects the success of low carbon mobility objectives.

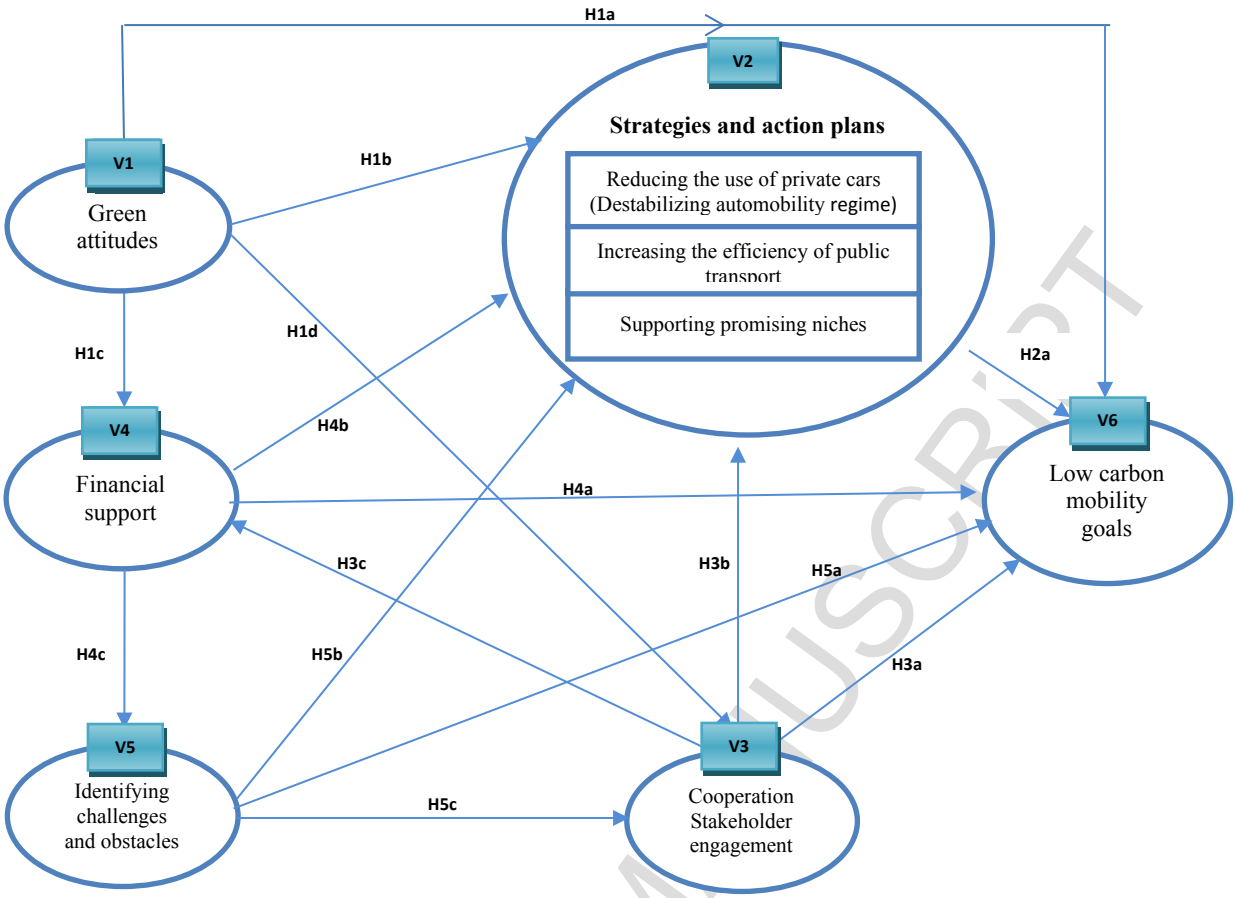
H5b: Identifying challenges influences strategies and action plans.

H5c: Identifying challenges affects cooperation patterns.

4.1.3. The conceptual framework

Based on the abovementioned constructs (variables) and relations among them, a conceptual framework was developed. Figure 2 shows the conceptual framework developed in the first phase and used to evaluate the efforts of municipalities in the transition process.

Figure 2: Conceptual framework: Variables and their interactions that affect the successful achievement of low carbon mobility goals



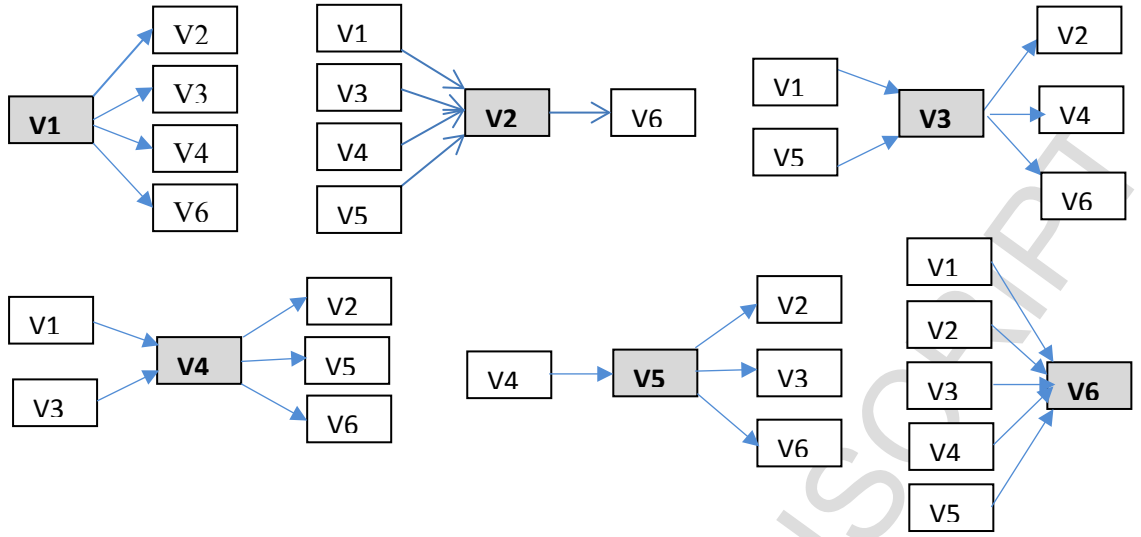
4.2. Local government's effect on the transition process

The conceptual framework shows urban mobility stakeholders' expectation of municipalities in Italy as the representative of local government in transition management process. The hypotheses were tested through statistical tests of municipal mobility managers' responses to questionnaires. Bivariate correlation and path analysis were used to test the hypotheses. First, correlation analysis was used to estimate the relations between variables and then path analysis was used for a more precise evaluation of those relations. The final results were used to justify the conceptual framework, eliminate excessive links and variables, and present a framework of practical actions.

4.2.1. Variables affecting success of low carbon mobility goals in Italy

In this paper, correlation analysis was the first step in testing the analytical framework and the relations between variables. Correlation analysis was used to calculate the paired links between variables (V1 to V6 of which V6 measured success of low carbon mobility goals, and V1 to V5 are the variables that affect V6.) Correlation coefficient is a measure of linear association between two variables. Values of a correlation coefficient are always between −1 and +1.

Figure 3**:** Hypothetical relations between variables based on conceptual framework



Spearman and Kendall's rank correlation coefficients were used to observe nonparametric correlations; a bivariate correlation matrix displaying the relations between pairs of variables is presented in Table 7.

Table 7**:** Meaningful correlation coefficient between variables°

	Attitudes V1	Strategies V2	Cooperation V3	Finance V4	Obstacles V5	Success V6
Attitudes V1	----					
Strategies V2		----				
Cooperation V3		0.620**	----			
Finance V4		.540**	0.368**	----		
Obstacles V5					----	
Success V6		0.315**	0.238*			----

° Only values with significance >0.05 are shown in the matrix.
** Indicates that the correlations are significant at 0.01 error level, which means 99% confidence.
*Indicates that the correlations are significant at 0.05 error level and 95% confidence.

The correlation coefficient matrix shows that success of low carbon mobility objectives depended on the strategies and on cooperation between stakeholders, while the strategies are affected to a great extent by the level of cooperation and financial support.

Another method which is used to test the relation between variables is path analysis. Path analysis is an extension of ordinary multiple regression; it describes the directed dependencies among a set of variables (predictors) and the interaction between them (Wright, 1934). This analysis enables the researcher to see the indirect effects of independent variables on dependent variables; it would also be possible to clarify the direction of these effects[8] (Habib Pour and Safari, 2009). Considering the analytical model presented in Figure 2, path analysis was performed in three different steps to test the research hypotheses:

- The direct effect of all independent variables (V1 to V5) on the dependent variable (V6).
- The indirect effect of all variables on the dependent variable.
- The effects of variables on each other.

The first step of path analysis was to analyze the effect of variables V1 to V5 on variable V6, which tests Hypotheses H1a, H3a, H4a, and H5a. Success of emission reduction targets considered as the endogenous (dependent) variable, affected by attitudes of decision makers, strategies and action plans, existing obstacles, financial supports and the municipality's cooperation with other stakeholders. The results of path analysis reject Hypotheses H1a, H3a, H4a, and H5a. This means that according to municipal mobility managers, only strategies have a direct effect on the success of low carbon mobility objectives; so, all other variables influence the success of low carbon mobility targets by affecting emission reduction strategies and plans.

Another analysis conducted to see if the "strategies" affected by other variables (V1, V3, V4 and V5). In the conceptual framework these relations are formulated by hypotheses H1b, H3b, H4b and H5b. According to correlations analysis results hypotheses H1b and H5b are rejected indicating that local government attitudes and sustainable mobility obstacles do not affect strategies. Path analysis confirmed the results of the correlation analysis and revealed that strategies are only influenced by "Finance" (international and national financial support) and "Cooperation" with transport sector stakeholders. The only difference in findings is that correlation analysis confirmed hypothesis H3a, indicating a link between cooperation and success of emission reduction objectives, while path analysis rejected the hypothesis and revealed that this relation is not a direct effect.

The final step is to examine the interrelations between variables based on the analytical model. In this model variable V1 (Attitudes) is an exogenous variable which is not affected by any other

[8] Before starting the analysis the researcher considers a specific direction and performs the analysis, if the path coefficient obtained at the end of analysis is minus (−), the considered direction should be reversed.

variables. The next dependent variable which is going to be analyzed is "Cooperation" which is supposed to be affected by "Attitudes" and "Obstacles" (hypotheses H1d and H5c); the results of path analysis reject the hypothesis H5c and revealed that "Cooperation" is only dependent on the "Attitudes" of local authorities.

The effects of other variables on strategies were examined before, so the next variable for interaction analysis is "Finance". According to Hypotheses H1c and H3c the amount of financial support is influenced by "Attitudes" and "Cooperation"; path analysis rejected H1c and showed that "Finance" is only affected by "Cooperation" level.

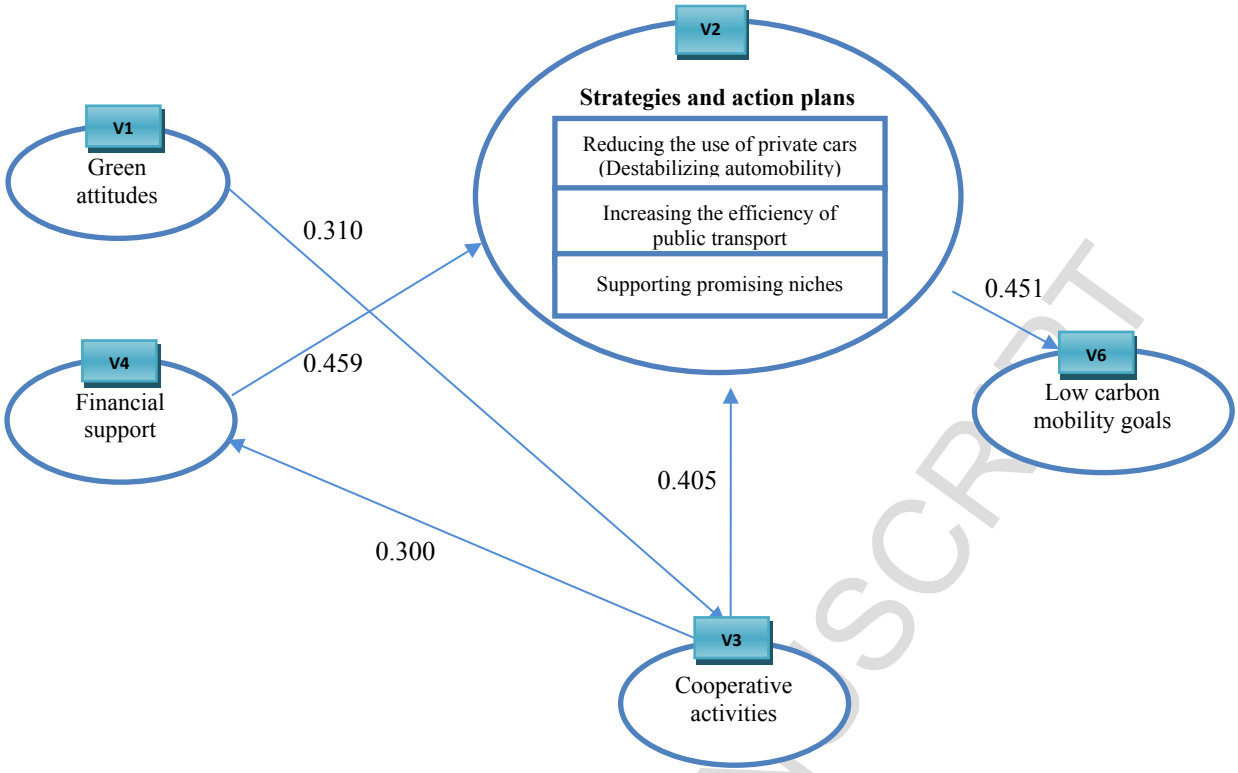
The last variable was "Obstacles." According to the conceptual model and Hypothesis H4c the amount of funds will help in removing obstacles, but path analysis showed that respondents did not consider obstacles to be an important variable in the sense that it does not influence or is affected by any other variable. So this variable was eliminated from the model.

4.2.2. Final framework: practice of low carbon mobility in Italy

Based on the above analyses the final framework could be developed by eliminating the excluded relations and variables. As was indicated in the primary framework (Figure 2), the analyses highlighted strategies as the main tool for achieving low carbon mobility objectives and the existing challenges and obstacles are totally put aside. The final framework, which was adjusted based on the analysis of results, is presented in Figure 4. This framework shows that low carbon urban mobility at a local level in Italy is affected by the triangle of strategy, finance and cooperation; local authorities mainly rely on building networks and attracting financial resources to perform strategies that are focused on three main categories:

- Destabilizing car-based regimes
- Effective public transport systems
- Supporting clean mobility niches.

Figure 4**:** Final framework explaining the factors that affect low carbon mobility transition in Italy



5. Discussion

This paper aimed at presenting a framework of the practical actions taken to achieve low carbon urban mobility goals in Italy. Three main approaches from transition studies were used to build the conceptual framework which is used to evaluate the efforts of local government in Italy. First, we discussed scenarios and transition pathways with interviewees to visualize the desired future system, identify the stakeholders and discuss the needed changes with the stakeholders. Second, we used qualitative research to identify the factors affecting low carbon urban mobility goals at three levels of MLP approach (macro, meso and micro). Finally, all types of actions highlighted by transition management scholars were considered while measuring the efforts of local authorities. The role of local government was highlighted in the selected scenario and in transition management approach.

The trends and statistics of vehicle ownership in Italy showed that the current mobility system is a locked-in automobility regime. Stakeholders indicated that the ECO-City scenario is the most appropriate scenario to be followed in the near future considering low carbon mobility targets and infrastructure in Italy. This scenario introduced a coalition of actors working together to breakdown the existing regime and support clean mobility niches.

The results of interviews and secondary data analyses showed that five factors influence the successful achievement of low carbon mobility goals in Italy. These factors are:

- Attitudes and commitment of decision makers to perform the systemic changes.
- Strategies and action suggested by transport plans or mobility managers.

- Cooperation between different groups of stakeholders in urban mobility system.
- The amounts of funds received for the implementation of plans and projects.
- The existing challenges and obstacles that vary from city to city.

This finding is similar to the results of Frantzeskaki and colleagues' study (2014) which found that local authorities are influential leading actors in sustainable urban development through setting an agenda, developing a vision, creating collaborative opportunities and platforms, or providing funding and allowing self-organization of different types of partnerships (Frantzeskaki et al., 2014).

These factors and the relations among them were used to build a conceptual framework. The conceptual framework was tested and adjusted according to the reported actions of municipalities in Italy. In order to measure the efforts of local government (and municipalities as their representative), a questionnaire was developed and distributed to municipalities obliged by Italian legislation to develop a transport plan (PUM or PUT).

The quantitative analysis of the questionnaire data revealed that respondent municipalities believe the only factor that directly affects low carbon mobility objectives is "strategies and actions" and other variables only have indirect influence on the final aims through their effect on those strategies and plans; for instance, financial support positively affects the performance of strategies and projects within mobility plans. However, two important factors that directly affect policy goals and strategies were underestimated by respondent municipalities as well as the definition of strategies and actions to tackle them; these factors are "attitudes and commitment of deciding authorities" and "identification of impediments". This confirms the arguments of previous researchers who indicated that urban planners underestimate the key challenges and obstacles in transport planning process (Banister, 2005; Staley and Balaker, 2006; Wickham, 2006). The neglect of the effect of attitudes on strategies arises because municipalities mainly perform goals and strategies defined by a higher level of authority (regions) (Vesperini, 2009); for many years regions limited their involvement with local authorities (municipalities) to just asking their opinions, but in recent years it was recommended that they act as coordinators for the various levels of government without prevailing over sub-regional bodies (Marchetti, 2010).

Also, the framework showed that although there is cooperation between municipalities and stakeholders, their overall cooperation is weak and takes place within the political-administrative system in order to decide joint strategies to achieve the defined objectives, but does not yet involve stakeholders from the private sector and civil society; this confirms "TRANSFORUM" report results. In addition, cooperation with nearby municipalities was not identified.

The last point is that although municipalities relied on funds from higher levels of authorities, interviewees from regional and national administrations noted that some municipalities were not aware of available funding and had never asked for financial support. Small and medium-sized

municipalities are encouraged by national government to develop long-term strategic plans (PUM[9]) for their area and receive better funding support for their mobility plans from government.

6. Conclusion

This paper set out to explore the patterns of low carbon transition management at a local level and identified how Italian municipalities contribute to managing the transition process toward low carbon urban mobility. The paper particularly focused on the role of local government in influencing transition process dynamics. The role and contribution of local government is critical to achieve climate change targets, as local government represents the closest level of government to the citizens, and is able to develop a better understanding of practical barriers.

The concept of transition theory, MLP and transition management approach shaped the theoretical background of a conceptual framework showed the factors that affect low carbon mobility transition objectives from the viewpoint of urban mobility stakeholders and actors. These factors are: "Attitudes and commitment" of policy makers to emission reduction targets (Landscape dynamic); "Strategies and plans" for changing the dominant regimes of private cars to more sustainable, less polluting regimes (public and non-motorized transport), and strategies for developing the niches of clean mobility (Niche and Regime level dynamics). Furthermore, some managerial tools have an effect on and control the dynamics of government action: "Cooperation" (Networking) and "Finance". These four factors (Attitudes, Strategies, Cooperation and Finance) shape the driving forces of the transition process. All of the factors face the restraining forces of existing "challenges and obstacles", which differ from city to city. Whereas challenges are considered difficulties that could be overcome, obstacles are the forces that can prevent the progress of actions and objectives.

When applying the theoretical framework in the practice of the studied context, the study revealed that "strategies and plans" are the only factors that had a direct effect on the success of emission reduction targets. These strategies depend on management tools (Cooperation and Finance). The landscape factor "attitudes of policy makers" that most interviewed stakeholders considered important (especially transport service providers) does not have an effect on success and it only influences cooperation patterns, according to municipal managers.

Thus, the paper contributes to the literature by providing evidence of local level practices to achieve low carbon urban mobility objectives in Italy. Furthermore, the work enriches the ability of policy makers and public sector employees to debate and decide on transition management and the tools to be applied.

[9] This plan is obligatory for municipalities with more than 100,000 inhabitants but groups of smaller municipalities can develop it and get the financial benefits and support they look for. Article 22 of the Law n. 340/2000 assigns a state funding of up to 60% of the whole investment of Urban Mobility Plan (PUM) for a group of municipalities (as well as individual municipalities).

The study encountered some limitations mainly related to the data collection and data availability. For instance, many measures are available at national and regional levels, but the local level lacks detailed measures. Furthermore, the study focused on a defined population of medium to large-sized municipalities due to data availability and accessibility. Nevertheless, investigating the effects of sustainable urban mobility actions on smaller municipal areas would be of interest.

Finally, although the study mainly focused on regime transformation, further research could be directed to the study of the process of niche development and strategic niche management to forecast the potential of promising niches (for instance EVs, HEV[10]s, hydrogen fuel cells and ITS systems). Since this paper attempted to make a contribution to the debate on low carbon urban mobility, we hope that it will inspire future research in this field.

[10] Hybrid Electric Vehicles

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Annex 1: Questionnaire

A. General information

Role of the respondent.....

Department.....

B. General information

Please answer the following questions based on the most recent activities

Questions	Yes	No	Remarks
Does your municipality have transport plan?			From the year.....
Is there any department or person responsible for transportation in your municipality			Person □ Department □
Have you started to implement the transport plan?			From the year.....
Does the plan cover the whole area of municipality?			
Do you monitor or assess your mobility plans?			
Have you developed special scenarios for sustainable mobility?			
Have you used any funds for emission reduction projects, studies or strategies?			From which organizations .....
Do you have any plan to support innovations related to emission reduction?			
Have you assigned responsibilities and resources for sustainable mobility plans?			
Have you considered a special budget for sustainable mobility in municipality's plan?			

C. Green attitudes

Please rate the extent to what you agree with the following statements

(1 completely disagree and 7 strongly agree)

GHG and CO_2 reduction	1	2	3	4	5	6	7
GHG emission reduction is a priority of municipality							
specific goals are needed for CO_2 reduction							
specific funds should be assigned for CO_2 reduction projects							
Specific resources should be assigned for CO_2 reduction goals							
There are written strategies for CO_2 reduction							
We believe in implementing our own plans instead of continuing the previous plans or higher organizations							
There are periodical measurements for the level of CO_2 emissions in the city							
There is periodical evaluation for the results of strategies							
The results of evaluation are published periodically							
The proper correction made to the strategies regarding the obtained results							
surveys done to know the degree of customer satisfaction from public transport							

D. External funds and resources for mobility plans

Please indicate the extent to what you use funds for the indicated purposes

(1 means never and 7 means always)

External fund and resources for emission reduction	never	Very rarely	rarely	Occasionally	frequently	Very frequently	always
	1	2	3	4	5	6	7
The extent to what you used funds from national government for the CO_2 reduction programs							
The extent to what you used funds from national government for GHG emission reduction programs							
The extent to what you used funds from international organizations for CO_2 reduction programs							
The extent to what you used funds from international organizations for GHG reduction programs							

E. Cooperative activities

Please indicate the extent to what you cooperate with the following stakeholders for emission reduction goals

(1 means never and 7 means always)

R&D cooperation for clean vehicles and fuel technologies	never	Very rarely	rarely	Occasionally	frequently	Very frequently	always
	1	2	3	4	5	6	7
Vehicle manufacturers							
Local public providing companies							
Transport agencies							
Energy and Fuel providers							
Universities and research centers							
Ministries and other policy makers							
EU green transport projects and plans							
Other municipalities							
Other stakeholders							
Cooperation with other network actors in other fields	1	2	3	4	5	6	7
Vehicle manufacturers							
Local public providing companies							
Transport agencies							
Energy and Fuel providers							
Universities and research centers							
Ministries and other policy makers							
EU green transport projects and plans							
Other municipalities							
Other stakeholders							
Cooperation results	1	2	3	4	5	6	7
The extent to what you think cooperating with following actors will help you achieve emission reduction objectives							
The extent to what you think cooperation with following actors will help you solve the challenges of sustainable mobility							
The extent to what you think cooperation with following actors will help you achieve plans for cleaner fuel vehicles							

F. Strategies for reducing use of private cars

Please indicate that the extent to what the following strategies are applied in your area

Reducing the use of private carts	Not applicable	Not a priority at present	deliberating the issue	Have adopted policies/ guidelines	Implementing pilot project(s)	Implementing in specific case(s) or area(s)	Implementing throughout municipality area
Motivating and restraining policies							
Tax reduction for cleaner vehicles							
Closing historic city centers for clean vehicles							
Limited traffic zones							
Fuel price policies							
Other incentives							
Alternative transport modes							
Shifting passenger transport to other transport modes							
Shifting freight transport to other transport modes							
Promote walking							
Promote cycling							
Efficiency of Public transport							
Implementing car sharing/ carpooling system							
Integrated transport infrastructure and tickets							
Expanding and developing the subway network							
Decentralizing public administration offices							
Regulation of parking areas							
Traffic congestion							
Renovating public transport fleet (buses)							
Renovating commercial transport and other heavy duty vehicles							
Increasing public awareness							
Advertisement							
Educating population							
Special events							
Interactive information on schedules and delays							
Clean fuel infrastructure							
Expanding infrastructure (charging points) for electric vehicles							
Expanding infrastructure (charging points) for natural gas vehicles (LPG, CNG…)							
Expanding infrastructure (charging points) for other types of fuels (methane diesel, etc.)							
Clean vehicles							
Distributing goods in city centers with ecological vehicles							
Using vehicles with cleaner fuels in public transport							
Using cleaner fuels in freight transport vehicles							

G. Challenges and impediments

Please, indicate the extent to what you evaluate the existing challenges of your municipal area in the following fields

(1 being not important and 7 means very important)

challenges	1	2	3	4	5	6	7
Integration of urban transport plans with sustainable environmental objectives							
Provide efficient and appropriate public transport services							
Availability of public parking, especially in city centre							
Adequacy of infrastructure for clean fuel or low emission vehicles							
Strict regulations and administrative process							
Promote non-motorized transport modes (cycling, walking)							
Reducing traffic congestion							
Changing citizen´s behaviour in use of private vehicles							
Impediments	1	2	3	4	5	6	7
Lack of financial resources							
Environmental regulations that are particularly strict							
Lack of cooperation between the transport sector stakeholders							
Lack of support from the central government / ministry							
Changing political leaders/ policy makers turn over							
High prices of technological innovations							
Cultural barriers							
Social responsibility of public transport system (prices,tickets)							
Inefficiency of alternative transport modes							

H. Success of emission reduction strategies

Please, indicate the extent to what you agree with each statement,

(1 completely disagree and 7 strongly agree)

Goals and objectives	1	2	3	4	5	6	7
public transport meet existing demands							
The clean fuels infrastructures are enough							
The citizens are satisfied with the public transport							
Citizens are aware of emission pollution hazards							
There is a growing number of citizens using public transport compared with the last 5 years							
There are less people using their private cars compared to 5 years ago							
There are more people using walking and cycling for their everyday commuting							
Indicates the extent to what you consider that:							
The collaboration with the actors listed above will help the municipalities to achieve the goals of reducing emissions							
The collaboration with the actors listed above will help the municipality to meet the challenges of sustainable mobility							