

Reducing car dependency in Italy

Identifying new initiatives and barriers on the road to a more sustainable mobility system in a car dependent society

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16-8-2019

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Opleiding: MSc Environmental & Infrastructure Planning



Voorwoord

Beste lezer,

Dit document, mijn afstudeerscriptie voor de master Environmental and Infrastructure Planning, is het resultaat van waar ik het afgelopen anderhalf jaar mee bezig geweest. Door de moeite die daarmee gepaard ging, in combinatie met andere problemen, leek het er lange tijd op dat er aan mijn afstudeerthesis geen eind te maken was.

Mijn wens om naar Italië te gaan voor mijn scriptie ontstond na een zomer gewerkt te hebben op Elba in Toscane. Ik wilde graag een keer naar Italië om een mooie ervaring rijker te worden, mijn kennis van het Italiaans te verbeteren, en om iets nieuws te ontdekken.

Het uitvoeren van het onderzoek was moeilijker dan dat ik verwacht had. Het zou me niet gelukt zijn zonder de hulp van de geïnterviewden, die *tante grazie* verdienen. Daarnaast gaat er natuurlijk een woord van dank uit naar een aantal personen. Ten eerste naar mijn thesisbegeleider Jos Arts, ondanks dat ik niet altijd in staat was de grote ladingen feedback het beste te verwerken. Tevens een woord van dank voor de hulp toegereikt door andere mensen uit de academische hoek, te weten Ferry van Kann, Hans Jeekel, Paola Pucci en Paul van Steen, tevens betrokken bij de uitwisseling naar Milaan.

Ten slotte verdienen ook mensen in mijn persoonlijke omgeving in deze de aandacht en dank. Ten eerste mijn beide ouders en mijn broer, die in ook voor hun moeilijke tijden alles gedaan hebben om me te helpen. Ten tweede andere familie, in het bijzonder mijn neef Jip en mijn oom René, die klaarstonden om te helpen door me de buitengewoon belangrijke zet te geven richting de afronding van het onderzoek.

Daan Smit

Abstract

The current car-based transport system is under pressure by environmental and social problems related to mass car use. These problems make it necessary to identify what can be done to reduce the car dependency. The overall aim is to provoke a transition towards a more sustainable, less car dependent, transport system.

The research case is Italy, arguably one of the most car dependent countries in Europe, indicated by a high vehicle density. This study explores the Italian car dependency more in-depth, and also the implementation of sustainable mobility niches. These are the development of soft mobility, collective mobility, cleaner mobility and car restrictions. Furthermore, it explores the barriers that make it difficult to both improve and align those niches. The barriers are caused by car dependency itself, which are a car-oriented style of land-use, urban sprawl and the existence of a car culture. Also, the fragmentation of decision-making, and a lack of integration within and between the alternative transportation modes are significant. On the other hand, the study aims to identify opportunities to overcome these barriers and set the transition into motion.

Keywords

Car dependency, sustainable mobility, transitions, Italy, niches, barriers

Table of content

<i>Voorwoord</i>	1
<i>Abstract</i>	2
Keywords	2
<i>List of figures</i>	5
<i>List of tables</i>	6
<i>1. Introduction</i>	7
1.1 Background	7
1.2 Case relevance	7
1.3 Research objective	8
1.4 Research question	8
1.5 Reading guide	9
<i>2. Theoretical framework: Car dependency and mobility in a transition</i>	10
2.1 Intro	10
2.2 Car dependency	10
2.3 Sustainable mobility	13
2.4 Transition management	15
2.4.1 The multilevel perspective	15
2.4.2 Transition dynamics	17
2.4.3 Mobility transition	18
2.5 Conceptual model	18
<i>3. Methodology</i>	20
3.1 Case study approach	20
3.2 Data collection	21
3.2.1 Quantitative: statistical research	21
3.2.2 Qualitative: literature research	21
3.2.3 Qualitative: interviews and videos	22
3.3 Analysis of findings	23
3.4 Ethical concerns	25
3.5 Summary	26
<i>4. Findings</i>	27
4.1 The Italian car regime	28
4.1.1 Vehicle ownership and density	28
4.1.2 Car dominance in daily mobility	30

4.1.3 Car-oriented transport planning	33
4.1.4 Reduced travel options and stigmatisation of public transport	34
4.1.4 Culture	36
4.1.5 Spatial planning and land-use	36
4.2 Landscape pressures and sustainable mobility niches	36
4.2.1 Landscape pressures	36
4.2.2 Opportunities for sustainable mobility niches	37
4.3 Potential impact of niches on car dependent regime	38
4.3.1 Soft mobility	38
4.3.2 Collective mobility: shared and public transportation	39
4.3.3 Cleaner mobility	40
4.3.4 Car restrictions	40
4.3.5 Alignment and niche-clustering	41
4.4 Barriers	42
4.4.1 Soft mobility	42
4.4.2 Collective mobility	43
4.4.3 Clean mobility	44
4.4.4 Car restrictions	44
5. Conclusion and discussion	45
5.1 Conclusion	45
5.2 Discussion	46
5.3 Epilogue.....	48
Appendix.....	49
References	49
Interviews	52
Car dependency indicators	52

List of figures

Figure 1 Schematic research design

Figure 2 Cycle of automobile dependency

Figure 3 Land-use transportation feedback cycle

Figure 4 Desired shift in mobility

Figure 5 Multiple levels of society

Figure 6 Transition phases

Figure 7 Transition levels and dynamics

Figure 8 Conceptual model

Figure 9 Truth from different perspectives

Figure 10 Increase in car ownership in Italy

Figure 11 Vehicle density trend in the last years

Figure 12 Italian regions and categories

Figure 13 Normal distribution of private mobility of municipalities in 1981 and 2011

Figure 14 Historical comparison of private mobility

Figure 15 Private mobility in 2011

List of tables

Table 1 Vehicle density in OECD countries in 2014

Table 2 Sources of statistical data

Table 3 List of Italian policy documents and research reports

Table 4 Italian professional literature

Table 5 Interviewees

Table 6 List of videos

Table 7 Codes used in Atlas

Table 8 Data collection and analysis in relation to the research questions

Table 9 Car dependency indicators

Table 10 Number of cars possessed by families

Table 11 Share of private mobility in Italian regions from 1981-2011

Table 12 Number of 'car' dependent municipalities

Table 13 Road system versus public transport system

1. Introduction

1.1 Background

The globalised society of today is built upon the possibility to transport goods and passengers. Mass transportation comes with environmental and social problems, especially if transportation becomes car dependent. Some of the problems that are most associated with car dependency are: accidents in traffic, congestion, climate change, air pollution, noise pollution, soil pollution and energy dependency (Maibach et al., 2008, Martens, 2014; Litman, 2014; Cucca & Tacchi, 2012; Jeekel, 2011; Ryley & Chapman, 2012). These problems put the sustainability of transportation and mobility under pressure (Banister, 2008).

Car dependency can have many connotations and distinctions. Jeekel (2011) defines it as the impossibility, perceived or real, to use a form of transport other than a private vehicle, to reach a destination. Not only does this lead to the problems mentioned above, it also means that people that do not have access to a private vehicle are severely restricted in their mobility.

Litman (2002) initially defined car dependency initially as the number of automobiles for every 1000 people. Later, he connected elements of car-dependent societies, that involve urban sprawl, a car-oriented type of transport and land-use planning and the lack of available alternative means of transportation (Litman, 2014).

Due to the problems described, the current car dependency is seen generally as an unsustainable situation. For this reason, transportation is need of a transition towards a system that is more sustainable and less dependent on individual cars (Moradi & Vagnani, 2018). Sustainable mobility has become the overall name for niches, new technologies or alternatives, that are aimed at reducing car use, by facilitating and promoting the use of other transportation modes (Banister, 2008). Those modes have to be less harmful for the environment, and they must be accessible to more people. The general aim of sustainable mobility is therefore to reduce the dependence on private motorised vehicles. It has been one of the objectives on policy agendas in Western countries, which suggests that the car dependency is recognised as a problem. Although some changes have already taken place, making effective differences to reduce car dependency still appears to be difficult (Jeekel, 2011; Marletto et al., 2017; Graham-Rowe et al., 2011).

1.2 Case relevance

This thesis focuses on car dependency in Italy. The main reason for this is the fact that Italy belongs to the top-three of most car dense countries in Europe, led by Iceland and Luxembourg (see table 1). Of those three, Italy is the only country with a considerable population (60,6 million in 2016). This makes Italy an interesting country for further in-depth investigation.

Country	Private car ownership per 100 inhabitants	Change in % 2000-2014	Country	Private car ownership per 100 inhabitants	Change in % 2000-2014
New Zealand	68	35	Spain	48	11
Iceland	66	17	Sweden	47	5
Luxembourg	66	12	Netherlands	47	14
Italy	61	6	Japan	47	13
Finland	58	42	United Kingdom	47	9
United States	58	23	Czech Republic	45	34
Australia	57	11	Greece	45	53
Austria	55	8	Portugal	43	22
Switzerland	54	10	Ireland	43	22
Germany	54	2	Denmark	41	17
Norway	52	27	Slovak Republic	35	47
Slovenia	52	19	Hungary	32	36
France	51	8	Korea	31	82
Poland	51	95	Israel	30	35
Estonia	50	48	Chile	22	86
Canada	50	10	Mexico	21	108
Belgium	49	8	Turkey	13	95
OECD America	49		OECD	47	
OECD Asia-Oceania	45		OECD Europe	46	

Table 1 Vehicle density in OECD countries in 2014 (OECD, 2015)

1.3 Research objective

The aim of this thesis is to explore how the conditions that are required for a transition towards more sustainable mobility can be created. Understanding the nature of the problem, car dependency, is required, as is the identification of the opportunities and barriers to reduce it.

1.4 Research question

The main research question is *What are the conditions for a transition from car dependency to sustainable mobility in Italy?*. Answering to that question requires gaining insight to the nature of car dependency in Italy, the potential of sustainable mobility niches on reducing the car dependency and the identification of opportunities and barriers. This results in the following sub-questions.

1. *What is car dependency and why is it something that needs to change?*
2. *What are sustainable mobility niches?*
3. *What are the conditions for a transition towards a less car dependent system?*
4. *What are the specific circumstances regarding car dependency in Italy?*
5. *Which niches are being used to reduce car dependency?*
6. *What are the barriers related to the sustainable mobility niches?*

7. What recommendations can be made to achieve the necessary conditions?

1.5 Reading guide

The thesis is built up as follows:

Background	Theory	Empirical research	Conclusion
IMPORTANCE OF TRANSPORT PROBLEM STATEMENT	Car dependency	Data analysis	NECESSITY TO INTEGRATE IN ORDER TO PROVIDE GOOD ALTERNATIVES
RESEARCH QUESTION HOW CAN CAR DEPENDENCY IN ITALY BE REDUCED?	Sustainable mobility	Literature research	
AIM CONTRIBUTIONS AND PROBLEMS RELATED TO SUSTAINABLE MOBILITY STRATEGIES	Transitions	Interviews	
	CONCEPTUAL FRAMEWORK	NATURE OF CAR DEPENDENCY IN ITALY	
	CAR DEPENDENCY AND SUSTAINABLE MOBILITY IN THE TRANSITION LANDSCAPE	EXPECTED CONTRIBUTION OF SM-STRATEGIES TO REDUCE CAR DEPENDENCY IN ITALY	

Figure 1 Schematic research design

In this first chapter, the subject matter was introduced, together with the relevance and the research questions. Chapter 2 will cover the theoretical frameworks that will be applied in the course of the research. The theoretical frameworks used are focused on automobile dependency, sustainable mobility niches and transitions of complex interdependent systems. Chapter 3 will cover the methodology: the type of research methods applied and a high level overview of the results of this research. The data gathered will be used in chapter 4, to explore the nature of car dependency in Italy using the theoretical framework for car dependency.

2. Theoretical framework: Car dependency and mobility in a transition

2.1 Intro

This chapter introduces three concepts that are strongly related to car dependency and reducing it. Those are car dependency itself, sustainable mobility, and transitions.

2.2 Car dependency

Authors writing about car dependency in some cases refer to it as automobile dependency (Litman, 2002; Newman et al., 2016). Since they both refer to the same, in this thesis, the term car dependency will be used. The word car is used with reference to the private, individual automobile. This paragraph discusses the literature on car dependency and in order to be able to explain two things. The first of those is the term itself and what it is that makes it problematic. The second is what makes it difficult to change.

In general, car dependency is understood as the situation in which the car is the dominant, most convenient and the fastest mode of transportation. This is linked with accessibility of places and people. Car dependency implies that people and places are accessible (almost) only by car (Lucas & Jones, 2009; Martens, 2014).

Car dependency is indicated by a high vehicle density, frequent car use, dispersed and homogenous land use patterns, reduced alternative travel options, non-drivers being disadvantaged, public space being dominated by motorised traffic (Litman, 2002).

The scientific literature that conceptualises car dependency, explains that motorisation in general, and the car more specifically, has become more important over time, which in the end leads to a state of dependency (Mattioli, 2014).

An easy measurable starting point in the exploration of car dependency is the number of automobiles, usually with respect to the number of people. This number is known as 'degree of motorisation' or 'vehicle density'. The increased vehicle density has led to more car use, which in turn led to a more spread land-use, known as urban sprawl.

Sprawl, often associated with car dependency, is defined as the spatial spread of activities, such as living, working and shopping. The sprawl is argued to be facilitated by the availability of the car, as the car allowed for those activities to move from a city centre to outside the city (Lawrence, 2005). At this point, the performance of alternatives comes into the definition. Alternatives, in relation to car dependency, refer to travel modes other than the car. In sprawled areas, all sorts of activities are spread throughout the space, alternative modes of transportation lose attractiveness. For this reason more people will find

themselves in need of a car, which in its turn stimulates car dependency (Ewing, 2005). Urban sprawl is a typical example of the self-reinforcing nature of car dependency in relation to land-use. This relationship will be explored more deeply in the next section (see figure 3 and 4).

Another self-reinforcing mechanism is presented by Jeekel (2011), who pointed at a distinction between (1) the frequent use of cars and (2) actually being car dependent. He illustrates several degrees of car dependency. Each of those degrees leads to a next, more strongly car dependent, degree. It goes from travelling by car, then getting used to travelling by car, then relying strongly on the car and eventually being dependent on the car. This definition of car dependency involves the not only frequent usage, but also the inability to travel and to be and stay without access to a car. This is the case not only for individuals, but for entire societies.

Despite this, there is some distinction between individual and societal car dependency. Individuals are car dependent if they feel forced to use a car as a mode of transportation (Jeekel, 2011). Societies are car dependent if the environment corresponds with the indicators and attributes of car dependency in table 2.

Knowing that individuals, and the environment that they live in, together form a society, Goodwin (1995) explains car dependency arguing that

“... car dependence is a process, not a state. It operates both at the individual and the social level. Individually, people increase the use made of cars, tend to rely on them more, and over time pay less and less attention to other alternatives which are open to them. Socially, changes take place in land use and the provision of services which make car use more necessary, and alternatives less attractive. ...” (Goodwin et al., 1995, p. 152)

According to Martens (2014), the car use becoming more necessary leads to a social problem that is caused by the reduced performance and availability of alternatives, especially public transportation. In *Transport justice*, he argues that traffic congestion, one of the problems associated with car dependency, is usually combated by investing in car-infrastructure to reduce the congestion. This way, car use is only being facilitated, while the role and the importance of alternative travel modalities is being ignored. At the individual level, people who cannot use a car, and are dependent on the alternatives, are confronted with less available and less attractive travel options (Grey et al., 2001; Shergold et al., 2012). This problem is known as car-related transport disadvantage, which in some cases can lead to people being

“... prevented from participating in the economic, political and social life of the community because of reduced accessibility..., due in whole or in

part to insufficient mobility in a society and environment built around the assumption of high mobility.” (Kenyon et al., 2002)

Their insufficient mobility is a result of the low availability and attractiveness of the alternative travel modes. These alternatives in turn become stigmatised. The stigmatisation of alternatives can be seen in relation to the affection, again both on the individual and the social level, to automobiles themselves and the reluctance to using alternatives (Sheller, 2003; Steg, 2005).

All issues discussed lead to the existence of a car dependent mobility system. In such a system, travelling by car becomes, or tends to become, compulsory for the individual (Soron, 2009). Related to this is that people and places are accessible almost exclusively by car.

The reason why car dependency is under discussion largely derives from the external problems mentioned in the introduction, and because of the insufficient mobility for carless people. Car dependency comes with problems such as traffic congestion, road and parking facility costs, crashes, and pollution (Maibach, 2008). At the same time, car dependency reduces the range of solutions that can be used to address those problems (Litman, 2002). This brings us to why it proves to be so difficult to reduce car dependency. The same Litman (2014) drew a feedback cycle that shows the reinforcing relationships between car dependency factors (see figure 2). In this cycle, car ownership, alternatives and sprawl are mentioned.

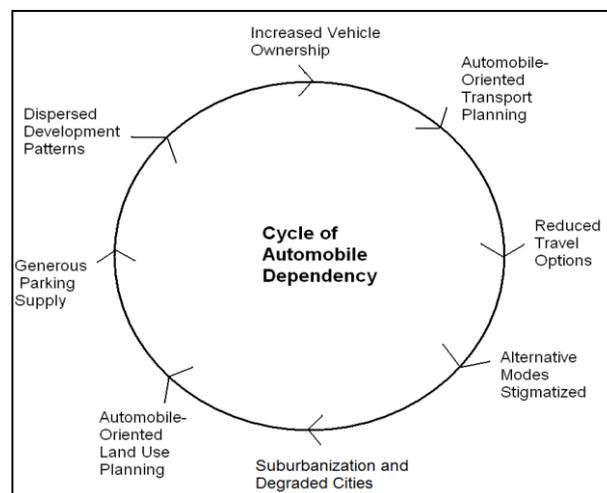


Figure 2 Cycle of automobile dependency (Litman, 2014)

Because of its self-reinforcing nature, car dependency can be seen as a subject of what is called “path-dependency”. Path-dependency suggest that once a system, or a society, starts taking shape in a certain way, it becomes increasingly difficult to reverse the processes that take place according to this path (Sorenson, 2015). The indicators and factors of car dependency conform to this pattern. Also, it gives an explanation for the difficulty in reducing car dependency, keeping the positive feedback loops in mind:

“Where positive feedback exists, each step down a particular pathway increases the likelihood of further steps along the same pathway, and increases the cost of reverting to some previously available option.” (Sorensen, 2015, p. 8)

In figure 2, it is illustrated that the transport network and land use are relatively rigid elements. Infrastructure, once constructed, will be present and hardly changeable for a certain period. The same goes for the allocation of housing and industry. They also conform to the path-dependency theory. This theory suggests that dependency in itself, on anything at all, already implies difficulty to cope without this particular thing. This means that reducing the dependency, let alone eliminating it, is always difficult and complex. This is the case also for car dependency (Mattioli, 2014).

In line with this, Marletto et al. (2017) argued that the car dependency today is indeed the result of the ongoing pathway. In relation to car dependency and its factors described earlier, each step down the *pathway* refers to some of the elements in the cycle from figure 2. These can be the construction of a motorway, the allocation of a shopping mall accessible especially by car, or a reduction of public transportation services. All of those are caused by car dependency, and reinforce car dependency at the same time (Litman, 2014).

2.3 Sustainable mobility

Despite the existing thoughts about car dependency being impossible to reduce, this section elaborates on ideas that aim for reducing car dependency. Sustainable mobility has become the overall name for such ideas. Banister (2008) is one of the authors who recognised the need for a mobility system that is more sustainable. His general focus in *the sustainable mobility paradigm* is on the decarbonisation of the transport sector, that is making it less fossil energy consuming. The sustainable mobility paradigm is supposed to guide policy makers, planners and urban designers towards a situation that people are less dependent on cars, that is, they are not forced to have or to use a car as much as they are now (Banister, 2008).

Reducing car dependency and reducing car use are the most important aims of the planning paradigm. Acknowledging the self-reinforcing nature of car dependency, Banister (2008) argued that the aim should be a situation where the environment and public space are designed in such a way that people can be mobile even without a car. Even though car use and car dependency are not synonyms, reducing car dependency is necessary to reduce car use. Sustainable mobility favours the use of walking and cycling, along with a priority for public transportation, so that “the need to use the car would be minimised (Banister, 2008, p.74)”, which is what the actual car dependency is all about (Jeekel, 2011).

In the previous section, the term pathway was mentioned as well, with reference to Sorensen (2015). The pathway perspective to car dependency is used by

Marletto et al. (2017), who refer to the current car dependency pathway as the AUTO-City pathway, where urban development, spatial planning and mobility are based upon the assumption that cars are to be the dominant and most attractive mode of transportation. Banisters ideas in the sustainable mobility paradigm correspond broadly with the second pathway that Marletto et al. (2017) and Moradi & Vagnoni (2018) described, namely the ECO-City pathway, where spatial planning, land use and mobility are based on the idea that car use should actually decrease rather than being favoured, as is the case on the previously mentioned AUTO-City pathway. On this pathway, transportation modes – cycling, walking, public transport and car sharing - that are now seen as alternatives, are the dominant and most attractive.

In the previous section, the interrelationship between car dependency and urban sprawl was mentioned. The availability of cars facilitates urban sprawl, and urban sprawl leads to more car dependency (Ewing, 2005). The theoretical link between car dependency and land use is illustrated by Wegener & Fürst (1999). They linked transport to accessibility, activities and land use. This is shown in figure 3. This figure is relevant because sustainable mobility can be achieved only through a new planning approach that connects those four factors. The illustration suggests that investments made in infrastructure have an influence on accessibility, which determines land-use and spatial planning, which in turn has an impact on travel behaviour, creating a demand for infrastructure. The feedback loops, connecting spatial planning, transportation, and infrastructure, make it that the current situation can be seen as the result of a pathway, an ongoing process on which all those elements are reinforced by each other (Mattioli, 2014).

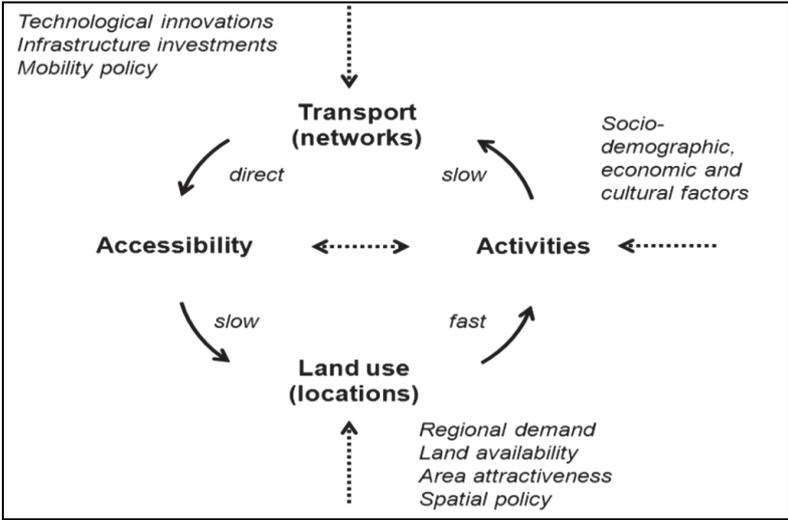


Figure 3 Land-use transportation feedback cycle (Wegener & Fürst, 1999)

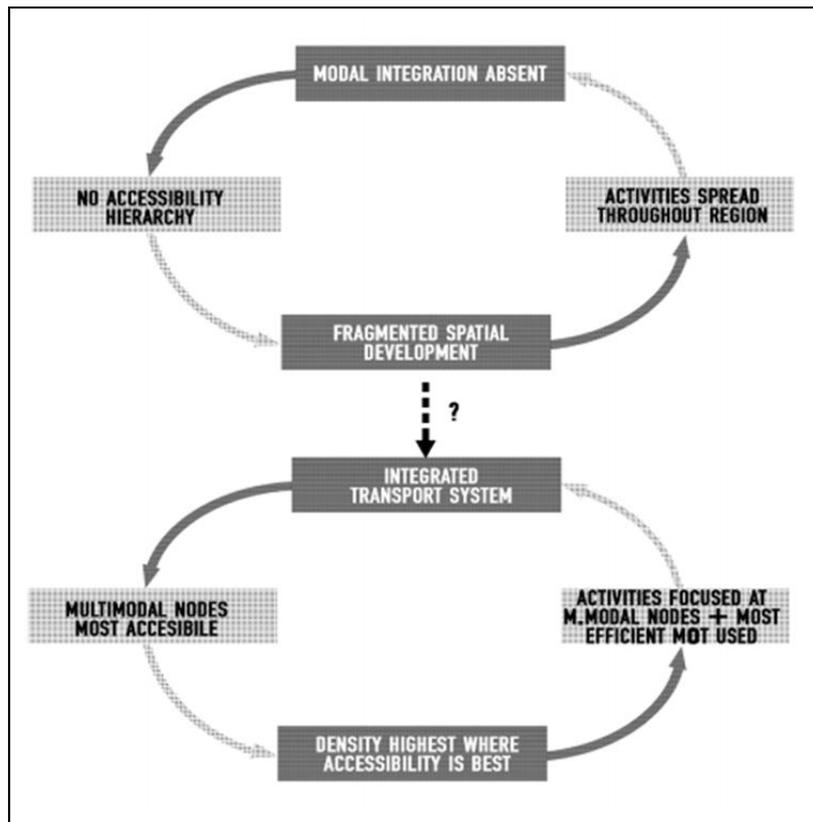


Figure 4 Desired shift in mobility (from Switzer, 2013)

Switzer (2013) applied the feedback cycle from figure 3 to both the situation of car dependency, and that of sustainable, integrated, mobility. Figure 4 is the result of this. It illustrates a shift from the car dependency cycle to a sustainable mobility cycle. This shift is also called a transition, a term that will be discussed in the next section. The arrow with the question mark next to it refers to this transition and the opportunities and barriers related to this transition.

2.4 Transition management

The shift from one pathway to another – from the current car dependency pathway to a more sustainable one which is less car dependent – can be coined as a transition (Marletto et al., 2017). A transition takes place when a current situation, determined by the pathway, cannot be sustained any longer (Rotmans et al., 2001; Geels & Schot, 2007). Reasons for this are usually global developments or regulations that demand for the current situation to change. What this means to car dependency will be elaborated in this paragraph.

2.4.1 The multilevel perspective

To conceptualise a society, one that changes or needs to change, transition theorists like Rotmans et al. (2001) and Geels & Schot (2007) divide it into three levels: macro, meso and micro (see figure 5). In this section, the distinction and the relationships between the levels is elaborated.

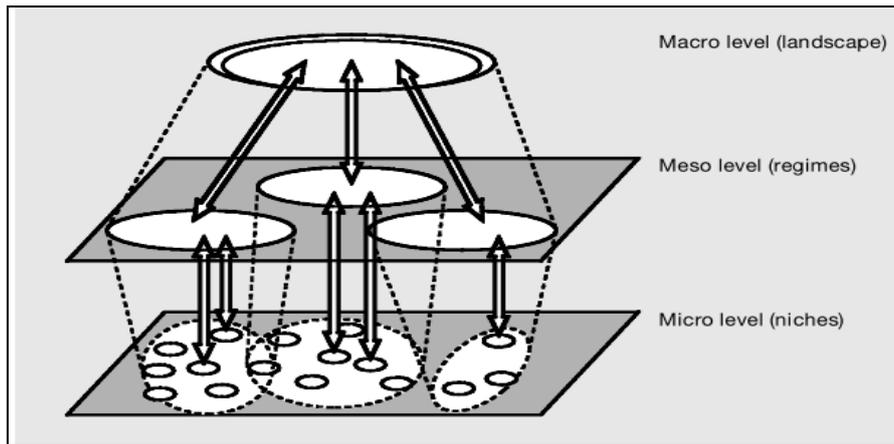


Figure 5 Multiple levels of society

Geels & Schot (2007) describe the socio-technical landscape as the

“...exogenous environment beyond the direct influence of niche and regime actors (macro-economics, deep cultural patterns, macro-political developments)...”

Even though the landscape cannot be seen as something that never changes. The landscape is determined and changed by

“... (1) factors that do not change or that change only slowly, such as climate; (2) long-term changes, such as German industrialisation in the late 19th century; (3) rapid external shocks, such as wars or fluctuations in the price of oil...”

Those factors in some cases call for a change in the regime, on the meso level, which is related to

“...dominant practices, rules and shared assumptions. At the meso level are the interests, rules and beliefs that guide private action and public policy.”

On the micro-level there are new developments that are supposed to be an alternative to the dominant regime. In transition literature, those developments are referred to as niches. Niches can originate for example from the pressure caused by the landscape developments; the idea that the current regime will not be able to reach the goals and objectives with the used niches and instruments within the regime. Niches are innovations, new technologies and new practices. Usually they start on a small scale, and try to compete with the dominant practices in the regime. But for a niche to be effective, it cannot be too distant, too radical, from the regime that it is aiming to change. Too radical niches have lower possibility to compete with the existing regime, due to a lack of public and social support and interest (van der Hoeven, 2010). An innovation that requires a too radical societal change, is not likely to receive the support it needs to be adopted.

2.4.2 Transition dynamics

The dynamics in transition differ in accordance with the phases that Rotmans et al., (2001) distinguished. Those phases are predevelopment, take-off, acceleration and stabilisation (see figure 6). The vertical axis in the figure represents the actual change accomplished by the transition forces. The horizontal axis represents the time span. What the time span is, depends on the domain of the transition. The domain refers to the subject that undergoes the transition; for example an ecosystem, a culture or an economy. Ecosystems and culture change slowly, so the time span of a cultural transition is likely to be quite long, while economic changes can occur suddenly. Technological and institutional changes are expected to take place faster than economic -, but slower than cultural ones (Rotmans et al., 2001).

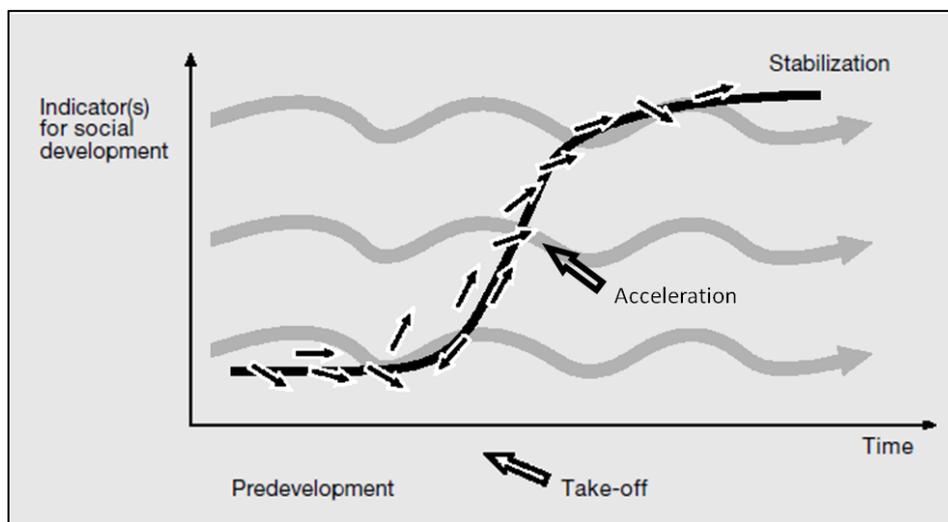


Figure 6 Transition phases (Rotmans et al., 2001)

Starting as a novelties in the phase of predevelopment, niches have the possibility to develop into mainstream options up until they become aligned (Loorbach, 2010). At the same time, the landscape pressures have to stay active. Niches can then create a take-off, which coincides with the breakthrough. Then, they are strong enough to form a *new configuration* and to make use of the opportunity created by the landscape pressure on the regime (see figure 7).

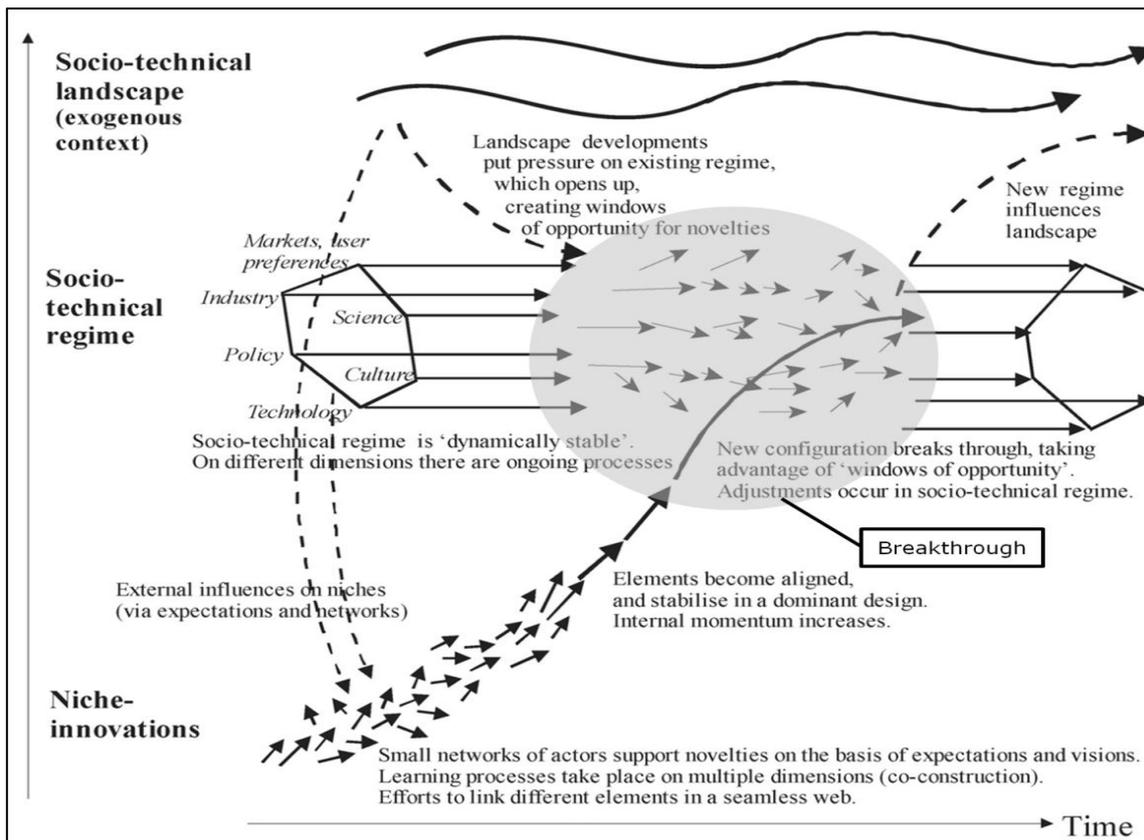


Figure 7 Transition levels and dynamics (Geels, 2002)

2.4.3 Mobility transition

Referring to car dependency, we observe that the active dominant regime is the “automobile regime” (Jeekel, 2011). The practices, rules, beliefs and interests of a regime are the elements that determine the current car dependency. This car-regime is under pressure by global issues such as climate change, space consumption and oil dependency (Jeekel, 2011). This demonstrates a change in the landscape, as climate change has not always received as much attention as nowadays. Commitments have been made to reduce emissions, including those caused by transportation. Niches therefore, are novelties that try to find answers to the demands deriving from climate change and air quality issues. In practice, the niches can either be a technological innovation, for instance a new type engine that runs more efficiently. It can also refer more to societal novelties, that is, for example, policy instruments aiming at the reduction of car use (Banister, 2009; Moradi & Vagnoni, 2018).

2.5 Conceptual model

The conceptual model in figure 8 shows how the different theoretical components relate. In the top left corner, the landscape pressures that make car dependency unsustainable are mentioned. The regime is represented by the circle on the meso level, indicated with ‘car dependent regime’. The land-use transportation feedback cycle as applied by Switzer (2013), is used to represent the path dependency of the car dependent regime. Cultural aspects are not represented in the model visually. Nevertheless, Switzer (2013), Litman (2014) and Jeekel

(2011) and Steg (2005) all paid attention to cultural aspects of car dependency. Also, theory on transitions includes culture as a regime element (see figure 7). Thus, the car-dependent regime being indicated in figure 8, intrinsically conceptualise cultural aspects.

At the micro level, there are niches of sustainable mobility that are trying to compete with the car dependent regime by. Those pressures together with the development of sustainable mobility niches could create opportunities, or window of opportunity, for a breakthrough.

The S-shaped line indicated as the transition curve, represents the shift to a transportation regime that is more sustainable, where the feedback cycle is more in favour of ecologically and socially friendly transport and land use. The barriers posed by car dependency on the meso level, that is, the path dependent nature, cultural and political factors, have to be eliminated or overcome by the opportunities to generate a breakthrough. Only then, the transition can move from the predevelopment phase to a take-off, acceleration and stabilisation.

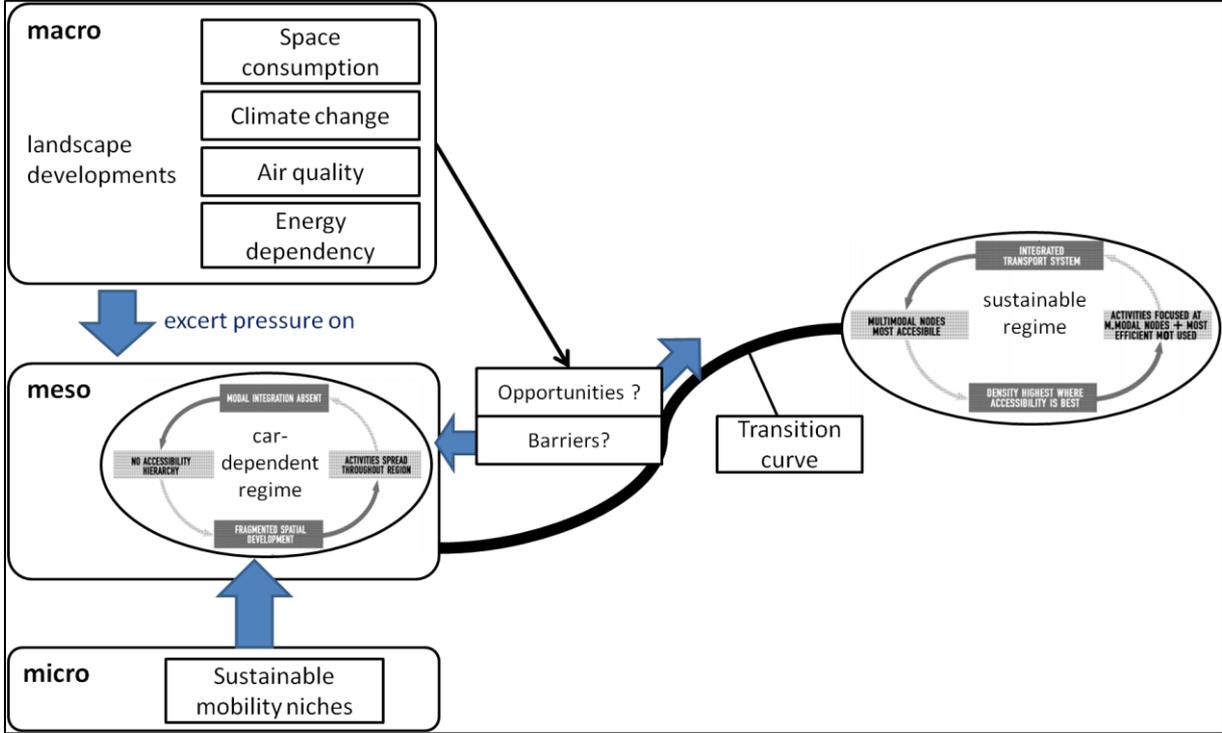


Figure 8 Conceptual model

3. Methodology

In this chapter, the research methods are described and it is explained how they are used. This thesis has an explorative nature, aimed at the identification of problems and potential solutions to those problems. The collection methods used are described in this paragraph. The first three questions listed in paragraph 1.3 are in whole or in part dealt with by literature research.

3.1 Case study approach

The focus of this thesis is on car dependency in Italy as seen from several perspectives, with respect to the three levels (landscape, regime and niches) explained in chapter 2. The dynamics on each level are explored. Because the current car dependent regime determines the starting point for the transition, the current pathway and regime is dealt with first. The second issue, which regards the pressures on car dependency from the landscape level, was already broadly discussed in chapter 2. The question is which pressures are being perceived in the Italian regime. Finally, regarding the niche level, the focus is on the potential contribution of sustainable mobility niches on reducing the car dependency.

The research takes a case study approach, in which the case is Italy. A case study provides a researcher with the best opportunities to identify and explore the contextual factors that contribute to car dependency, and the potential of niches to reduce it. The selection of Italy as a case was based on what Flyvbjerg (2006, p. 230) calls an information-oriented selection. Italy was a compelling research object beforehand as it seemed to be a strongly car dependent society. This assumption was based especially on a cross-country comparison regarding vehicle density (see introduction and table 1). It makes Italy an unusually problematic case.

The collection of research data involved several research strategies, including both qualitative and quantitative strategies. The nature of car dependency is complex. Some of the causes and indicators are measurable quantitatively, others have to be explored in a qualitative way. Such an explorative research requires an approach that is described by Bryman (2014) as a mixed method of qualitative and quantitative research strategies. In this thesis, those strategies were the conduction and analysis of semi-structured interviews, analysis of policy documents, literature research and statistical analysis of secondary data. Section 3.2 addresses the application and the use of the strategies more in detail. To carry out these research strategies, I took part in an exchange program in Milan, Italy's second largest city, which allowed me to gather context related information about mobility, transport, policy, and problems with public transportation and other indicators related to car dependency. By being in Italy, I had the ability to conduct interviews with experts and to use soft qualitative research methods. These were own observation and experience mobility in practice.

3.2 Data collection

Each subsection 3.2.1 to 3.2.3 addresses one of the research strategies used to collect the data used in the other chapters. Table 8 in the end gives an overview to how the strategies relate to the research questions.

3.2.1 Quantitative: statistical research

The quantitative part consisted of the analysis of official statistics about mobility in Italy. They involve statistics regarding car ownership, the modal split of daily travel and the age of the car park (see table 2). Sources are the ISTAT, the official Italian statistic bureau and the ACI, the Italian automobile club.

Type	Year
Car ownership	2013-2018
Modal split	1981-2011

Table 2 Sources of statistical data

In addition, statistics used were found through the analysis of Italian literature such as research reports, books, and policy documents (see paragraph 3.3).

3.2.2 Qualitative: literature research

Literature research was carried out in relation to the sub questions numbered 1 to 5. The first three questions are of a theoretical nature and are therefore primarily dealt with in chapter 2. Search terms used in Google Scholar and SmartCat to get this type of literature were *car dependency*, *automobile dependency*, *sustainable mobility*, *transitions* and *path dependence*.

Search terms used to obtain information specifically on the Italian case are *spatial planning in Italy*, *infrastructure investments*, *modal split in Italy*, *mobility problems*, *public transport in Italy*, *sustainable mobility in Italy*.

The collected specific literature consists of papers, articles discussing issues related to car dependency in Italy. Some of the literature or documents were recommended by the sources of qualitative information mentioned in the next paragraph. The sources are listed in tables 3 and 4.

Source name + Year	Description of content
Zambrini 2016	Relevance of transportation on climate change
ISFORT 2016	Report on Italian mobility and behaviour
Donati et al. 2018	Air quality and mobility policy in the fourteen large cities in Italy
SUMP Milano 2015, 2017	Local policy objectives and strategies
PRMS Lombardia 2016	Regional policy objectives and strategies
PRMS Piemonte 2016	Regional policy objectives and strategies
Connettere l'Italia	National policy guidelines

Table 3 List of Italian policy documents and research reports

Author name + year	Book title and translation	Description of content
Federico Paolini 2005	<i>Un paese a quattro ruote.</i> A country on four wheels	Historical perspective on the relationship between the Italian society and the automobile expansion in the previous century.
Guido Viale 2006	<i>Vita e morte dell'automobile.</i> Life and death of the automobile.	Why mass use of private automobiles is a problem; how mobility should look like in the future; and what changes need to happen to reach such a future.
Several authors 2004	<i>Il sistema italiano tra prospettiva storica e innovazione.</i> The Italian system, between historical perspective and innovation.	Expertise vision on the Italian-specific causes of the automobile dependency; institutional weakness and culture.

Table 4 Italian professional literature

3.2.3 Qualitative: interviews and videos

Additional qualitative information is gathered through the analysis of videos of conferences and lectures, the analysis of subject-specific literature and the conduction of semi-structured interviews with Italian stakeholders, who are active in the field of mobility, planning and transportation. The interviews were semi-structured, meaning that the subject and questions to be asked was determined beforehand, but not set out in a strict manner (Verschuren & Dorewaard, 2004). The names of the interviewees surfaced during the search for terms mentioned in the previous section. They were the authors of policy plans, essays, journal articles and research reports. Depending on the activities and competences of the interviewees (see table 5), the focus of the interviews was either on what is currently wrong, and how this could be changed. Four of the interviews were conducted face to face in the work place of the interviewees. The remaining two were conducted by telephone. The content of this qualitative information was made into transcripts.

Position of interviewee	Main subjects
1 Director of Planning & Mobility, Milan municipality	Planning processes Legal and political barriers
2 Researcher Uniontrasporti	Lack of public transportation Accessibility problems
3 Expert on economies of transportation	Economical deficiencies of public transportation
4 National expert for Italy, Transport & Environment	Policy making to favour electric & integrated

5	Transportation expert	mobility Encountering spatial and administrative fragmentation
6	Expert on transport policy, Observatory for public transportation in Italy	Lack of public transportation Failing management of public transportation Cultural barriers

Table 5 Interviewees

The final source of qualitative information were videos in which stakeholders and experts announced their point of view on mobility problems, and issues that they had to discuss (see table 6).

Source + year	Title
Anna Donati 2014	Muoversi in città; esperienze e nuove idee per una mobilità sostenibile.
Claudia Terzi	Proposta Lega su Area C
L'automobile	Opinione del direttore sulla benzina.

Table 6 List of videos

3.3 Analysis of findings

Bryman (2014, p. 106) identifies sixteen methods of analysis used in mixed method research, sometimes with some overlap. The five ones used in this study are triangulation, explanation, illustration, diversity of views. *Triangulation* refers to the extra contribution of combining both qualitative and quantitative information. An issue that is measureable can be argued by an expert, supported by quantitative data. *Explanation* shows some overlap with this as it aims at using one of the two types to help explaining results that are found by the other type. *Illustration* refers to “the use of qualitative data to illustrate quantitative findings, often referred to as putting meat on the bones of dry quantitative findings.” Writers of articles and experts often use this to make a problem statement or to evaluate the utility of an instrument to solve a problem. *Diversity of views* is used to know why and where alternative travel options are reduced, and if there might be another reason that either substitutes or enriches the information put forward in another source.

These methods are executed by coding the qualitative findings. For coding, Atlas software, provided by the university, was used. Initially, the texts were coded deductively. The passages were provided with a categorising label as to what issue they addressed. Those were elements of car dependency, the presence of a pathway in the current regime, niches of sustainable mobility, the need of a transition, and the opportunities and barriers related to this transition.

Code category	Code description	Definition
Car dependent pathway	Deficiency of public transportation	Statements regarding the quality, safety and attractiveness of public

	Cultural aspects	transportation in Italy. Statements regarding the significance of cultural aspects, user preferences, lifestyles and other 'irrational' motives for car use.
	Other car dependency indicators	Statements regarding one or more car dependency indicators shown in table 9 in the next chapter.
Pressures from macro (landscape) level	Issues that underline the problems caused by, or related to, car dependency.	Statements regarding air quality, climate change, transport justice, energy dependency and space consumption.
Sustainable mobility niches on the micro level	Development of alternative transportation modes	Statements regarding the existence and the potential contribution of alternative transportation modalities: soft mobility, collective mobility, cleaner mobility and car restrictions.
Opportunities	Niche-clustering	Statements regarding examples of integration of niches.
Barriers	Difficulty to make a sustainable mobility niche effective.	Statements regarding the difficulty of niches to develop and to integrate, and to make an effective contribution to reducing car dependency.
	Difficulty to change circumstantial environment	Statements regarding slow processes in regulation and institutional fragmentation.
Other	Uncertainty	Statements regarding the uncertainty to what will happen in the future.

Table 7 Codes used in atlas

The first issue addressed in the findings is the exploration of the path dependent nature of car dependency in Italy. This was done by searching for information regarding the car dependency indicators listed in table 9 in the next chapter. Those are the elements that create the car dependency feedback cycles that were explained in chapter 2.

The second part regards the identification of opportunities for a transition. Those are the sustainable mobility niches in Italy. An assessment is given to the niches, based on their potential to reduce car dependency, that is, reducing the elements that are part of the car dependency feedback cycles addressed in chapter 2. Also, the barriers faced by the niches are addressed.

Sub questions	Type of information	Source	Method of retrieval	Documentation
1. What is car dependency and why is it something that needs to change?	Theoretical knowledge as to what car dependency is, what causes it, and which type of problems it leads to.	Literature on car dependency.	Literature research	Theoretical description and elaboration
2. What are sustainable mobility niches?	Theoretical knowledge	Literature on reducing automobile dependency	Literature research	Theoretical description and elaboration
3. What are the conditions for a transition towards a less car dependent system?	Theoretical knowledge about transitions	Literature on transitions and car dependency	Literature research	Theoretical description and elaboration
4. What are the specific circumstances regarding car dependency in Italy?	Descriptive information Statistics	Literature (books, policy documents, essays) Interviews Video's ISTAT	Literature research and Semi-structured interview Statistical analysis	Book citations Transcript of video's and interviews Maps and tables
5. Which niches are being used to reduce car dependency?	Descriptive information about strategies that are being applied	Literature (policy documents) Interviews Video's	Literature research Semi-structured interview	Transcript of video's and interviews
6. What are the barriers related to the sustainable mobility niches?	Describing the barriers that a niche finds in order for it to reduce car dependency	Literature (policy documents) Interviews Video's	Literature research Semi-structured interview	Transcript of video's and interviews
7. What recommendations can be made to achieve the necessary conditions?	Indications for possible future directions	Professional literature Interviews Video's	Literature research Semi-structured interview	Transcript of video's and interviews

Table 8 Data collection and analysis in relation to the research questions

3.4 Ethical concerns

The integrity of the research depends partially on the position of the researcher. The collection of qualitative data took place in Italy, as part of an exchange program. Being in Italy allowed for a higher understanding of circumstantial

factors, contexts and cultural aspects. The research was not dependent on market forces or political interests and the interviews were not aimed at uncovering or provoking controversial and compromising expressions.

The position of the researcher was determined by the ideal desire to reduce car dependency, for the sake of the societal and environmental problems that were described in chapters 1 and 2. To eliminate this bias, the aim was to get the optimal vision of the truth, by exploring different perspectives (see figure 9). These perspectives were, as can be seen in table 5 and 6, the ones used by policy makers, researchers, experts and representatives of interests.

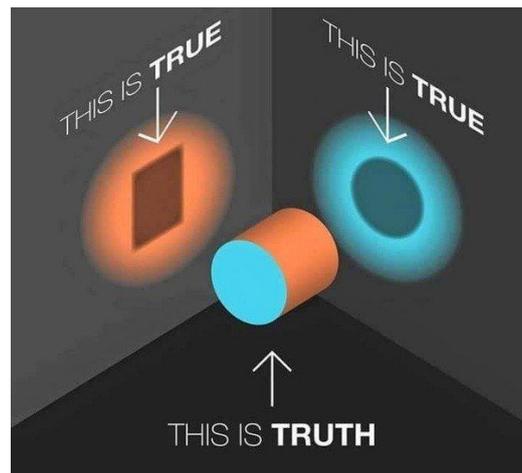


Figure 9 Truth from different perspectives (from Quora.com)

3.5 Summary

This research makes use of a number of theoretical concepts and frameworks that were introduced in chapter 2. To fill in these concepts and frameworks, data that is gathered and assembled during a case-study research that consisted of quantitative analysis, semi-structured interviews and the assessment of policy documents. In chapter 4, the findings from the research strategies described in this chapter are used to explore the specifications of car dependency in Italy, historical developments, and to assess the potential to reduce car dependency of sustainable mobility niches.

4. Findings

The first part of the chapter discusses the meso level: the nature of car dependency in Italy. It is built upon the feedback cycles drawn by Litman (2002) and Switzer (2013) that determine the current car dependent regime. It establishes that the current pathway has led to a car dependent society, meeting the classification 'car dependent' according to the indicators in table 9.

The second part first discusses the macro level, which are the landscape pressures. Those are the reasons why car dependency is seen as a problem in Italy. The pressures create the opportunities for sustainable mobility niches on the micro level.

Indicator	Description	Car dependent
Vehicle Ownership	Per capita motor vehicle ownership (usually measured per 1,000 population)	450 / 1000 or more
Vehicle Travel	Per capita annual motor vehicle mileage	13,000 kilometers
Vehicle Trips	Automobile trips as a portion of total personal trips	80%+
Quality of Transportation Alternatives	Convenience, speed, comfort, affordability and prestige of walking, cycling and public transit relative to driving.	Alternative modes are very inferior.
Relative Mobility Of Non-Drivers	Mobility of personal travel by non-drivers compared with drivers.	Non-drivers are severely disadvantaged.
Land use patterns	Land use density (residents and jobs per acre) and mix (proximity of different land use types).	Dispersed and homogenous
Transport system	Type of transportation facilities and services available.	Mainly automobile (roads and parking facilities).
Roadway design	Design features of public roads.	Designed to maximize auto traffic speeds and volumes.
Shopping Options	Where retail and other public services are located	In private malls, located along major highways
Market Distortions Favoring Automobile Use	Relative advantage provided to automobile transportation over other modes in planning, funding, tax policy, etc.	Significant bias favoring automobile travel.
Automobile commute mode split	How people travel to work and school.	More than 65%
Errand travel	How people normally travel to stores, professional appointments, recreation activities, etc.	Mostly automobile.
Performance Indicators	How transport system performance is evaluated	Automobile-oriented

Table 9 Car dependency indicators (from Litman, 2014)

The third part elaborates on the transition on the regime level (see figure 5). The focus in this part is on the Italian car regime, the potential impact of sustainable mobility niches on the elements of car dependency that keep the current car-regime in place, and on the barriers need to be dealt with before it can move to a next phase.

4.1 The Italian car regime

“For almost a century, the train had a monopoly in transportation on the medium and long distances, while on the short and would continue to use the old transportation means from before the industrialisation, until the advent of the car” (Maggi, 2004).

This paragraph contains the information gathered regarding some of the car dependency indicators from table 9, that is, the ones about with information was found. It starts with displaying data about vehicle ownership, used as an overall indicator for car dependency. In the other sections, the focus moves slightly to the relationships between car dependency and planning issues, culture and the performance of public transport.

4.1.1 Vehicle ownership and density

The Italian history showed a rapid increase of vehicle ownership. This happened during the so-called ‘economic miracle’ in the 1960’s and 1970’s (Paolini, 2005). The rapid increase, almost following the typical S-curve is visible in figure 10.

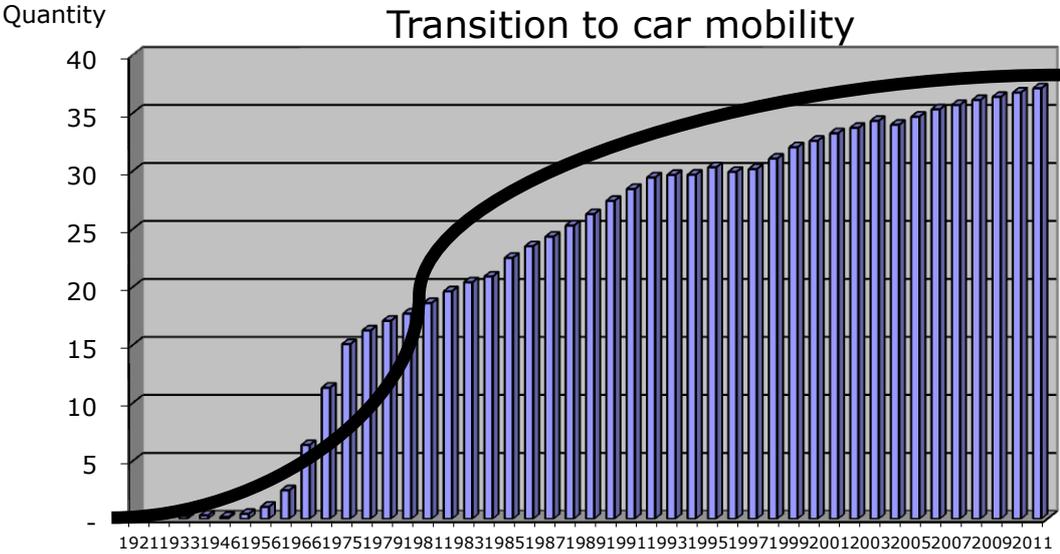


Figure 10 Increase in car ownership in Italy (source: ACI, 2012)

Attempts have been made to explain how the number of vehicles increased so radically and fast. A significant role is given to the importance of the Italian producer FIAT. Maggi (2004) argued that car dependency was actually favoured, despite the problems caused by it. Ironically, the national economy was dependent also on selling cars.

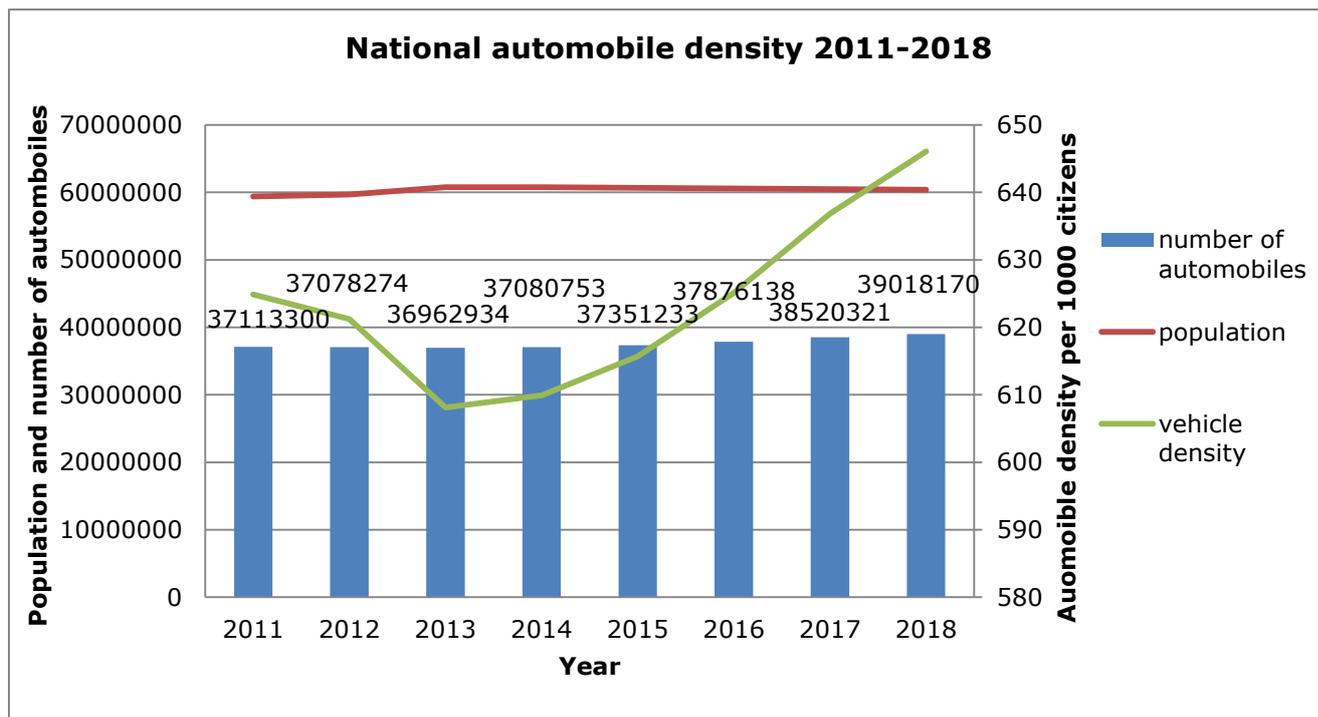


Figure 11 Vehicle density trend in the last years (elaboration on ACI and ISTAT data)

An analysis of more recent development shows, as can be seen in figure 11, a slight decrease of vehicles and vehicle density during the last economic crisis. From 2013 onwards, the number of vehicles has been raising again; from 37 thousand to 39 thousand in 2018. The crisis did not lead to reducing car dependence in the long term. The vehicle density increased also by a slight population decline.

It is reasonable to also analyse the situation on a lower geographical level, that of the provinces. Italy has 108 provinces. In each one of them, the vehicle density is higher than the European average of 46 per 100. Indeed, one of the peculiarities mentioned by Paolini (2005) was that the fast increase in the amount of vehicles was seen in the entire country, rather than only in some regions.

The high vehicle density creates a demand for parking space in cities. Even though Italian cities, ever since the late 1960's, have been trying to avoid cars being parked in their historic centre, Italian cities have become "open-air parking garages" (Donati, 2014).

Number of automobiles	Italy	North-West	North-East	Central	South	Islands
1	58,3	57,6	52,1	55,7	65,0	64,1
More than one	41,7	42,4	47,8	44,3	35,0	35,9
2	35,4	36,7	39,8	36,4	30,3	31,0
3 or more	6,3	5,7	8,0	7,9	4,7	4,9
% of families with at least one	79,5	79,1	82,8	81,5	75,7	78,4

automobile

Table 20 Number of cars possessed by families (ISTAT, 2006)

4.1.2 Car dominance in daily mobility

One of the car dependency indicators in Litman's table (table 9) is car use, which can be measured in total distance covered by cars. Statistics in Italy provide useful data especially about what is referred to as 'commuting mobility'. The statistics used to provide this section with insight in commuting mobility behaviour all refer to the share of people resident in the region or municipality that uses an individual motorised mode of transport for their work or school-related mobility, of all people that travel to school or work in from the same region or municipality. This means that the numbers are relative, and that the use of motors and motorcycles is also included in the number. The numbers displayed in any way in this section are derived from the ISTAT dataset '*Censimenti della Popolazione e delle Abitazioni*', available on <http://ottomilacensus.istat.it/>. It contains a historical elaboration of data on regional, provincial and local level regarding various indicators. Measurements contributing to this dataset were taken in October from 1951 every ten years until the most recent *censimento* in 2011. Statistics regarding mobility and transport first appeared in 1981. All regions show an increase systematic car-use from 1981 until 2011, at least in the years that the values were measured. The maps, graphs and tables are all based on that source.

Figure 12 Italian regions and categories (own creation)



Regione no.	Regione	1981	1991	2001	2011
1	Piemonte	34,4	51,1	62,4	64,3
2	Valle d'Aosta	40,5	57,1	62,9	67,2
3	Lombardia	34,9	50,4	62,1	62,9
4	Trentino-Alto Adige	32,9	45,0	49,5	50,7
5	Veneto	38,7	53,2	64,0	67,0
6	Friuli-Venezia Giulia	41,2	56,1	65,0	67,6
7	Liguria	27,6	43,6	53,5	56,0
8	Emilia-Romagna	42,3	58,0	67,5	69,0

9	Toscana	40,9	56,6	67,1	69,6
10	Umbria	41,1	58,1	70,2	74,7
11	Marche	39,6	57,2	68,4	72,2
12	Lazio	28,9	46,9	59,8	62,6
13	Abruzzo	31,2	50,1	63,2	68,8
14	Molise	23,3	41,4	55,1	64,7
15	Campania	17,8	35,2	49,3	55,3
16	Puglia	22,7	40,3	53,6	60,0
17	Basilicata	20,5	38,7	53,3	61,8
18	Calabria	23,2	41,6	56,2	65,3
19	Sicilia	28,1	48,3	61,1	69,3
20	Sardegna	29,0	45,6	59,1	66,9
	ITALY	32,0	48,7	60,6	64,3

Table 11 Share of private mobility in Italian regions from 1981-2011 (ISTAT, 2011)

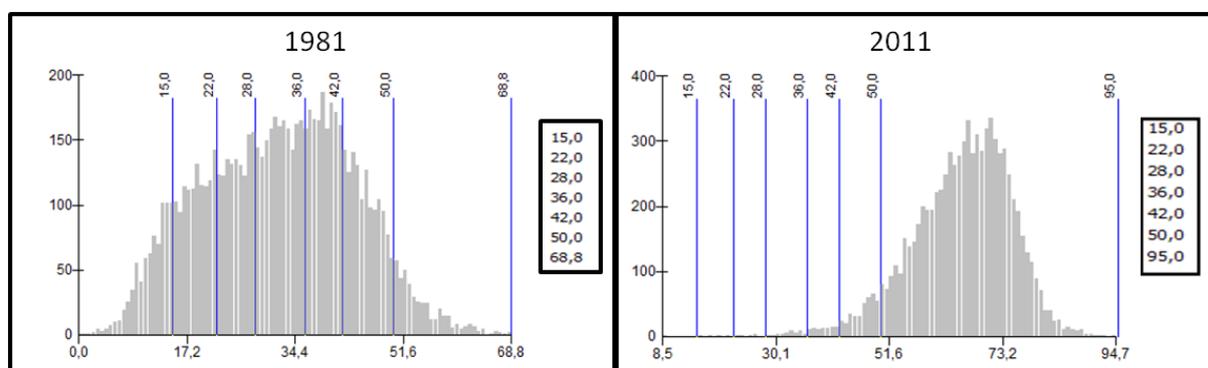


Figure 13 Normal distribution of private mobility of municipalities in 1981 and 2011 (ISTAT, 2011)

Figure 13 shows the normal distribution of private mobility at the municipal level in 1981 and 2011, divided into 7 classes of proportions: less than 15, 15-22, 22-28, 28-36, 36-42, 42-50, and more than 50. Each class goes with a shade of red. In the maps referring to 1991, 2001 and 2011, the same classes were used to make the development visible through time. Figure 13 also shows a shift to the right of the normal division: there are more municipalities where private mobility is the absolute dominant mode of travel, that is more than 50% in proportion (see table 12). The column on the right shows the same number but for those that have more than 65% private mobility. Those are the places that are 'car dependent' according to Litmans (2014) table of indicators (table 9).

Year	Total number of municipalities	...that have more than 50% private mobility	... more than 65%
1981	8086	429	9
1991	8100	3642	385
2001	8101	6510	2807
2011	8092	7559	4573

Table 12 Number of 'car' dependent municipalities (ISTAT, 2011)

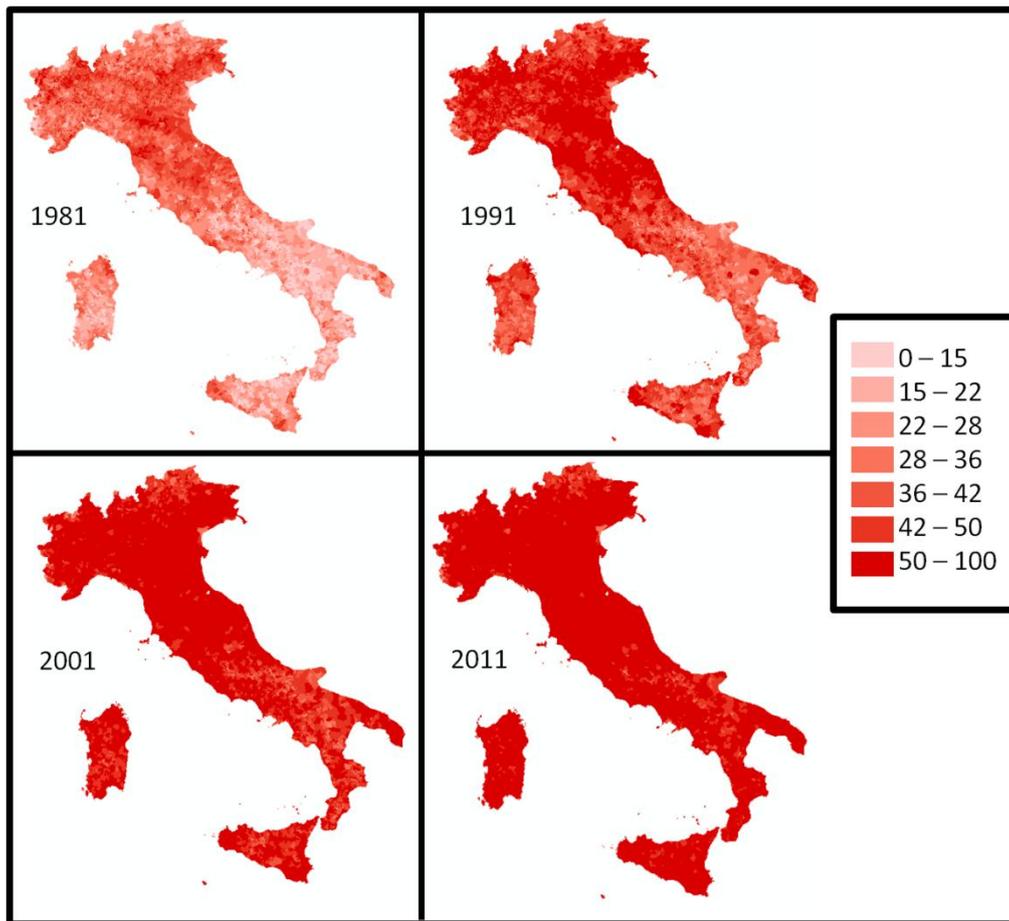


Figure 14 Historical comparison of private mobility (ISTAT, 2011)

In the four maps in figure 14 it can be seen that systematic mobility, especially in the southern regions, was not yet dominated by private motorised traffic in the early 1980's. The darkest colour is given to all municipalities where the proportion of private mobility was higher than 50%. It means however that the maps referring to 2001 and 2011 do not illustrate regional differences between areas, because as we can see in figure 13 and table 12, almost all municipalities have a value higher than 50%. A different methodological distribution, applied to the data 2011, reveals the regional differences (see figure 15). It shows rather high values of car use, except for large parts of the southern regions Puglia, Basilicata and Calabria, and Trentino in the north.

As to what causes the increased use of private mobility, the interviewees had some ideas.

“There is a huge offer and huge costs of public transport, but the results are not there, because the bus can serve only some things but cannot serve others. With a model of life like we have today, which is not the same as the last 100 years, when we just went like this: home-work-home, home-factory-house. But it is like this, because we are richer and therefore we move much more, and in a much more irregular way. We do the shopping, we bring the children to school, we take the children to

tennis class, much more visits. From time to time public transport cannot serve low density areas, as on average they are low in Italy.” (interviewee 3)

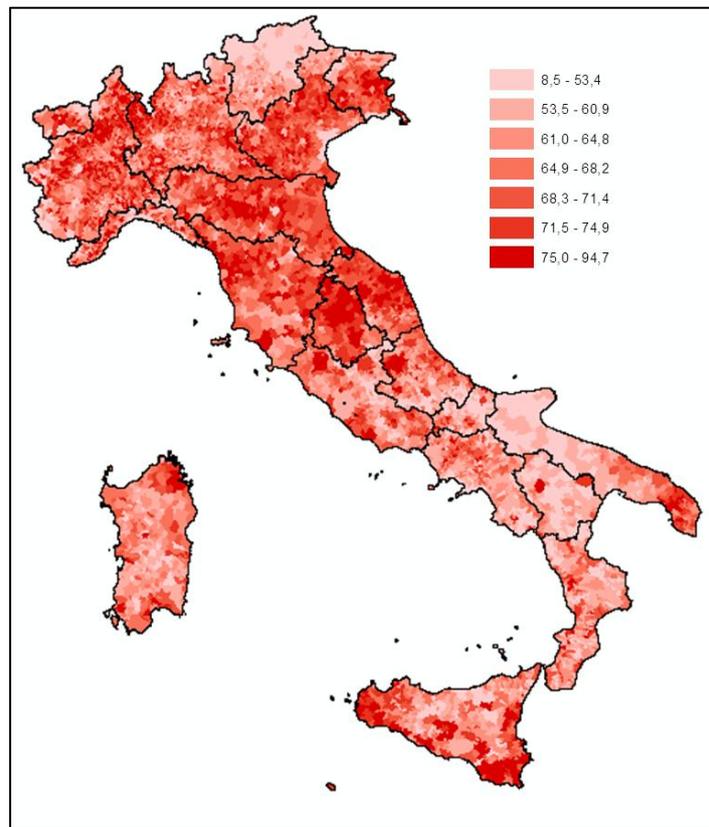


Figure 15 Private mobility in 2011 (ISTAT, 2011)

The map also reveals a different pattern with respect to the north and the south of the country. In the north, cities have less private mobility than the surrounding areas. In the south, it is slightly the other way around.

4.1.3 Car-oriented transport planning

Initially, the increased vehicle density in Italy led to the recognition of an infrastructural void. The capacity of the road network was considered too low to deal with the increasing amount of traffic (Osvaldi, 2004; Paolini, 2005). Connecting the entire country with highways became an important objective of policy making back in the day. Illustrative is the national program *Progetto 80*, which was active from 1971 to 1975. It contained the ideology that a uniform road network would guarantee a balanced development of the country (Bertolotto, 2011).

Still in between 1980 and 1993, the infrastructure for public transportation on rail actually declined, while the total length of the roads kept increasing (see table 13).

Year	Railways in km	Roads in km	Tramways in km
1980	19715	296270	581
1985	19721 +	300360	467 -
1989	19562 -	303906	442 -
1993	19466 -	306510	405 -

Table 13 Road system versus public transport system (from Paolini, 2005)

4.1.4 Reduced travel options and stigmatisation of public transport

Car dependency according to the indicator table by Litman (2014) is determined by the quality of the alternatives (table 9). Public transportation is one of those alternatives. The marginalisation of public transport in Italy largely consisted of tram services that were dismantled during the 'automobile boom' (Donati, 2014; Paolini, 2005). In chapter 2 it was mentioned that this happened in many other places as well. What this has led to is another important factor of car dependency, which is the lack of alternative modes of transportation. People without access to a private vehicle are forced either to stay in their home town, or to buy a car.

Six interlinked issues regarding the efficiency and convenience of Italian public transportation emerge from the data that was collected. The first of those were investing practices in public transport, trains in particular. About 80% of the investments have been made in further development of infrastructure that is used for long-distance trips. It involves the capacity of the numerous airports on one hand, and the high speed railway services on the other. Those trains are heavily subsidised and can only be of use to a small group of people (Interviewee 3, 2018). In one case underlined by Balotta (2018) even led to a dismantling of a satisfactory express train service, that was replaced by high speed trains.

A second problem mentioned was the extensively long contracts that are used to assign public transportation services. There has been a reform of public transport aimed at the decentralisation and privatisation of the entire transport sector in Italy, all in an attempt to create the competition required to guarantee decent services. Marcucci & D'Alessio (2004) and interviewee #6 (2018) criticised the ongoing nature of those assignments, which are often for extensively long periods (20 years or more) and without any real competition.

Thirdly, it is arguable that services are used more frequently if using them is attractive and convenient. This is compromised by the fragmentation of services. The network of public transportation exists of several operators and on several levels. Most businesses, founded in the past, are focused on the municipal level that they originate from.

"Before, years ago, when mobility was concentrated only in the urban centre, it made sense to have municipal transport companies, and they were municipal. Nowadays, things have changed. The fragmentation has a right origin, 50 years ago. There was only mobility within the municipality, who was out of the municipality? Society, and public transport, is no

longer as it used to be, because it is no longer municipal, because you travel for work, and therefore the sociability of public transport has changed its form.” (interviewee 6)

It leads to the fourth issue, which is the situation in which an intermodal trip (local bus from house to station – train – local bus from station to workplace) becomes inconvenient, because the services are not integrated. Not only the services are separated, the tariffs are as well.

“It is a topic that we have to address, not only from a network point of view, but also from that of tariff integration. If I leave Milan, I immediately need another ticket. This theme is still a bit tricky to deal with; as soon as I leave Milan, the tariff increases. It grows, but not adequately, that is, let’s say, it is not proportional to the level of service. Actually it is inversely proportional to the level of service. I pay more to have a worse service. It is strange, but unfortunately in Milan, in the hinterland that is how it is.” (interviewee 1)

To make the intermodal trip, a traveller needs a separate ticket or membership to use each of the modalities required. Though this seems to be easily solvable, it appears to be a severe challenge to change this particular situation.

The fifth issue is the quality of the services. Public transport in Italy is criticised for its low level of convenience and quality, as can be drawn from its overall reputation. The general opinion is that buses and especially the regional trains are too inconvenient because of delays and suspensions. This problem is more severe in the south of the country than it is in the north. The quality can also relate to the perceived safety of public transportation.

“There are certain things that are not easily quantifiable, but that have to be guaranteed; but that is my perception, above all, of safety. For example, taking a subway at 11 at night or midnight, what I do here in Milan, in Naples I would never do that. Because I don't feel safe.” (interviewee 2)

The sixth issue mentioned in the literature and interviewees is the non-use and unavailability of public transportation in the direct hinterland of the Italian cities, Milan included, where public transport services are either absent or insufficient. The best way to illustrate this is showing the travel time differences between urban settlements in the area around Milan.

“The lady who cleans this office right here at 6 o’ clock in the morning. How do you think she got here, from Lodi? By car, so she loses quite a part of her stipend just to get here.” (interviewee 6)

The argument is that people in most cases do not have the possibility to travel by public transportation, and are forced to travel, expensively, by car.

4.1.4 Culture

Cultural aspects are not clearly addressed the feedback cycles in chapter 2. However, according to several authors addressing car dependency, the cultural aspects of it cannot be ignored (Steg, 2005; Lucas, 2009; Switzer, 2013). Roots for this in the Italian case can be found in several places. It is argued for instance, that the average Italian has always been underestimating the costs of a having a vehicle; maintenance, taxes, toll, fuel or parking.

Data on culture barely exists. In qualitative terms, it is argued that Italians have a strongly car-oriented lifestyle. Related to this are two things. The first is the almost absolute preference to use a car for completing a trip for which an alternative is at hand (Paolini, 2005). The second is the lack of perception related to the actual costs of having and driving a car.

“The costs of maintaining my private car, including road tax, insurance, tires, are very high. But it is a cost that the average Italian does not perceive, as a real cost. It is a cultural thing, in fact. This is a thing of the things for which, when we walked around the city to present the mobility plan that said: we must reduce the number of machines that we own, we explained this concept. Because it is not a concept that is present in the common mentality.” (interviewee 1)

4.1.5 Spatial planning and land-use

The auto-oriented style of transportation planning went along with a scattered type of urban development (Calafati, 2009). In the allocation of activities, such as housing, shopping and industrial areas, issues regarding transported were not incorporated. The developments usually took place without any transportation plan, which meant that those locations became accessible only by car.

“Italy is made up of small centres, of beautiful little poles that are located at a few kilometres from each other. In those places, private mobility will be very, very difficult for it to be completely abandoned, both for cultural reasons and for reasons like low efficiency of public transport, in areas with low housing capillarity. So with a low living density, therefore, the capillarity, so where you can arrive with non-private forms, is limited.” (interviewee 4)

Newman et al., (2016) and Litman (2002) argued that the separation of activities in space is a contributing factor to car dependency. It appears that urban development in Italy took place in the absence of considering issues related to transportation and accessibility (Paolini, 2005).

4.2 Landscape pressures and sustainable mobility niches

4.2.1 Landscape pressures

In Italy, it appears that two particular landscape pressures are relevant, which are the overconsumption of space and poor air quality. The space consumption

refers to the congestion and the overuse of parking space (Cucca & Tacchi, 2012; Viale, 2006). Air quality refers to the emission of fine particles by vehicles. To combat poor air quality and the overconsumption of space by individual cars, Italian cities are experimenting with sustainable mobility practices and niches. These pressures initially led to car restricting being applied as a niche in Italian cities. This is done in most Italian cities, through the implementation of a ZTL, a limited traffic zone, but is usually limited to the city centre. To enter such an area with a private car, a permit is required, which is usually available to residents living in that particular town or city. Already in the late sixties urban traffic congestion started to become recognised as a problem. In 1965, Siena, in Tuscany, was the first Italian city to ban cars from parts of its historic city centre. Three years later, they were followed by twelve other cities, including Rome and Milan (Paolini, 2005). Nevertheless, this issue in an automobile dominant regime, as is the case in Italy, has not received much societal and political attention (Maggi, 2004). Despite this, there is some knowledge on the emission of greenhouse gases, contributing to climate change, from the Italian transportation sector (Zambrini, 2016).

Pressure related to air quality and climate change have also been leading to investments made by actors in the automobile regime, including FIAT, in improving the current situation by investing in cleaner, but still individual, vehicles (Paolini, 2005; Interviewee 3).

Air quality and space consumption both relate to mobility in urban areas, as they are considered to be relevant particularly for cities. The transport justice issue, the situation of being dependent on cars, in areas that are not served sufficiently by public transportation, seems to be of less relevance (Interviewee 6). In those areas, the pressure of poor air quality and too much space consumption by cars is less likely to be felt (Interviewee 3).

4.2.2 Opportunities for sustainable mobility niches

These pressures have led (see previous section) and still lead to the need for change, starting with sustainable mobility niches (Interviewee number 4; Connettere l'Italia, 2017). The niches addressed derive from two sources. The first is the theoretical knowledge; what is described by Banister (2008) as *sustainable mobility* or by Marletto et al. (2017) as part of the *ECO-City pathway*. The second are niches that are brought up by the interviewees or the authors of the documents. This paragraph explores which niches there are and how they relate to air quality issues and space consumption.

In a sustainable, eco-friendly situation, the transportation system is dominated by systems of integrated mobility, instead of cars. Integrated mobility refers to a decent availability and performance of public transportation and shared vehicles; and a considerable role for so-called soft mobility.

The first addressed in the next section is soft mobility, which is the most environmentally friendly alternative to car use. Soft mobility refers to

transportation that is not motorised; cycling and walking. The niche involves providing bicycles themselves, and the availability of infrastructure to use them safely. With respect to car dependency, soft mobility has to be made more attractive. It has to reduce the need to use a car for short distances. The second type of niche, shared and collective mobility, refers to car sharing and public transport. Shared mobility refers to car sharing platforms. Public transport refers to the conventional modes; trains, buses, trams and subways. The third, cleaner mobility, also belonging to the sustainable mobility paradigm, refers to more energy efficient vehicles, the electric car, or other cars that are powered by less harmful energy sources. The fourth is the legal limitation of car use in specific areas. Sustainable mobility niches can thus be divided in four types, which are ecological or soft mobility, collective mobility, cleaner mobility, and car restrictions.

4.3 Potential impact of niches on car dependent regime

This section discusses the impact that can be expected from each of the sustainable mobility niches on the following car dependency indicators that are mentioned in the theoretical section on car dependency: vehicle density, transportation planning, culture and land use planning. This way, the contribution of niches related to the strategies mentioned above is clarified. The objective of each niche is the reduction or elimination of the car dependency indicator that is influenced by the niche.

One of these objectives is reducing the vehicle density. It is argued that for people to their only car, a much more cultural shift is required than for people to abandon one of the cars that they have access to (Interviewee 1). The first step is therefore to reduce the number of households that have more than one vehicle. There is no recent data on how many households actually have multiple cars. The most recent statistics are from 2006, which are shown in t. The categories of regions in the north-west, north-east and so on is displayed in figure 12.

Another element is car-oriented transportation planning. Reducing car dependency requires that transportation planning be less based on automobiles. The transport system would have to be favouring the use of non-motorised or public transportation. Related to this is land-use planning. Land-use planning that is less car dependent means that it is more compact. Activities would be close to each other, so the need to use a vehicle would be absent. In the upcoming section, the niches are explored to know if and how they can contribute to a mobility regime that is less car dependent than the current one. Finally, another important objective is having a contribution on changing the 'car culture' in the long term.

4.3.1 Soft mobility

The first niche is the promotion and facilitation of soft mobility. Safer and more attractive soft mobility can create a situation where the need to use cars for a

short trip in an urban environment is reduced. This way, it is possible to eliminate the absolute necessity to have multiple cars per household. As for transportation planning, soft mobility requires infrastructural measurements in Italian cities in order to render it more attractive and safer to travel by foot or by bike. The attractiveness then could have an influence on culture and lifestyle. This particular relationship remains doubtful due to culture only being able to change slowly. Soft mobility is often related to compact and mixed types of land-use planning, as the distances between activities are low and easy to overcome by foot or by bike.

A niche proposed by Donati (2014) to favour soft mobility is the implementation of speed reductions in urban environments. Instead of limiting traffic, this niche is aimed at moderating it. It reduces air and noise pollution and it is seen as a stimulation of soft mobility at the same time.

4.3.2 Collective mobility: shared and public transportation

The availability of shared vehicles as an alternative in Italian cities can help people to realise that they can cope with one less car per household. The numbers on Milan show that the availability of car sharing was followed by a slight decrease in the vehicle density, but only until 2017. Nevertheless, at least families that have multiple cars, should and could be encouraged this way to maintain only one car (Donati, 2014). A promising aspect of shared mobility is the role it can take in an integrated mobility system (Aneris, 2018). Conventional public transport will always leave gaps at places and times where the demand for transport is weak, so to say, unpredictable. Those gaps could be filled with shared vehicle.

As for land-use planning, sharing mobility does not necessarily reduce the attractiveness of car dependent locations, because the availability of cars increases. The consumption of space on the other hand reduces, as less parking space is required.

Investing in conventional public transportation is not expected to be promising to bring car ownership down. This can only be expected in areas that are closest to the urban core. This is because the main condition for a network of public transportation to bring down car density, is that it is as capillary as the one in the city of Milan.

Note that Milan is rather unique to this in the Italian context. However, even in Milan, already on the urban fringe, this condition is compromised by the existing deficiencies in public transport addressed in paragraph 4.3.1. New trains and buses can help reducing the poor imaginary that is associated with public transport. For investments in conventional public transport to have an impact on reducing the car-oriented land use planning, alignments are required between public transport and soft mobility and allocation of activities. Public transport in general is more sustainable than cars, but is dependent on what type of public transport is invested in. This is also the case in the face of justice, as public

transportation is particularly available in areas where living is too expensive for the majority of the people.

“The people that cannot afford to live in Milan, they have to use their cars. They pay high taxes, almost two third of the petrol price. This money then is used to subsidy public transport in the city, where the rich people live. Does that seem justice to you?” (interviewee 3)

Nevertheless, it is clear that a higher frequency of local and regional trains can improve the performance of the network as a whole.

Interviewee number 2 pointed at a different type of collective mobility that are to be added, so to speak, to existing public transportation services. Shuttle services are organised by an entity that recognises the need for an alternative that is not offered by existing actors.

4.3.3 Cleaner mobility

The influence on vehicle ownership through electrical mobility cannot yet be fully predicted. The reasonable expectance is, according to a Dutch research agency, that it might reduce the number of people who can afford to have a car. This way, it can reduce the vehicle density. Electrical cars make a contribution in reducing or minimising some of the transport externalities, air pollution and noise pollution. One of the precautions on cleaner mobility is that it does not reduce the *reliance* on and *dominance* of the private vehicle, which are also car dependency elements. If all the conventional cars were to be replaced by electrical vehicles, the demand for more roads, would not decrease. It does not push for a less car-based type of transportation planning. In the favour of cleaner cars in general speaks that they are not likely to face cultural barriers as much as public or shared transportation. Spatial planning is auto-oriented in the Litman cycle, cleaner cars as such are not expected to make spatial planning less based on individual cars. Instead, investments are needed to create electrical car-friendly infrastructures. Car dependency therefore cannot be reduced by only replacing conventional cars with electric cars.

4.3.4 Car restrictions

Car restricting is done in Italy usually by implementing ZTL's (zona a traffico limitato), where car traffic is limited to the residents that live in such a zone (Paolini, 2005). They are very often the centre of a city or a town. To enter such an area with a vehicle, a permission is required, which is usually available only to residents living in that particular town or city. Car restrictions can reduce the number of cars entering a city and the amount of space required by cars. Restricting car use in certain areas is a transportation planning issue. Its influence on transportation policy has been that, as mentioned, Italian cities try to avoid a certain number of cars in a city centre.

According to interviewee 3, financial car restrictions can have a positive impact on issues regarding the justice of transportation. The same interviewee pointed

at the injustice of having the car dependent people in the urban periphery paying a lot of taxes for their petrol, in order for the state to be able to subsidise public transport in the urban centre.

“It can help the people in the periphery. Right now it is not fair, so it is better to shift this tax collection from the petrol, let’s say from driving a car, to a congestion tax, and then collect it from rich people in the centre instead. Because many car drivers are not that rich.” (interviewee 3)

Extending for example the urban area that is accessible by car only by paying a ticket, which is done in Milan, more resources are raised from people that can actually afford to pay more.

4.3.5 Alignment and niche-clustering

In addition to the niches addressed so far in this section, the clustering and alignment of those niches is expected to be crucial in making an effective contribution to reduce car dependency. Geels & Schot (2007) argue that a transition involves more than one type of niche to take advantage of pressure on the current regime. In paragraph 2.5, it was mentioned that niches need to make use of windows of opportunities in order to cause a breakthrough to a sustainable mobility system. In addition, the niches need to become aligned. A policy maker interviewed pointed at the potential of transit oriented development, or TOD. This involves a combination of public transport, soft mobility and land-use. The clustering and integration of new forms of mobility is crucial to reduce some of the car dependency elements. The clustering, which refers to the integration and the aligning of the sustainable mobility niches, becomes important. This is crucial also in the ability of niches to create a breakthrough in a transition. In Italy, this type of clustering is taking place to an extent. There is an example of this in Milan. Car restricting measurements are combined with stimulating shared and cleaner mobility. The Area-C, the city centre, is accessible only by paying an entrance-fee. This does not apply to shared vehicles and hybrid cars.

Another integration that is experimented with is the integration between suppliers of different types of, in this case, collective – public and shared – mobility.

“This integration in Italy has still remained a niche. I come to think of the partnership between Trenitalia and Car2Go or Enjoy; so you take the train and then you have the shared car to travel the last mile. This presents a form, but in general we are still far behind and the new forms of sustainable mobility, in Rome, suffer greatly from competition with the private car”. (interviewee 4)

In current policy making, the desire to reduce car dependency is present. Investments are made in public transportation, promoting the use of bicycles and offering car sharing services. Italian municipalities can have access to a national

fund of 9 billion euro's by submitting the so-called Sustainable Urban Mobility Plans (SUMP), according to the guidelines set on the supranational level by the European Commission.

4.4 Barriers

This paragraph discusses two types of barriers. First, barriers can be difficulties in the development of a niche. It then refers to offering an alternative mode of transportation. A second type of barrier is for the niche to make a difference, that is, being attractive enough for end-users to perceive it a niche as a decent alternative, so that the niche can have an actual influence on car dependency.

4.4.1 Soft mobility

The promotion of soft mobility is a niche that receives appreciation by policy stakeholders (interviewee number 1; PRMT Lombardia, 2016; Cucca, 2009). The provision of space reserved for soft mobility is of significant importance. There are however normative barriers that make it difficult to take lessons from elsewhere. The Italian Road Law poses that space for bicycles can only be created through physical structures that are to place on the road. This way, they become separated from automobile traffic. One of the ideas of sustainable mobility however is the integration of traffic and people.

“We have some mayor normative difficulties to put certain themes forward. One difficulty regards, for example, realising bicycle paths. That is difficult because unfortunately our ‘codice della strada’ (= road law) has not changed since 1992. And the world has changed a bit, hasn’t it? This law forces me to realise bicycle paths that are too expensive, which makes it difficult for me to do so. If I do however, it has to be with separated structures, or with curbs. We saw in cities such as Copenhagen and Munich that where there is a mixture of heavy traffic flows, such structures are necessary. But at places where they succeed in slowing traffic down, often they can create bicycle pathways as well just by drawing stripes on the ground. Here in Italy, that is not always possible because there are these normative barriers that prevent you from doing that.” (interviewee 1)

Recently, this problem has been recognised and addressed in the field of law-making. It makes it possible to create one-way streets, which remain however accessible to cyclists from both ways. Another barrier to soft mobility lies in the presence of other traffic in the direct environment.

“But also walking means that you have to walk in rumour, you have to stay, because cars can come from everywhere, or a bicycle runs into you from behind.. So also the conditions in which I walk have to change.” (interviewee 2)

4.4.2 Collective mobility

Shared mobility is limited in its ability to be used, due to its absence in the extra-urban zone and the periphery. Services are available only in the urban core of Milan and Rome. The coverage of the services need to grow, while one of the car sharing platforms that does offer services in the urban periphery complains about high costs.

The second issue is that people effectively using a shared vehicles pay for every minute. Being stuck in traffic, costs money for every minute.

“Currently sharing in Italy in large urban centres suffers, from competition with the private car. And if the local administrator does not intervene in time so to speak, this issue can cause this form of mobility to suffocate. In the sense that, if I take a shared car, and then I am stuck in traffic for an hour, and I pay on time, it is clear that this is a disincentive for me to use the shared car rather than my own.” (interviewee 4)

A third barrier to car sharing is the cultural aversion to sharing mobility in general.

“It is very promising. A little less in Italy however, although that applies to all things that are shared, because *“the car must be mine, and I need to be one my own there. Because I have my radio, air conditioning, etcetera...* The lady who works in the ministry in Rome, when she is in the daily traffic jam to go to work, she stops at the traffic light, she stops in the queue, she does her make-up with the mirror, she does her nails, she makes a phone call, writes an email...; thanks to the fact that she doesn't drive. It is hard to abstain from this mentality, it is very hard.” (interviewee 6)

A first barrier to increase the frequency and capillarity of public transportation can be its low effectiveness and efficiency, especially in a context that is determined by car dependency.

“It does not make sense to put them all on the train, because they live and work in places where there are no train stations.” (interviewee 3)

The second barrier for improving the performance of local public transport are extensively long contracts. They guarantee a monopolistic position for the contractors, the providers of public transportation services, which makes it difficult to force them to take initiatives and responsibility to improve their performance.

The third barrier to public transportation is that recently, cuts have been made as to the amount of money that is allocated for region to carry out those responsibility (PRMT Regione Lombardia, 2016). The Lombardy region has not been the only one to complain about this issue. The distribution of funding on a

national level, often receives critical remarks from policy makers in the northern regions.

4.4.3 Clean mobility

Cleaner or electrical vehicles should not be expected to allow for a 'simple' change of the type of energy that is used to keep cars driving (Aneris, 2018; Balotta, 2018). The first issue is the time it requires to renew an entire automobile system, referring to the vehicle-park (Jeekel, 2014).

This is not dependent only on the number of electrical engines that can be produced, or on the number of places where it is possible to re-charge an engine within five minutes, but also on the diffusion rate and replacement rate of an automobile park. It would be possible to estimate the time to replace a carbon-built vehicle park powered with electrical energy, based on how long cars are used.

A second consideration to be made concerning electrical cars as being the future substitute of cars powered with fossil fuels, is that the use of soil is basically ignored. Congestion, the result of it, will be less harmful for the environment, but the loss of travel time and, from a 'modernisation' discourse, the need for more infrastructure, remains equal. The third issue is the costs of buying an electric vehicle. The costs of such a vehicle can present a barrier. Not every Italian household can afford an electric vehicle. It is an issue that Italians worry about more than other Europeans, when asked what could prevent them from buying an electrical vehicle (Thiel et al., 2002).

4.4.4 Car restrictions

A barrier to car restricting policies is the lack of public acceptance. Car restrictions in the past in most cases led to severe protests. It goes against the presumption taken that every citizen should be allowed to go where they want, whenever they want (Viale, 2006).

5. Conclusion and discussion

5.1 Conclusion

As stated in the introduction, the main research question is: *How can the conditions for a transition from car dependency to sustainable mobility in Italy be met?*

What is car dependency and why is it something needs to change?

Italy is in many ways a typical car dependent society. All areas of the country have a high vehicle density with respect to other European countries. In some environments, personal mobility is carried out by cars for more than 90%. Apart from some exceptions, public transportation and sharing mobility is not an adequate alternative. In addition, roads are designed particularly in favour of car use, which puts the convenience and safety of alternatives - cycling and walking in particular - under pressure.

The mutual reinforcing relationship of urban sprawl and car dependency is also of relevance in Italy. The spatial distribution of activities makes it difficult, if possible, to build and maintain a network of public transportation in a cost-effective way. Car dependency is reinforced by this, because more people are in need of private transport in the absence of a decent public transportation network.

Then what are sustainable mobility niches?

Sustainable mobility niches are initiatives aimed at the establishment, development and improvement of alternative transportation modes, in such a way that the need to have, or use, a private car is reduced. Those niches are the promotion and facilitation of soft mobility (cycling and walking), collective mobility (public transport and car sharing), cleaner mobility (electric or hybrid cars) and car restrictions.

What are the conditions for a transition towards a less car dependent system?

Effectively reducing car dependency is arguably not possible through carrying out only one or two niches at the same time. A transition requires changes in all elements of the regime, which is why the integration, alignment and clustering of the niches are crucial. Currently, the urge to change is only recognised by spatial planners. The other elements, transportation planning, vehicle density and culture are still contributing to the reinforcement of car dependency.

What are the specific circumstances regarding car dependency in Italy?

Italy has become car dependent from the 1960's and 1970's onwards. The ideology that the car could provide the entire country with the chance of extending its horizon led to the necessity to construct highways. Contemporary with this, public transportation services were either reduced or dismantled. As a

result, systematic use of private motorised transport increased fast and was visible for the entire country. In 2011, more than half (56,5%) of the municipalities had a modal split of private mobility that was higher than 65%.

Reducing car dependency requires a transition away from the car dependent pathway. This is moderately acknowledged, in the sense that the desire to reduce the car dependency, seems to be present. It requires the aligning of sharing and electrical mobility, the facilitation of soft mobility requires normative arrangements that make designing infrastructure for soft mobility easier to apply and implement. Integration of local public transportation systems to make them more accessible and attractive, and to reduce travel time by public transport. Currently, the regime is still dominated by the car. Niches appear to be in need of a significant amount of time of predevelopment, before they are strong enough to create the required breakthrough.

Which niches are being applied?

From the existing regime actors, investments are made in cleaner mobility, that is, making cars cleaner and more energy efficient. This can help solving three landscape pressures, which are air quality, space consumption, and depending on the source of electricity, climate change as well. On the other hand, developing cleaner mobility does not reduce car dependency itself.

To reduce car dependency in Italy, investments are being made in offering better and more attractive alternatives. This involves an improvement and integration of collective mobility; public transportation services and networks. Policy makers try to better integrate these networks to make them more attractive to use. In addition, cities are experimenting with car sharing platforms, ideally related with conventional public transport. The goal is to persuade people to use car sharing in places where this is available. These services still need to expand beyond city boundaries, to increase the number of people that can use car sharing.

What are the barriers?

Barriers that make it difficult for a transition to take-off in Italy are the strong cultural preference of the public to use cars rather than any of the alternatives, slow planning and law-making processes, and a lack of urgency regarding the landscape pressures energy dependency, and inability to be mobile without access to a car. In the majority of countries, Italy included, the transition to sustainable mobility has not yet taken off. Eliminating or overcoming the barriers mentioned here, is the most challenging aspect of meeting the conditions for a transition.

5.2 Discussion

The existence and persistence of the barriers, together with the self-reinforcing mechanisms, according to some, provide a reason to doubt if it is actually possible to reduce car dependency. Jeekel (2011) for example criticises the idea

of a transition to away from car dependency. The predevelopment phase has been going on for over two decades, which creates doubt as to if a transition is actually realistic. Niches have been present for a long time, but the actual impact that they have had on reducing car dependency so far is hardly significant (Jeekel, 2011). This is due in part to the barriers caused by the path-dependency. The self-reinforcing nature of car dependency makes it difficult for the transport system to undergo the desired transition (Mattioli, 2014).

The strength of this research was the application of several research strategies, combined with an exchange to Italy. This allowed to include contextual and interpretative information. The Italian professional literature provided detailed information about developments and happenings in Italian history that are related to the country becoming and being car dependent. The interviews also contained useful information on what type of problems there are, but less concrete recommendations to fasten the transition to sustainable mobility.

A limitation of the research was the difficulty to find a balance between the practical restrictions that are inherent to a master thesis, and the extensive magnitude of the problem under discussion. A problem with car dependency and researching it, is the very delicate balance between a focus that is either too narrow or too broad. Car dependency exposes itself through a high number of cars driving and parked on the streets and congestion in cities, but this does not really cover the dependency, the inability to live without a car outside the city. Those are only two of several elements, and already covering only one of those elements would not have been sufficient to determine the interrelationships between them. That on the research. `

As for the research topic, it was clear that so far, the transition from car dependency to sustainable mobility has not shown any sign of moving from what is called the predevelopment phase to a take-off. In short, novelties, niches of sustainable mobility, are present on several levels, but have not yet been able to take over the current car regime.

Reasons for this are various. In institutional terms, car dependency is embedded strongly in societies. Jeekel (2011) includes the contribution of a risk society, arguing that people like cars because they contribute to a sense of safety. In addition there is the comfort that the car brings, some people do not like to share their space, others actually like driving a car. Getting an entire society to perceive car dependency as a problem is a challenge in itself. Pressure caused by climate change and the dependency on fossil fuels is not strong enough yet to change those mentalities. Neither have they been of relevance in the most recent elections.

Additionally, changes involving a radical shift in an entire society, require time. It has been mentioned that integration between levels is important to avoid spatial and administrative fragmentation of transportation services. Also, it was said that the integration of services and tariffs is tricky to carry out. Attempts are

being made in the right direction but it was not until 2017 that an agency issued with this task was established. This is the multi-provincial 'agency of local public transport of Milan, Monza-Brianza & Pavia'.

It can be recommended are niches to become aligned, which requires coordinated action between and within the development of sustainable mobility niches. Networks of alternative modes need to become attractive, that is possible only through integration of the networks that are now separated.

Regarding future research, it has to be mentioned that transitions can take a long time. Therefore, longitudinal research has to be done in the future, to establish ongoing changes in vehicle density and mobility behaviour. A new census (censimento) will probably be held in 2021. Also, the relevance of landscape pressures such as a potential increase of the petrol price will only be visible in the future.

5.3 Epilogue

Concluding my master thesis, there are some issues to be mentioned, as to what I am content about, and what I have learned from carrying out this research and writing the results down.

I am content with the diversity of information I collected, thanks to the Italian experts that were willing to give up some of their time to provide me with their opinions and perspectives to car dependency and sustainable mobility in their motherland. Also, the fact that I could find out mobility and transport in Italy for myself, was helpful to experience it personally. Another positive outcome of my stay in Italy has been that my knowledge of the Italian language took a huge leap, which has helped me a lot to better understand the statements made by the interviewees and authors of Italian professional literature, which in some cases can be somewhat ambiguous and difficult to understand

The difficulty in the demarcation of the research subject and defining a clear research objective made it hard to determine and to justify what to include exactly. It was also quite a challenge to maintain the focus needed to finalise the thesis, after all the data had been collected. The complexity of the problem made it difficult to think of possible solutions, despite the fact that solving the car dependency problem once and for all could have never been the final aim of my research. It created so much doubt in my mind that finalising my thesis seemed almost as difficult as solving car dependency itself. I learned that determining a clear research objective and methodology is crucial for being able to determine when a thesis is done. At certain moments, I seemed to be investigating the whole world.

In the end I can be nothing but satisfied and grateful about being able to find a way to reach a conclusion to this long-lasting project.

Appendix

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Interviews

The interview data is to be found in the file which contains the Italian interview transcriptions.

Car dependency indicators

This is the full car dependency table adopted from Litman (2014).

Indicator	Description	Low	Medium	High
Popular Name		Carfree	Multi-modal	Automobile Dependent
Vehicle Ownership	Per capita motor vehicle ownership (usually measured per 1,000 population)	Less than 250 per 1,000 pop.	250-450	450+
Vehicle Travel	Per capita annual motor vehicle mileage	Less than 4,000 miles (6,500 km)	4,000-8,000 miles (6,500-13,000 kms)	8,000+ (13,000 km plus)
Vehicle Trips	Automobile trips as a portion of total personal trips	Less than 50%	50-80%	80%+
Quality of Transportation Alternatives	Convenience, speed, comfort, affordability and prestige of walking, cycling and public transit relative to driving.	Alternative modes are of competitive quality.	Alternative modes are somewhat inferior.	Alternative modes are very inferior.
Relative Mobility Of Non-Drivers	Mobility of personal travel by non-drivers compared with drivers.	Non-drivers are not severely disadvantaged.	Non-drivers are moderately disadvantaged.	Non-drivers are severely disadvantaged.
Land use patterns	Land use density (residents and jobs per acre) and mix (proximity of different land	Very compact and mixed.	Moderately compact and mixed	Dispersed and homogenous

	use types).			
Transport system	Type of transportation facilities and services available.	Mainly non motorised and public transit	Very mixed: non motorised, public transit and automobile.	Mainly automobile (roads and parking facilities).
Roadway design	Design features of public roads.	Highly pedestrian oriented	Mixed.	Designed to maximize auto traffic speeds and volumes.
Shopping Options	Where retail and other public services are located	Along public streets	Mainly along public streets near transit areas	In private malls, located along major highways
Market Distortions Favoring Automobile Use	Relative advantage provided to automobile transportation over other modes in planning, funding, tax policy, etc.	Minimal bias favoring automobile travel.	Moderate bias favoring automobile travel.	Significant bias favoring automobile travel.
Automobile commute mode split	How people travel to work and school.	Less than 35%	35-65%	More than 65%
Errand travel	How people normally travel to stores, professional appointments, recreation activities, etc.	Mostly walking, cycling and public transit.	Walking, cycling, public transit and automobile.	Mostly automobile.
Performance Indicators	How transport system performance is evaluated	Quality of walking, cycling and public transit	Multi-modal	Automobile-oriented