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Barriers and drivers for sustainable mobility in Cuenca, Ecuador

Reflections towards sustainable mobility transitions

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Abstract

Acknowledging, the research gap within sustainability transitions in analysing the local scale of transition processes, this work primarily, seeks to contribute to sustainability transitions studies by identifying the main factors that are enabling and hindering the materialization of low carbon mobility in Cuenca, Ecuador.

The use of a case study as a research strategy and the nature of the research objective required a qualitative approach, that consisted in the collection of qualitative data through semi-structured interviews and document review. The data was analysed based on a theoretical framework built on insights from sustainability transitions literature, path dependence and path creation concepts, and insights from sustainable mobility literature. From the transitions studies field, a socio-institutional approach was applied in order to understand the institutional and political dynamics of the mobility system under study, and insights from sustainable mobility allowed to explore the spatial factors that are influencing the dynamics of the system as well.

The main findings suggest that the mobility system in Cuenca, is dominated by private car transport in terms of resources and infrastructure allocated for it, while public transport is inefficient, whereas infrastructure for walking needs to be improved and cycling infrastructure is still incipient. Cultural factors that see the car as the ideal mode of transport and formal factors, such as the lack of policy strategies are hindering the institutionalization of low carbon mobility. However, important efforts are taken place towards sustainable mobility driven by visions and actions of diverse actors, who inter alia advocate from policy strategies. Furthermore, Cuenca as an intermediate city offers opportunities to better address urban challenges towards a more sustainable mobility system.

The coevolutionary, multi-dimensional, multi-actor and multilevel nature of transition processes require that multiple developments take place and get aligned in order to enhance fundamental changes that sustainability demands. Understanding these dynamics in the local context is critical for city actors in order to take accurate decisions and actions, therefore this work additionally seeks to call for reflection among local policymakers.

Keywords: sustainability transitions, sustainable mobility, urban mobility

Executive Summary

Latin America and the Caribbean is the second most urbanized region in the world with 81% of its population living in urban areas (UN, United Nations Department of Economic and Social Affairs, Population Division, 2018). In this region, the urbanization process and economic growth during the two last decades have taken place in intermediate cities. Call for low carbon societies has been a concern of nations around the world, demanding nations and cities to take actions for reducing environmental impact and achieving sustainable societies (UN, 2015; UN, Habitat III, 2016; UNFCCC, 2015). Within the global political and research field cities are seen as key actors for achieving global goals regarding sustainable development (Bulkeley, Castán Broto, & Hodson, 2013; Fenton & Gustafsson, 2017), where sustainable mobility systems are fundamental to progress in the achievement of these global goals (SM4All, 2017).

Problem definition

Sustainable transport systems require structural and societal changes (transitions) in the technological, economic, cultural, political, and institutional dimensions (Bulkeley et al., 2013; Nunen, Huijbregts, & Rietveld, 2011). Therefore, it is necessary to address mobility systems looking at them as complex and adaptative systems, where the interaction of different elements (political, institutional, technological, cultural and economic) are coherently organized in a structure that enables a set of behaviors whose outcomes are not sustainable (built after Meadows & Wright, 2008).

Transitions are the result of co-evolutionary and adaptative processes, where developments take place in multiple domains and at different levels, thus are seen as multi-level, multidimensional and multi-actor processes (Loorbach, 2007). In terms of sustainable transitions, mobility has gained momentum among scholars, although it has been argued that transition studies tend to overlook the spatial (territorial particularities) context when analyzing processes of change. According to Smith et. al (2010), as cited by Mäkinen, Kivimaa, & Helminen, (2015) the lack of attention to spatiality is due to overwhelming focus upon transitions on a national level, with limited literature with a local focus.

Urban sustainability issues inter alia mobility systems have been studied from diverse perspectives, although the attention has being mostly devoted to metropolis (i.e.Wulfhorst & Klug, 2016), overlooking other levels of urban settlements, such as intermediate cities, in spite of their relevance for the achievement of the global sustainable development agendas as argued by Salazar, Irarrázaval, & Fonck, (2017).

Furthermore, Loorbach, Frantzeskaki, & Avelino, (2017) argue that transitions research have sporadically addressed sustainability challenges in developing geographical contexts, suggesting that this field should open up toward more heterogeneous backgrounds.

Research objectives and Research question

The overarching aim of this work is to contribute to the field of sustainable transitions from a local perspective, choosing the mobility system of an intermediate city as case study. As secondary aim this work seeks to contribute to the city of Cuenca, by providing evidence that allows to reflect and improve the governance of the mobility system towards a sustainable one. In order to achieve these goals, the following research question (RQ) steer the approach of this work:

RQ 1 What are the political, institutional and spatial factors triggering the transition towards low carbon mobility (public transport, walking and cycling) in the city of Cuenca and which ones are hindering it?

To answer the overarching RQ, the following sub-research questions need to be addressed:

SubRQ1: How is the current mobility system?

SubRQ2: Who are the main actors that are shaping the mobility system?

SubRQ3: What are the external factors influencing the mobility system?

Sub RQ4: How are the spatial features influencing the mobility system?

SubRQ5: What are the cultural and formal elements shaping the mobility system?

Research design and methodology

Research strategy

In order to achieve the overarching aim of this work, a case study has been selected as research strategy. Case studies are characterized by the small number of units of analysis, but for seeking depth analysis of them. In the present work the strategy is a single case study, focusing on the mobility system of Cuenca. Case study as research strategy relies on three types of data: on site observation, interview and document analysis. Due to the approach of this research (socio-institutional approach) the on-site observation was not performed, in deed the research was conducted from Sweden, further detail about the data gathering process is described below.

Methodology

The process of this research is deductive, therefore, first through desk research the relevant theories were selected, and the theoretical framework was built, in order to guide the data collection process, which is explained in the following sections.

Data collection

Desk research:

Desk research was performed in order to build the theoretical framework. Research of terms and combination of terms such as "urban mobility", "sustainable mobility", "sustainable transitions" "policy", was conducted. Preliminary desk research regarding the mobility system in Cuenca, also was performed. This process guided to the selection of insights from sustainable transitions studies to build the theorical framework in addition to concepts from urban mobility and sustainable mobility literature.

Interviews:
Semi- structured interviews were performed were performed to ten local actors from diverse sectors. The interviews were conducted by the so-called VoIP technologies which allows communication in real time and face to face interactions.

Document review:

Qualitative and quantitative data comes from secondary data, such as relevant academic articles, reports and planning documents, accessed mainly through digital search.

Data analysis

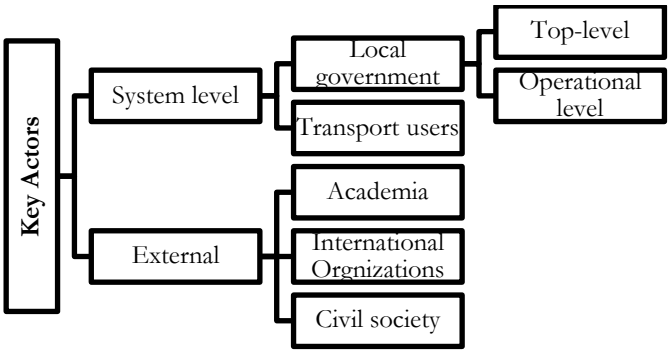
The analytical approach of this work relies mainly on the multilevel perspective (MLP) and transition management (TM) approaches and sustainable mobility.

Findings

SubRQ1: How is the current mobility system?

The main findings suggest that the mobility system in Cuenca, is dominated by private car transport in terms of resources and infrastructure allocated for it, while public transport is inefficient, whereas infrastructure for walking needs to be improved and cycling infrastructure is still incipient.

SubRQ2: Who are the main actors that are shaping the mobility system?



The answers for the remaining SubRQs are summarized as follows:

In addition, cultural factors that see the car as the ideal mode of transport and lack of policy strategies are hindering low carbon mobility. However, important efforts are taken place towards sustainable mobility driven by visions and actions of diverse actors, who inter alia advocate from policy strategies.

Main barriers

Political

- Power of population that relies on private car for transportation
- Lack of political will for taking strategic decisions
- Lack of a Mobility Plan formally approved as public policy

Formal

- Resource constraints (financial and human)
- Lack of vision of sustainability

Cultural

- Perception of private car as the ideal mode of transport
- Lack of awareness of sustainability issues
- Lack of respect for walkers and bike users

- Bad quality of public transport

Spatial

- Lack of proper infrastructure for cycling and walking
- Disperse and disorganized urban growth

Main enablers

Political

- Steering documents at national level that advocate for low carbon mobility

Formal

- Vision of sustainable mobility among some institutional (local government actors)
- Recent policy strategies that support low carbon transportation (public bike, a tram system, improvement of bus service)

Institutional

- Pressures from external actors (academia, international organizations, civil society) who advocate for changes in the mobility system towards a more sustainable data. They support through a diverse range of actions (scientific evidence, projects, funding, awareness campaigns, etc)

Cultural

- Predisposition of some car users to shift to other modes of transport, mainly cycling

Spatial/Geographical

- Demographic features of the city→ Intermediate city
    - The size of the city is ideal for enhancing low carbon mobility
    - The scale of the challenges makes easier to handle, compared with metropolis
- More cycling infrastructure built recently

Conclusions and Reflections

The coevolutionary, multi-dimensional, multi-actor and multilevel nature of transition processes require that multiple developments take place and get aligned in order to enhance fundamental changes that sustainability demands. Understanding these dynamics in the local context is critical for city actors in order to take accurate decisions and actions, therefore this work additionally seeks to call for reflection among local policymakers.

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1 Introduction

1.1 Background information

Globally, 55% of the population lives in urban areas, and it is expected that by 2050 this number will rise to 68% (UN, United Nations Department of Economic and Social Affairs, Population Division, 2018). By 2010, cities consumed 80% of the energy production, and were responsible for around 80% of the global greenhouse gas emissions (World Bank, 2010). By 2015, approximately 60% of the worlds urban population lived in cities with less than 1 million inhabitants (intermediate and small cities) (UCLG, 2016). Latin America and the Caribbean is the second most urbanized region in the world with 81% of its population living in urban areas (UN, United Nations Department of Economic and Social Affairs, Population Division, 2018). In this region, the urbanization process and economic growth during the two last decades have taken place in intermediate cities[1]. ("Ciudades Emergentes y sostenibles | IADB," n.d.). Approximately, a quarter of the greenhouse gas (GHG) emissions from fuel combustion come from the transport sector, where around three quarters correspond to road transport (IEA, 2017). According to the World Bank, (2012), this sector is the fastest growing consumer of fossil fuels and the fastest growing source of CO2 emissions, due to energy consumption and emissions from the increasing urban transport sector, as result of the rapid urbanization in developing countries.

Call for low carbon societies has been a concern of nations around the world requiring a shift in the production and consumption patterns through actions at national and local level. Lately, global instruments such as the Paris Agreement, the Agenda 2030 which contain the Sustainable Development Goals (SDGs) and the New Urban Agenda (NUA) demand nations and cities to take actions for reducing environmental impact and achieving sustainable societies (UN, 2015; UN, Habitat III, 2016; UNFCCC, 2015). Politics and academia consider cities key actors for achieving global goals regarding sustainable development (Bulkeley et al., 2013; Fenton & Gustafsson, 2017), where sustainable mobility systems are fundamental to progress in the achievement of these global goals (SM4All, 2017).

This work seeks to explore mobility systems at the local context by selecting an intermediate city as a case study, looking forward to understanding the challenges that cities face, and the opportunities that they offer towards more sustainable societies in the mobility sector.

Transport systems have enabled economic development upgrading the ability to move people and goods. Thanks to technological developments in mobility systems, people can access education, employment, and leisure. However, the unsustainable growth in the demand for motorized mobility enabled mainly by technological developments and traditional transport planning approach is threataning society with environmental degradation. Motorized mobility increases consumption of non-renewable resources, traffic congestion causing pollution and fuel consumption, further demand of infrastructure, leading to faster urban growth and

[1] In demographic terms intermediate cities are medium size cities, with a population between 50.000 to 1´000.000 inhabitants, while from a function perspective these cities are characterized by their intermediary role, allowing the connection and flow of goods and people between rural andother urban areas(UCLG, 2016).

demand for more motorized mobility (Attard & Shiftan, 2015); Gallez & Motte-Baumvol, 2017; C. Hermida, 2016; Newman, Kosonen, & Kenworthy, 2016).

1.2 Problem definition

Mobility systems are influenced by and affecting other domains such as housing, working, production and trade systems. Car-based transport systems have influenced the growth of cities and how they have been planned (Mäkinen et al., 2015; Markard, Raven, & Truffer, 2012), enabling economic development but also negative social and environmental impacts, as described above. In order to tackle the harmful effects of the current mobility systems a wide range of strategies have been identified within the sustainable mobility field. These strategies include technological developments such as electric vehicles, engine vehicles efficiency, intelligent transportation systems, etc. Other strategies rather than have exclusive technological focus seek to reduce motorized mobility demand by promoting low carbon modes of transport, intermodal mobility, and urban planning approaches such as land use planning (Geels, 2012; World Bank, 2012).

Sustainable transport systems require structural and societal changes (transitions) in the technological, economic, cultural, political, and institutional dimensions (Bulkeley et al., 2013; Nunen et al., 2011). Therefore, it is necessary to address mobility systems looking at them as complex and adaptative systems, where the interaction of different elements (political, institutional, technological, cultural and economic) are coherently organized in a structure that enables a set of behaviors whose outcomes are not sustainable (built after Meadows & Wright, 2008).

Transitions are understood as non-linear, multidimensional and dynamic processes of change that structurally alter the culture, structure, and practices of a societal system, generating new and relatively stable structures (Geels, 2012; Loorbach, 2007). Transitions are the result of co-evolutionary and adaptative processes, where developments take place in multiple domains and at different levels, thus are seen as multi-level, multidimensional and multi-actor processes (Loorbach, 2007). Building on these concepts low carbon[2] mobility transitions are dynamic processes that pursue change towards a more sustainable behavior enabling low environmental impact, accessible and efficient mobility. The core of transitions thinking is that a sustainable development process requires fundamental (radical) shift of a socio-technical system, rather than incremental change, thus it calls for transformation of social structures and practices (Loorbach, Frantzeskaki, & Thissen, 2011).

It has been argued that low carbon transitions in the urban perspectives are primarily driven by institutional and political processes through new policy and planning approaches (Bulkeley et al., 2013). Hence, governance of low carbon transitions requires policy instruments able to create space and pave the ground for processes of change(Loorbach et al., 2011; Upham, Kivimaa, Mickwitz, & Åstrand, 2014; Upham, Virkamäki, Kivimaa, Hildén, & Wadud, 2015).

In terms of sustainable transitions, mobility has gained momentum among scholars, although it has been argued that transition studies tend to overlook the spatial (territorial particularities) context when analyzing processes of change. According to Smith et. al (2010), as cited by Mäkinen, Kivimaa, & Helminen, (2015) the lack of attention to spatiality is due to overwhelming focus upon transitions on a national level, with limited literature with a local

[2] Sustainable and low carbon transitions in the context of this research are used as interchangeable and similar terms

focus. Furthermore, accounting the spatial dimension in sustainable transition studies is even more critical when studying mobility systems, due to its spatial nature (Mäkinen et al., 2015).

Bulkeley et al., (2013) suggest that is necessary to analyse low carbon urban transitions accounting the fundamental socio-technical nature of interventions in urban infrastructure systems. Additionally, focusing on the local context discloses institutional particularities of the scenario where the transitions are taking place (Coenen, Benneworth, & Truffer, 2012) .

Urban sustainability issues inter alia mobility systems have been studied from diverse perspectives, although the attention has being mostly devoted to metropolis (i.e.Wulfhorst & Klug, 2016), overlooking other levels of urban settlements, such as intermediate cities, in spite of their relevance for the achievement of the global sustainable development agendas as argued by Salazar, Irarrázaval, & Fonck, (2017).

Furthermore, Loorbach, Frantzeskaki, & Avelino, (2017) argue that transitions research have sporadically addressed sustainability challenges in developing geographical contexts, suggesting that this field should open up toward more heterogeneous backgrounds.

1.3 Research objectives and Research questions

The overarching aim of this work is to contribute to the field of sustainable transitions from a local perspective, choosing the mobility system of an intermediate city as case study. As secondary aim this work seeks to contribute to the city of Cuenca, by providing evidence that allows to reflect and improve the governance of the mobility system towards a sustainable one. In order to achieve these goals, the following research questions (RQs) are steering the approach of this work:

RQ 1 What are the political, institutional and spatial factors triggering the transition towards low carbon mobility (public transport, walking and cycling) in the city of Cuenca and which ones are hindering it?

First, it is necessary to identify what the current situation of the mobility system in Cuenca is, thus the following sub-research question needs to be answered:

SubRQ1: How is the current mobility system?

Acknowledging the multi-actor nature of the transitions processes, it is necessary to address the following sub-research question:

SubRQ2: Who are the main actors that are shaping the mobility system?

Following the MLP, the TM postulates and the sustainable mobility literature the following sub- research questions are addressed as well:

SubRQ3: What are the external factors influencing the mobility system?

Sub RQ4: How are the spatial features influencing the mobility system?

SubRQ5: What are the cultural and formal elements shaping the mobility system?

1.4 Scope and Limitations:

1.4.1 Scope

Mobility in the context of this research is understood as the movement of persons within the city on daily basis by land-based transportations systems. Transport of goods (freight) in the city are excluded from the analysis.

Transitions processes are multi-actor, which result of multiple developments at different dimensions and levels influencing the structure of the system. This work takes a socio-institutional approach, thus focusing on understand transitions in terms of social and institutional routines, rather than having a technological focus. This work limits its scope by seeing low carbon mobility in terms of reducing private car use and the promotion of public transport, cycling, and walking. Thus, technological (i.e. engine efficiency, alternative fuels) and other innovations (i.e. sharing car) that are happening in the context of private motorized mobility are excluded of the analysis.

1.4.2 Limitations:

Practical

The research was performed from Sweden, which did not allow to the author to obtain data from field work. Therefore, secondary data from previous studies were used in this research. The collection of primary data through interviews was performed through VoIP technologies (Voice over Internet Protocol). See section 3.23.2 for further detail.

Research related

The research approach was limited to a single case study, having as unit of analysis the city of Cuenca, Ecuador, therefore the results may not be generalizable.

The approach of this research gives a general overview of the factors affecting the transition towards a sustainable mobility system. Therefore, the author recognizes the need for future research performing a deep analysis of the materialization of each of the different sustainable modes of transports or technological and social practices that may reinforce each of them.

Seeking to achieve the aim of this research interviews with several city actors were performed, academia, international cooperation, political, experts, civil society and local government representatives, however from the private sector none representative was interviewed. More detail regarding this issue is provided in the discussion section.

1.5 Ethical considerations

The selection of the case study was based on convenience due to practical reasons, since the author is a local. Therefore, previous perceptions regarding the mobility in the city influence the selection of the case, the same that previous knowledge as a local influenced the selection of the topic and selection of some interviewees.

1.6 Audience

This thesis is the final work of the Master Programme Environmental Management and Police at the International Institute for Industrial and Environmental Economics (IIIEE) at Lund

University. Therefore, academia is one of the subjects that this thesis is intended for, mainly to those researchers from sustainable mobility, sustainable transitions and urban studies.

Additionally, the findings of this work may be relevant for policymakers and institutional actors who may use the content of this work as instrument to reflect upon.

1.7 Disposition (outline)

Chapter 1 provides background information, poses the problem definition, and indicates the aims of this research and the research questions to be addressed in this study, it informs regarding limitations and ethical issues, and indicates the intended audience.

In Chapter 2, key concepts used in the research are described, followed by literature review and illustrates the main theories and additional concepts that guide this research. While in Chapter 3, the research design and methodology are explained. The results and analysis are presented in Chapter 4. The significance of the findings and further reflections, including recommendations for future research are developed in Chapter 5. Finally, Chapter 6 illustrates the conclusions of this work.

2 Literature Review and Theoretical Framework

This section provides key concepts from (sustainable-urban) mobility that are used in this work, followed by an explanation of the main theories and concepts used for guiding the approach of this research.

2.1 Key concepts

This section aims to provide key concepts used in this study mainly from Urban Mobility and Sustainable Mobility field research.

2.1.1 Mobility and transport:

The term mobility can be defined from different perspectives, for the purpose of this study the term is used to describe the movement of people as a social practice within the city, on daily basis seeking to the realization of activities that allow people to participate in social, economic, and cultural exchange, to discover, to learn, to experience something new, and hopefully to achieve long-term objectives (built on Gregory et al., 2009; Wulfhorst & Klug, 2016).

Mobility is a broader and a more holistic concept compared with transport. Mobility focuses on the subjectivity and materiality of the displacements, while transport focus on the way how the displacement takes place (Gutierrez, Andrea, 2012). In this sense the term mobility comprehends the drivers and conditions shaping the choices related to the modes of transport of mobility, transport being the material element of the mobility (C. Hermida, 2016; Wulfhorst & Klug, 2016). When referring to transport this study refers to the material component of the mobility (modes of transport: cars, trains, buses, etc., transport systems).

2.1.2 Sustainable mobility and transport:

In spite of the wide and sometimes loose use of the terms sustainable mobility and sustainable transport, it is not easy to properly define them, it depends how sustainability is conceived (Wulfhorst & Klug, 2016).

Mobility that contributes to sustainability should be safe, save economic resources, be time-efficient, allow accessibility for economic and social interaction, with low impact as possible in terms of pollution, GHG emissions and congestions (Fusco, 2004; Nunen et al., 2011; SM4All, 2017).

2.1.3 Motorized mobility

Motorized mobility herein is understood as the mobility that is performed by the use of transport modes that rely on a motor or engine, such as vehicles used for private transportation and public transport modes. Public transport modes are considered less harmful in relation with private car based on the emissions measured in gram per passenger kilometre(Santos, Behrendt, & Teytelboym, 2010)

2.1.4 Non-motorized mobility

This term refers to the mobility that takes place through means of transport that not rely on a motor or engine, mainly referring to the mobility that takes place by walking or biking, but also through. Pedestrian and bicycle travel are seen as means to alleviate traffic congestion and

reduce vehicular emissions[3], while from a public health perspective these modes of travel are considered as means to enhance the level of physical activity in the population.(Okrah, 2016; Orellana, Daniel, Hermida, Carla, & Osorio, Pablo, 2017).

Intermodal mobility

The term refers to the type of mobility that takes place by the flexible combination of transport modes in one route. The intermodal mobility relies on the availability of different choices of modes of transport. In relation to sustainability, the intermodal mobility may have sustainable outcomes if it enables to reduce emissions per passenger, by the combination of at least two transport modes (i.e. individual-public, -individual-individual- public-shared). For instance when a trip is performed, by biking and walking, or private car and public transport, etc. (Jonuschat, Stephan, & Schelewsky, (2015) . Three types of modes are distinguished by Jonuschat et al., (2015) individual modes, shared modes and public modes.

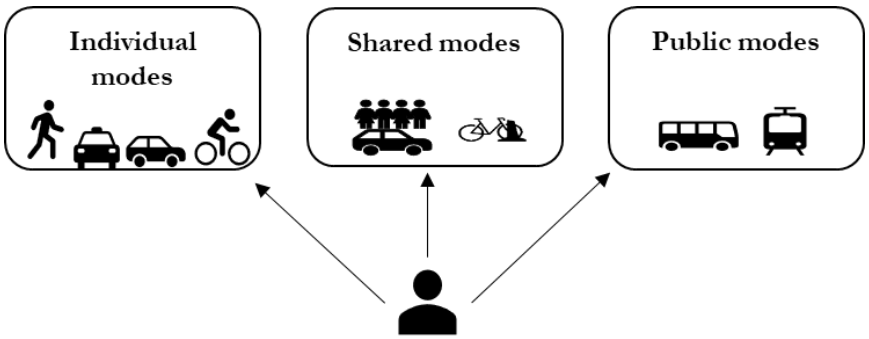

Figure 2-1 Intermodal mobility.

Adapted from(Jonuschat et al., 2015)

2.2 Theories and concepts guiding this work

In addition to the insights provided by the field of sustainable and urban mobility, where the definitions above described were taken from the following theories and research fields are guiding this work. This section provides the main insights of each of them, while the following indicate and illustrate the different elements selected from each one.

2.2.1 Sustainable transitions studies

As mentioned in the introductory section, mobility systems need to shift towards sustainability, which implies that processes of change must take place. Sustainable transition studies have emerged to study these processes. Transitions as a phenomenon have been studied within several disciplines, and been applied in a wide range of different types of systems to describe changes within them(Loorbach, 2007). The introduction of transitions for studying sustainable development, governance and policy was proposed by authors such as Rotmans and Kemp (see Loorbach, 2007; Loorbach, Frantzeskaki, & Thissen, 2011; Markard et al., 2012 for further detail).

In order to understand the dynamics of the transitions taken place within the mobility city in Cuenca, a socio-institutional approach is taken. Within the field of sustainable transition

[3] Although the emissions reduction is relative, not all strategies that seek to increase non-motorized trips result inf decreasing motorized travel, levels of motorized travel may stay the same (Okrah, 2016)

studies, the socio-institutional approach is used to understand systemic changes in complex societal systems, being widely used for studying mobility systems. In addition, the use of the socio-institutional approach according to Loorbach et al. (2017) is used often to study specific geographical areas. Furthermore, without excluding technological elements, the socio-institutional approach emphasizes the importance on studying social practices, interests, regulations in the transition processes (Loorbach et al., 2017). In this research the institutional approach is used to understand the institutional and political dynamics of the mobility system in a specific geographical context (Cuenca, Ecuador).

According to Markard et al., (2012) four are the major dominant frameworks that have achieved prominence in transitions studies. For the purpose of this study these are understood as analytical approaches: a) the strategic niche management (SNM), b) the multi-level perspective (MLP), c) transition management (TM) and, d) technological innovation systems (TIS), arguing that these approaches offer a systematic view of the transformation process of socio-technical systems[4]. (Markard et al., 2012). Table 2-1 briefly describes the main focus of the four different approaches.

Table 2-1Main schools of socio-technical studies.

Main socio-technical schools			
Strategic niche management	**MLP**	**Transitions Management**	**TIS Technological Innovation systems**
Deliberate creation and support of niches: a way to trigger off regime shifts	Explain technological transitions by the interplay dynamics at three levels: landscape, regime and niches	Combines the work on technological transitions insights from complex systems theory and governance approaches	It is concerned with the emergence of novel technologies and the institutional and organizational changes that have to go hand in hand with technological development.

Source: Adapted from (Markard et al., 2012)

For the purpose of this research, mobility is seen as a socio-technical system, however the approach of the study takes a socio-institutional approach since it aims to understand the system dynamics from a social, political, institutional, and spatial perspective, while in terms of analytical frameworks this work relies on elements of the MLP and TM. The following section explains in further detail how these analytical approaches are used in this work.

Multilevel perspective (MLP)

The multilevel perspective (MLP) approach has its origins in innovation and technology studies (Loorbach, 2007). Based on the statement that transitions are non-linear and multidimensional

[4] The term socio-technical is understood in the context of transitions in the sense that processes of changes do not rely only on technological developments, rather they require institutional structures and changes in user practices.

processes that take place by the interaction of the different elements of the socio-technical systems in three different analytical levels: landscape, regime and niche (Geels, 2012).

The landscape is the macro level of the system, formed by the external environment affecting the sociotechnical development. The elements forming this level are beyond the direct influence of individual actors, rather they are influencing the stability of the system (Geels, 2005, 2012). The regime is the meso-level, which is characterized by relative stability where an alignment of the different elements such as technologies, consumers behaviours, regulations infrastructures, cultural discourses are shaping the system. At this level the dominant structures of the system are giving stability, guiding the decision-making processes and individual's behaviour of the different actors, who are the ones reproducing, maintaining and changing the elements (physical and immaterial) of the system. The final level under the MLP is the micro-level, known as niche where the innovative activities take place with potential to alter the regime. Innovation is not reduced to technological changes, rather it refers to a wide range of novel proposals that includes institutional, organizational, social innovation (WIFO, 2013).

Transitions are the result of the interaction of processes on multiple dimensions, in the different levels, where innovations at the micro-level (niches) build up internal momentum when the elements become aligned in a dominant design, while the landscape level exerts pressure at the regime level, this destabilization creates windows of opportunity for the niche innovations. There is no certainty that transitions indeed take place, niche innovations can fail, or the windows of opportunity are not materialized. (Geels, 2012)

From the MLP and transitions theory, changes at regime level are rather incremental due to path dependence and lock-in mechanisms, avoiding fundamental structural changes (Geels, 2012; Loorbach, 2007). Lock-in mechanisms are understood as "(…) mechanisms, which reinforce a certain pathway of economic, technological, industrial and institutional development and can lead to path-dependency" (Klitkou, Bolwig, Hansen, & Wessberg, 2015 p. 23).

2.2.2 MLP in transport studies

It is argued that globally the current mobility systems are dominated by the private-car use (Newman et al., 2016), thus also often nominated as automobile regime, whereas other transport modes, such as public transport, walking, and cycling cannot be considered as niches in the sense of being precarious or novel developments, rather they are seen as subaltern regimes due to its modest representation in the mobility patterns, compared with private car use (F. W. Geels, 2012). The regime has a certain level of rigidity preventing that innovations alter the system, enabling the development of the subaltern regimes. This study follows this criterion, considering low carbon mobility modes of transport as subaltern regimes, while niches are understood as those developments that seek to boost the subaltern regimes.

2.2.3 Limitations

The MLP it is categorized as heuristic framework that represents an interpretative research suited to study messy processes such as transitions. Its application requires interpretative creativity allowing to discover relevant patterns and mechanisms (WIFO, 2013), which can be seen as an advantage but also a limitation.

The MLP has a strong temporal orientation, since it attempts to explain the transformative processes over time, it has been criticized for its limitations in not fully considering the spatial dimension of the transitions (Bulkeley et al., 2013; Geels, 2012; Mäkinen et al., 2015). Although,

Bulkeley, (2013) recognizes that the MLP provides a critical starting point for the analysis, illustrating the dynamics of change within the systems, suggesting the insights from the social study of urban infrastructure may be suitable. Bulkeley, (2013) argues to understand low carbon transitions it is necessary to conceptualize the city and infrastructure systems as co-constitutive, reinstating material and spatiality fixed components of the city life.

Insights from this theory are applied in a specific geographic context, therefore particularities of the local context will be analysed, and insights from urban mobility will be used to overcome this limitation.

MLP studies the system in three levels, the macro, meso and micro levels, described as landscape, regimes and niches respectively (Geels, 2005). However, Loorbach, (2007) argues that from a complex systems perspective the dynamics of a socio-technical system are defined by its internal interaction and also by its interaction with the external environment. In order to be able to understand these dynamics, is necessary an analytical model that differentiates at least four levels, rather than three as proposed in the MLP, adding the societal system level. In this level (societal system) the dynamics result from the internal system interaction and the developments taking place in the outside environment, defining the characteristics and dynamics of the system as a whole.

2.2.4 Transitions Management Theory

Loorbach(2007), is one of the major exponents of the transitions management, who proposes transition management as a governance approach for sustainable development, which sees systems as complex and adaptative, therefore traditional approaches of governance are not enough. It recognizes that complex systems face complex problems that need to be addressed in long time, thus, one of the key elements in the governance of societal transitions is the long-term planning (strategic activities). It needs to be combined with tactical activities, which imply the interaction of landscape elements with system structures, enabling the alignment of the regime, with the long-term vision, thus transitions are driven in a certain direction. Furthermore, activities at operational level are necessary, these activities have a short-term horizon, which mainly refer to the development of innovations. All the above activities (strategic, tactical and operational) require reflexive events, which are understood as all forms of reflections, particularly, those related with monitoring, assessment and evaluation tools of the ongoing activities and social change(Loorbach, 2007; Upham et al., 2015; Vagnoni & Moradi, 2018).

2.2.5 Policy in sustainability transitions

Sustainability transitions require actions from the various actors of the socio-technical system. This interventions must come from state and non-state actors (Markard et al., 2012). Policy is a concrete and specified form of intervention of public authorities (state actors), even though the policy building and policy implementation must obey to participatory processes (i.e. consultative processes) where other non-state actors are involved (Bemelmans-Videc, Rist, & Vedung, 1998; Upham et al., 2015). In this study policy instruments are understood as "set of techniques by which public sector authorities wield their power in attempting to effect social change or eliciting support" (Vedung, 1997, p. 122).

According to Upham et al., (2014) government policies are positioned in variable ways among the three levels within the MLP approach. They are viewed as contributors of niche developments, while in the landscape level policies are seen as political settings (horizontal top

level policies and polices of other domains are part of this level), and in relation to the regime level policies are seen as driver of change but also as stability elements (Upham et al., 2014).

Sustainable transitions entail novel policy approaches to support the redirection and acceleration of technological change (Rogge & Reichardt, 2016; Upham et al., 2015), but also it should enable changes in terms of social practices, enhancing behaviour change. Kivimaa & Kern, (2016) argue that transitions require disruptive policy mixes seeking systemic change, and qualifying policy mixes as "motors" of creative disruption, stating that "(…) policy mixes favourable to sustainability transitions need to involve both policies aiming for the "creation" of new and for "destroying" (or withdrawing support for) the old." (Kivimaa & Kern, 2016 p.206). Policy mixes are understood as the combination of different instruments in a coherent and comprehensive way, responding to an overall policy strategy (Rogge & Reichardt, 2016).

2.2.6 Path dependence

The path dependence is a relevant concept of social sciences used to study and explain processes of change. The path dependence theory seeks to explain how systems behave in relation to the dynamic process whose development is governed by its own history, characterized by positive feedbacks and self-reinforcing dynamics. The concept of path dependence commonly is illustrated as "history matters". (David, 2007; Mäkinen et al., 2015; Pierson, 2000). Path dependency results from technological, social and cultural lock-ins, where incumbent practices and technologies which not necessarily are better, but ae more widely diffused, challenging new practices and technologies to get institutionalized (built on Klitkou et al., 2015).

2.2.7 Path creation

The idea of path creation was introduced as counterargument to path dependency by Garud & Karnøe, (2001), where the central element is the "agency" of actors who intentionally deviate their actions form the existing structures, leading to potential inefficiencies in the present, but aware that such process are necessary to create new developments. From a MLP approach the path creation implies niche innovation, where novelties take place in protected spaces, with new visions, learning processes, supportive networks, potentially with the alignment of the required elements, may end in socio-technical transition (Geels, 2012; Mäkinen et al., 2015).

Bearing in mind that within transport studies, public transport, walking and cycling are rather considered subaltern regimes, the concept of path creation in the context of this study is used to refer to innovations or developments that allow the reinforcement of these subaltern regimes towards sustainability.

2.2.8 Path destabilization

Within transitions path destabilization is understood as processes that are introducing changes in regimes rules or withdrawing support to the dominant socio-technical practices or weakening the reproduction of core regime elements, where windows of opportunity may happen (Mäkinen et al., 2015).

2.2.9 Urban Mobility literature

Seeking to do not overlook the spatial features of the urban and mobility transitions, this study uses insights from (sustainable) urban mobility literature and the so-called theory of urban fabrics (TUF) to explore the enablers and barriers of the spatial dimension of mobility. As spatial dimension this study understands those elements that are related with the physical component of the city, this study will refer to the spatial dimension in terms of urban form.

The urban form can be described as the set of physical and spatial structures that result from the interaction between transportation systems, urban design and land use patterns. The urban form is influenced by transport systems, but transport systems are influencing the urban form as well (Rodrigue, Comtois, & Slack, 2013).

The theory of urban fabrics (TUF) is proposed by Newman et al., (2016) and has its foundation on the intricately relationship of the urban form and urban mobility systems. According to the proponents, three urban fabrics can be distinguished in relation to the cities´ transport systems: the original walking urban fabric, the public transport (transit) urban fabric and the motor-car (car) urban fabric. The authors divide the urban fabrics in three, where cycling can be included within the walking urban fabric or as part of the transit fabric, however for this study cycling is consider as an independent fabric at the same levels of others, called cycling urban fabric.

Newman et al., (2016) define urban fabrics as products of transport-related lifestyles and functions which require certain physical elements and environments to enable them. Consequently, each fabric has a particular set of spatial relationships, typology of buildings and specific land-use patterns that are based on their transport infrastructure priorities. The theory suggests that all the cities can be described in terms of the combination of their urban fabrics. Cities are shaped by many historical and geographical features however, transportation may have a great influence in shaping cities due to its relationship with land use patterns.

Each fabric has its own distinctive features, in terms of elements, qualities, lifestyles surrounding them, etc. and are influenced by some features of the city, such its density and land use patterns. Below, a description of some of these features are provided.

Density

The relationship between the density and mobility has been widely discussed among researchers, and several have argued that dense cities tend to be more efficient in many aspects including mobility(Florida, n.d.). Dense cities are attributed to have effective transit systems, the distances between destinations are shorter, the volume of trips is lower enabling multipurpose trips, tend to impose high costs to users of car trips, and lead to multimodal mobility, and the use of car is limited by public transport and non-motorized modes. However, it has been stated by Fusco (2004) that dense cities offer limited urban freeways in combination with high transit, which can be derived in congestion (Fusco, 2004).

Additionally, Fusco, (2004) points out that low dense cities have a low pollution rate per hectare and offer low time consumption for travel. However, this is relative, dispersed cities demand more infrastructure which may lead to pollution, while the time consumption depends on other factors such as land use where the access to some services can be concentrated in one sector of the city leading to congestion, therefore, affecting travel time.

Land use

Land use refers to how the different activities are distributed within the urban territory. Rodrigue et al., (2013) states that two elements are comprising the land use, the nature of land use, which concerns to which activities are developed in what part of the territory, while the second element is what he calls the level of spatial accumulation, which refers to the intensity and concentration of activities. The relation of land use and mobility lies on where the different activities take place and how these activities generate mobility demand.

Currently, the urban fabrics coexist, even though the Modern City concept has led to the dominance of car-oriented approaches, focusing on one kind of urban fabric (car), rather than

three, according to Newman, Kosonen, & Kenworthy, (2016). The car use has been attributed to the boost of urban sprawl and intensive urbanization of suburban areas by allowing faster trips, and encouraging residential decentralization, supporting people to live in a better proximity to nature on the outskirts of cities. In spite of some benefits associated to the use of automobiles, it also has been criticized since it has led to unsustainable patterns. The way how people move and live is conditioned to the car use (Le Néchet, 2012).

Mobility choices and built environment

Transport related decisions are influenced by diverse factors. Regarding cycling and walking as mode of transports Orellana, Daniel, Hermida, Carla, & Osorio, Pablo, (2017) argue that the transport choices are not limited to factors such as time and distance. The built environment plays a key role in the mobility patterns of the population as showed in studies conducted by (Brown et al., 2013; Carlson et al., 2015; Ewing & Cervero, 2010; Lee, Zegras, & Ben-Joseph, 2013). Accessibility, security, comfort, and pleasure are the main factors influencing the mobility decisions in relation to the built environment, according to the work performed by Orellana, Daniel et al., (2017).

Litman, (2017 p. 2) defines accessibility to "(…) people´s ability to reach goods, services, and activities, which is the ultimate goal of most transport activity". However, accessibility in addition should be understood as the ability to reach and use the mobility infrastructure.. Orellana, Daniel et al., (2017) state that a key aspect of accessibility is connectivity regarding to walking and cycling, in terms of continuity of the road and presence of obstacles influence the decision for cycling and walking. Security is influenced by the built environment, in terms of building density, and infrastructure (i.e. lane, sidewalk features, materials, road signs, road illumination). Connectivity and continuity of walking and cycling infrastructure are influencing road safety and perception of security for decision makers, if infrastructure is not accurate designed vulnerability of pedestrians and cyclers increases (Lee et al., 2013; Orellana, Daniel et al., 2017). While pleasure and comfort are related with the travel experience, linked to the aesthetic features of the environment, which is especially relevant for pedestrians and cyclers due to the direct interaction with these features (Orellana, Daniel et al., 2017).

2.3 Theoretical framework

The theories and concepts described in the previous section shape the content of this research. Thus, this research seeks to identify and analyse the political, institutional (including policy strategies) and spatial/geographical factors that are influencing the transition towards a sustainable mobility system. The main theoretical inputs are summarized in Figure 2-2. In the next section, further detail is provided with regards to the application of the theoretical framework.

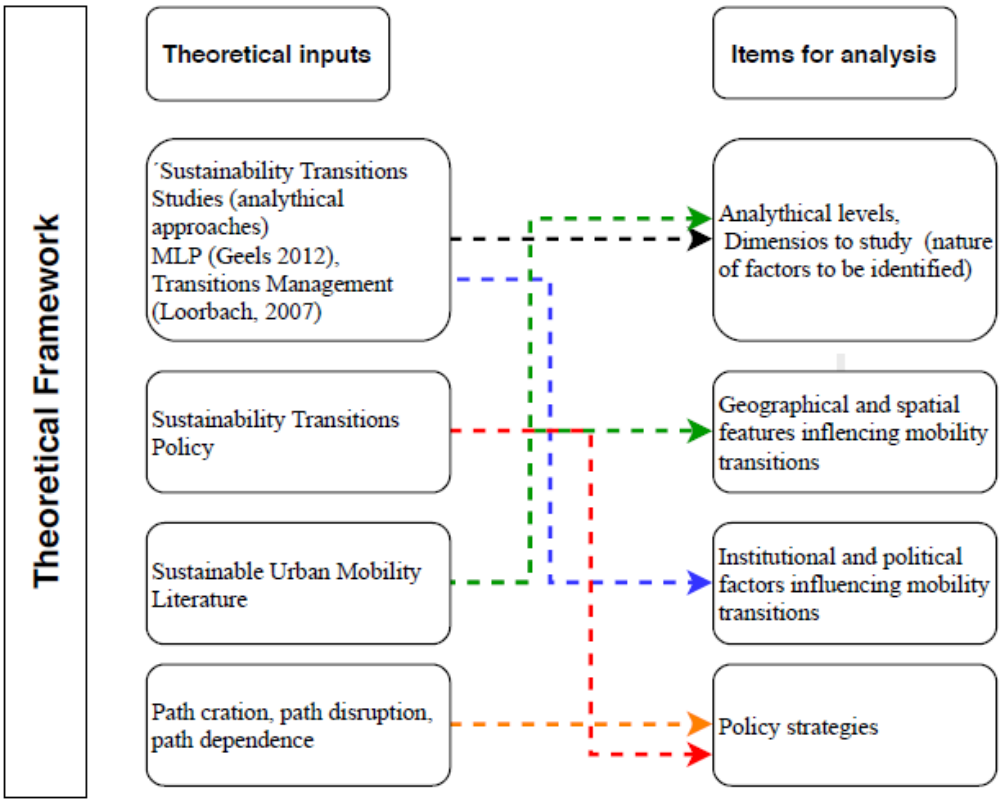

Figure 2-2 Theoretical Framework

Source: Own elaboration

3 Research design and methodology

This section aims to provide detail regarding the research design and steps taken in order to answer the research questions proposed in section 1.2.

3.1 Research design

3.1.1 Research strategy

In order to achieve the overarching aim of this work, a case study has been selected as research strategy. Case studies are characterized by the small number of units of analysis, but for seeking depth analysis of them. In the present work the strategy is a single case study, focusing on the mobility system of Cuenca. The selection of Cuenca as case study, even though obeys to convenience factors (author is a local), the use of this case is considered relevant to the field of study that this work relies on. First, as mentioned the relevance of intermediate cities has been recognised in the global geopolitical context (UN, Habitat III, n.d.); second, there is a need to study transitions at local level, as indicated in the research problem; third, it has been argued that there is a lack of attention in the field of sustainability transitions studies to developing contexts (Loorbach et al., 2017), and finally the city has been chosen for implementing diverse pilot projects in the context of intermediate cities at regional level, since it is considered as a case that can offered guidelines, ideas for governance for intermediate cities (Orellana, D, personal communication, 2018, June, 26, hereinafter I1).

Case study as research strategy relies on three types of data: on site observation, interview and document analysis (Verschuren, Doorewaard, & Mellion, 2010). Due to the approach of this research (socio-institutional approach) the on-site observation was not performed; indeed, the research was conducted from Sweden. Regarding the spatial features of the city shaping and shaped by the mobility system, this research relied mainly on previous academic studies and official (local government) documents. Further detail about the data gathering process is described below.

3.2 Methodology

The process of this research is deductive, therefore, first through desk research the relevant theories were selected, and the theoretical framework was built, in order to guide the data collection process, which is explained in the following sections. Figure 3-1 presents a simplified model of the methodology applied in this study.

3.2.1 Data collection

Preliminary desk research regarding the mobility system in Cuenca, was performed through media press and academic articles review. In parallel desk research was performed in order to build the theoretical framework, using research engines such as 'Google', 'Google Scholar', and LUBSearch, where terms and combination of terms such as "urban mobility", "sustainable mobility", "sustainable transitions" "policy", were consulted. Thus, scientific articles published in diverse academic journals were revised. Digital and printed books were also consulted. This process guided to the selection of insights from sustainable transitions studies to build the theorical framework in addition to concepts from urban mobility and sustainable mobility literature.

Once the theoretical framework was elaborated, the data collection took place through interviews and document review.

Interviews:

3.2.1.1.1 Interviewees selection

Interviewees were selected based on previous knowledge of the author, who as a local selected some actors from diverse sectors, and other interviewees were identified during the process of data collection (interviews and document review). Acknowledging the multi-actor nature of the transition processes, in total 10 interviews were performed with actors from different sectors. Table 3-1 provides details of the interviews performed, with the identification of the actors and other relevant information.

3.2.1.1.2 Interviews features

Semi- structured interviews were performed, previous of which an interview guideline was elaborated based on the theoretical framework (See Appendix A).The interviewees were asked about their perception regarding the mobility system in the city, what are the challenges perceived by them, the same as the features of the city that may allow a transition towards a sustainable mobility system. Depending on the role of the interviewees, further specific questions were asked.

The interviews were conducted by the so-called VoIP technologies which allows communication in real time and face to face interactions (Lo Iacono, Symonds, & Brown, 2016), like Skype. These options may pose some limitations and ethical issues related with confidentiality- anonymity, privacy, and consent. The lack of direct interaction may also influence the control of the interview, and the ability to read body language.

The interviewees were contacted first via email (8) and text message (2) for coordinating the date and logistics (format) of the interview. In order to address the potential limitations that the VoIP methods can pose, during the interviews, the interviewees were informed and asked about confidentiality issues. The interviews were performed in Spanish, informing the interviewees that the thesis is written in English, therefore the use of interviews material needs to be translated.

The interviews were performed mainly through videoconference, although due to some technical issues some were performed only using audio (phone), while one of them took place through voice and text messages. Table 3-1 summarizes the interviews details.

Table 3-1Interviews details

Interviewee information				Interview details			
Name	**Position**	**Institution**	**Sector**	**Date**	**Time**	**Format**	**Reference in text**
Orellana, D	Researcher	Llactalab Research Center	Academia	2018, June 26	0:53:36	Videoconference	I1
Castro, A	Director	Empresa Pública de Movilidad, de Cuenca, (EMOV EP) (Mobility Agency)	Local government	2018, July 16	0:51:49	Videoconference	I2
López, J	Activist	Bici Cuenca	Civil society	2018, July 16	01:17:58	Phone	I3
Idrovo, A	Project Coordinator BiciEscuela, in partnership with EMOV EP and GIZ	Mujeres en Bici	Civil society	2018, July 17	00:18:34	Phone	I4
Cárdenas, D	Coordinator of the Mobility Division in the local government	Local government		2018, July 22	01:56:13	Videoconference	I5
Mancheno, P	Expert in Mobility and Coordinator for the elaboration of the Mobility Plan	Currently working at EMOV EP	Mobility Expert	2018, July 24	01:05:13	Phone	I6
Espinoza, J	Researcher	University of Cuenca	Academia	2018, July 24	00:58:40	Phone	I7
Avila, M	City Council Member	Local government		2018, July 26	00:48:08	Videoconference	I8
Velasco, A	Representative of the project "Sustainable Intermediate Cities" (SIS)	GIZ (International Development Agency for Sustainable Development)	International Cooperation	2018, July 26	00:34:07	Phone	I9

Source: Own elaboration

Document review

Qualitative and quantitative data comes from secondary data, such as relevant academic articles, reports, minutes and planning documents, accessed mainly through digital search. Academic documents that have as object of study the city of Cuenca, in topics related to mobility, urban issues, sustainability, were consulted. These documents were searched and identified, through web search engines, including google scholar, in addition to databases accessed through LubSearch, and digital academic repositories of the local (Cuenca) universities.

Additionally, the data collection includes information from reports and studies conducted by third parties related with the local context, such reports issued by international organisms (i.e. Interamerican Development Bank). National and local policy and planning documents were used also as source of information, accessed mainly through digital search, in web pages of the local government.

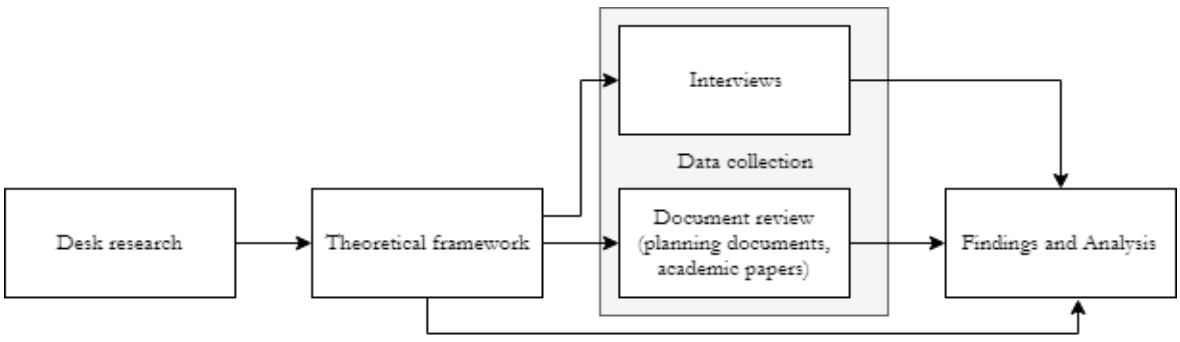

Figure 3-1 Methodology summary

Source: Own elaboration

3.2.2 Data analysis

As indicated in the literature review section, the analytical approach of this work relies mainly in the multilevel perspective (MLP) and transition management (TM) approaches. The first one is well known for being a heuristic framework that calls for creative interpretation of the researcher, therefore interpretation was unavoidable. First, interpretation of the MLP and TM insights took place in order to define the levels of analysis for this work, 5 levels were identified, which are explained below.

The interviews were recorded, and its content were allocated in different categories, according to the different analytical levels, and dimensions (see next section). The document review, including scientific documents, followed the same process.

Levels and actors

In line with Loobarch (2007) and Geels 2012, as explained in sections 2.2.2 and 2.2.3, the following levels are established in this study.

3.2.2.1.1 System specific level and regime (s) level

First, the core of the analysis is the system specific level, restricted to the material component of the mobility the transport systems. This level of analysis allows to set up the boundary of the system (not of the analysis) in order to allow the differentiation of the internal dynamics of the system, and the interactions of the system with those elements from the external environment. Only for analytical purposes, local decision makers are the foci actor of the system, and mobility systems users. Looking the governance of the system form a top-down approach.

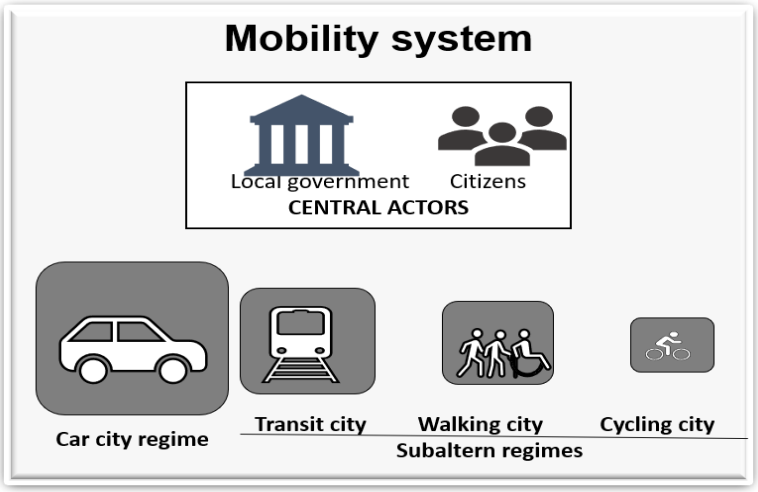

Figure 3-2 Mobility system

Source: Own elaboration, built on Geels, (2002), Loobarcch (2007)

Within the system specific level, the regime (s) are located. Four regimes are placed at the system level, the car city, transit city, walking city and cycling city. The later three are the ones that need to emerge for achieving a low carbon transition. Thus, this study relies on the assumption that barriers are all those factors that are reinforcing the car city regime, while

enablers are those which are destabilizing it and/or supporting the emergence of the transit city, walking city and cycling city subaltern regimes. The system elements reinforcing the car city are considered as regime stabilizers or lock-ins, while those that are threatening the stability of the dominant regime are called regime cracks. The elements placed on this level come from the system specific actors.

3.2.2.1.2 Landscape level

In order to be able to clearly differentiate the landscape from the other levels, this study understands as exogenous elements those that come from other societal systems, from macro political and macro- economic and macro institutional dimensions. For the specific case of policy at landscape level, this study follows the interpretation done by Upham, Kivimaa, Mickwitz, & Åstrand, (2014) who understand as landscape policy instruments those horizontal top-level policies, the same as policies from other domains. In addition, the visions, and actions from actors outside the mobility system are placed within this level, bearing in mind that these visions and actions are influencing it either by supporting the regime stability or threatening it.

3.2.2.1.3 Urban form level

The "Urban form level" is placed between the system level and landscape level. This level aims to describe those elements related to the urban form, and physical infrastructure which due to their relevance are placed in a separate level from the landscape level but are directly influencing the mobility system. The actors of this level are the same ones of the system-specific level.

3.2.2.1.4 Niche level

As mentioned, the niche level comprises those novel practices and technologies that seek to get momentum within the system, reconfiguration it. However, for the purpose of this work, following the premise that walking, public transport and cycling are not novel practices, this work treats them as subaltern regimes, rather than niches. In this sense, the niche level encompasses those developments (social and technical) that seek to support the cycling, walking and public transport city subaltern regimes. However, this study does not focus on this level.

Figure 3-3 illustrates the levels that are analysed in this work, where the niche level is not included. The arrows show the relationship between the different levels. The landscape pressures influence the system specific-level (Regime and subaltern regimes), by reinforcing (orange arrow) the regime or by destabilizing it, supporting (blue arrow) the further development of the subaltern regimes towards a more sustainable system. The dual relationship of the urban form and the mobility system is illustrated by the bidirectional arrows.

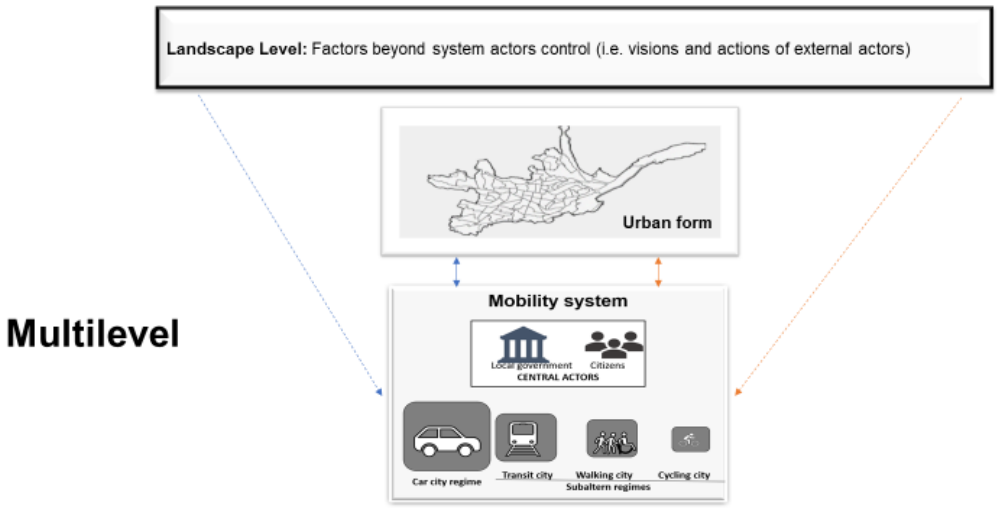

Figure 3-3 Levels of analysis

Source: Own elaboration

The results identified from the document review and the interviews, were allocated within the different levels of analysis. Then, an analysis was performed based on the theoretical framework. In relation to the institutional and political factors, the analysis was performed with those components from the theoretical framework related with sustainable transitions theory insights and concepts of path creation, path disruption and path dependency. The urban form level in addition was analysed based on insights of sustainable mobility literature, including the TUF. Furthermore, when analysing the formal dimension of the system-specific level, insights from policy innovation, and sustainable transitions policy were used.

Dimensions

The socio-institutional approach leads to look at social structures and institutions influencing the dynamic of the system. Therefore, it seeks to identify factors of political and institutional nature. Below a description of each of these dimensions is provided, which allowed to categorize the findings of this study. Figure 3-4 illustrates the dimensions analysed in this work. The factors that belong to the spatial dimensions were placed in the "urban form" level.

3.2.2.1.5 Political

The political dimension encompasses those factors related the visions of the different steering documents identified, that are influencing the mobility system, that obey to determined political moments (i.e.: planning documents at national and local scale). Additionally, all the factors related with relations of power and visions of policymakers at top level were placed within this dimension.

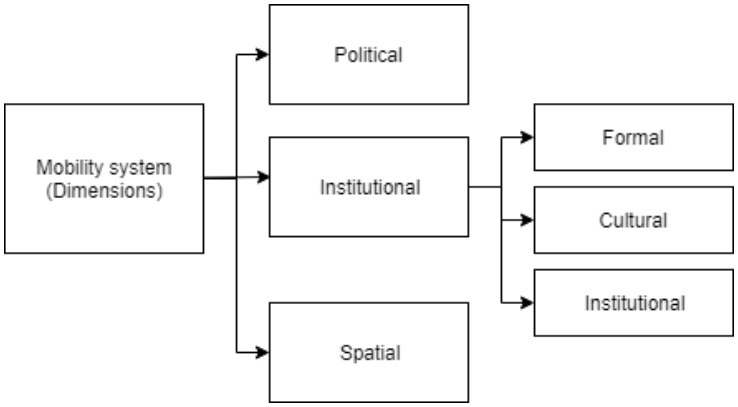

Figure 3-4 Dimensions analyzed in this work

Source: Own elaboration

3.2.2.1.6 Institutional

Institutional factors are derived from social and formal institutions. Thus, they are divided in cultural, formal and institutional (built on Hinnen, (2015))

3.2.2.1.6.1 *Cultural*

Cultural factors are understood as those related with visions, beliefs, perceptions and attitudes imbedded among social actors (i.e. perception of public transport)

3.2.2.1.6.2 *Formal*

Formal factors are those related with visions, skills and outcomes from governmental bodies and legal frameworks (i.e. technical capacity, policy instruments). Within this level, the policy instruments were assessed by their potential to steer change towards more sustainable mobility, based on previous work by (Mäkinen et al., 2015)

3.2.2.1.6.2.1 Policy strategies analysis

The different policy strategies brought up by interviewees, were analyzed by the following framework:

Table 3-2 Policy Analytical framework

Indicator	**Path dependence**	**Path creation**	**Path destabilisation**
Vision behind policy instrument	Support for established structures car city regime	Visions of innovative low-carbon mobility technologies, practices and structures	Withdrawing support for elements of the car city regime
Presence of learning	Policy based on previous knowledge	Attempts to learn, e.g. new ways of doing things, including policy innovations/experiments	Questioning existing beliefs and knowledge
Type of networking	Existing networks of policymakers, implementers and users	Creation of new networks	Restructuring of networks of policymakers, implementers and users

Adapted from: (Mäkinen et al., 2015)

3.2.2.1.6.3 *Institutional*

The term institutional is used to refer to visions, beliefs and actions from actors different from governmental actors, and society, (i.e. vision or goal of a project, perception from third parties in relation to mobility).

3.2.2.1.7 Spatial

Factors that fit under the spatial dimension, are those that are related with the physical infrastructure and territorial features of the city. These factors were allocated within the urban form level. Institutional factors are also affecting this level; therefore, they are included as well.

Data analysis summary

Recalling the nature of transitions (multidimensional and multilevel) as above described, Figure 3-5 Levels and dimensions of analysisFigure 3-5 illustrates the categories by which the data collected was allocated and analysed in this work.

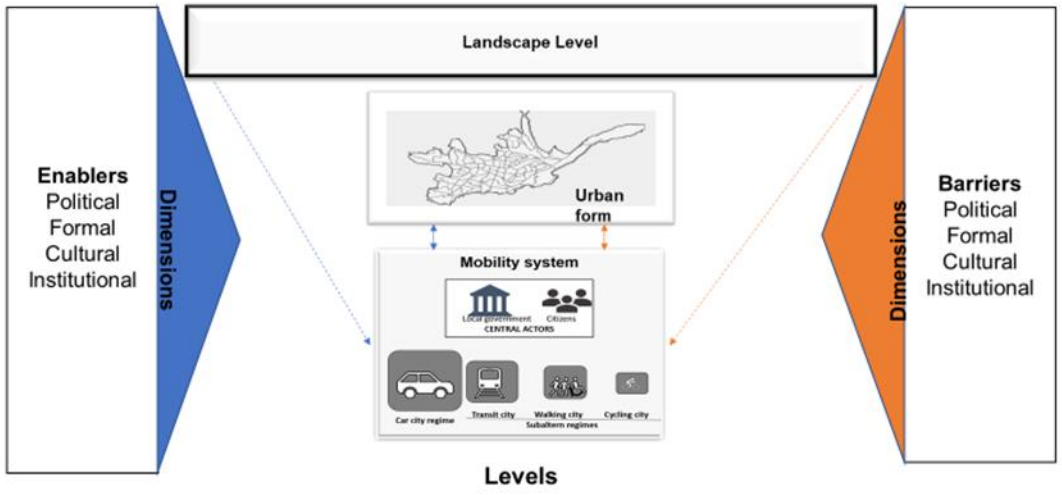

Figure 3-5 Levels and dimensions of analysis

Source: Own elaboration

4 Results and analysis

Previous to report the results regarding barriers and drivers it is necessary to provide further information about Cuenca, as case study. Section 4.1.1 provides that information. Section 4.2.1 presents the enablers (destabilizing regime pressures) and barriers (stabilizing regime pressures) at landscape level, section 4.2.2 illustrates the barriers and enablers in relation to the spatial dimension, while 4.3 presents the results of the enablers (regime cracks) and barriers(regime stabilizing factors) at the internal level of the system. Section 4.4 indicate the main actors of the system under study.

The results of both interviews and document review are reported together. The interviews are referenced as I1 to I9, according to the Table 3-1.

4.1 Mobility system in Cuenca

4.1.1 Background information

In Latin America and Caribe, according to Terraza, Rubio Blanco, & Vera, (2016), intermediate cities of the region inter alia, are facing an unconsolidated, disorganized and discontinue urban growth, they tend to be monocentric, residential land use replaced by commercial and service land use, resulting in increasing CO2 emissions due to mobility patterns and unnecessary increment of the urban print.

Cuenca is an intermediate city located in the southern part of Ecuador. It is the capital of the Azuay province and the third most important city of the country. The total area of Cuenca is 366,532.96 hectares formed by 21 rural district and 15 urban districts forming the Cuenca canton. Cuenca´s population is about 505,585 inhabitants according to the last statistical study conducted in 2010. Around 66% of the population lives in the urban area while 34% are distributed among the 21 rural districts. (Municipio de Cuenca, 2015a). The focus of the study is the urban area.

The city of Cuenca, as most of the intermediate cities in Latin America, has mobility as one of its main challenges. Orellana, D, (I1) researcher at the University of Cuenca, states that Cuenca can be compare with a teenager, who is facing changes, for one side sees itself growing, looking forward to being independent, but at the same time, still depends on the central government. The decisions taking now will mark the future of the city in the next 100 years, like a person whose decisions taken as teenager quite likely will mark the adulthood.

The biggest source of GHG emissions in the city is the transport sector, where the public transport (buses) is the main source of emissions, partly because of the low standards at national level, that allow high emission levels and the bad quality of the fuels (I8, TIEMPO, 2018).

In 2011, the city of Cuenca, approved the Development Plan (hereinafter PDOT) under the new planning system approved in 2008 by the latest Ecuadorian constitution. The PDOT was updated in 2015, after the last local government was elected. The document is the overall steering document that includes a diagnostic of the problems of the city where mobility is identified as one of the critical ones.

Diverse studies conducted by third parties and the local government have identified that one of the key challenges of the city it is the disorganized and disperse urban growth, which has enabled increasing mobility demand, looking at private car as an ideal option (Terraza, Beltrán,

& Orbea, 2014). In part this is due to the higher prices of urban land, encouraging people to move towards peri urban and rural areas, this dispersion results in low density and posing difficulties to the provision of public transport, and inadequate mobility patterns within the urban area (Municipio de Cuenca, 2015a).

M. A. Hermida, Hermida, Cabrera, & Calle, (2015) argue that still the city does not face intensely the negative effects of the urban growth model, for being an intermediate city, however it is providing signals that these growth model needs to change.

The mobility in Cuenca is predominantly motorized, relying on public bus systems and private car use. The public transport is used by the majority of the population with 43%, 36% of the population use private car, 16% moves by walking, motorbikes are used by 2% , and bikes users represent 2% as well, while 1 % uses taxi (Municipio de Cuenca, 2015b). Figure 4-1 shows the percentage of users in relation of each transport mode.

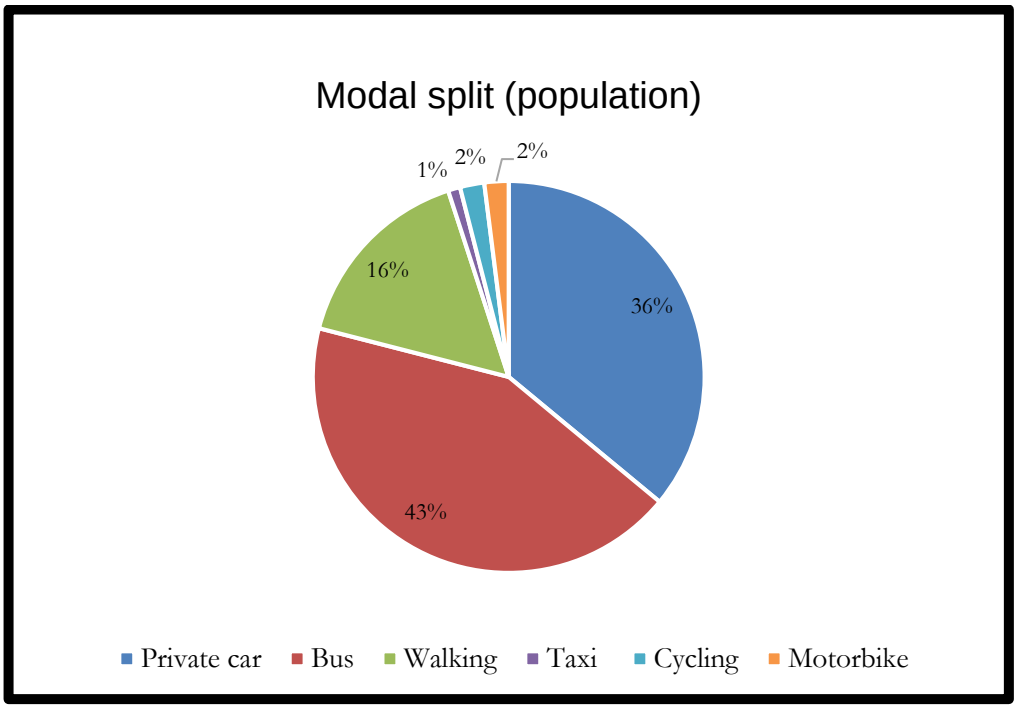

Figure 4-1 Transport mode use.

Source: Adapted from (Municipio de Cuenca, 2015b)

However, in relation to the number of trips performed within the city (approximately 600.000), around 69% of the trips take place through motorized modes of transport, while the 31 % correspond to walking and biking trips. From the motorized share, private car trips represent the 32%, while bus trips account for 31, 4% take place by taxi, and 0,4% by motorbike. From the total trips less than 1 % are done by bike and the remaining 1% by other modes. (EMOV EP, 2017; Municipio de Cuenca, 2015b)

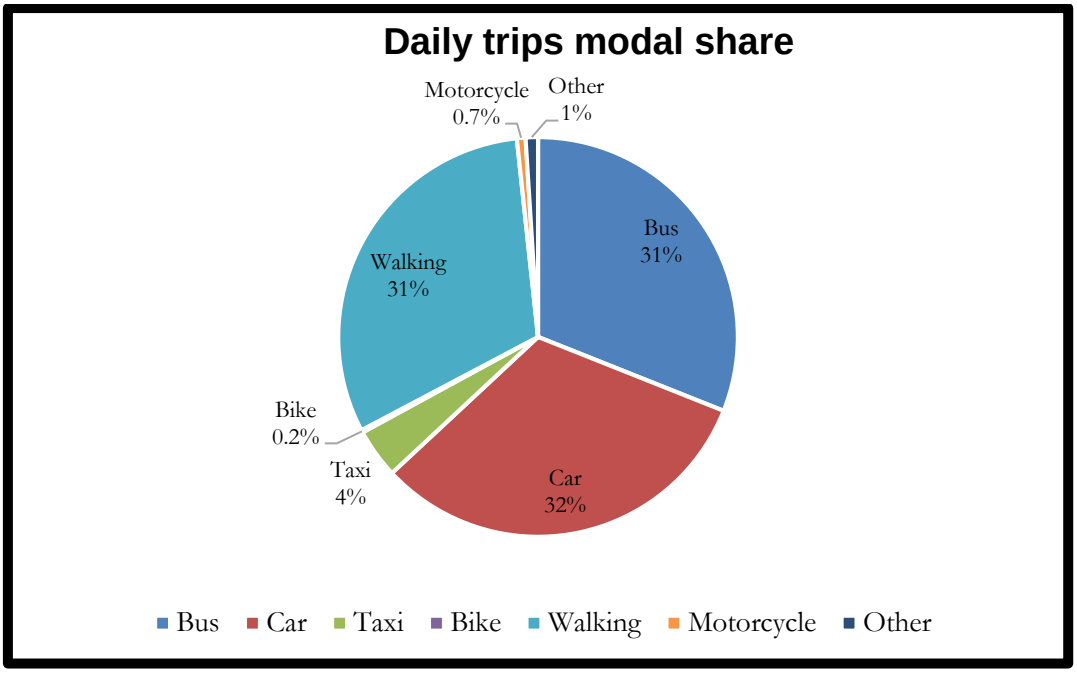

Figure 4-2 Mobility patterns of Cuenca by mode of transport.

Source: Adapted from: (EMOV EP, 2017; Municipio de Cuenca, 2015b)

The private car fleet is around 130.00 vehicles, and has present growth rate between 13 and 15% during 2013 and 2015 per year (Mejía & Morocho, 2016). While the population growth rate is about 2 % (Terraza et al., 2014). The share of vehicles circulating within the city is dominated by private car. Until 2014, 90,8% of vehicles corresponded to private cars, followed by 2,70% of buses, and the remaining percent to other vehicles (Municipio de Cuenca, 2015b).

In 2015, a mobility plan of the city was launched (PMEP), which establishes as goal the reduction of 10% of private car use, in a time horizon of 10 years, trips that should be performed through the other modes of transport (Municipio de Cuenca, 2015b). Even though, this plan has not been formally approved, for the purpose of this study is considered as reference document. The formal approval of the plan is analysed and discussed in the following sections. Furthermore, both planning documents PDOT and PMEP establish the need to the further development and boost of low carbon mobility. In the last years attempts to address mobility issues have been reflected in few interventions, some of them will be analysed in this work.

4.2 Enablers and Barriers for low carbon mobility

4.2.1 Landscape

The following section describes those external factors identified through interviews and document review. The results are divided in destabilizing pressures of the regime, interpreted as those which have potential and/or are influencing the reinforcement of the structures of the walking city, cycling city and transit city, enabling them to gain momentum, looking towards a reconfiguration of the mobility system. The second set of results are categorized as stabilizing factors, which are preventing that the subaltern regimes (walking city, cycling city and transit city) gain space and rather are reinforcing the car city regime.

Destabilizing pressures

4.2.1.1.1 Political dimension

At national scale the following instruments have been identified as policy and regulations influencing the mobility system under study. At national level the most relevant instrument is the Constitution, that is the overall steering document guiding the state. In this sense, the last Ecuadorian Constitution in force since 2008, has established as its development principle, the approach known as *Buen Vivir (Spanish), Sumak Kawsay (Kichwa[5]), Living Well (English)*. This domestic development approach sees mobility (transport) as strategic sector [6] which must follow among others sustainability and efficiency criteria. Additionally, the Constitution states that the State must adopt climate change mitigation strategies for reducing the GHG emissions, and should promote energy efficiency, and the development and use of sustainable practices and technologies. The diverse levels of government should promote and enable non-motorized transport systems, especially through cycling infrastructure, and also public transport. (Constitution, 2008, art. 413, art. 414, art. 415).

At national level, as broader planning instrument integrating the landscape of the mobility system, is the National Development Plan (NDP), which is the steering document that the central government develop for its period of governance, demanding that local governments align their planning documents under this framework.

The last National Development Plan was approved for the period 2017-2021. Regarding with mobility and transport it includes as public policy the promotion of inclusive, sustainable mobility, prioritizing public transport systems quality and efficiency and the non-motorized mobility. Additionally, according to the plan the alternative transport (in our understanding refers to the sustainable modes of transport), by planning cities shifting its focus from the automobile system. ("Plan Nacional de Desarrollo 2017-2021 'Toda una Vida,'" 2017).

At national level, there are some public policies that are influencing positively mobility patterns, according to I8, like the public education service, that organize the provision of the service based on the residence place of students, however that only is mandatory for the public education.

At local level the Development and Zoning Plan (PDOT) is the overall steering document guiding the planning at local level. It foresees the development of the city until 2030, identifying and establishing the main areas to intervene at local level, stating short, medium and long-term goals and strategies. The vision of the plan includes sustainability as key component of the local development. Furthermore, recognizes the need to implement policy strategies to address the different local challenges such as urban growth, climate change adaptation and mitigation, and energy systems (Municipio de Cuenca, 2015a).

4.2.1.1.2 Institutional dimension

The institutional dimension of the landscape level is understood as the set of values, visions and trends that are shaping the course of action of the different social institutions at any scale

[5] Kichwa is one of the languages spoken by some indigenous communities

[6] Strategic sectors in the Ecuadorian system are those sectors which its relevance and magnitude greatly influence the economic, social, environmental and political dimensions (Constitution, 2008), art. 313.

and those formal institutions different form the local government that exert pressure through the development of different kind of projects.

4.2.1.1.2.1 *Local actors' visions*

In the first group of results, the visions of non-governmental sectors that are pursuing changes in the system towards sustainable mobility are illustrated.

4.2.1.1.2.1.1 Academia

Regarding with Academia, a representative of this sector highlights the role of the academia regarding sustainability. Recalling, the three areas of action of academia: education, research, and civic community engagement, I7states that sustainability should be a cross cutting element of academia, now this approach is getting momentum in the local context. Through education, academia is responsible for shaping professional with skills and criteria for addressing sustainability issues, while in the research area academia generates data, and propose social changes (I7, I1). However, in terms of civic engagement academia faces some challenges on getting third parties (mainly private sector) for developing projects together (lack of engagement), although through education and research the civic engagement can be boost (I7). In terms of research, one of the research centres that has been cooperating with local government is the Llactalab Research Centre, as recognized by interviewees from the local government and international cooperation sectors (I2, I5, I8, I9). The main purpose of this centre is the generation of scientific evidence to support the tackle of the cities´ challenges like urban growth, resources constraint, quality of life, social equity (I1).

4.2.1.1.2.1.2 Civil society

Regarding with civil society, visions such as the ones from Organizations like Mujeres en Bici (Women in bike), that started as recreational initiative, however according to its representative (I4), the vision of the organization is wider now, by promoting the bicycle as a mode of transport. This shift in the approach of the organization, according to its representative obeys to a citizen duty, thus, they aim to promote cycling mobility by diverse of initiatives, like awareness campaigns. Currently, the organization is cooperating with other organizations (The local Mobility Agency hereinafter EMOV EP and GIZ) in projects that aim to promote cycling among women and children.

Within the civil society, the vision towards sustainable mobility of activists such as one of the interviewees (I3) are considered as destabilizing pressures as well. I3, has been enrolled in citizen activism in terms of sustainability in diverse ways, through BiciCuenca, in order to promote cycling. Additionally, the activism has advocated the improvement of the public transport service and walking as modes of transport.

4.2.1.1.2.2 *Regional and international institutional pressures*

The second group of results in relation to the institutional destabilizing pressures are the visions of third parties from the regional and global context that have influenced and are influencing the mobility system. During the interviews (I1, I9, I8, I6, I5, I2) the role of organizations such as international cooperation institutions was highlighted. The interviewees mentioned a range of projects that seek to support sustainable development at local level, highlighting the role of the mobility systems within this process.

Institutions like international development agencies that promote sustainability, have been influencing and pursuing change towards sustainable mobility. In cooperation with the local government some projects have been developed such as: a) the development of the Mobility

Plan, that results from the cooperation between the local government and the Spanish institution "Junta de Andalucía", b) the development of the Action Plan of Cuenca within the project called " Emerging Sustainable Cities" led by the Interamerican Development Bank (IDB), that concludes that one of the key challenges of the city is the mobility sector, demanding for improvements in the public transport sector and the strengthening of non-motorized mobility (Terraza et al., 2014).

Currently, the city is cooperating with the Latin American Development Bank (CAF) in the project "Footprint of Cities" that seeks to reduce the carbon footprint in the city. Requena, B (2017), representative of the CAF, states that the mobility system in Cuenca is inefficient, highlighting as one of the key issues the rate of growth of the private car fleet[7], recognizing that the city needs to provide alternatives for transport modes for discouraging the demand of car use. The project seeks to enhance the development of public policies, projects and programmes for achieving a reduction of GHG emissions. In exchange access to financial aid from international organisms is offered through sustainable finance programs, as stated by the representative of the CAF (Requena, B, 2017).

The program "Sustainable Intermediate Cities" developed by the German Technical Cooperation (GIZ), seeks to support intermediate cities towards sustainability. Cuenca is one of the partnerships of the program, where mobility was selected for being addressed within the project, due to the challenges that the sector is facing. The representative of the project (I9), highlights that one of the main objectives of the project is to influence in the public policy context to enhance the generation of policy instruments towards low carbon mobility.

Landscape stabilizing pressures

Within this level, some of the interviewees pointed out issues related with national political and economic context. Three major issues were identified that are supporting the car city regime:

4.2.1.1.3 Disconnection between the national and local context:

According to some of the interviews, there is a lack of coherence between the mobility state actors at national level and the local context. An example of this was illustrated by one of the interviewees (I1) who illustrates for instance when the National Mobility Authority required that all the buses at national level should offer bicycle racks, while at local level still there is no proper cycling infrastructure. The measure was not successful.

4.2.1.1.4 Lack of stringent regulations and standards in the national context

Connected with the above-mentioned situation, actors from the local government (I2, I5, and I8) see as problematic that at national level, those issues of mobility that are under control of the central government are not stringent. One of them is the conditions for doing the technical revision of private cars and public transport vehicles. While in the main cities of Ecuador (Cuenca, one of them), each year vehicles should pass a technical inspection, in smaller cities the inspection is just visual, and the conditions for obtaining the yearly permit for circulation are less stringent, citizens prefer to get the permit in other cities, creating challenges for the local government for the enforcement of the technical inspection (I1). Related with this at national level the standards of emissions for public transport are lax, causing smoke emissions,

[7] The rate of growth of the car fleet is around 10% per year

affecting the health and discouraging walking, and cycling (I3). The emission standards for public buses have not been revised since 2002, it is an obsolete regulation (I1).

4.2.1.1.5 National political and economic incentives

According to interviewees form the academic and civil society (I1, I3), the financial system and market provides conditions to demand private cars. In Ecuador, the demand of private car is increasing, even though in 2015 and 2016 the sales of new cars decreased compared with previous year. The recovery in 2017, is attributed to the elimination of importing quotas, and the reduction and suppression of charges to cars. These measures were the result of the entry into force of a Trade Agreement with the European Union (AEADE, 2018; Telégrafo, 2018). Furthermore, there is the perception that the financial system, the State through subsidies are providing facilities for the further demand of private vehicles (I 1, I3). Regarding the fossil fuel subsidies, Rivera, (2018) states that is problematic, not only because it is perceived as an enabler for private car use, but also because the high costs that represents to the state. The fossil fuel subsidies were introduced around 40 years ago, and create economic distortion, consumers do not pay the real cost, leading to unsustainable consumption patterns such as buying bigger cars, more cars per household, etc. From an economic efficiency perspective, the subsidies need to be addressed, "(…) it has been a drug which Ecuador has been dependent on for about 40 years". (Rivera, 2018)

Additionally, in terms of resources, I3 states that there is an unequal battle, while the car industry is owned by multinationals, those who advocate for sustainable mobility do not have resources. Furthermore, the aggressive marketing campaigns persuading people about buying cars.

4.2.2 Spatial enablers and barriers for low carbon mobility

This section aims to provide a description of the spatial features of the city that have a stretch relationship with the mobility systems. First, some general features are indicated, followed by a description of the main elements of each of the urban fabrics. The urban fabrics (car city, transit city, walking city, and cycling city) are explained in terms of their spatial features and also complemented with the main factors (i.e. formal and cultural) that are influencing the spatial configuration of the city.

General features

Interviewees perceive that the disorganized growth of the city (I1, I2, I5, I8), leading in unnecessary dispersion, land use patterns (I5, I6), bad infrastructure conditions (I1, I2, I3, I5, I6, I8, I10) are the main spatial factors affecting the mobility.

Cuenca has low density and is a dispersed city. The density[8] rate in the city is 49,9 inhabitants/hectare[2] (Municipio de Cuenca, 2015b). Although according to a study conducted by Hermida, Hermida, Cabrera, & Calle, (2015) the city until 1950 approximately was a compact city which offered good living conditions, that gradually has become in a dispersed city. The first Regulatory Plan for the city, was made in 1947 by the Uruguayan architect Gilberto Gatto Sobral, who had a modernist vision for the city. This vision included the building of a road system with wide streets and avenues to prevent traffic congestion, gave

[8] Newman, Kosonen, & Kenworthy, (2016) argues that the minimun (high) density for walking city is around 100 persons/ha, medium density for transit city min 35persons/ha, while low denistity areas where cities have as the predominant structure the car city are those with low denstity below 35 persons/ha. As reference the optimal density in the rgion (Latin America) is between 60 and 100 inhabitants per hectare.

priority to the car use, the sectorization of the city lead to the increasing distances between resident and work places. (Donoso Correa, Mario Ernesto, 2016; M. A. Hermida et al., 2015). According to a recent study the urban growth rate is the double in comparison with the population growth (Terraza et al., 2014).

The dispersion and disorganized growth of the city are two of the key issues that have enabled and encouraged the use of private car, imposing challenges to the city, not only in terms of mobility but also result in high costs for the city the provision of other services (I5).

Institutional factors influencing the spatial issues

The infrastructure provided by the different institutions that generate mobility demand (workplaces, schools, hospitals, recreational places, services providers, etc.), that encourage car use, by offering facilities for car use. For instance, universities provide all the facilities for car use(I1). Additionally, the distribution of different activities in the city, in terms of land use, some services are concentrated in certain areas, while others lack of them, influencing the mobility demand (I6).

The preferences for housing are influencing the land use and city growth patterns. In this sense the population that have more economic capacity seeks to live outside the city in order to have houses with big green spaces. In addition to the low cost of land in the outer areas compared with the urban zones, as highlighted by (I1, I8).

The urban planning regulations that seek to address the growth and density of the city are not enforced (M. A. Hermida et al., 2015; Municipio de Cuenca, 2015a), in addition, that they need to be updated, the last urban plan of the city was issued in 2003(Municipalidad de Cuenca, 2016).

Walking city

The city business district (CBD) is distributed in the city center and the zone known as "El Ejido" which is the area that concentrates the majority of trips performed by walking. The walking city fabric overlaps with transit city and car city. These zones are characterized by mix land use, where different urban equipment and services are concentrated, leading that residents from these zones move mainly by walking (Municipio de Cuenca, 2015b).

Going outside from the city center, the walking behavior starts declining due to the lack of infrastructure, thus the walking city fabric declines in outer areas (Municipio de Cuenca, 2015b). Within this outer areas, trips are performed by bus or car due to the lack of infrastructure, generating demand of these modes of transport when is not necessary for traveling short distances (I6). Figure 4-3 illustrates the zones with higher (dark blue) and lower

walking trips, the city center is the area with the highest walking trips, while the outer parts walking is lower (light blue).

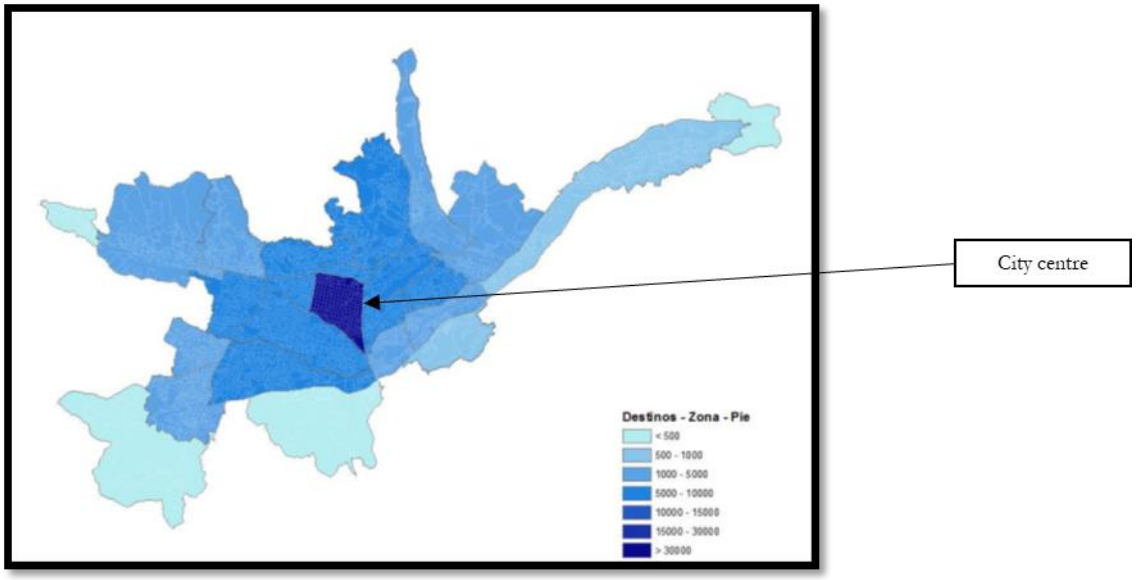

Figure 4-3 Walking trips zones.

Source: Adapted from: (Municipio de Cuenca, 2015b)

According to the diagnostics performed in the Mobility Plan 2015-2025 of Cuenca, the mobility that takes place by walking is performed in spaces which not always have a proper infrastructure. The study suggests that around 60% of the road infrastructure have sidewalks are about 2m wide, fulfilling the minimum requirement in relation to the sidewalk width (minimum 1,5 m) without obstacles. However, the study states that there are spaces that pose unacceptable conditions that are not in line with the national standards. Furthermore, the study highlights the lack of a public policy that enhances the mobility of a pedestrian under secure, accessible and comfort conditions (Municipio de Cuenca, 2015b).

A recent study conducted in the urban area of Cuenca shows that the infrastructure for people with disability (mainly wheelchair users) do not fulfill with the minimum requirements, such as sidewalks without obstacles. The study selected several routes (67 in total) dispersed within the city and suggest that none of the routes achieve 100% of compliance with the current regulations. Only 7 achieve 75% of compliance while 21 routes are in the range of 25 to 50% of compliance. Furthermore, the obstacles for an efficient mobility of the disabled users identified are diverse, including barriers such as the material used, poles, bust stops, hydrants, stairs, ramp, cables, parked vehicles, among others.(Bustos, M.E, Marín, M, & Orellana, D, 2017). However, these obstacles highly interfere in the accessibility and mobility of the disabled population, but also affect other users. Figure 4-4 illustrates the findings of the study conducted by Bustos, M.E et al., (2017), where shows how the infrastructure for non-motorized mobility for the disabled population is limited. The green dots illustrate a high rate of compliance (none 100%) while the yellow, orange and red dots illustrate low rate of compliance, gradually.

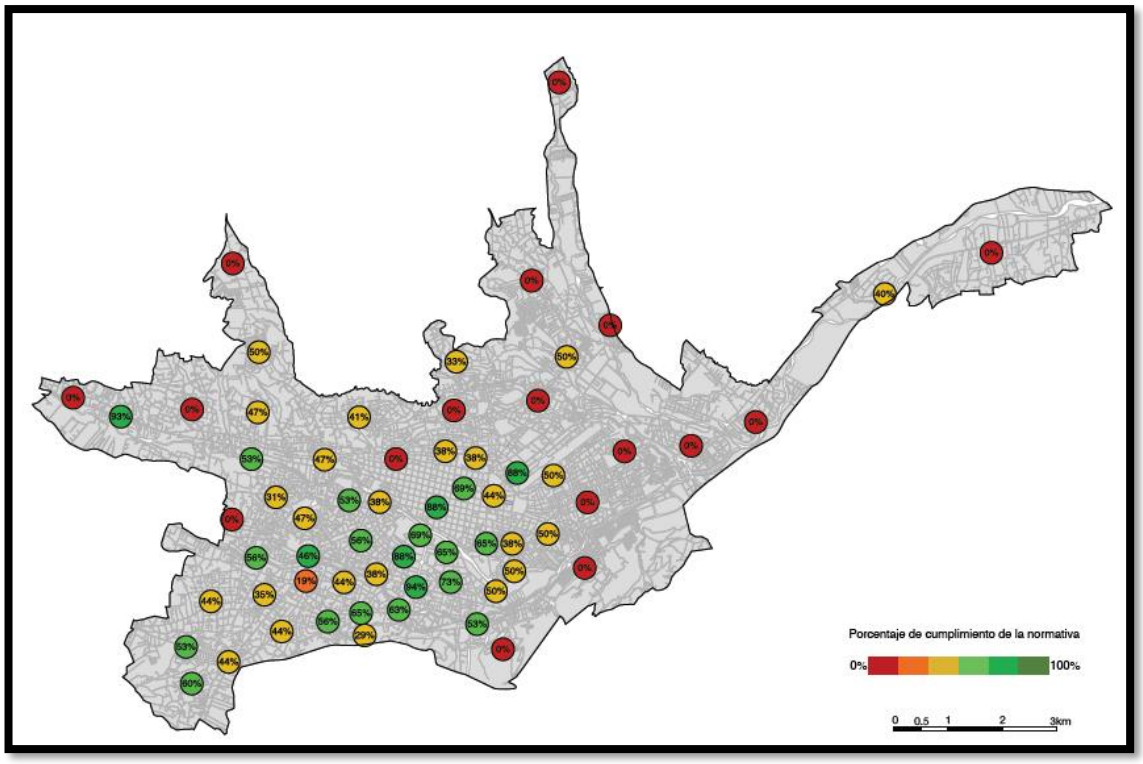

Figure 4-4 Percentage of compliance of infrastructure for the disabled population

Source: Adapted from: (Bustos, M.E et al., 2017)

Cycling city

In 1996, the first bike lane was implemented in Cuenca, although until nowadays is used for recreation. In the last decade, cycling infrastructures started to be built, although it is perceived among some of the interviewees (I1, I3) that the bike lanes lack continuity and connectivity. Even though, they recognized that in the last year (2018) more infrastructure has been provided, it has technical mistakes, that affect the connectivity and safety (I3). The offer until 2014 was about 38 km distributed mainly in shared spaces with pedestrians, with 11,6 km of infrastructure exclusively allocated for cycling (Municipio de Cuenca, 2015b). Furthermore, the bike lanes are concentrated mainly in one area of the city (El Ejido), whereas there are areas that lack completely of cycling infrastructure (I3).

Transit city

In Cuenca, currently, the public transport system relies on the public bus network. Even though, is expected that a tram system starts operating in 2019 (See section Tram building for further detail). The transit fabric covers around 77,5 % of the urban space according to to the PMEP and 92 % of the population has access to the bus service, with bus stops located within 300m of the households. However, the 8% of the population that do not have access to public transport lives in dense zones. In relation to the bus stops, the conditions are not homogenous, while they are further located from the city center, the accessibility of bus stops is lower.

The TUF suggest that low dense and disperse cities tend to have as dominant urban fabric, the car city, especially when there is a lack of public transport infrastructure or service. The dispersion of the city adds complexity to the provision of public transport. This is confirmed

by the Coordinator of the Mobility Division in the local government (I5) who attributes the disorganized growth of the city is posing challenges to the local administration, in terms of further demand of public transport, and with a limited offer which additionally is not efficient at the moment.

Car City

Even though only around 30% of the population use the car as a mode of transport, the urban infrastructure is planned and developed around car dependency (I1, I3, I8). M. A. Hermida, Hermida, Cabrera, & Calle(2015), argue that the city has faced an unnecessary dispersion generating low dense areas, with all the sustainability issues derived from those patterns, reinforcing the car dependence and unsustainable mobility habits.

Regarding parking facilities, is recognized in the PMEP that they are key conditions that enable the use of the private car. In the city can be distinguished parking areas in the public space and those provided within parking buildings owned mainly by third parties, but few also operated by the Municipality. Regarding those parking spots distributed in the public space, there are two modalities: a temporal parking spots and the free parking space. The first one allows parking in the public space a maximum 2 hours period by a fee, mainly distributed within the CBD. While the "free parking" allows parking as long as the user desires without any payment, these parking spots are mainly located in residential areas, located outside the CBD. The parking buildings provided by third persons also distributed mainly in the CBD. The parking facilities providing within buildings, 54% are located in the center, 35% in El Ejido and 10% in the Zone known as "Feria Libre"[9]. Almost half of the facilities located in the city center are not legally authorized. The offer according to the diagnostics performed in the PMEP suggests that parking facilities generates an excess of traffic.

4.3 System-level enablers and barriers

The general perception of the population is that Cuenca is facing challenges within the mobility, sector. Car drivers, public transport users, bike users, and pedestrians feel affected by the mobility (I1). The perception study conducted as part of the Mobility Plan (PMEP) shows that 97% of people surveyed states that the traffic in the city is problematic (Municipio de Cuenca, 2015b).

From the interviews performed to different local actors of Cuenca, there is a common perception that the mobility system of the city is dominated by the private car, in terms of the growth rate of the car fleet in the city (I1, I2, I3, and the resources allocated for it. Even though, approximately only 30% of the population use the car as mode of transport for their daily trips (Municipio de Cuenca, 2015b), more than 70% of the public space and resources are allocated for private car-based mobility as stated by Orellana, D (I1) who additionally argues that this is a " (…) extreme social injustice, meaning that as City we are investing a considerable amount of efforts, resources and space in solving the life just to a third of the population, which is the population sector with better economic conditions, those who own private car (…) The financial system gives all the facilities for buying private cars. (…) Lots of logistic resources allocated for traffic control and management road infrastructure. All these resources are invested for allowing that private car users move in the city in a comfortable and fast way, while the 70% of the population needs to solve the mobility issues by their own."

[9] Feria Libre, is a zone distinguished by its high activity due to the location of one of the biggest markets, surrounded by other facilities

4.3.1 Car city reinforcing factors (low carbon mobility barriers)

Cultural lock-ins

All the interviewees brought cultural factors as a barrier for the low carbon mobility when they were asked about the challenges that the city faces in terms of mobility. Secondary data in addition also highlight cultural factors hindering low carbon mobility. The main cultural barriers are summarized in the following section.

In Cuenca, as cultural lock-ins identified are the socially shared beliefs regarding the private car. The civil society representative (I3) perceives that in Cuenca, the use of car obeys to a cultural perception looking car as a symbol of status. In line with this (I1) from his research experience, argues that the use of a car is linked with cultural and comfort aspects, rather than need, pointing that people who need to move within short distances requiring around ten minutes of walking or public transport use, do not do it, rather, they use the car. In a similar way, the PMEP illustrates that the main reasons why people use the private car is due to comfort reasons and still is a fast mode of transportation.

Those who are currently using public transport do it because they do not have a private car stating that if they have the opportunity they would shift to a private car as mode of transport. Additionally, the experience of car drivers in Cuenca is related mainly with security and freedom (Municipio de Cuenca, 2015b).

From another side, there is a perception that private cars are dominating the public space and car drivers do not respect pedestrians and bike users (I2, I3, I4). In relation to the perception of cycling, I2 and I10 argue that private car users perceived negatively cycling and cycling infrastructures since car drivers feel that cycling interventions are invading their space. While the representative of the City Council (I8), argues that society perceives cycling as a foreign element of the local culture, which implies a challenge for ptomoting ot as mode of transport.

While the representative of the cycling group (I4) argues that one of the main reasons that are limiting the use of bicycle as mode of transport is safety since car drivers do not respect bicycle users. This perception was indicated also by I3, who states that cars do not respect pedestrians and bike users who are the most vulnerable group in the mobility system.

In relation to public transport, it is perceived as insecure (Municipio de Cuenca, 2015b), as inefficient and bad quality in terms of service. While in relation to the physical conditions of the buses, they are perceived as obsolete, the majority of buses are older than ten years, and do not provide facilities for disabled population (I1, I2, I3, I5, I8).

4.3.1.1.1 Formal lock-ins

Interviewees indicate a few factors that are preventing the development of low carbon mobility related with the (no) actions of the local government. This section described the main ones:

4.3.1.1.1.1 *Institutional vision and culture*

Th member of the City Council (I8). argues that one of the weaknesses at local level is the planning approach, even though there are well done planning documents they are not fully integrating the vison of sustainability, in addition that some city planners were professionally formed with other vision of urban planning. Additionally, he states that in spite that some city planning steering documents, the outcomes of them are not consistent, there is a disconnection between planning and actions.

Furthermore, within the local government the institutional culture of sustainable mobility is mainly imbedded among those departments who are dealing with mobility issues (I5). Even though sustainable mobility is part of the public discourse, just few institutional actors are knowledgeable of what it means (I6). Moreover, there is a lack of coherence what is said in the public discourse in relation to sustainability and sustainable mobility and the real actions (I3), while some interventions that will enhance sustainability stay in planning stage (I1). It was stated that some decisionmakers tend to overlook the futures needs of the city (I6).

4.3.1.1.1.2 *Resources*

The Coordinator of the Mobility Dependency of the local government (I5) states that one of the challenges that the local government has limited economic resources, therefore interventions need to be strategic. In addition, human resources are not enough, compared to the workload that demands most of the time for solving daily bureaucratic issues, preventing to shift the attention to issues established in the PMEP (I5).

4.3.1.1.1.3 *Lack of a Mobility Plan and Long-term vision*

The lack of a mobility plan as public policy, has been identified as critical barrier, it is a shared opinion among the interviewees (I1, I3, I6, I8, I9).The current Mobility Plan, (PMEP), has not been formally approved, as it is required in order to be considered a public policy[10], even though, at institutional level (local government) it is used as guideline for the planning and development of strategies, inclusive for building formal regulations (I2, I5, I6, I8, I10). According to the overall city planning document (PDOT) the approval of a Mobility Plan is required. Furthermore, third parties also advocate for the approval of a Mobility Plan for the city as public policy (Terraza et al., 2014).

One of the representatives from the civil society (I3), stated that the interventions in the city regarding mobility, have not obey to a plan. It is necessary to have as public policy a Mobility Master Plan, that enable the expedition of complementary plans. In addition, the lack of long-term planning is an important barrier in the public sphere at national and local level (I7), thus the lack of development and implementation of actions with a long-term perspective.

4.3.1.1.1.4 *Political will and decision making*

The head of the Mobility Agency (I2), despite the lack of formal approval of the PMEP, states that this document is 'The Bible' for the activities of this organization. Although, recognizes that decisions taken in the last period are decisions that should have been taken in the past, many years ago.

Among the interviewees the approval and application of the PMEP represents a high political cost, thus, it is a matter of political will, which may be the consequence of lack of vision and knowledge, and fear among decision makers, who lack of 'urban maturity' (I1, I6 and I8).

When interviewees were asked regarding to who are the key actors for working towards sustainable mobility, it was pointed out that the citizens, specially the new generations are key, due to the level of awareness of environmental issues. However, regarding the role of the private sector, it was pointed out that this sector is not engaged with sustainable mobility(I8) or that is difficult to expect engagement from them, unless economic incentives are provided

[10] Due to the scope and object of a Mobility Plan, by law it requires to be approved, following the formal process stated by law. This process require that the City Council discuss it and approve it. In October 2016, the City Council was merely informed about the plan. However, the formal process of approval has not started (Municipalidad de Cuenca, 2016)

(I6). However, I2 highlight that the private sector has been cooperating with the local government in terms of provision of parking facilities for cycling.

4.3.1.1.1.5 *Political power*

It was pointed out, one of the main barriers is that decisions are taken favouring a small but powerful sector of the city. In this minority are private car users, that represent about 30% of the population (I1, I8), and often are the ones who choose to live in suburban areas in order to satisfy their housing demand (I1). In addition, it was indicated that the pressure exerted by those who feel affected by interventions that enhance cycling in areas where they work or live poses additional challenges (I10).

Regime cracks

The following regime cracks were indicated, when the interviewees were asked about the factors that are contributing or can contribute towards a low carbon mobility.

4.3.1.1.2 Intermediate city

The size of the city was highlighted by the interviewees as key enabler and advantage for enhancing sustainable mobility. Being an intermediate city, implies that the city is growing, however still is manageable (I1, I2, I3, I5, I6, I8, I9). The size of the city provides opportunities to enhance walking and cycling. Comparing with bigger cities and metropolis of the region, the scale and complexity of the mobility challenges are easier to handle (I2). I6, highlights that Cuenca is a city of proximity, walkable and cyclable (I6).

4.3.1.1.3 Culture and Education

Interviewees (I7, I8) point out that the vision and sustainability awareness of young generations provides opportunities to enhance sustainable mobility in Cuenca. Potential outcomes of campaigns targeting children are seen as key enablers for promoting sustainable mobility, according to I6.

4.3.1.1.4 Willingness to bike

The researcher of the LlactaLab Research Center (I1) indicates that in recent studies conducted it was identified that a share of current private car users is willing to shift to cycling as mode of transport, if proper infrastructure and safety conditions are fulfilled. Until, 2014 when the PMEP was elaborated, 0,7% of the daily trips were performed by cycling, currently (until May 2018) according to the representative of the Non- Motorized Mobility Division of the EMOV EP (I10), it increased to 1.3%, who attributes this growth to the new cycling infrastructure built in the city.

4.3.1.1.5 Local government culture

In terms of formal enablers, (I7) highlights that there is a change of culture, how sustainability issues are perceived in the local government. From his experience by working about 10 years ago in the local government, sustainability issues started to be discussed in terms of mobility, however, in the last years important efforts have been made, like in terms of infrastructure (i.e. cycling).

The technical capacity and the vision of some local government actors is emphasised by (I9), indicating that in the local government there are people with technical skills and visions towards sustainable mobility, an example is how this new vision is reflected in the Mobility Plan (PMEP) which is a well-elaborated document.

4.3.2 Policy strategies and instruments

Interviewees mainly from the local government (I2, I5, I6, I8, I10) mentioned several policy strategies that have been developed and others that are in process to be approved, that are seeking to address mobility. This section will briefly describe some of these instruments. In Section 5 the implications of these instruments are discussed.

Mobility Plan

Even though, it is not a formal public policy, the Mobility Plan (PMEP) is considered a well-elaborated document, as indicated in previous sections. The PMEP, seeks to improve the mobility system within the city, but also provides strategies related with the organization of public space. The main strategies proposed in this plan are:

4.3.2.1.1 Intermodal Mobility

This strategy seeks to provide alternatives of modes of transports, that requires an integrated transport system, where the different modes coexist(Municipio de Cuenca, 2015c).

4.3.2.1.2 Inverse Mobility Planning

This strategy suggest that the city planning (urban and mobility), should have as starting and central point pedestrians, followed by bike users, public transport, freight transport and at the private cars as last element (Municipio de Cuenca, 2015c)

4.3.2.1.3 Public space distribution

That allows inter alia the provision of high-quality infrastructure for walking, and cycling, and infrastructure for public transport (i.e. bus stops) traffic calming design, parking spaces in strategic places, etc.(Municipio de Cuenca, 2015c).

Tram building

In 2014, the construction of the first tram line of Cuenca started. The tram project consists of a line about 21 km length, which covers zones with high demand of trips, including the historical centre. The route has 20 stops and is expected that the total route takes 35 minutes. The system is electrically powered. The system has the right of way and will run in a separate lane segregated by a physical barrier in most of the route, except the city centre where the tram lane is not segregated (Terraza et al., 2014). It was expected that the tram started its operation in 2017 (Municipio de Cuenca, 2015b) however, the execution of the project has faced several implementation issues, including legal and technical problems, and high social resistance. Yet (2018) the execution is not finished, although according to the last chronogram is expected that the tram starts operating on March 2019.

Even though, the tram was planned before the development of the PMEP, it sees the tram as a key component of the proposed integrated transport system, to be complemented with the public bus network, and a public bike system (I1, I6, I8)

Among the interviewees the tram project as a technical measure is perceived that can benefit the mobility in the city, in spite of its implementation issues (I1, I3). However, it also was stated that one of the main issues of this strategy, is that it did not obey to an integral mobility planning (I1). Nevertheless, the PMEP additionally, suggest that the fee for using the public

transport also needs to respond to an integrated system (Municipio de Cuenca, 2015b). The cost per trip by tram still is not defined.[11]

One of the challenges of the local government, is to deal with the outcomes of the tram building which as result has enhanced resistance among the citizens, mainly those residents and business owners of the zones where the project is implemented. Due to delays in the execution, the city centre has been affected, inter alia regarding accessibility, where business of the area shut down. Thus, some interventions planned in the PMEP are paused in order to do not cause further affections, as indicated by the Coordinator of Mobility (I5).

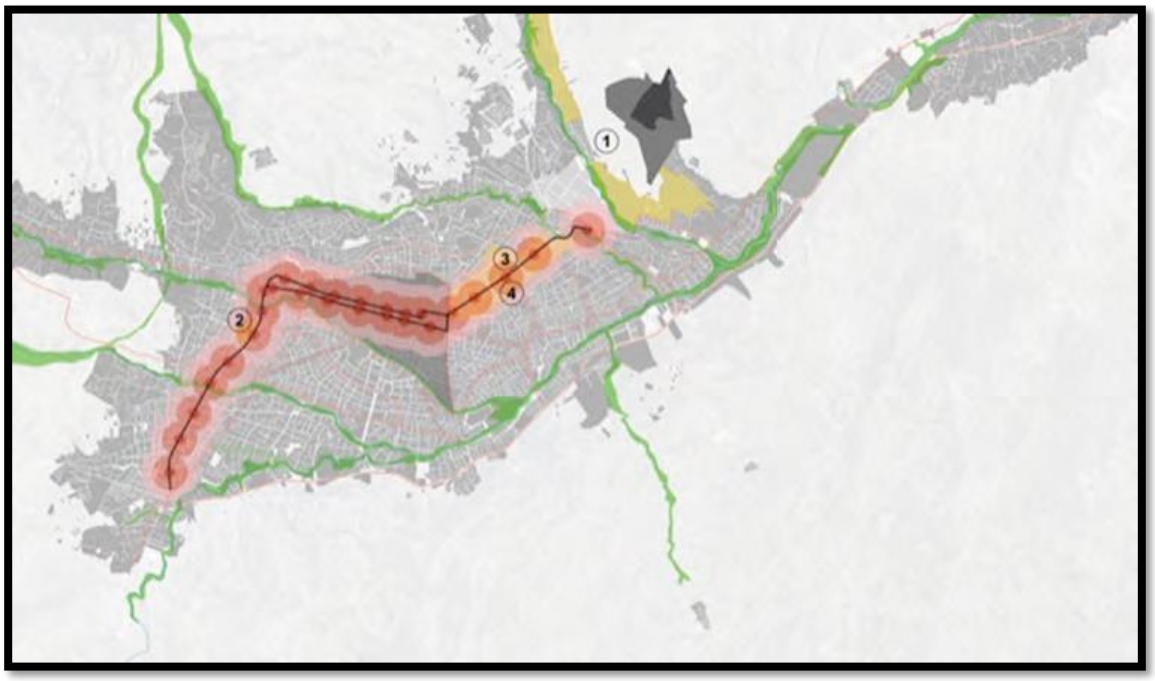

Figure 4-5Tram route (red)

Source: Adapted from (Terraza et al., 2014)

Ordinance for improving the public transport conditions

Currently, the bus system is the only mode integrating the public transport system (is expected that soon the tram and public bike start operating). The system has been recognized as inefficient in terms of the vehicle conditions, but also in terms of service as indicated in the previous section.

Aiming to upgrade the bus system service in July 2018, the local government approved the Ordinance that regulate the improvement of the urban public bus service in Cuenca. This policy instrument has as target group the companies in charge of the operation of the public

[11] According to the Major, the fee per trip will cost betwwen $0.35 and $0.50 depends on the demand. Furthermore, it has been stated by the authorities that a integrated tariff system needs to be implemented for the whole public transport system (bus, tram and bike) once the latter systems start operating.

bus service[12]. The main goal is the improvement of the conditions under which the service is provided, in counterpart the increasing of the service fee.

The improvement of the conditions includes technical conditions, but also minimum requirements related with the quality of the service. The technical conditions (i.e. engine emissions) of the buses aim to reduce the environmental impact from the system, by setting up more stringent performance standards in terms of emissions allowance and life span of the vehicles.

The regulation requires the renovation of the bus units according to the new requirements, which encompasses technological (i.e. engine performance requirements, use of technological and information systems) and accessibility features(i.e. percentage of low floor buses), provision of accurate spaces for vulnerable population (i.e. wheel chairs, elderly, etc), internet service within the bus, mandatory training programs for bus drivers, the establishment of a system for controlling that drivers respect of bus stops, schedules and routes, information systems of bus tops , cameras within the buses, speed control mechanisms, among others.

The regulation includes a coercive regime in case of non-compliance with the conditions. With the entry into force of this regulation the renovation of the buses should take place since November 2018 progressively until 2019.

The regulation requires from the local government the provision of infrastructure that allows the accessibility for disabled population into the buses (i.e. ramps) at the bus stops if needed.

The ordinance for improvement the public transport service, emphasize the use of an electronic card as the only mean of payment.

Public bike

It is expected that at the end of 2018, the public bike system (hereinafter PBS) starts working. The strategy for implementing a public bike system is based in various planning instruments, including the PMEP, the Operative Biking Plan (POB), which is a complementary plan of the PMEP, and other previous studies that suggest the feasibility for the establishment of a public bike system (I10). The POB concludes that the cycling is well positioned in the city but in terms of recreation and sport activity, while as mode of transport rather is not perceived as a prioritized choice (Municipalidad de Cuenca, n.d.) Additionally, is expected that with the implementation of the system, the modal share of bike increases at least to 3% in combination also with the use of private bikes(I10).

The POB identifies as enablers for implementing the PBS the size of the city, the demographic composition in terms of the share of the student population, the fact that 50% of the trips within the city are below 4km of distance (EMOV EP, 2018)

The PBS aims to establish a public bike system within the urban area of Cuenca, by the provision of 240 bikes and the implementation of 20 stations to borrow from and return the bike, additionally aims to generate data concerning the trips done through the system. The spatial distribution of the public bike stations is focused on the CBD, where the share of the car, walking and transit city fabrics are balanced.

[12] The bus service is operated by private companies

The PBS is going to be managed and implemented by a third party under the control and regulation of the EMOV EP, through a public-private partnership. The cost of the service is expected to be equal or lower than the bus cost.

Biking-school

The biking school is a strategy implemented by the EMOV EP, since 2015 which has as its main purpose the promotion of non-motorized modes of transport, through an education al program which has theoretical and practical components.

The project has as specific goals: a) enhance a more responsible mobility habits, b) generate a perception of security regarding the use of bike as mean of transport, c) increase the number of bike users in the city, d) reduce the sedentary lifestyle, e) reduce environmental impacts, f) enhance the coexistence of the use of the different modes of transport, and g) encourage the use of the current biking infrastructure already built in the city.

The target groups are children, teenagers and women; thus, the project is divided in three programs according to the target group. An initial school which is target to children from 5 to 8 years old. The second program is a bike school targeted to children older than 8 years old to teenagers of 17 years old. While working with children and teenagers, it was identified that there is a generational issue, where the mothers of the children and teenagers never had access to cycling, thus a third area of the program was launched called BiciMujer, whose target group is adult woman.

Since 2017 the project started working with public and private schools, and other civil society sectors. The EMOV EP in the last year looked for the possibility to replicate the Bike Schools with the collaboration of different sectors, thus a partnership with GIZ and a local bike initiative Mujeres en Bici, are managing and implementing a Bike School project whose target group are children of low-income groups.

Furthermore, a partnership with the GIZ, has established economic support for the project allocating resources for the development of written material (i.e. manual for bike users, educational guidelines about sustainable mobility).

The Bike School is free of charge and is divided in two components and is a permanent project. The theoretical component is related with traffic regulations, environmental issues, such as climate change, bike fitting and repair, while the practical component focuses on the use of the bike in the bike infrastructure and developing biking skills among participants in relation to urban biking.

4.4 Strategic Actors

Interviewees were asked about who the strategic actors are for achieving sustainable mobility at the city. Among interviewees the following actors were highlighted as strategic.

Academia is perceived as key actor for boosting sustainable mobility (see section 4.2.1.1.2.1.1). Interviewees from local government besides academia, point out, civil society as strategic actor, highlighting that inputs from this sector have been relevant for the development of recent regulations (Ordinance for Active Mobility[13]) (I2).

[13] On May 2018, the mobility agency (EMOV EP) proposed a policy strategy called Mobility for Active Mobility, that seeks to promote walking and cycling. It was developed with the participation of different stakeholders during almost a one-year

Interviewees presented different opinions in relation to the private sector, for one side I2 highlights that this sector is engaged with mobility, cooperating through the provision of parking facilities for bikes and as sponsors of projects led by the local government. While some interviewees (I8 and I6) perceive that private sector, actors are not involved with mobility matters, stating they only get involved when they have economic incentives. The role of international cooperation actors was highlighted as well, by I5, who additionally points out that institutional (local government) actors are important, in terms of cooperation and collaboration between the different local departments (i.e. urban planning and mobility planning).

Furthermore, local government (I1) states that the central government is a strategic actor for sustainable mobility, some challenges depend on matters that are under its control (i.e. standards settings, national regulatory issues).

Moreover, cooperation from multilateral and international development agencies has been mentioned by the interviewees as relevant for enhancing changes in the mobility system, thus they are identified as strategic. Figure 4-6 Summary of actors summarizes the main actors of the system. Bering in mind the analytical framework, the actors are divided into system level actors and external actors. The system level ones comprise the local government, where the top level refers to policy-decision makers, elected to do so through democratic mechanisms (City Council members), while the operational level encompasses those decision makers and employees of the municipality who have as their duty the policy implementation. While the citizens refer to those who decide to move by being car users, public transport users, pedestrians, or bicycle users. The external actors whose course of action takes place at the landscape level.

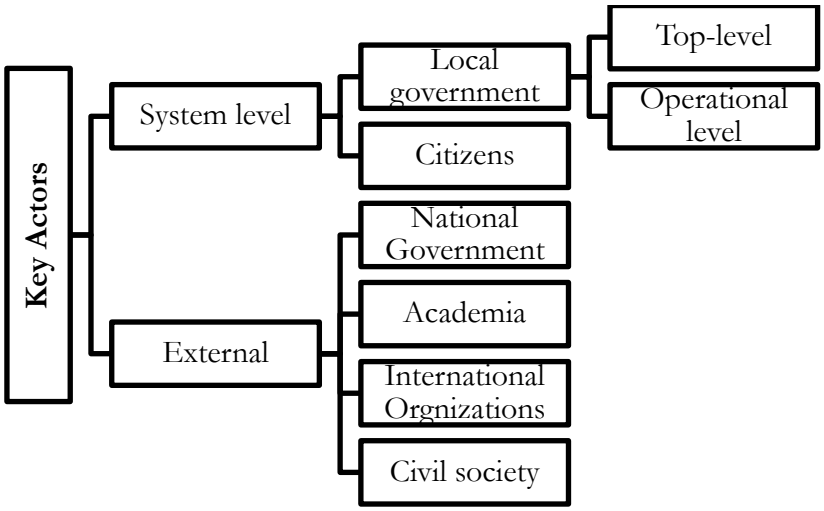

Figure 4-6 Summary of actors

Source: own elaboration

period. However, it was excluded from the analysis since it was proposed by the EMOV and delivered to the local government for the formal process of approval which yet has not started.

5 Discussion

Recalling the aim and RQs proposed in this work this section seeks to answer them by discussing the results presented above, in the context of the theoretical framework established in this research. This study aimed to understand the transition processes within the mobility system in Cuenca, Ecuador, by identifying the major barriers and enablers for the materialization of low carbon mobility, based on interviews and document review.

The socio-institutional approach of the study allowed to identify the embedded cultures, structures, and practices within the mobility system, as source of path dependency in the system, but also allowed to identify institutional and political enablers for the materialization of a low carbon mobility system.

5.1 Transitions as multilevel, multi-actor and multidimension processes

The results show the complex and adaptative nature of a societal system, as mobility. The dynamics of the system are shaped by the interaction of diverse actors, with different views and interests, that have governed the city dynamics. The way how the city has grown is a sign of this, its evolution from a compact city to a disorganized and dispersed one is the result of visions and actions of the local actors. The current mobility patterns are the result of this unsustainable growth, but also are driven by cultural and formal aspects, that are further discussed in this section.

For analytical purposes the mobility system was divided in different levels, in each of them the visions and actions of diverse sectors were identified. The results show the crucial role of the local government for the governance of sustainability transitions, since key factors influencing the transition processes are formal.

5.1.1 Multi-actor

As the results have shown several actors are influencing the dynamic of the mobility system. Actions and lack of them by several actors are reinforcing the system, but also other actors are rather taking action against the system, aiming to change it, through several mechanisms.

The role of state actors is highly relevant in issues like mobility, considering the strategic role that mobility systems plays in relation to economic and social development. Therefore, seems imperative that state decision makers pursue to have efficient and sustainable mobility systems. Bearing in mind the role of policy and policy mixes in sustainability transitions, formal barriers related with policy intervention are critical, the same as policy interventions that are enhancing the reinforcement of the transit city, walking city, and cycling city are fundamental as well.

At the landscape level, actors from the regional and global scale (i.e. development agencies and multilateral organizations) are strategic to exert pressure in the mobility system, through financial mechanisms, considering that one of the issues of the city is the constraint of resources, as stated by institutional actors. The visions of these actors are critical for the origin and enhancement of different novel developments that will reinforce the transit city, cycling city and walking city.

At local level, academia is a key player in the transition process. An important aspect to highlight is how local government actors perceived the role of academia, interviewees appoint out that the collaboration with academia is strategic. The local government highlight the role of academia as provider of scientific evidence, but also as partnership for developing new

projects. Furthermore, as indicated by one of the academia representatives, the role of the university in relation to sustainability is not only limited to research, it also is key for spreading sustainability culture through education.

The landscape pressures destabilizing the car regime are influencing path creation and path destabilization towards low carbon mobility. The visions of academia, civil society, and international cooperation organizations have shown signs for path creation, their vison deviate from the dominant systems structures.

In order to enhance structural changes at the local level, sustainability transitions literature suggests that is necessary that developments are driven by diverse actors, and also it requires that new actors' networks emerge. Results show that actors from the academic sector, civil society and multilateral organizations are pursuing and exerting pressure on local government to take actions towards sustainability. In addition, some actions of the local government have reflected the vision for enhancing structural changes in the system.by deviating some of its actions from the car city. The cooperation and collaboration among these actors are crucial for enabling these changes.

However, one issue that calls for the attention is the perception of some of the interviewees in relation to the role of the private sector for fostering sustainable mobility in the city. Some interviewees argue that this sector is not engaged with mobility matters, even though private business and organizations, are generating mobility demand.

The central government plays a key role in the transition process, even though the local nature of urban mobility. Issues that are under control of the national government are influencing the dynamics of the mobility system. The pressures from the national government on the system are rather stabilizing the car city regime. Lack of stringent standards in terms of emissions and conditions of the public transport, are affecting cities, especially those that are seeking to upgrade the conditions of the transport systems. In addition, subsidies and low quality of fossil fuels are issues to be addressed at national level but are imposing challenges at national level. This led us to reflect about the challenges for cities for being frontrunners of sustainable development.

5.2 Multilevel

The analytical framework allowed to identify the factors that are reinforcing the car city system within the different levels of analysis, and also the nature (political, institutional, spatial) of them. The main findings from the landscape level were discussed in the previous section, from the actors´ perspective. Therefore, this section will focus on discussing the findings regarding to the urban form level.

5.2.1 Urban form level

The results of this study confirm the intricate relationship between the urban form and mobility systems. Recalling, that density is a component that can contribute to a more sustainable city., as stated by Florida,(n.d).; Fusco, (2004); Newman et al., (2016), the case of Cuenca, confirms their statements.

The main problem of the city in relation to its geographical features highlighted by the interviewees and document review, is the dispersed and disorganized growth of the city, causing low population density per hectare. This pattern is imposing challenges to the local government but also to all the society who are ultimately the key actors within mobility. In a disperse city, the alternatives for transportation are limited (Newman et al., 2016), therefore it

represents a crucial barrier for the emergence of low carbon mobility. The results of Cuenca have shown that the city is facing challenges in providing public transport efficiently, in part due to the disperse growth, which is driven also by cultural perceptions in relation to the ideal house and land use costs.

Results from section 4.2.2 show how the physical infrastructure is affecting mobility choices. The high rate of walking mobility in the city business district (CBD) is a proof of this. The mixed land use, concentration of activities and physical infrastructure (sidewalks in better conditions compared with outer areas) are enabling walking. However, the concentration of activities within this area are enabling car-based mobility and also public transport mobility. While the cycling rate in the city in the city has increased according to the local government due to the provision of infrastructure in some areas, despite technical mistakes that were pointed out by some interviewees. This confirms the influence of the built environment on mobility choices, especially for walking and cycling as suggested by Brown et al., (2013); Ewing & Cervero,(2010); Lee et al., (2013)

5.3 Multidimensional process

The institutional approach of this work led the research to focus on issues of social nature, rather than technological or market related. The main findings of institutional and political dimensions are discussed below.

5.3.1 Formal and political dimensions

Among interviewees one of the major concerns is the lack of a mobility plan as public policy. Although, some local government actors argue, that in spite of the lack of approval of the plan, it is getting implemented. This issue calls for reflection from the following perspectives:

The perception of the interviewees is that the lack of a long-term policy plan for addressing mobility is due to the lack of vision and political will, which is required mainly at the top level. Despite of lack of vision towards sustainability at the top level, the PMEP is implemented and guiding the actions at operational level (i.e. some planners and some departments), despite of not being a formal policy, which lead us to suggest that at institutional level some actors have a different view of the city and mobility more in line with sustainability. However, there are some actions that require top level decision (i.e. budget allocation), that if not taken may hinder fundamental changes at city level. This may lead in a selective implementation of the plan. Furthermore, having an instrument as a formal public policy may guarantee its stability and coherent application as a city strategy and not merely as a plan at operational level, that normally could be changed.

Moreover, as stated by Loorbach, (2007) transitions require strategic, tactical and operational activities, where a long term goal is crucial for steering the transition processes. In line with this sustainability transitions call for the and implementation of policy mixes as motors of innovation in complex societal systems. Policy mixes in order to be successful should have an overall policy strategy from which policy instruments should be derived. In the case of Cuenca, the PMEP in formal terms does not represent a policy strategy. Policy strategies guide the design and development of policy instruments.

Even though, few recent strategies in Cuenca have their foundation in the PMEP, policy mixes are based on the interaction and coherence of the different instruments, therefore the implementation cannot be selective. Furthermore, acknowledging the relation between transport systems and the urban form of the city, policy mixes within the transport sector

require instruments from other domains. In the case of Cuenca, an urban plan and land use plan are imperative for the success of mobility policies.

The following section provides a brief analysis of some strategies approved to address mobility issues in the city.

Policy strategies in low carbon mobility transitions

5.3.1.1.1 Tram building

Physical infrastructure strategies are one of the typical strategies in them mobility sector, the physical infrastructure of transport systems are influencing the spatial features of the city, as suggested by Newman et al., (2016).The outcome of this strategy results in the provision of further infrastructure in the transit fabric.

The implementation of this infrastructure implied the occupation of space previously allocated to car use and in lower percentage for walking, which, thus it can be considered an element of path disruption, in terms of the physical space distribution. While in terms of type of networking, the implementation of the system additionally lies, and its success depends on how the policymakers, implementers and users interact. This factor is especially important, since the project has enhanced social resistance, due to direct impacts of the building process, delays in the building, legal issues between the city and the contractors, etc. Furthermore, it represents a novel system in the local context that requires cooperation with implementers, and also socialization process with future users and also with those that will share the space with it (private car users, pedestrians, cyclers), in this sense new social networks are configurated. It represents a completely new mode of transport for the context of Cuenca, which in combination with other modes of transport in the mobility system, may enhance intermodal mobility. The tram building process and its future implementation represents a learning process, still the outcomes are uncertain. Even though is perceived as a key element for the mobility system, the success of the implementation depends on how it is integrated in the whole system. Overall, this strategy shows deviation from the car city regime, reinforcing the transit city. While from a technological perspective, the tram system deviates from fossil fuel technology, which is relevant to highlight.

5.3.1.1.2 Ordinance for improving the public transport system

One of the goals of this strategy is to upgrade the service conditions, which may represent an opportunity to discourage the shift to private car use to those users who have stated that desire.

Recalling that the major source of CO2 emissions in Cuenca, is the public transport, therefore the technical requirements and standards settings in terms of emissions and lifespan of the buses is a strategic measure for sustainable transport systems.

In terms of the vision of the strategy, represents a deviation from the car city regime, posing opportunities for reinforcing the transit city subaltern regime.

5.3.1.1.3 Public Bike

This system, the same as the tram represents a novel intervention at the local context. The vision of the policy is the cycling city, thus is deviating from the car city, allocating resources and infrastructure for a new system. In terms of actors, this intervention is the result of a public-private partnership, which implies first, the creation of a new type of network, second

that under this modality, the responsibility is shared between both parts, which can lead to further cooperation looking forward the success of the system.

5.3.1.1.4 Bike school

The vision of the program is also the cycling city, although form a different perspective. It rather seeks first, to enhance the use of the current infrastructure, and second to enhance and reinforce cycling culture in the city. Additionally, as illustrated in the previous section, the strategy started as an initiative of the local government (EMOV EP), and now some components of the program are rather a collective initiative, incorporating actors from civil society (Mujeres en Bici-I4) and international cooperation (GIZ), which illustrates the creation of new type of networks.

Overall reflections of policy instruments

The previous analysis suggests that each of the policy strategies described, present opportunities for path creation, in terms of their vision and targets. However, as mentioned in previous paragraphs, sustainability transitions require policy mixes with a variety of instruments from many domains that respond to a policy strategy. Therefore, success of each of these strategies depends on the coherent development of additional instruments. Policy instruments should lead to path creation and also to path disruption, as suggested by Kivimaa & Kern, (2016). Consequently, in the context of Cuenca, strategies that target to disrupt the car city regime are required. This type of measures can be challenging, due to some barriers that need to be addressed at national level.

In addition, the strategies described reflect a variety of instruments that are used to enhance low carbon mobility. Policies like bike school may have an impact in cultural change which is one the key challenges of Cuenca. While the other strategies are rather to focus in the provision and improvement of infrastructure, that is also required for influencing mobility choices. Nevertheless, it is necessary to implement instruments that seek to behavioural change disincentivizing the preference of private car as mode of transport, that can change the cultural aspects (i.e. beliefs like car as symbol of social status, or cycling is not for Cuenca, etc.) that are hindering the materialization of low carbon mobility.

5.4 Final reflections

Overall, the findings suggest that the mobility system in Cuenca, is facing a transition process, although the transformation process is not granted if, further actions are not taken. The findings suggest that a change towards a low carbon mobility system depends on a complex interaction between the different factors of diverse nature. Therefore, it is difficult to identify what type (formal, cultural, political, institutional) of factors are dominating the transition, it rather confirms the multidimensional and co-evolutionary nature of processes of change.

The study has identified that is critical that actions should be taken from a policy perspective. The results show the dynamic nature of the mobility system and also its relative stability, where landscape actors are supporting changes in the system, but also reinforcing the regime lock-ins. At the system level, efforts that may steer change towards low carbon mobility system were evident. Although, if not all the elements of the systems get aligned, there is a risk that the fundamental changes in the system do not happen, enhancing rather incremental change.

5.4.1 Intermediate cities, cities of hope

The role of cities for delivering sustainability outcomes, has been recognized by governments and scholars, as indicated in the first section of this study. Although, intermediate cities and

small cities are often overlooked. The findings of this study suggest that due to its demographic characteristics, Cuenca has a great opportunity and responsibility for contributing towards low carbon societies.

5.4.2 Limitations

The socio-institutional approach of this study limited the scope of the research to find barriers and drivers from institutional nature, thus some relevant technological issues could have been overlooked. Furthermore, the findings of the results, concerning to the possible outcomes of the transition process are speculative, mainly regarding to the potential policies outcomes, which are uncertain and need further research in the future.

The analytical framework applied requires high degree of interpretation from the researcher, therefore the methodology follows the same approach which may have influence on the findings. Furthermore, the nature of mobility issues obeys to specific local conditions, while a single case study as research strategy, do not allow to corroborate the generalisability of the findings.

5.4.3 Recommendations

5.4.3.1 Future research

Urban sustainable transitions

Bearing in mind, the opportunities that intermediate cities provide for addressing sustainable development, this research is limited to study a single case, therefore further research is suggested regarding sustainability transitions in other intermediate cities, looking forward to understanding the dynamics of these cities, providing evidence that can lead to the development of strategies that can enhance sustainability transitions in their systems.

Local level

The approach of this research was limited to see governance of transition process from a top-down perspective, having the central government as key actor. Yet, sustainability transitions processes require actions from state and non-state actors. Therefore, bottom-up governance is one of the areas identified for future research at the local context (Cuenca).

This work has identified few policies in implementation process, therefore an evaluation of them assessing their effectiveness, would be valuable for the local context, having in mind that sustainability transitions are processes also characterized by learning and experimentation.

5.4.4 Local decision makers

This study has highlighted the need for long-term strategy, therefore one of the key issues to address is to have an overall strategy for sustainable mobility, as formal public policy, part of coherent policy mix.

In addition, the current instruments and future instruments that seek to address mobility issues should be evaluated, bearing in mind that achieving fundamental changes in systems happen through complex processes characterized by learning and experimenting.

Considering the multi-actor character of transitions, the author believes that private sector can be a strategic actor in supporting low carbon transitions, since corporations have a key role on how people (i.e. consumers, workers, providers) move by generating mobility demand.

Therefore, it is suggested to explore opportunities for further cooperation, that goes beyond bicycles parking facilities and financial support, like enhancing that enterprises start incorporating mobility plans for their employees, for instance. In addition, private sector are who have the resources for innovate, thus local government in cooperation with academia and private sector could develop innovation in a wide range of areas that can support a more sustainable mobility systems, from applications to new business models.

6 Conclusions

Cities are key players for addressing sustainability challenges, where mobility is one of the sectors that demands shift towards sustainability, due to its role as enabler of economic and social development, but also because the dominance of motorized mobility which is causing critical environmental challenges, like climate change. Lately, at the global political context the role of intermediate cities has been recognized as critical for addressing sustainability challenges, although among scholars this role has been rather overlooked.

Sustainability transitions as field of study has emerged to understand the processes of societal change, where mobility sector has gained momentum. However, it has been argued that sustainability transitions studies tend to ignore local scale dynamics influencing transitions, which is imperative, even more when studying mobility systems.

This research aimed primarily to contribute to the sustainability transitions literature by studying the process of change that are taking place within the mobility system from an intermediate, Cuenca, Ecuador.

The main research question of this study steered the analysis towards identifying the factors that are enabling the materialization of low carbon mobility in the city and those that rather are hindering them.

The socio-institutional approach of this study steered to identify and analize institutional and political factors. The theoretical framework was mainly built with insights from sustainability transition studies, path dependence and path creation concepts and urban sustainable mobility. This framework allowed to identify both institutional and spatial factors influencing the mobility system.

To answer the research question, few sub-research questions were proposed, whose answers are summarized as follows:

SubRQ1: How is the current mobility system?

The main findings suggest that the mobility system in Cuenca, is dominated by private car transport in terms of resources and infrastructure allocated for it, while public transport is inefficient, whereas infrastructure for walking needs to be improved and cycling infrastructure is still incipient.

SubRQ2: Who are the main actors that are shaping the mobility system?

Due to the approach of this research, the main actors of the mobility system are the citizens who on daily basis behave in a certain matter regarding their mobility patterns. Their decisions are influenced by several factors, such as values and beliefs that currently prioritize car as the ideal mode of transport. Furthermore, these values and beliefs are interlinked with infrastructure issues, confirming the influence of the built environment on mobility decisions.

The local government is strategic in providing the infrastructure and organizing the territory and growth of the city that enable sustainable mobility patterns.

The findings of this work suggest that external factors, such as researchers, international development agencies, national level institutions and civil society organizations are vital to influence the mobility system dynamics.

SubRQ3: What are the external factors influencing the mobility system?

As previously stated, the outcomes of the actions of external actors have influenced the system dynamics. One of these factors is the scientific evidence produced by the academia, that illustrates possible pathways for improving the mobility system. The demands from few sectors of the civil society organizations that calls for new strategies towards a more sustainable mobility system, who additionally seek to raise awareness and institutionalize low carbon modes of transport, like cycling. International development agencies which aim to steer change mainly through financial resources. Thus, the beliefs and values of these actors have the potential to steer the sustainable mobility transition process. In terms of political factors, at national level the planning documents demand actions that reinforce the low carbon mobility regimes, however it also poses challenges to the local government when policies and factors of other domains do not respond to these planning instruments (i.e. fossil fuel subsidies).

Sub RQ4: How are the spatial features influencing the mobility system?

The findings of this work confirm the intrinsic relationship between the mobility systems and the urban form, where the land use patterns and the growth of the city in a dispersed way have led to an unsustainable mobility model. However, it was pointed out that the size of the city provides opportunities to make of Cuenca, a walkable and cyclable city due to its proximity, but it requires proper infrastructure in combination with other actions that address the cultural challenges regarding the institutionalization of low carbon modes of transport.

SubRQ5: What are the cultural and formal elements shaping the mobility system?

The cultural barriers were a reiterative factor pointed out by interviewees and within the document review, in the sense of the preference of the private car over low carbon modes of transport, due to comfort and pleasure reasons, for being perceived as a social status symbol. In addition, the common belief that the bus service is deficient, while cycling is seen as foreign of the city culture. Among interviewees, education and awareness is key to change these beliefs and enhance the use of low carbon modes of transport.

Regarding to the formal elements, the findings of this study suggest that sustainable mobility transitions in Cuenca, required to have long-term strategy that influence fundamental changes in the system.

This requires paradigm shift in all the actors, but the local government has a key role to steer changes towards sustainability, through policy interventions.

Overall, this work concludes:

"Hard environmental problems require a great deal of political will, an almost as a consequence, an aware, educated and supportive electorate" (Vigar, 2002 p.200).

Sustainability transitions require policymakers´ vision and political will to implement coherent strategies dealing with urban planning, land use and transport systems. Furthermore, it is required that citizens change their perception and beliefs in relation to mobility, that privileges private car use, as the socially desired mode of transport. This cultural change calls for cooperation and action from other societal actors, corroborating that sustainability transitions governance relies on actions from state and non-state actors.

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Appendix A Interview Guide

a. Ethical considerations:	i. Consent for recording the interview
	ii. The interview will be conducted in Spanish; however, the research will be written in English, therefore the content of the interview will be translated
	iii. Consent for referencing the interviewees identity
b. About the interviewee	1. What is your name and position?
	2. What is the main goal of your organization?
c. Mobility System	3. What is your opinion with regards to the mobility system in the city?
	4. Which are the challenges that the city face in terms of its mobility system? What are the problems and their causes?
	5. Which is the mode of transport that dominates the mobility system?
	6. What do you think that a sustainable mobility system should be?
	7. Which are the features of the city that may enable a sustainable mobility system?
	8. Do you think that the city has taken actions for improving the mobility system? If yes, which ones could lead to achieve a more sustainable mobility system?
	9. Who are the key actors for transforming the mobility system? How are they helping or could help to this transformation?
d. Additional information	10. Do you have, ay question or any additional comment?