

THE FUTURE OF PUBLIC TRANSPORT



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# THE FUTURE OF PUBLIC TRANSPORT

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## AN ANALYSIS OF SOCIO-ECONOMIC TRENDS AFFECTING THE PUBLIC TRANSPORT

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## **Master thesis**

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## PREFACE

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This thesis was written for the completion of a master's degree in Economics and Business with the Urban, Port and Transport Economics specialisation at Erasmus University Rotterdam. From begin to end, I have enjoyed writing this paper and got the opportunity to expand my scope due to the across-countries perspective of this report.

I received a lot of support during the writing process and I would like to express my appreciation towards those who supported me. First of all, I would like to thank my thesis supervisor Dr. Guiliano Mingardo, for supporting me, keeping up my enthusiasm for this research and providing me with his valuable feedback during our meetings. I would like to thank my co-reader Dr. Alexander Otgaar for making the effort of reading my final thesis. I would also like to thank Dick-Jan Vossers, Theo Konijnendijk, Willie de Swart and all other colleagues for guiding and advising me during the internship at RET N.V and making this time very pleasant.

Finally, my husband Himmet Keskin and my family have been very important for me during the writing of this thesis and my entire degree. They always believed in me and helped me to stay positive all the time. I would especially like to thank my mother for encouraging me to do the best I can. I owe them all a debt of thankfulness.

I wish the reader much pleasure in reading my thesis.

Thursday, 23 July 2015

Gülbahar Uysal - Keskin

## ABSTRACT

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The world is changing rapidly and attempting to look forward is as difficult as it is necessary. Market trends play an important role in the way different consumer groups define or adjust their behaviour. In order to succeed in your core function as business or government, it is crucial to plan for trends and respond to those. One of these organisations is the public transport provider. In this thesis, 13 important trends with a considerable impact on public transport have been found which are: ageing, population growth, transforming families and household sizes, globalization, shift of economic power, urbanization, individual empowerment, pressure on natural resources, innovation and technological development, knowledge society, flexible working, sharing economy and declining popularity car use. Tentative statements are conducted, following from the literature analysis. These statements are then tested by using a questionnaire with experts' opinions. For analyzing the results the strength of consensus method is used. According to the results, the observation was that urbanization, population growth and pressure on natural resources are the trends expected to affect the public transport strongly positive and the trends sharing economy, ageing and individual empowerments are expected to influence the public transport strongly negative. Moreover, regarding the trend of sharing economy it appeared that there is a big lack of clarity for its effects. It is recommended to policy makers to increase the frequency and efficiency or to provide alternative routes in order to cope with the growth in demand. Moreover, it is also advised to provide public transport services from urban sprawl areas to cities and vice versa and to enhance the accessibility of public transport for the ageing population.

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## CHAPTER 1: INTRODUCTION

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Approximately 57 billion passenger journeys were made by local public transport in the European Union in 2012. This equals to nearly 182 million journeys on the average working day. Local public transport, also defined as the collective scheduled transport of passengers, over relatively short distances, mainly within urban and suburban areas, is one of the backbones of urban mobility within the EU. Public transport services include road transport, like urban and suburban buses, or rail modes, like tramways, light rail, metro, suburban heavy rail and in some cities also waterborne transport (International Association Public Transport, 2014).

Public transport enables the reduction of congestion and health- and environmental-harming emissions in urban areas, especially when they run on alternative, cleaner fuels. The European Commission strongly encourages the use of public transport as part of the modal split (European Commission, unknown). To ensure a greater consistency between the quality of the public transport supply and the wishes of travellers, RET<sup>1</sup> participates in a European project called CIPTEC. CIPTEC aims to make recommendations for growing the share of public transport in the modal split by gaining extra passengers for a limited additional cost. The consortium of CIPTEC consists of universities, public authorities, public transport operators and consultants from various countries like Greece, Italy, Belgium, Germany, United Kingdom and the Netherlands. At the first part of the project, where market and societal trends will be analyzed, Aristotle University of Thessaloniki (Greece), Metropoolregio Rotterdam Den Haag (Netherlands), Mobycon Concordis Group (Netherlands), White Research (Belgium), Ortelio Ltd. (United Kingdom), MemEx (Italy), European Passengers Federation (Belgium), European Metropolitan Transport Authorities (France) and traffiQ (Germany) will be the main participants.

Market trends play an important role in the way different consumer groups define or adjust their behaviour. In this thesis, the research phase will take centre stage, which will be the analysis of market trends. Important market trends that might influence transport consumers will be analyzed. The analysis of these market trends will cover also the effect of societal trends on market trends, since both of them influence significantly the transport sector. The technological orientation is for example a trend with an important influence of the usage of public transport.

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<sup>1</sup> Rotterdam Electric Tram NV (RET, 2015)

<sup>2</sup> Collective Innovation Public Transport European Cities (MRDH, 2015)

The objective of this thesis is to provide an overview of major trends in society, the transport market and their impact on travellers, travel behaviour and public transport. The output of this thesis will be an extensive and comprehensive overview of market trends and their influence on public transport. For each market trend, an analysis will be made, on how it will influence (potential) public transport consumers and the supply of public transport.

Rotterdam Electric Tram NV (RET) is a Dutch transport company active in the urban transport in and around the city of Rotterdam. Public transport is carried out by tram, bus, metro and ferry. The principal is Metropoolregio Rotterdam Den Haag <sup>3</sup>(MRDH). The Metropoolregio Rotterdam Den Haag covers the area of 23 municipalities. The municipalities join their forces to increase the accessibility of this area and to strengthen the economic business climate (MRDH , 2015 ).

The department of Management and Development (M&D) has a policy input at a tactical level of the city public transport system. This involves several tasks such as transport design, coordination with concession grantors, city regional marketing, tariffs, regional travel information and business development and/or innovation. This department is the link between the grantor and the various concessions from the RET, is the contact for other stakeholders (including municipalities, consumer groups, provincial government and other parties) in the Rotterdam region. Besides, it monitors the joint interest of good public transport and the attractiveness of public transport. The Management and Development department works partly on behalf of the City of Rotterdam and partly as the department of Strategy and Innovation for the RET.

The main question which will be examined in this study is as follows: What are the major trends in the society and in mobility and what is their impact on travellers, travel behaviour and public transport demand?

The main question of this research will be answered by the following sub-questions:

- What are the most important economic and societal trends in general?
- What are the most important economic and societal trends in mobility?
- What are the effects of such trends on travellers and travel behaviour?
- What are the possible effects on the supply of public transport?

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<sup>3</sup> Metropolitan Region Rotterdam The Hague

In answering these questions the regional, national and European level will be taken into account.

The methodology used on this thesis consists in the extensive literature research followed by an expert panel. This ensures that the valid results could be obtained. This panel will consist of several partners who participate in this project.

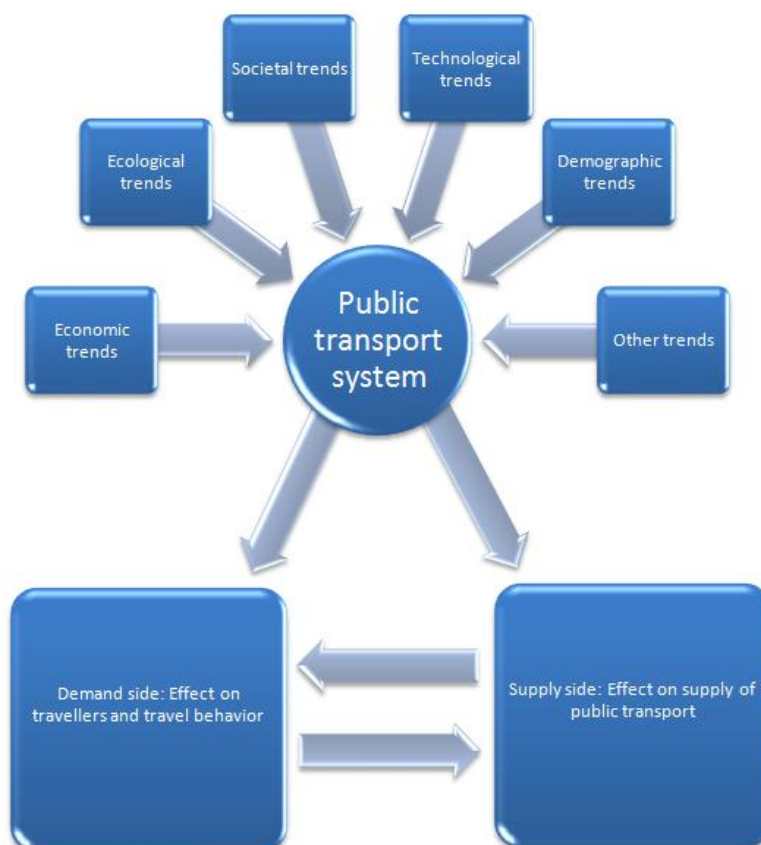
This thesis is structured as follows: Initially, the analytical framework is discussed in chapter 2, followed by an extensive literature review for identifying and analyzing the trends and their impact in chapter 3. The second part consists of an experts' opinion where experts and qualitative personal are asked to fill in a questionnaire. According to Rowe and Wright (2001), experts' opinions are often necessary in forecasting the future due to a lack of appropriate or available information (Rowe & Wright, 2001). In chapter 4 data and methodology of this research approach is will be given. Next to that, the outcomes and their impact on public transport will be discussed in chapter 5 and 6. Finally, a conclusion will be given provided with policy recommendations (chapter 7). Limitations of research and recommendations for further research are discussed in chapter 8.

## CHAPTER 2: ANALYTICAL FRAMEWORK

Van de Riet and Egeter (1998) have developed a conceptual model that provides a good basis for the analysis of the transport system (Riet & Egeter, 1998). In this conceptual framework, the transport system is viewed from a macro-economic perspective, consisting of three markets: the displacement market, the transport market and the traffic market. For this thesis, this conceptual framework will be used as a basis for further analysis. For the sake of the research, the conceptual framework is adjusted to a public transport system and simplified by replacing the three markets with the demand side of the public transport market and the supply side. Economic, societal, demographic, ecological, technological and other trends are included in the macro-environment affecting either directly or indirectly the public transport system. These domains are derived from the PESTLE analysis which is an analytical framework used to examine external macro environment in which they operate (Oxford learning lab, 2015). The original conceptual framework of Riet and Egeter (1998) supplemented by Kiel (2012) is included in the appendix (Appendix Figure A) (Kiel & Maurer, 2012; Riet & Egeter, 1998).

The framework, which is illustrated schematically in figure 1, assumes that a trend belongs to a domain and might affect the demand side and/or the supply side of the public transport system.

FIGURE 1 - MODIFIED CONCEPTUAL FRAMEWORK (RIET & EGETER, 1998)



Unfortunately, it is hard to foresee future trends with strategic importance to decision makers, since the future is always 'unknown'. As stated earlier, trends are highly interrelated with each other and may therefore influence each other significantly and this might amplify or reduce some effects. In this thesis, it is attempted to underpin important developments with its main effects. Despite the fact that one must not forget that these developments are forecasts, these expectation of these trends becoming existent is high.

However, there might be an abrupt change, which in some reports is stated as a 'wild card' or a 'black swan' (Hoorens, et al., 2013). Due to their nature, these disruptive events are impossible to predict. In this thesis, events or developments with high impacts on the public transport system mentioned in many reports are highlighted. When these trends, their interrelatedness and their impacts are identified, decision makers may be alert for early signals (Hoorens, et al., 2013).

## CHAPTER 3: THEORY

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This chapter aims at providing an overview of the literature concerning major economic and societal trends in general (global and/or European level) and in mobility. Afterwards, their effects on travellers, travel behaviour and supply of public transport are going to be analyzed and examined. For this review, different literatures are used like reports and academic research

### 3.1 TRENDS IN GENERAL

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The world is changing rapidly and attempting to look forward is as difficult as it is necessary. In order to succeed in your core function as business or government, it is crucial to plan for trends and respond to those. However, it is important that some trends are not only posing a risk but might be also opportunities. An important note is that trends are highly interrelated with each other and/or may cause several sub-trends in its own turn. For instance, increasing global population is a trend and causes an increase in demand for natural resources and it may also affect the climate change. It is important to consider this interrelatedness between several trends.

Economic and social performances are the main determinants of many developments and changes from region to region. However, it is hard to generalize the European economy since the conditions in different countries vary noticeably from one area to another. Nevertheless, there are some global trends that affect the whole European economy and even the whole world and have its own intensity for these different regions. These global megatrends are long-term issues with a time span for at least 20 years (KPMG, 2013). Moreover, these megatrends are relevant for a bigger region than just a country or city. At this part of the literature review, some major global and European trends influencing the economy and the society will be discussed and the first sub-question is attempted to answer.

*What are the most important economic and societal trends in general?*

By conducting a literature review a basic knowledge on the subject has been acquired. For the literature review research reports and articles presented in journals has been used. Initially, general trends were sought, in which no distinction was made between global and European trends. The key words that were used in the search process were: 'global trends', 'megatrends', 'European trends', 'key trends', 'future trends', 'future trends for Europe', 'future global trends', 'future megatrends', 'forecasting trends'. Subsequently, trends have been identified that occurred specifically in the mobility market. For this part of the search process the trend had to be necessarily taking place in Europe. Obviously, this might also include a global trend which

exerts a significant influence on Europe. For this search process the following key words were used: 'trends in mobility', 'future trends in mobility market', 'trends in public transport', 'European mobility trends', 'future trends in mobility Europe', 'future of mobility', 'future of public transport'.

After analyzing and reviewing many articles discussing long-term trends and developments for the coming 15-20 years, 10 trends have been found. These are ageing, growing population, bigger middle class, transformed families and household sizes, increased trade and globalization, shift of economic power, urbanization, individual empowerment, growing demand for natural resources and innovation. These trends can be subdivided into demographic trends, economic trends, social trends, ecologic trends and technologic trends (Table 1). These domains are derived from the PESTLE analysis which is an analytical framework used to examine external macro environment in which they operate. PESTLE is an acronym which stands for Political, Economic, Socio-cultural, Technological, Legal and Environmental. This construction enables to analyse the whole business from different points of view (Oxford learning lab, 2015).



Domain	Trends in general	Sources	Trends in mobility	Sources	Short description
<b>Demography</b>	1. (Rapid) Ageing of global population	(ESPAS, 2015; KPMG, 2013; Fiedler, 2007; Harms, Jorritsma, 't Hoen, & van de Riet, 2011; National Intelligence Council, 2012; Bhimani, 2008; Clark & Moonen, 2014; Holm, et al., 2009; Roland Berger Strategy Consultants, 2011)	1. (Rapid) Ageing of global population	(Forum for the Future , 2010; Göll & Evers-Wölk, 2013; Kayser & Christian Grote-meier, 2011; Delle Site, et al., 2012; Rudinger, Donaghy, & Poppelreuter, 2006; Brög, Barta, & Erl, 2005; ALLIANZ, 2012; Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Sessa & Enei, 2009; Rudinger, Donaghy, & Poppelreuter, 2006; Kayser & Christian Grote-meier, 2011; Jorritsma, 't Hoen & van de Riet, 2011; Zmud, Ecola, Pjleps & Feige, 2013; Scheiner, 2006; Go-Ahead; Passenger Focus, 2012)	Higher life expectancy and decreasing birth rates causes a higher proportion of elderly people.
	2. Increased global population	(National Intelligence Council, 2012; ESPAS, 2015; Roland Berger Strategy Consultants, 2011; Zmud, Ecola, Phleps, & Feige, 2013; Holm, et al., 2009; Clark & Moonen, 2014).	2. Increased global population	(Delle Site, et al., 2012; Forum for the Future , 2010; Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Harms, Jorritsma, 't Hoen, & van de Riet, 2011)	The global population will grow, especially due to emerging economies.
	3. Bigger middle class	(see trend 2)			More people will belong to the middle class.
	4. Transforming families and household sizes	(Fiedler, 2007; Holm, et al., 2009; Hoorens, et al., 2013; OECD , 2012; Billari, 2005).	3. Transforming families and household sizes	(Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Göll & Evers-Wölk, 2013; Delle Site, et al., 2012; Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Sessa & Enei, 2009; InnoZ-Bausteine, 2008; Rogge, 2005; CPB, RBP, MNP, 2006; Go-Ahead; Passenger Focus, 2012)	Growing share European population staying childless, maternity at a later age, increased divorces and less constant marriages
<b>Economy</b>	5. Increased trade and globalization	(KPMG, 2013; ESPAS, 2015; HSBC, 2013; Roland Berger Strategy Consultants, 2011; Gros & Alcidi, 2013; Bhimani, 2008; Holm, et al., 2009)	4. Globalization	(Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Göll & Evers-Wölk, 2013; Sessa & Enei, 2009; Bhimani, 2008)	Globalisation increases mobility of capital, technological innovations, interdependency and uniformity of national markets.

	6. Shift of economic power	(OECD, 2010; ESPAS, 2015; World Economic Outlook, 2014; Zmud, Ecola, Phleps, & Feige, 2013; OECD, 2014; Roland Berger Strategy Consultants, 2011; National Intelligence Council, 2012)			The shift of economic power from the 'West' to the 'rest'
<b>Social</b>	7. Urbanization	(Holm, et al., 2009; Zmud, Ecola, Phleps, & Feige, 2013; National Intelligence Council, 2012; UN News Centre, 2014; RICS Foundation, University of Salford, The Futures Academy and King Sturge, 2010; KPMG, 2013; Roland Berger Strategy Consultants, 2011; ESPAS, 2015)	5. Urbanization	(European Environmental Agency, 2011; Kompil, et al., 2013; Göll & Evers-Wölk, 2013; United Nations, 2011; Delle Site, et al., 2012; Harms, Jorritsma, 't Hoen & van de Riet, 2011; Voorst & Hoogerwerf, 2013; Kayser & Christian Grotemeier, 2011; Williams & Hammond, 2015; Groenhuijsen & Jeurissen, 2015; Frost & Sullivan, 2014; Transport Research and Innovation Portal, 2013; Riberio, et al., 2007; Sessa & Enei, 2009; Go-Ahead; Passenger Focus, 2012)	An increase in population in cities and towns versus rural areas
	8. Individual Empowerment	(ESPAS, 2015; European Union Institute for Security Studies, 2011; National Intelligence Council, 2012; Roland Berger Strategy Consultants, 2011)	6. Knowledge Society	(Forum for the Future, 2010; Kompil, et al., 2013; Delle Site, et al., 2012; Göll & Evers-Wölk, 2013; UITP, 2014; Graaff & Rietveld, 2007; Kenyon, 2010)	Citizens will be able to reshape economic developments, to redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs (ESPAS, 2015)
			7. Flexible working	(Brög, Barta, & Erl, 2005; InnoZ-Bausteine, 2008; Lanzendorf & Gather, 2005; Rogge, 2005; RAI vereniging, 2014; Sessa & Enei, 2009; Eenink & Vlakveld, 2013; Voorst & Hoogerwerf, 2013; Kayser & Christian Grotemeier, 2011; Go-Ahead; Passenger Focus, 2012; Hemily, 2004)	
<b>Ecology</b>	9. Pressure on	(ESPAS, 2015; Roland Berger	8. Pressure on resources	Transport Research and Innovation	Increasing pressure on natural

	natural resources	Strategy Consultants, 2011; International Energy Agency, 2014; KPMG, 2013; National Intelligence Council, 2012)	and needs for sustainability	Portal , 2013; Frost & Sullivan, 2014; RAI vereniging , 2014; ALLIANZ, 2012; Groenhuijsen & Jeurissen, 2015; Delle Site, et al., 2012; Sessa & Enei, 2014; Forum for the Future, 2010; Göll & Evers-Wölk, 2013)	resources
<b>Technology</b>	10. Innovation and technological development	(Cullmann & Geppert, 2012; Zmud, Ecola, Phleps, & Feige, 2013; KPMG, 2013; Roland Berger Strategy Consultants, 2011; ESPAS, 2015; Bhimani, 2008; Gros & Alcidi, 2013; National Intelligence Council, 2012; ESPON, 2010; Holm, et al., 2009)	9. Innovation and technological development	(Forum for the Future , 2010; Kompil, et al., 2013; Göll & Evers-Wölk, 2013; Arthur D. Little; UITP, 2014; ALLIANZ, 2012; Bray, 2014; Ribeiro, et al., 2007; Delle Site, et al., 2012; Voorst & Hoogerwerf, 2013; Go-Ahead; Passenger Focus, 2012)	Accelerated technological developments and innovations
<b>Others</b>			10. Sharing economy	(Arthur D. Little; UITP, 2014; Cornet, Mohr, Weig, Zerlin, & Hein, 2012; ALLIANZ, 2012; Groenhuijsen & Jeurissen, 2015; RAI vereniging, 2014; OIS, 2014)	
			11. Declining popularity car use	(Ribeiro, et al., 2007; Forum for the Future , 2010; Cornet, Mohr, Weig, Zerlin, & Hein, 2012; Eenink & Vlakveld, 2013; OIS, 2014; RAI vereniging , 2014; Groenhuijsen & Jeurissen, 2015; SWOV, 2012)	

TABLE 1 – OVERVIEW OF TRENDS

## TREND 1: AGEING

One major trend, mentioned in many reports as an important development is the (rapidly) ageing of the population (ESPAS, 2015; KPMG, 2013; Fiedler, 2007; Harms, Jorritsma, 't Hoen, & van de Riet, 2011; National Intelligence Council, 2012; Bhimani, 2008). Higher life expectancy and decreasing birth rates are increasing the proportion of elderly people across the world. As it can be observed from figure 2, with an average age of 44.7 years, Europe will become the 'oldest' continent (Figure A, Appendix). Moreover, in 2030 the expectation is that the European Union's population will increase to 23% above the 65 years (16% in 2013). In addition, the OECD states that the human race is not only growing older but also richer, with more inequalities (OECD, 2014). An important note is that, despite the fact that more inequalities seems to be contradictory to the trend of the rising middle class, it should be considered separately from each other. The rise of the middle class is a trend applying to most developing countries, whereas increasing inequalities also applies to developed countries where richer becomes richer.

FIGURE 2- MEDIAN AGE IN DIFFERENT REGIONS OF THE WORLD IN 2030 (ESPAS, 2015)



Ageing is one of the most important developments since it has major implications for different aspects like pressure on the labour force, global productivity, personal savings, pension funds, global productivity and health sector. According to the Clark and Moonen (2014), smaller cities in Western Europe became under pressure for being more productive. This might lead to higher variation in economic performance across cities (Clark & Moonen, 2013). Interestingly, it is also expected that ageing and slowdown of the population growth might enhance the economy since they have more time and money to spend, are more productive and have more savings (ESPAS,

2015). These implications are big challenges for governments. Furthermore, some countries are also facing the challenge of integrating large youth populations into saturated labour markets. For governments and businesses it might be important to take healthcare, aged care, pensions and accessible infrastructure into account (KPMG, 2013). Additionally, in some countries the observation is that the retirement age is increased. This leads to more elderly people working and thus also travelling. All these changing demographics will have a weighty impact on the economy all over the world.

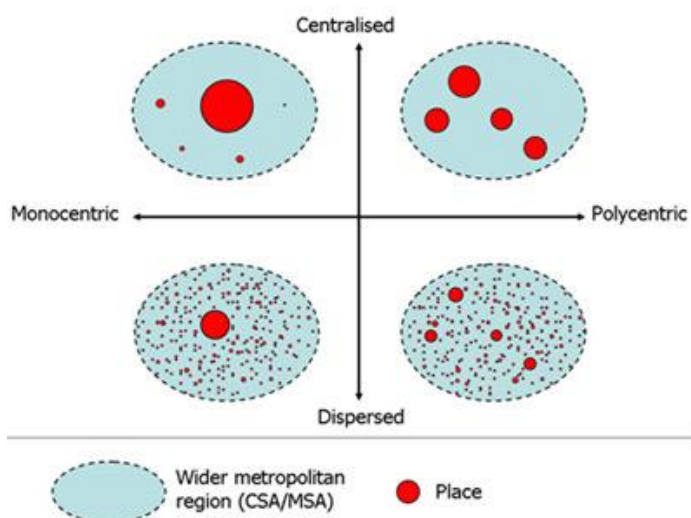
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## TREND 2: GLOBAL POPULATION AND RISING MIDDLE CLASS<sup>4</sup>

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A second major demographic trend analyzed in the literature deals with the population growth going together with a rise in middle class. According to different reports, it is expected that in the world of 2030 the global population will reach approximately 8.3 billion people (National Intelligence Council, 2012; ESPAS, 2015; Roland Berger Strategy Consultants, 2011; Hoorens, et al., 2013; Holm, et al., 2009). An increase in global population, going together with an increase in the middle class, will lead to different consumption patterns. According to recent research done for the Global Cities Initiatives (2014), who aims to equip metropolitan leaders with research and information, found that population growth is taking place in the larger and/or capital cities to the detriment of second and third level cities. This pattern is, especially evident in larger monocentric European countries (Figure 3), with bigger national distances, like London, Stockholm, Paris and Warsaw (Clark & Moonen, 2013) .

FIGURE 3 - DIMENSIONS OF REGIONAL URBAN FORM (MEIJERS & BURGER, 2010)

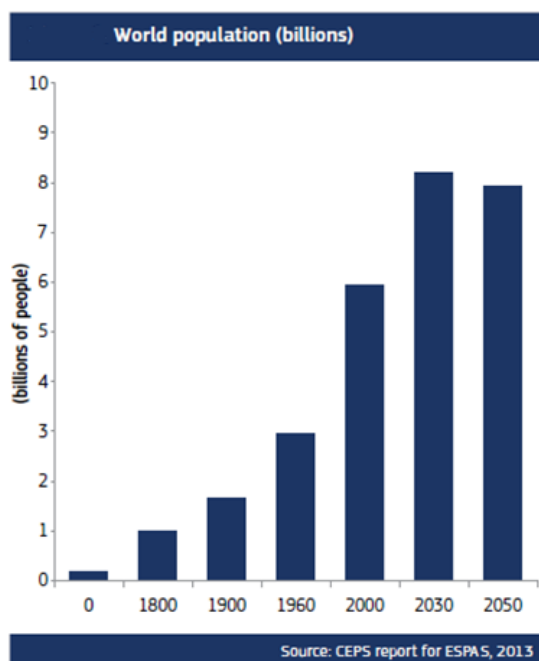


<sup>4</sup> There are multiple applicable definitions of what constitutes membership in the middle class. The definition used in this report belongs to Goldman Sachs which is GDP per capita of \$6,000-30,000 per year, which yields a similar estimate of 1.2 billion middle-class people in the world in 2010.

In identifying this development, quantitative and perception-led benchmark and studies were used (Clark & Moonen, 2013). This trend may therefore cause another sub trend of growing pressure on food, water and energy with approximately 40%. Moreover, the climate change might strengthen these effects since researches on environmental issues suggest that wet areas will become wetter and dry areas becoming more so (National Intelligence Council, 2012). Changes in the global population is a strong and major issue which affects structural the economy, society and the environment. Therefore, it is for governments and other institutions very important to be prepared on the changes set in motion in response to this trend.

Interestingly, according to the forecasts of the ESPAS report, the expectation is that the global population might peak in 2030 (Figure 4). They state that the population growth is declining everywhere and that this trend is underestimated. The global population might reach the top boundary and start to decline. In contrast to the other literatures, they expect after 2030 the demand for natural resources to fall and thus that the availability of natural resources, especially energy, should not be a major concern (Gros & Alcidi, 2013). This statement is very remarkable since the global footprint and the use of these scarce resources has become a major concern on the micro, meso and macro level. More and more firms, countries and major forces are trying to contribute in order to make their operations more eco-friendly.

FIGURE 4 - WORLD POPULATION (BILLIONS) (ESPAS, 2015)



However, research literature and projections agree with the trend of population growth (ESPAS, 2015; Holm, et al., 2009; Hoorens, et al., 2013; Roland Berger Strategy Consultants, 2011).

According to some reports, world population will even grow to between 8 and 9.6 billion by 2050. Additionally, they also agree about the slowdown of the population growth. The prediction of the falling share of world population is an important prediction which has been analyzed by several social scientists, politicians and media. The expectation is that the share of EU27 in the world population will decrease from 18 % in 1970 to 10% in 2030. Nevertheless, we could not state that the slowdown of the population growth would take away the pressure on natural resources, since the population is still growing in absolute numbers and the natural resources are still scarce.

As mentioned before, the growth in population goes together with the global middle class will more than double between the years 2009 and 2030 (Figure B, Appendix). This equals to 60% of the world population belonging to the middle class. Middle classes are expected to expand substantially in absolute numbers and shares. We already stated in the beginning in this chapter that there is a high interrelatedness between trends and developments. The growth in the middle class is also expected to cause a significant rise in education levels, increased literacy and increased access to new technologies. Moreover, it might also increase the demand for consumer goods and transport. According to the reactions to the report of the National Intelligence Council it appeared that the rising middle classes were a key megatrend with significant implications, which points out the importance of this development (National Intelligence Council, 2012).

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### TREND 3: TRANSFORMING FAMILIES AND HOUSEHOLD SIZES

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The literature points to a fourth trend which is likely to emerge in the European union and other developed economies in the future (Fiedler, 2007; Holm, et al., 2009; Hoorens, et al., 2013; OECD , 2012; Billari, 2005). This trend is transforming families and household sizes are linked to societal, demographic and cultural changes and changes (Fiedler, 2007) in the living arrangements of people (Billari, 2005). According to Holm, et al. (2009), as the average number of children per household decreases, several changes occur like economic empowerment of women, further decrease of birth rates, changes in class structures and rising education (Holm, et al., 2009).

All these changes in family structures and household sizes are affecting the way in which Europeans live. Evidence shows that an increasing share of the European families remains childless, parenthood begins at a later average age and divorces are increasing (Hoorens, et al., 2013). Moreover, OECD (2012) and the European commission forecasted for the period between 2030 and 2100, that Europe will face a rise in single-adult households (OECD , 2012). This is partly caused by an increase in single-parent families, partly by an increased number of childless



couples and partly caused by a decline in average household size. In addition, an increase of single households is also partly caused by an increased share of elderly people (Fiedler, 2007; Hoorens, et al., 2013). As a result, elderly people are missing the support from their relatives or partners and have to travel to see her families (Fiedler, 2007).

However, according to the literature (Hoorens, et al., 2013; OECD , 2012; Billari, 2005), the future prospects and its effects of transforming families is unpredictable due to hard predictable variables like personal choices, shifting values and preferences, fertility and/or mortality levels. Nevertheless, an important expectation is that car ownership and mobility will increase (Hoorens, et al., 2013). This is caused by the increased amount of families, emerging from divorces and increased single-person families. People will have an increased need to travel more (families and relatives) and would like to own a car per household.

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#### TREND 4: INCREASED TRADE AND GLOBALIZATION

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European cities have long been centres of global trade, but the recent globalisation began at the end of the Second World War (Newman & Thornly, 2002). The OECD describes globalization as ‘an increasing internationalisation of markets for goods and services, the means of production, financial systems, competition, corporations, technology and industries. It gives rise to increased mobility of capital, faster propagation of technological innovations and an increasing interdependency and uniformity of national markets.’ (OECD, 2001). The interconnected global economy will increase the levels of international trade and capital flows (KPMG, 2013). Globalisation and technological development have strongly transformed the balance and shape of global economic relations over the past 25 years. Worldwide exports of goods increased on average 7.3% per year (ESPAS, 2015) and are expected to increase with approximately 5% per year through 2030 (HSBC, 2013). Due to globalisation, the global markets for high-end skills and labour, research, innovation and new technologies, and capital investment flows will increase too (KPMG, 2013).

Globalization has been a hot topic for experts and the public, since it is considered as a key driver of growth. According to Roland Berger and their trend projections for 2030, globalization will continue with exports and FDI growing faster than GDP (Roland Berger Strategy Consultants, 2011). Though, globalisation will be increasingly driven by new actors with different values and these emerging economies will persist to catch up (ESPAS, 2015). Moreover, the expectation is that in the developed countries the growth of GDP is slowing down as compared to the past 20 years. This development will lead to developed countries losing their GDP and FDI share in the world sharply and developing countries will grow almost four times



faster (Roland Berger Strategy Consultants, 2011). Nevertheless, according to Gros and Alcidi (2013), the boost of the emerging economies in developing countries might lower its effect if these economies become mature (Gros & Alcidi, 2013). However, an economy becoming mature might take more years reaching its maturity years after 2030 (Duijn, 2013). A critic on this report is that they do not agree with the assumption that the emergence of unconventional oil and gas (shale-gas) might lead to a reindustrialization of the country (Kang, 2012).

Globalization has led to higher level of economic interconnectedness with increased information exchange immediately via the media and social networks, the rise of the international trade and more flexible production technologies (Bhimani, 2008). Interestingly, in the METRIS report by Holm et al. (2009), report (Monitoring European Trends in Social Sciences and Humanities), it is stated that globalisation will lose its importance as compared to recent years (Holm, et al., 2009).

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#### TREND 5: SHIFT OF ECONOMIC POWER

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The shift of economic power from the 'West' to the 'rest', as ESPAS states, is highly related with the increased globalization and interconnectedness. The rebalancing of global power with more pressure on emerging economies <sup>5</sup>leads to less poverty and higher influence on the global economy. These developing countries will generate 57% of the global GDP in 2030 (OECD, 2010) and the income differences across countries will shrink caused by openness to globalization, savings and human capital (ESPAS, 2015). Despite the fact that these emerging economies has less poverty and gained more wealth, there is also a growing inequality within borders. Disregarding moral and political considerations, the increasing inequality will lead to economic, political and social problems (World Economic Outlook, 2014). Essentially, the growing inequality within countries will not take place in emerging economies, but at global level including the developed countries (Hoorens, et al., 2013) (OECD, 2014). As a conclusion, the economic shift will narrow the income differences *between* countries, but increase the inequalities *within* countries.

The expectation is that the BRIC<sup>6</sup>- countries and Next Eleven <sup>7</sup>will become the new powerhouses of the economy (Roland Berger Strategy Consultants, 2011) (National Intelligence Council,

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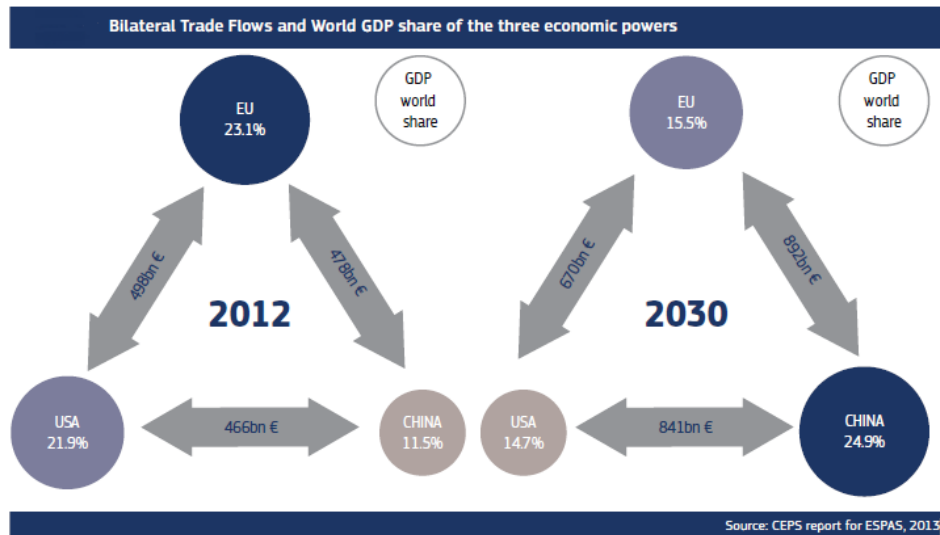
<sup>5</sup> Rapidly growing and volatile economies of certain Asian and Latin American countries. They promise huge potential for growth but also pose significant political, monetary and social risks (Business Dictionary, sd). 1117hb

<sup>6</sup> An acronym for the economies of Brazil, Russia, India and China combined (Investopedia, sd).

<sup>7</sup> Also known as N-11, these are the eleven countries that, according to a Goldman Sachs Group, Inc. prognosis, have the potential to become the world's largest economies in the 21st century. These are: Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea and Vietnam (Investopedia, sd).

2012) (ESPAS, 2015). However, according to Manning (2013), the economic power will be diffused and there will not be major pole. Instead, any single actor will gain the ability to form different conclusions according to the nature of the concern (Manning, 2013). Moreover, the trend of global ageing may affect the economic growth and domestic stability of the emerging economies significantly (ESPAS, 2015). The impact of ageing on an economy depends a lot on the levels of education. This means that people with a higher education will be able to work for a longer period, have more savings and be more productive, even after the age of 65. This implies that emerging economies without sufficient education together with a decrease in birth rates will face the biggest challenge (ESPAS, 2015). As it can be observed from figure 5, annual real GDP growth rate of china will be the strongest with 9.0% followed by India (8.4%), Brazil (5.5%) and Russia (5.3%). The share of the BRIC countries in global exports in 2030 will equal Europe's by increasing from 14% in 2010 to 23% in 2030. Moreover, the expectation is that all the BRIC countries will become the most attractive location for FDI in the world. The trend of rising middle class is also highly interrelated with the economic shift to emerging economies. The middle class in the BRIC countries will grow with 150% from 0.8 billion people to 2 billion people in 2030.

FIGURE 5 - BILATERAL TRADE FLOWS AND WORLD GDP-SHARE OF THE THREE ECONOMIC POWERS (ESPAS, 2015)



## TREND 6: URBANIZATION

The city is a place where people from across the world come to seek for work, knowledge, wealth etc. (Holm, et al., 2009). Urbanization is defined as an increase in population in cities and

towns versus rural areas and is initiated during the industrial revolution when agricultural workers moved towards manufacturing hubs in cities to obtain jobs (Business Dictionary, sd).

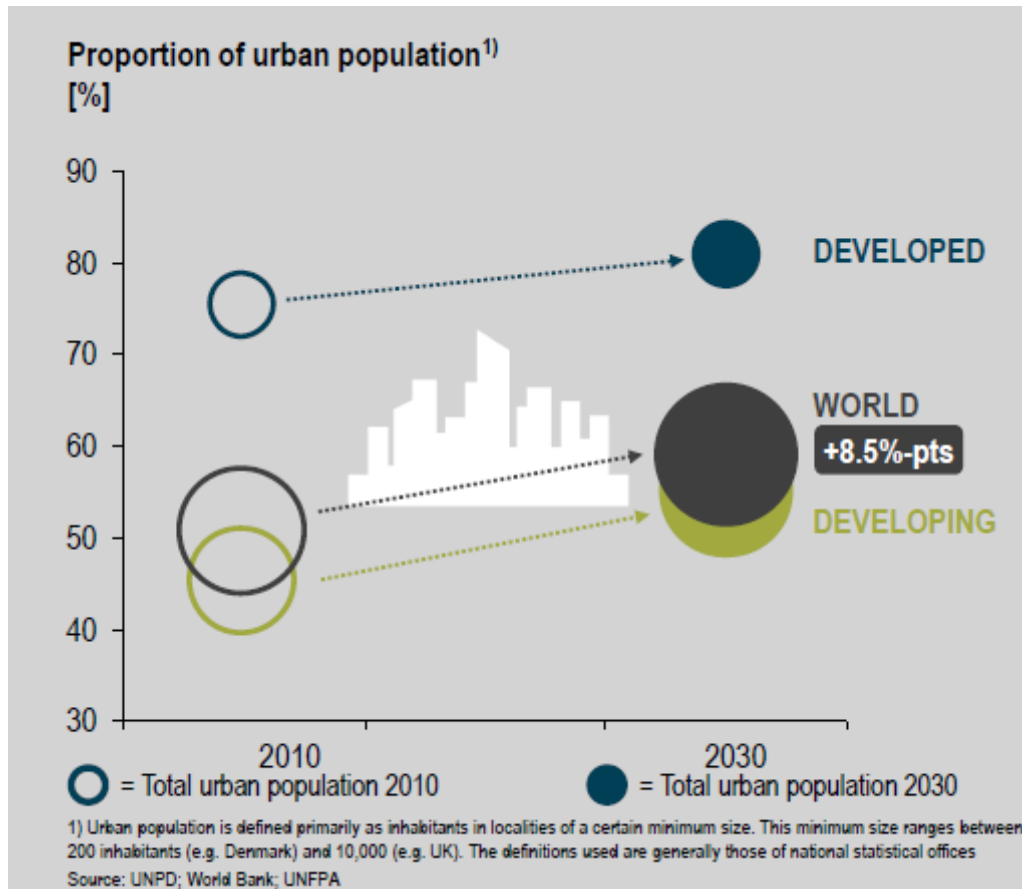
Despite the fact that in the western world urbanisation has slowed down, the redistribution of the population toward urban areas is still a major trend on global scale (Holm, et al., 2009). Moreover, the rise of the global middle class and increase of global population has sparked urbanisation.

Notwithstanding, urbanization will show its strongest impacts on developing areas, their effects will be global. The results from the analysis show that internal migration will continue to be closely related to urbanisation and that the long-term trend of urbanisation is expected to continue globally, regardless of countries' income levels (Figure 6). This increased migration as a result of urbanisation will mostly deal with educated and skilled workers attracted by the infrastructure of the city (Hoorens, et al., 2013). Rapid urbanization could therefore give a boost to the long-term competitiveness and social and political stability of developing countries (National Intelligence Council, 2012). However, they also might be attracted by material resources, social networks and access to the internet (Hoorens, et al., 2013).

In 2014, 54% of the world's population reside in urban areas (UN News Centre, 2014) and this proportion is expected to increase more (RICS Foundation, University of Salford, The Futures Academy and King Sturge, 2010; KPMG, 2013). Urbanization creates significant opportunities for social and economic development but (KPMG, 2013), importantly, increased urbanisation and population growth may also cause a big pressure on infrastructure and natural resources, in particular food, water and energy (National Intelligence Council, 2012). Increased stress of natural resources will be discussed later in this report. According to the Delphi exercise conducted by Hoorens, et al., (2013) there is strong uncertainty about this issue. Most experts mentioned a 50% likelihood that urbanisation will force international mobility (Hoorens, et al., 2013).

In the past, urbanization has always been viewed with as a social concern with rural poverty and creating new problems. However, recently it is considered through the sustainability perspective. It is increasingly clear that in advanced economies urbanization may lead to more energy-efficient and sustainable patterns (Holm, et al., 2009).

FIGURE 6 – PROPORTION OF URBAN POPULATION (%) (ROLAND BERGER STRATEGY CONSULTANTS, 2011)



## TREND 7: INDIVIDUAL EMPOWERMENT

Rise of the individual i.e. individual empowerment indicates to the situation ‘where citizens will be able to reshape economic developments, to redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs’ (ESPAS, 2015).

Advanced developments in global education and technology supported the empowerment of individuals, leading to bigger demand for transparency and contribution in government and public decision-making. This trend is amplified by the development of the middle class causing more people belonging to the middle class as compared to poor (European Union Institute for Security Studies, 2011), greater educational attainment, new communications and technologies, and health care advances (National Intelligence Council, 2012). According to the National Intelligence Council (2012), individual empowerment will be the most important megatrend, since it is both a cause and effect of most other trends, including intensifying global economy, accelerated progress of developing countries and widespread utilization of new communication and technologies.

Empowerment will definitely generate increased expectations and demands for individual rights worldwide and in all areas, economic, legal and cultural and education will become increasingly important as countries seek to develop knowledge-based economies. As consumers, this might lead to demanding better access to goods, to mobility and to technological processes. However, due to unequal access technology and information this trend might develop uneven for some social groups. Nevertheless, the expectation is that the individual empowerment will affect all players, including states, markets, businesses and the media (ESPAS, 2015).

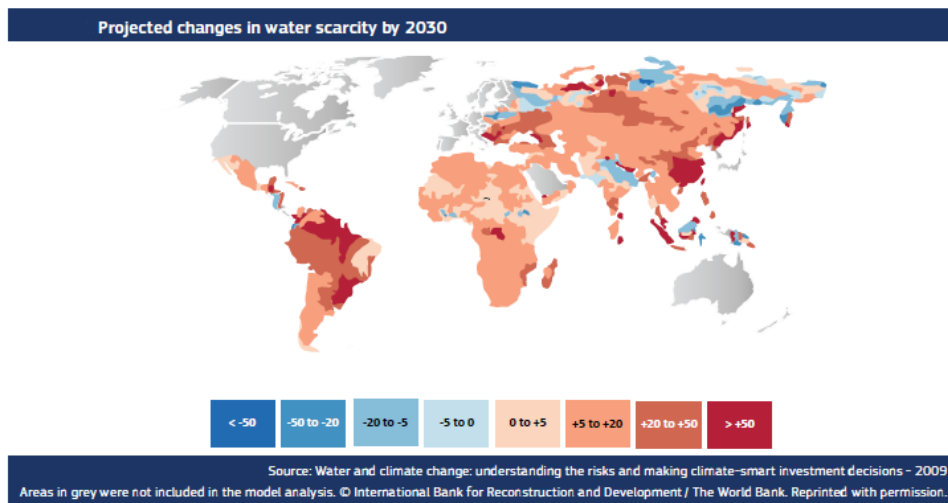
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#### TREND 8: GROWING DEMAND FOR NATURAL RESOURCES

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Despite the population growth slowing down, the global competition for access to natural resources will continue to intensify (ESPAS, 2015). The pressure that becomes increasingly bigger on natural resources can be seen as a result of the combination of other trends like population growth, increasing middle class and urbanization. By 2030 when the trends are developing and becoming real, the cumulative effects will create further stress on scarce global resources. It is expected that the food production needs a 50% increase and water 53% (Figure 7) to feed the growing and more demanding population. Moreover, the global primary energy consumption will increase with 26% (Figure D, Appendix) (Roland Berger Strategy Consultants, 2011; International Energy Agency, 2014). All these developments will eventually affect the prices (Roland Berger Strategy Consultants, 2011) and the agendas of the governments and businesses (KPMG, 2013). According to the National Intelligence Council, we are not necessarily headed into a world of scarcities, but the climate change will worsen the outlook for the availability of the natural resources. Their analysis on climate change suggests that wet areas will become wetter and dry areas becoming more so (National Intelligence Council, 2012). Without counteractive policies, severe and permanent changes are expected in global ecosystems. Moreover, increased scarcity in natural resources might also lead to risks like market volatility, geo-political tensions and instability (ESPAS, 2015).

FIGURE 7- PROJECTED CHANGES IN WATER SCARCITY 2030 (ESPAS, 2015)



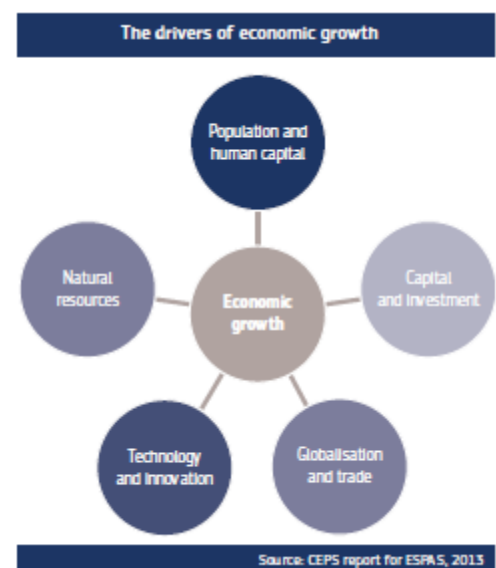
## TREND 9: INNOVATION AND NEW TECHNOLOGIES

The final trend which is repeatedly mentioned in many reports and articles is innovation and technological development (Cullmann & Geppert, 2012; Hoorens, et al., 2013; KPMG, 2013;

Roland Berger Strategy Consultants, 2011; ESPAS, 2015; Bhimani, 2008; Gros & Alcidi, 2013; National Intelligence Council, 2012; ESPON, 2010). It is incontestable that these developments have had a transformative impact on societies and economies over the last 30 years (KPMG, 2013) and will continue to have (Hoorens, et al., 2013). In the Europe 2020 Strategy (Lisbon Strategy) the significant role of innovation in the EU is highlighted to overcome the global economic recession and to gain competitiveness in relation to the rest of the world (ESPON, 2010). Technology diffusion increases and innovations are going to change our lives in developed countries as well as in developing countries (Roland Berger Strategy Consultants, 2011).

Technology and innovation is regarded as a driver of economic growth that will accelerate in the next years (Figure 8) (ESPAS, 2015). The technological revolution is going to have a deep effect on the society, the individuals, the working life and their social relationships. Moreover, economic growth in emerging market countries will further stimulate the technological innovation during the next 15-20 years (National Intelligence Council, 2012).

FIGURE 8 - DRIVERS OF ECONOMIC GROWTH (ESPAS, 2015)



The rise in high-tech industries, technology -based and knowledge intensive services gave this trend an extra boost (Cullmann & Geppert, 2012; ESPAS, 2015). The expectation is that in 2030, new regional innovation centres will be established in North-America, Europe and Asia. The National Intelligence Council (2014) especially expresses the development of information technology which is entering the big data era and the new manufacturing and automation technologies which will improve productivity (National Intelligence Council, 2012).

Additionally, according to the ESPAS report, increased uncertainty also has the ability to stimulate innovation and creativity in order to open the gates to diverse futures and to cope with global challenges like ageing, growing population, rapid urbanization (National Intelligence Council, 2012), climate changes and energy issues (Hoorens, et al., 2013; ESPAS, 2015). Moreover, the exponential growth in volume and speed of access to information and communication might lead to new markets and might challenge existing institutions (KPMG, 2013).

According to the ESPAS report is innovation especially essential for the public sector because since it enables to respond more effectively to public expectation and increase the client satisfaction by reducing administrative hurdles and increasing the competitiveness of the European economy (ESPAS, 2015).

Despite the fact that innovation and technological development will bring economic and societal benefits, people's fear regarding the complexity in protecting their own information might lead to mistrust and aversion towards technological innovation. Therefore it is important that continuously updated regulations will have to guarantee the integrity of these information and ensure that they are not misused (ESPAS, 2015).



## WHAT ARE THE MOST IMPORTANT ECONOMIC AND SOCIETAL TRENDS IN GENERAL?

The first sub-question was:

*What are the most important economic and societal trends in general?*

This question is attempted to answer by reviewing literature. The literature research, has pointed out several important economic and societal trends in general. These trends are *ageing, growing population, increasing middle class, transforming families and household sizes, increased globalization, shift of economic power, urbanization, individual empowerment, pressure on natural resources and innovation*. These trends with short descriptions are given in table 2.

TABLE 2 - TRENDS IN GENERAL

Domain	Trends	Short description
<b>Demography</b>	1. (Rapid) Ageing of global population	Higher life expectancy and decreasing birth rates causes a higher proportion of elderly people.
	2. Increased global population	The global population will grow, especially due to emerging economies.
	3. Bigger middle class	More people will belong to the middle class.
	4. Transforming families and household sizes	Growing share European population staying childless, maternity at a later age, increased divorces and less constant marriages
<b>Economy</b>	5. Increased trade and globalization	Globalisation increases mobility of capital, technological innovations, interdependency and uniformity of national markets.
	6. Shift of economic power	The shift of economic power from the 'West' to the 'rest'
<b>Social</b>	7. Urbanization	An increase in population in cities and towns versus rural areas
	8. Individual Empowerment	Citizens will be able to reshape economic developments, to redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs (ESPAS, 2015)
<b>Ecology</b>	9. Growing demand for natural resources	Increasing pressure on natural resources
<b>Technology</b>	10. Innovation and new technologies	Accelerated technological developments and innovations



### 3.2 TRENDS IN MOBILITY

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In the previous part, where the trends in general were discussed, it was stated that the world was changing rapidly. Since this thesis deals with future trends with a significant impact on public transport, this part of the report will analyze trends in mobility regarding *passenger transport*. Again, different literatures, reports and researches will be reviewed in order to give an overview of the most important economic and societal trends in mobility.

The world is changing fast and urban areas are occurring everywhere, due to the growth of cities (UITP, 2015). Urban mobility is one of the hardest challenges that cities face today as existing mobility systems are close to stop working. Urban mobility plays an essential role in economic competitiveness, social cohesion and sustainable growth (Transport Research and Innovation Portal, 2013). Mobility has considerably evolved in the past, under the influence of industrial evolutions, and will continue to evolve in the future. The second industrial revolution with the development of mass production enabled the emergence of the automobile industry and the third industrial revolution with digitalization enabled the emergence of computer-aided travelling. The next revolution deals with industry and technology convergence leading to the emergence of for example clean energy vehicles or connected smart mobility solutions (Arthur D. Little; UITP, 2014). In this part the following sub-question is attempted to answer:

*What are the most important economic and societal trends in mobility?*

After analyzing and reviewing articles and discussing long-term trends and developments for the coming 20-30 years, 11 trends have been found. These are ageing, growing population, transformed families and household sizes, globalization, urbanization, knowledge society, flexible working, growing demand for natural resources (sustainability needs), innovation, sharing economy and declining popularity car use. These trends can be subdivided into demographic trends, economic trends, social trends, ecologic trends, technologic trends and others (Table 1). An important note is that there might be overlap between the trends as discussed in paragraph 2.1 and the trends discussed in this section of the report. However, in this part these trends will be discussed again in the context of mobility.

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## TREND 1: AGEING

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In chapter 3.1 we discussed the trend of ageing. It was observed that Europe is rapidly ageing and will become the 'oldest continent'. This trend is also remarked as an important trend affecting the mobility sector, for instance by leading to more mobile seniors in the society (Forum for the Future, 2010; Göll & Evers-Wölk, 2013; Kayser & Christian Grotemeier, 2011; Delle Site, et al., 2012; Rudinger, Donaghy, & Poppelreuter, 2006; Brög, Barta, & Erl, 2005; ALLIANZ, 2012; Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Sessa & Enei, 2009; Rudinger, Donaghy, & Poppelreuter, 2006; Go-Ahead; Passenger Focus, 2012). Despite the fact that there are differences between the countries in Europe, since Germany, Austria and the Netherlands are aging more rapidly than Croatia, Hungary and Belgium, it can be concluded that ageing is an important trend in Europe, and even globally (Kayser & Christian Grotemeier, 2011).

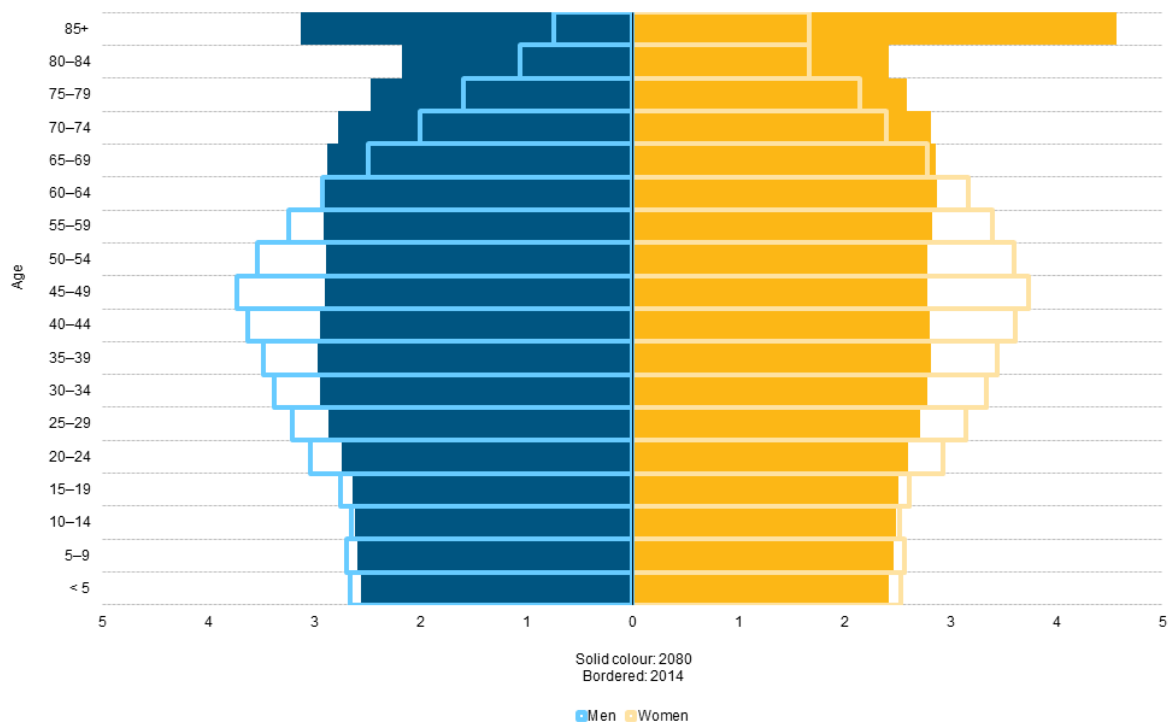
The increased numbers of elderly people worldwide means that society must reconsider mobility (ALLIANZ, 2012; Voorst & Hoogerwerf, 2013). The demographic trend of a more and more ageing population will generate new mobility patterns and needs, in addition to a strong demand for a flawless, flexible, more attractive and more user-friendly mobility system. This might be achieved through better information and integration between all modes (Kayser & Christian Grotemeier, 2011). Information technology and integration will be further discussed in this report. These changes related to ageing are expected to put a pressure on mobility since it will become hard to ensure affordable access to mobility solutions for the ageing population.

It is expected that the elderly people will have more money and time to spend. Moreover, they are expected to be highly- educated and have more often a driving license or car (Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Rudinger, Donaghy, & Poppelreuter, 2006). This is verified by Delle Site, et al, (2012) and ALLIANZ (2012) trends. Moreover, older people are expected to choose often to live away from inner urban areas and that this increases the need for mobility in low-density areas (Sessa & Enei, 2009) and that elderly people will use mobility more and more outside the rush hours (Eenink & Vlakveld, 2013). Another important effect of this trend is that ageing might lead to increased traffic accidents. A solution for this problem is increasing the usage of public transport by the ageing society (Eenink & Vlakveld, 2013). Besides, (Zmud, et al., 2013) makes a significant remark saying that as already aged people get older ('ageing of ageing'), things like step-free access at stations, reducing the gap between train and platform and low-floor buses become important (Zmud, et al., 2013).

The expectation is that actually daily mobility would decrease with age, mainly because health aspects and drop out of work. This development is especially expected for aged people becoming

older (80+). This group is forecasted to increase the most (Figure 9). However, since the ageing population are becoming healthier and wealthier as compared to the previous elderly generations. Moreover, they also become increasingly mobile due to leisure time/activities, social activities and everyday jobs, the total demand for mobility will grow (Scheiner, 2006). According to a survey among experts, demographic changes, including ageing and urbanization is accepted as a strongly serious influence and challenge (70%) (Göll & Evers-Wölk, 2013).

FIGURE 9 - : POPULATION PYRAMIDS, EU-28, 2014 AND 2080 <sup>(1)</sup> (% OF THE TOTAL POPULATION) (EUROSTAT, 2015)



(\*) 2080: projections (EUROPOP2013).  
Source: Eurostat (online data codes: demo\_pjangroup and proj\_13npms)

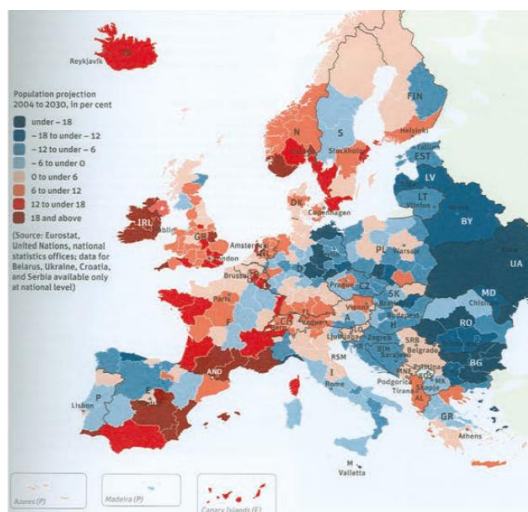
## TREND 2: POPULATION GROWTH

A second overlapping trend is population growth which is a determining factor significantly influencing the global economic, social and political developments and is therefore mentioned various times (Delle Site, et al., 2012; Forum for the Future, 2010; Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Kayser & Christian Grotemeier, 2011; Ribeiro, et al., 2007; InnoZ-Bausteine, 2008; Kompil, et al., 2013; UITP, 2015). Population is definitely growing, but that growth has slowed down and stabilized. The population showed a stable growth during the past 60 years (Delle Site, et al., 2012). As stated before, the growth of population is a major cause of pressure on resources and environmental issues, but it has also substantial implications for the mobility market by making it more difficult

to ensure a growing population accessing affordable mobility solutions (Forum for the Future , 2010). Identified consequences for the mobility market are for example increasing demand for mobility and transport services, rising fuel prices and increasing investments in alternative technologies and energy (Delle Site, et al., 2012). Eenink & Vlakveld (2013) are stating that a growing population will lead to more mobility, increased car ownership and increased traffic accidents. These patterns will especially visible in developing countries (Eenink & Vlakveld, 2013).

However, a very important note is that population growth will show major differences, thus it won't be evenly distributed; most of it will take place in Africa, China, India and Latin America (Forum for the Future , 2010). In particular in Europe population growth is expected to decrease (European Environmental Agency, 2011) and even to stagnate as it can be observed in figure 10 (Kayser & Christian Grotemeier, 2011; Voorst & Hoogerwerf, 2013). This is also verified by an article of Eurostat (2015) which states that the European Union will experience a continuing population growth for the EU-28 as whole, but the population of 12 EU Member States will decline (Eurostat, 2015). According to the European Environmental Agency (2011), stagnation and ageing of the European population is identified in all their projections (European Environmental Agency, 2011). These regions might experience an inefficient public transport infrastructure with unused capacities (Delle Site, et al., 2012). However, increasing migrations, which is very recent due to instable situations in the Middle-East, might play a significant role in future population growths (Duin & Stoeldraijer, 2014).

FIGURE 10 - POPULATION PROJECTION 2004-2030 (%) (HARMS, ET AL., 2011)



### TREND 3: TRANSFORMING FAMILIES AND HOUSEHOLD SIZES

Transforming families and household sizes is a widely discussed and debated topic (Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Göll & Evers-Wölk, 2013; Delle Site, et al., 2012; Voorst &

Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Sessa & Enei, 2009; Go-Ahead; Passenger Focus, 2012). Household structures and sizes are changing in Europe and in other developed countries. The average household size in some European countries has decreased by approximately 15%. In table 3 household characteristics of the Netherlands are shown. The observation is that households will become smaller, divorces will increase and that there will be an increase in 1-person households (Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Voorst & Hoogerwerf, 2013) and this table is becoming more and more representative for many other countries.

TABLE 3 - HOUSEHOLD CHARACTERISTICS THE NETHERLANDS (VOORST & HOOGERWERF, 2013)

<b>Netherlands</b>	<b>1960</b>	<b>1980</b>	<b>2005</b>	<b>2010</b>
Population size (mln)	11,4	14,1	16,3	16,6
Number of households (mln)	3,2	5	7,1	7,4
Average household size	3,6	2,8	2,3	2,2
1-person households (mln)	0,4	1,1	2,5	2,7
Divorces (1000 units)	2,2	7,5	9,1	8,9

This trend of changing household structures and sizes has a significant influence on mobility. Household sizes are highly related to the amount of car ownership and usage of public transport (Delle Site, et al., 2012). Initially, decreasing household sizes require more apartments (Delle Site, et al., 2012), which can be translated to more mobility, more car ownership and increased movements (Harms, et al., 2011). According to InnoZ-Bausteine (2008), the expectation is that traffic volumes will grow and travelling routes will become increasingly complex as a result of this trend. Decreasing average household sizes gives rise to car ownership and reduces the use of public transport, due to the need for more trips in small household to manage their daily activities and the inflexible image of public transport against a flexible image of the private car (Rogge, 2005; Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Eenink & Vlakveld, 2013). More households mean thus an increase in cars. Moreover, amount of cars per household is still ever increasing (Harms, et al., 2011). However, the rising fuel costs and environmental issues increase the attractiveness of public transport (Delle Site, et al., 2012).

Other main aspects interrelated with transforming families and household sizes mentioned in many literatures are individualisation<sup>8</sup> and changing lifestyles (Rogge, 2005; Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Voorst & Hoogerwerf, 2013). Demographically, individualization can be translated into an increased number of smaller families and single households. In addition, the household itself becomes also increasingly individualized. Family members have each their

<sup>8</sup> een toenemende vrijheid van het individu ten opzichte van zijn directe omgeving en gelijkheid ten opzichte van andere leden en groeperingen in de maatschappij (Schnabel, 2004, 2010).

own activities and agendas more than before (Harms, et al., 2011). Moreover, Eenink and Vlakveld (2013) add more working females to the concept of individualization. All these aspects lead to an increasing demand for customized products, which's need is fulfilled by the car, since it is still a symbol for personal freedom (Eenink & Vlakveld, 2013). Finally, lifestyle is been shown to be significant for car dependency (CPB, RBP, MNP, 2006)

As it results from this trend, the demand for individual mobility services, cars and movements will increase and lifestyles will become more flexible due to irregular and quickly changing everyday life (Rogge, 2005) (Brög, et al., 2005). The need for individual mobility is even strengthened by the liberalisation of working hours and conditions, making working life more flexible and less regular

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#### TREND 4: GLOBALIZATION

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Businesses and economies are increasingly globally interdependent (Voorst & Hoogerwerf, 2013; Eenink & Vlakveld, 2013; Göll & Evers-Wölk, 2013). As stated in part 2.1, the OECD describes globalization as 'an increasing internationalisation of markets for goods and services, the means of production, financial systems, competition, corporations, technology and industries. It gives rise to increased mobility of capital, faster propagation of technological innovations and an increasing interdependency and uniformity of national markets.' (OECD, 2001). In another report, globalisation is defined as 'an increasingly integrated world economy' (Sessa & Enei, 2009). According to these definitions, it can be stated that integration, internationalisation and interdependency are important aspects when considering globalization. However, it is worth to mention that globalization is an umbrella term that can bring about several trends and changes. Therefore, at this part of the research, the focus will be on only some aspects consequent to globalization.

Through internationalization are physical, economic and social boundaries off (Eenink & Vlakveld, 2013). The increase in the usage of ICT end other technological developments, the impact of globalization is constantly reinforced. Important questions that will then emerge include for example: Where and for whom will people work in thirty years? Which transport flows and modes will play an important role in the future? (Voorst & Hoogerwerf, 2013).

Economic development and transport are unavoidable linked to each other. Improvements give rise to transport demand, while the availability of transport encourages even more development by allowing international trade and economic specialization (Sessa & Enei, 2009).

Moreover, as mentioned before, globalization has led to higher levels of economic interconnectedness with increased international contacts, increased information exchange



immediately via the media and social networks, the rise of the international trade and more flexible production technologies (Bhimani, 2008). A crucial point is that globalization might have increased international contacts, which might lead to increased distances travelled, but on the other hand, innovation and technological developments decreased the need for travelling. Therefore it is important to approach this aspect carefully.

As conclusion we can state that the main effects of globalization can be described as follows; Increase in transport demand due to increasing trade, higher levels of economic interconnectedness, increased international networks and increased international information exchange.

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## TREND 5: URBANIZATION

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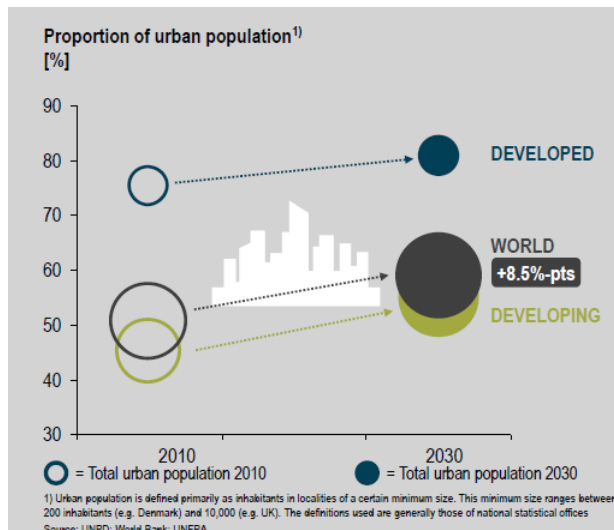
A trend that has been going on for decades and still continues rapidly is urbanization. According to a research done by Delle Site, et al. (2012), urbanization was one of the trends that were expected to have great impact on mobility (Delle Site, et al., 2012). In the previous part it was stated that especially in the emerging markets, high levels of urbanization were expected as represented in Figure 11 (European Environmental Agency, 2011; Kompil, et al., 2013; Göll & Evers-Wölk, 2013; United Nations, 2011; Go-Ahead; Passenger Focus, 2012). Also in Europe, there is apparently a (re)urbanization trend observable (Figure 9). Suburban regions are dealing with decreasing population due to the shift to big agglomerations and cities (Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Voorst & Hoogerwerf, 2013).

Urbanization is creating new spatial structures which are significant for the mobility and transport markets. Urbanization will impact the market shares in the transport sector. There is a concentration of people and regional labour markets in a few large centres (Kayser & Christian Grotemeier, 2011). Sufficient supply of mobility services is crucial for these densely populated commercial centres with high production and service levels. For example, Germany shows an increasingly growing public transport market shares in cities, but decreasing public transport supply in suburban regions (Harms, et al., 2011). This indicates that ongoing urbanisation might be a chance for public transport in the future in increasing their shares in cities (Kayser & Christian Grotemeier, 2011).

Urbanization will affect cities certainly, since a big share of the world's population lives in cities and this share is still growing. A lot of people will need to live, work and move around. Thus mobility will increase which will be a big challenge for the public transport sector (UITP, 2015). Urbanization will also lead to various problems like congestion and environmental issues (Williams & Hammond, 2015; Groenhuijsen & Jeurissen, 2015) and therefore also to mobility

solutions including car sharing, real time traffic information and cars designed for cities with new urban vehicle technologies (Frost & Sullivan, 2014; Transport Research and Innovation Portal, 2013).

FIGURE 11 - PROPORTION OF URBAN POPULATION (%) (ROLAND BERGER STRATEGY CONSULTANTS, 2011)



### *Urban sprawl*

Urbanization might occur as densification of existing cities, but it also occurs in terms of rapid growth in suburban areas and the rise of ‘edge cities’ i.e. urban sprawl. (Voorst & Hoogerwerf, 2013; Ribeiro, et al., 2007; Sessa & Enei, 2009), tackle the aspect of urban sprawl, which stand for a relative shift in the location of activities towards the peripheries of the urban agglomeration. This remains an established trend that affects the growth of modern cities. This trend has also important consequences in terms of associated trends of increasingly land consumption and car dependent mobility.

According to the report of the UITP (Union Internationale de Tramways/Internationaler Permanenter Strassenbahn-Verein i.e. International Association Public Transport) launched in 2015, urban sprawl has been a common feature of cities in developed economies. On the other hand, there is also evidence that some reversal is coming. For example, the population density of European metropolitan areas increased by approximately 20% between 2001 and 2012. The increased prevalence of knowledge and services, which is discussed at the part of knowledge society, is often cited to account for this trend (UITP, 2015).

This decentralization has created both a growing demand for travel and urban patterns that is not easily served by public transport, eventually resulted in an increase of personal vehicles (Ribeiro, et al., 2007; Williams & Hammond, 2015). If these activities are located away from



populated areas, it would be a challenge for public transport providers to do this at a reasonable cost. In the majority of the cases, these centres are largely accessed by car and have limited public transport options for reaching them. This is also verified by the UITP report where it is stated that the emergence of polycentric metropolitan areas might lead to new demand for facilities and equipments in order to provide connections between different sub-centres of this area. Therefore this report concludes that if the current trend of urban sprawl continues, a growing transport demand by car is expected, in cases where the public transport providers do not anticipate (UITP, 2015).

As a conclusion it can be stated that increased urbanization and the emergence will lead to an increase of local and short distance trips, through collective transport whereas urban sprawl will lead to increase of short-medium distance trip by car (Sessa & Enei, 2009). However, public transport providers might anticipate by meeting new demand for facilities, equipments and better connections (UITP, 2015).

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#### TREND 6: KNOWLEDGE SOCIETY

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A trend which has been pronounced several times in many reports and researches is the emergence of a highly integrated and service driven knowledge society (Forum for the Future , 2010; Kompil, et al., 2013; Delle Site, et al., 2012; Göll & Evers-Wölk, 2013). During the past decades, the economy in Europe has gone through a structural change from production to services. High quality products and research and development are now representing the European economy. All these are made possible by a high level of education and a know-how being built over time (figure 12).

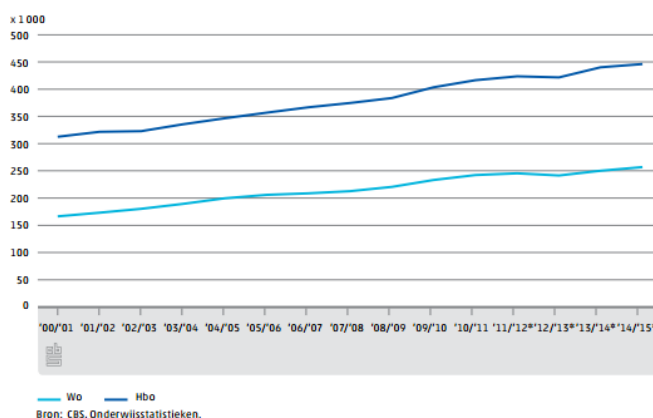
The trend of the emerging knowledge society is partly overlapping with the previous trend of innovation and new technologies. The combined trends of technological development and the emergence of the knowledge society will lead to significant trends. Actually, the impact of technological development is strengthened when the users of it increases rapidly. This trend has the ability to affect the attitudes, preferences and the demands of individuals on the market. Moreover, the economy, society, living habits and consumer behaviour have already experienced a fundamental change due to internet, smart phones and social media services. Therefore it is highly necessary for decision makers to consider reorganisation in terms of for example home offices and online services (Delle Site, et al., 2012). Whereas technological development has the potential for sustainability, as discussed above, it provides also space for an enhanced and optimized mobility experience. According to the report of (Forum for the Future , 2010) it is necessary to integrate mobility systems by providing people choice, flexibility and seamless connectivity, integrated tickets and to switch on to IT networks by enabling urban dwellers do

access more services online (Forum for the Future , 2010; Kompil, et al., 2013; Arthur D. Little; UITP, 2014).

The expectation is that the knowledge society will affect the mobility consumer significantly on the long-term regardless of his/her location. On the other hand, according to (Graaff & Rietveld, 2007), the most important variables affecting working at home or out of home were age and education rather than the access to ICT. The wide variety of online services will bring on dramatic changes in consumer awareness, attitude and behaviour towards personal mobility. Due to the information technology and service driven population it is expected that flexibility in working hours will increase. Moreover, (Kenyon, 2010) showed that virtual mobility can provide a feasible alternative to physical mobility.

Moreover, the intensified use of smart phones and its abilities is also strengthened by the emergence of the knowledge society, which is expected to have a considerable effect too. Real-time information about traffic situations and tariffs will increase and the consumer might actively response to it by choosing a particular mode of travel. However, mobility operators will also be able to use the same information for their services for example by optimizing the efficiency of the network infrastructure, by limiting the environmental impact of mobility patterns, by offering travel incentives to specific consumer groups or to customers on preferred travel modes and routes. Even more, the information became dynamic, varied and customized. All these technological developments lead to the fact that travellers are now able to optimise their own travel planning and route. Undoubtedly, ICT-based developments will be an outstanding aspect, principally in increasingly networked cities with knowledge societies (Forum for the Future , 2010).

FIGURE 12 - STUDENTS ENROLLED TO THE HBO <sup>9</sup>AND UNIVERSITY IN THE NETHERLANDS



## TREND 7: FLEXIBLE WORKING

<sup>9</sup> Higher professional education

The trends of transforming families and household sizes and the emergence of the knowledge society are expected to have a significant impact on lifestyle and values affecting mobility. Another key aspect which is also expected to have a substantial effect on mobility is the trend of flexible working (Brög, Barta, & Erl, 2005; InnoZ-Bausteine, 2008; Lanzendorf & Gather, 2005; Rogge, 2005; RAI vereniging, 2014; Sessa & Enei, 2009; Eenink & Vlakveld, 2013; Voorst & Hoogerwerf, 2013; Kayser & Christian Grotemeier, 2011; Go-Ahead; Passenger Focus, 2012; Hemily, 2004). The observation is that the everyday life becomes more irregular and quickly changing (Rogge, 2005; Brög, Barta, & Erl, 2005; InnoZ-Bausteine, 2008) due to the liberalisation of working hours and conditions (Lanzendorf & Gather, 2005).

The RAI vereniging <sup>10</sup>(Rijwiel en Automobiel Industrie) defines flexible working as work regardless of time and place in which is controlled by output (RAI vereniging, 2014). Flexible working contains different aspects like flexible working hours as well as flexible working places. Due to the emergence of internet and other ICT- technology, it is possible to work from home and other flexible places. This new style of working affects urbanization, spatial patterns (e.g. office and residential locations) and mobility behaviour (Eenink & Vlakveld, 2013; RAI vereniging, 2014).

Enhancing the flexibility of work contracts and working time is an important element of the European Employment Strategy. Enterprises are expected to become more flexible and innovative (Plantenga & Remery, 2010). Along with the flexibility of working a change in mobility patterns is created. This change is especially obvious in commuting journeys (RAI vereniging, 2014). The employee, who was formerly expected eight-thirty in the office, has now the flexibility to decide to use the saved travel time for another visit to a customer (Voorst & Hoogerwerf, 2013). This means that the employee can optimize his journey as well as making optimal use of the time. In addition, the infrastructure is for example expected to be used more evenly, unlike the peak loads as it is known today (RAI vereniging, 2014). For public transport this means that regular rush hour patterns are not visible anymore and public transport operators should provide reasonable trips during the whole day (Hemily, 2004). Moreover, flexible working has the power to straighten out traffic at rush hours which might reduce congestions and traffic jams. However, this may increase the demand for travelling by car.

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#### TREND 8: PRESS ON RESOURCES AND NEEDS FOR SUSTAINABILITY

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The observation is that commodity markets continue to come under pressure due to the increasing global demand for raw materials and other resources (RAI vereniging, 2014). The oil

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<sup>10</sup> RAI Association represents the interests of 500 manufacturers and importers of cars, trucks, trailers, car bodies, special vehicles, motorcycles, scooters and bicycles (RAI vereniging, unknown).

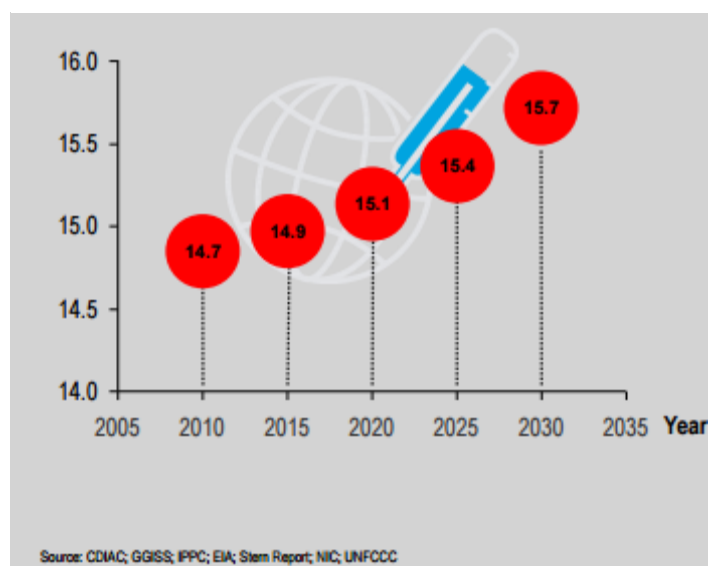
price is definitely one of the most important drivers in the world (Sessa & Enei, 2009). The challenges of global warming (figure 13), pressure on natural resources and increasing energy prices are principal issues on European, national and local policy agendas (Transport Research and Innovation Portal , 2013; Delle Site, et al., 2012). Price increases and shortages will make their debut on the various commodity markets. Hence, the industry should become less dependent of fossil fuels and therefore, green solutions are needed to reduce the environmental impact of transport, especially in urban areas (Transport Research and Innovation Portal , 2013; Frost & Sullivan, 2014). As a result, the need for sustainability increases (RAI vereniging , 2014; ALLIANZ, 2012; Groenhuijsen & Jeurissen, 2015).

Mobility is basically about offering the ability to access goods, services, people and information and can be therefore remarked as a derived demand. For that reason the upcoming response to the issue of scarce resources is expected to have a significant impact on urban mobility and quality of life. Cities need to response adequately in order to avoid the doom scenario with rapid population growth and a too small amount of resources to meet their demand (Forum for the Future , 2010). In addition to the increasing pressure on resources, lack of space becomes also an issue. Further urbanization (see trend 5), is putting force on available space. More intensive use of space leads to a relative increase in emissions. The issue of increasing emissions will also become a driving force behind the search for alternative and sustainable options (RAI vereniging , 2014).

The response to environmental issues is expected to deeply affect how cities will look in the future, will feel and will operate (Göll & Evers-Wölk, 2013). Due to the

increasing prices of natural resources, innovations become profitable (RAI vereniging , 2014). Becoming sustainable in mobility deals with smarter use of raw materials during the production phase, the using phase and eventually the recycling phase (Groenhuijsen & Jeurissen, 2015). The main source of energy in the mobility market is energy and fossil fuels. Integrating sustainability into the business models is for example

FIGURE 13 -AVERAGE TEMPERATURE ON EARTH (CELSIUS)  
(ROLAND BERGER STRATEGY CONSULTANTS, 2011)



possible by using renewable energy<sup>11</sup> (Groenhuijsen & Jeurissen, 2015). The expectation is that there will be a shift to renewable, low-carbon fuel vehicles and investments in battery and fuel technology (Forum for the Future , 2010; ALLIANZ, 2012). According to the findings of a survey among experts in Germany, the greatest number of respondents state that sustainability will remain relevant, even crucial, and that industry actors will have to deal with it more intensively (Göll & Evers-Wölk, 2013). According to Sessa and Enei (2009), in case without investing in sustainability, increasing energy prices might lead to travel reduction in long distances, due to change of more centrally located residence and/or trip consolidation, and to a modal shift toward walking and cycling (Sessa & Enei, 2009).

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## TREND 9: INNOVATION AND NEW TECHNOLOGIES

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Technological change has reached an unprecedented speed and this is likely to continue into the future. According to (Delle Site, et al., 2012), technological development will keep up, in particular information and communication technology (Delle Site, et al., 2012). The trend of innovations and new technologies can be stated as one of the most important trends causing the emergence of many other (sub)trends like technological developments used by the knowledge society and sustainable innovation (emergence low carbon mobility). Technological development, in particular transport technology (Ribeiro, et al., 2007), has the potential to reduce energy and carbon impacts due to vehicle technologies and fuels, but may also enhance and optimize the experience of mobility (total mobility) and enable e-mobility and the sharing economy (Forum for the Future , 2010; Kompil, et al., 2013; Göll & Evers-Wölk, 2013; Arthur D. Little; UITP, 2014; ALLIANZ, 2012; Bray, 2014; Ribeiro, et al., 2007; UITP, 2015; Go-Ahead; Passenger Focus, 2012)

According to a survey among 77 experts (Göll & Evers-Wölk, 2013)), the megatrend of technological development became the most seriously influencing and challenging trend. Technology is expected to shape and challenge the future. However, as stated in the first part of this report, developments in innovation and technology are expected to bring new dangers like (data) safety and security. Information security and data protection will represent some of the most important and complicated challenges for the future (Göll & Evers-Wölk, 2013)

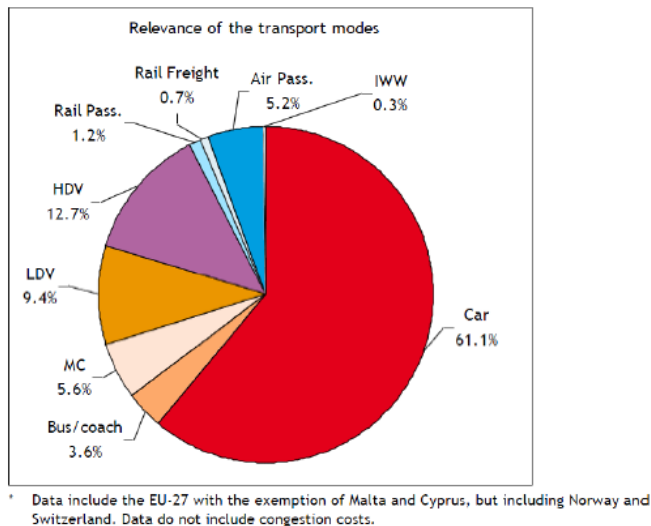
New technologies and innovations in transport includes changes in vehicle design, propulsion systems and energy sources, carbon emissions, safety but also integrated mobility systems, actively use of information (Forum for the Future , 2010; Voorst & Hoogerwerf, 2013 and virtual mobility (UITP, 2015). According to a report by Forum for the Future, UK's leading sustainable development NGO, the most anticipated trend for transport is for new electric vehicles, including

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<sup>11</sup> Electricity generated by wind, solar energy or hydrogen (Groenhuijsen & Jeurissen, 2015)

low carbon power-trains, hydrogen/bio fuel buses and cars (Forum for the Future , 2010). Whereas technological developments lead to decreasing carbon emissions, virtual mobility (business related like videoconferencing; leisure related like online shopping) has the potential to reduce the need for physical mobility.

FIGURE 14 - EXTERNAL COSTS FOR TRANSPORT MODES



## TREND 10: SHARING ECONOMY

‘The new generation of consumers are car buyers with “a twist”’. That is how (Cornet, et al., 2012) introduces the new trend of sharing economy. Sharing is a concept explaining the emergence of a sharing economy, which is highly supported by the younger generations. They seem to want to have a flexible lifestyle where having access has a higher priority rather than owning (UITP, 2015). According to the results of their research done in Germany, 38% of 18- to 39-years old inhabitants of big cities<sup>12</sup>, indicate that in ten years they will use car sharing more (Cornet, et al., 2012), and Frost & Sullivan predicts nearly ten million car sharing users globally by 2016 with a fleet of 150,000 cars (Frost & Sullivan, 2014).

There is a clear sign that traditional ideas about car ownership are changing towards a trend of shared mobility (Arthur D. Little; UITP, 2014; Cornet, Mohr, Weig, Zerlin, & Hein, 2012; ALLIANZ, 2012; Groenhuijsen & Jeurissen, 2015; UITP, 2015). More cars and bikes are being shared in cities. Car sharing has become a big business which has attracted some of the world’s biggest car manufacturers (Arthur D. Little; UITP, 2014). Moreover, it has benefited from innovations in social networking technologies, like peer-to-peer car sharing, in which a person

<sup>12</sup> Cities with more than 100,000 inhabitants (Cornet, et al., 2012)

can easily let somebody borrow his or her vehicle to online contacts. Younger generations seem to be less willing to spend more money for possessing a car, which results in a declining ownership of cars. According to the RAI, younger generations prefer combinations of cycling, public transport and car or bike sharing (RAI vereniging , 2014).

Car sharing is expected to be beneficial as well as for the environment as for the cities (Groenhuijsen & Jeurissen, 2015). The fleet of shared cars is expected that it will have a 10% share of electric vehicles fuelled with renewable energy, in contrast to a fleet of privately driven cars. This will lead to a decrease of CO2 emissions with 13% over the entire lifetime of the 'sharing fleet'. Moreover, cities will benefit because every car from a car sharing pool replaces up to three cars from the existing fleet (Cornet, et al., 2012).

Next to car sharing, a report about future mobility of A.D Little mentions also sharing of bikes and states that car and bike sharing is a key component of public mobility services. According to this report, European mobility systems is a clear leader in cycle path network, car sharing and bike sharing with Stockholm, Amsterdam and Copenhagen heading the table (Arthur D. Little; UITP, 2014; OIS, 2014)

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#### TREND 11: DECLINING POPULARITY CAR USE

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The trend of declining popularity car use appears from a research done by the RAI vereniging (2014) and is verified by other sources (Ribeiro, et al., 2007; Forum for the Future , 2010; Cornet, Mohr, Weig, Zerlin, & Hein, 2012; Eenink & Vlakveld, 2013; OIS, 2014; RAI vereniging , 2014; Groenhuijsen & Jeurissen, 2015). Also UITP mentions in his report that there is an observed demotorisation trend in Europe which shows that cars are less appealing to younger generations. Moreover, they state that this trend is linked to the emergence of smartphones and the internet, underlining a shift in consumer preferences (UITP, 2015). On the other hand, trend of rising middle classes as discussed in the previous section, might lead to increased demand for cars. However, on the other hand, the trend of urbanization might lead to a decline of cars (Forum for the Future , 2010). Kenworthy and Laube (1999) indicate that high urban densities are associated with lower levels of car ownership and car use, and higher levels of transit use (Ribeiro, et al., 2007) (Kenworthy & Laube, 1999). This is verified by the report of the RAI vereniging (2014). They state that due to the increasing urbanization in cities and the increasing number of vehicles and mobility the pressure on physical and environmental space rises. This leads to higher tariffs and restrictions on motorized personal transportation.

Future generations are expected to have a different set of mobility preferences. They are grown up with networking technologies and are more likely to spend their time in virtual spaces



(Forum for the Future , 2010). It also appears that the younger generation spends more money on smart phones and therefore no money is left for car-driving (UITP, 2015; Eenink & Vlakveld, 2013). This generation is seemingly less willing to spend money on the possession of cars. This results in declining car ownership (RAI vereniging , 2014) and is empirical shown by (Cornet, et al., 2012) which shows that car ownership among 18- to 29-years olds in Germany dropped with 44% between 2000 and 2010 (Cornet, et al., 2012). Also the Forum of the Future and OIS (2014). This verifies that there are signs for declining popularity of car use as a status of symbol, especially as congestion problems get worse and alternative status symbols emerge (Forum for the Future , 2010). The younger people are likely to shift to bikes, scooters, public transport and car sharing (OIS, 2014). The declining car use among younger people might be beneficial for road safety since young drivers have higher risks of having a crash (SWOV, 2012).

The young audience prefers to pay for use and gives a first choice for cycling, public transport and car sharing combinations. Therefore, the expectation is that there will be a shift from owning vehicle to use vehicles (RAI vereniging , 2014). Moreover, it seems that the bicycle is partly taking over the emotional relationship consumers had once with cars (UITP, 2015). Systems that allow pricing for use have the power to reach a bigger range of larger groups of users (RAI vereniging , 2014). The observable trend of declining popularity of car use is highly interrelated with the increasing flexibility of choices in mobility, like car sharing, and increased urbanization.

Groenhuijsen and Jeurissen tackle the point of declining car use rather than popularity. Due to developments in companies and in the labour market, travel patterns become varied and results in a declined car use. Modern employment conditions include for example working at home. As a consequence there are less mobility movements, fewer traffic jams, more time and decreasing CO2 emissions (Groenhuijsen & Jeurissen, 2015). This is also verified by Jorritsma and Berveling (2014), who state that young generations are only postponing the ownership of cars because a car does not fit with the life lead by young adults. From scientific literature, survey and research groups, it has been shown that the vehicle has a high status among young adults. Jorritsma and Berveling (2014) argue that the declining ownership of cars is caused by several reasons, like the economic recessions and urbanization (in the city there are more alternatives to the car) (Jorritsma & Berveling, 2014) .



TABLE 4 - OVERVIEW TRENDS IN MOBILITY

Domain	Trends	Short description
<b>Demography</b>	1. Ageing	Higher life expectancy and decreasing birth rates causes a higher proportion of elderly people.
	2. Population growth	The global population will grow, especially due to emerging economies.
	3. Transforming families and household sizes	Growing share European population staying childless, maternity at a later age, increased divorces and less constant marriages
<b>Economy</b>	4. Globalization	Globalisation increases mobility of capital, technological innovations, interdependency and uniformity of national markets.
<b>Social</b>	5. Urbanization and urban sprawl	An increase in population in cities and towns versus rural areas
	6. Knowledge Society	Increased level of education and know-how
	7. Flexible Working	
<b>Ecology</b>	7. Press on resources and needs for sustainability	Increasing pressure on natural resources
<b>Technology</b>	8. Innovation and new technologies	Accelerated technological developments and innovations
<b>Others</b>	9. Sharing economy	Traditional ideas about car ownership are changing towards a trend of shared mobility
	10. Declining popularity car use	The young generation is less willing to spend money on the possession of cars

### 3.3 THE EFFECTS OF TRENDS ON TRAVELLERS AND TRAVEL BEHAVIOUR

At the previous chapters, 10 general trends (ageing, population growth, transforming families and household sizes, globalization, shift economic power, urbanization, empowerment, pressure on natural resources, technological development and innovation) and 10 trends in mobility (ageing, population growth, transforming families and household sizes, globalization,

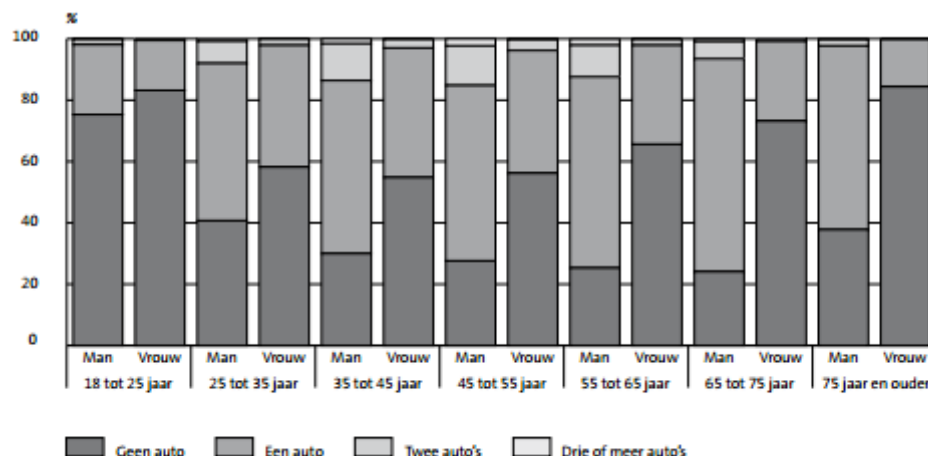
urbanization, knowledge society, pressure on natural resources, technological development and innovation, sharing economy, declining popularity car use) were identified. At this part of this report, tentative statements will be conducted, following from the literature analysis done in section 2.1 and 2.2. The first statement has a general scope, whereas the second statement deals specifically with public transport and the third statement deals with regional differences. All these statements will then be tested by experts' opinion. The questionnaire is included in the appendix. The experts' opinion will be explained detailed at the section methodology.

An important remark is that there is overlap between trends in general and trends in mobility, which is also obvious. Each trend, irrespective of it is a general trend or trend in mobility, will be translated into effects on public transport and/or passenger transport. Thus, overlapping trends will only be discussed once.

## EFFECTS OF AGEING

A report on car ownership conducted by the Centraal Bureau of Statistiek (2012), shows that the share of people older than 55 years without a car increases (Beuningen, et al., 2012). This is an indication that the trend of ageing might lead to decreasing car ownerships. An interesting point is that a bigger share of the age group 65-75 years has two cars as compared to the age group 55-65 (Figure 15).

FIGURE 15 - CAR OWNERSHIP BY AGE AND GENDER (BEUNINGEN, ET AL., 2012)



Ageing is definitely one of the most certain developments that is taking place and is expected to further expand its effects. The expectation is that the increased elderly people are characterized with having a higher education, more time and money to spend and more savings. Moreover, it is expected that these elderly people will be more mobile, have more often driving licences and prefer to live away from inner urban areas. Next to the trend of ageing, we also discussed that

already aged people also became older and this development changes the demand of those people. On the other hand, ageing population is expected to become healthier and wealthier and that this will lead to an increase in total demand for mobility.

On the other hand, ageing is related to personal constraints such as functional and cognitive/intellectual constraints which might lead to a mobility decrease. This is especially expected after the age of 75 years. Moreover, the expectation is that ageing will decrease the distance travelled. The public transport helps ageing people for staying longer independently mobile. Contrary to ageing people which is expected to be more mobile by car, in reports it is stated that ageing will decrease the demand for transport during the peak hours and that elderly people will use the public transport more due to health reasons (e.g. not able to drive themselves, medicine/walker usage, no confidence).

According to the literature research, the following statements are conducted:

*The ageing population is more mobile by car.*

*It is important for the elderly people to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses.*

*In my region, ageing population prefers to live away from inner urban areas. This increases their demand for public transport in rural areas.*

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## EFFECTS OF POPULATION GROWTH

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The growth of population is a major cause of pressure on resources and environmental issues, but it also affects the mobility market by making it more difficult to ensure a growing population accessing affordable mobility solutions (Forum for the Future , 2010). The effects on the mobility market that were identified in the literature review were increased demand for mobility and transport services, rising fuel prices, increased investments in alternative technologies and energy, (Delle Site, et al., 2012), increased car ownership and traffic accidents (Eenink & Vlakveld, 2013).

According to the literature research, the following statements are conducted:

*The trend of a growing population increases car ownership.*

*The trend of a growing population puts pressure on public transport.*

*In my region, it is hard for public transport providers to keep up with the trend of population growth.*

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## EFFECTS OF TRANSFORMING FAMILIES AND HOUSEHOLD SIZES

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A trend observed in Europe and other developed countries are changing household structures and sizes. The observation is that households will become smaller, divorces will increase and that there will be a rise in single-person households. An increasing share of the European families' remains childless, parenthood begins at a later average age, divorces are increasing, and Europe is facing a rise in single-adult households. This is to a degree caused by an increase in single-parent families, by an increased number of childless couples, by a decline in average household size and increased share of elderly people living alone.

Declining household sizes facilitate re-urbanisation, due to that single or two person's households have a higher propensity to locate in urban centres (Petersen, et al., 2009). Assuming that the motorization rate will continue to increase, decreasing household sizes may lead to higher traffic densities. This effect might be balanced by the use of sharing services by younger people which are more oriented towards the use of mixed modes of transport services as alternative travel solutions.

According to the literature research, the following statements are conducted:

*The trend of increased single-person families leads to increased car ownership.*

*The trend of increased single-person families leads to increased usage of public transport.*

*In my region, the trend of increased single-person families leads to more mobility.*

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## EFFECTS OF GLOBALIZATION

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Businesses and economies are increasingly globally. One definition of globalisation is 'an increasingly integrated world economy' (Sessa & Enei, 2009). According to the literature research it seems that integration, internationalisation and interdependency are important aspects in view of globalization. By globalization physical, economic and social boundaries are taken away. The main effects of globalisation can be stated as: Increasing demand for (international) transport of both goods and people, higher levels of interconnectedness, increased international networks, increased international information exchange.

The effects on travellers and travel behaviour are in this context increased distances travelled and increasing amount of foreigners travelling. For the public transport the effects can be translated into reinforced information technology and expansion of its applications at global level which leads to a potentially more efficient transport network.

According to the literature research, the following statements are conducted:

*With the help globalization it is easier to keep up on innovations and technological developments worldwide.*

*The trend of globalization increases the amount of travelling foreigners (work/study/leisure) in public transport.*

*In my region, globalization leads to an increased development on innovations and technology.*

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### EFFECTS OF SHIFT ECONOMIC POWER

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The shift of economic power and rebalancing of global power with more pressure on emerging economies leads to less poverty and higher influence on the global economy. These developing countries will be responsible for 57% of the global GDP in 2030 (OECD, 2010) and the income differences across countries will contract due to openness to globalization, savings and human capital (ESPAS, 2015). However, from the literature research it is observed that this trend seems to have no effect on passenger mobility and/or public transport.

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### EFFECTS OF URBANIZATION

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Urbanization is a trend which is still ongoing. Urbanization is creating new spatial structures which are significant for the mobility and transport markets. Also in Europe, there is apparently a (re)urbanization trend observable. On the other hand, suburban regions are dealing with decreasing population due to the shift to big agglomerations and cities (Harms, Jorritsma, 't Hoen, & van de Riet, 2011; Voorst & Hoogerwerf, 2013). The growing size of urban population and density, as well as the urban sprawl, is expected to result in a higher demand for transport and mobility.

According to the literature research, the following statements are conducted:

*The demand for car ownership increases in areas with high urbanization levels.*

*The demand for public transport services increases in densely populated areas.*

*In my region, public transport providers can't fulfil its purpose without investment because the trend of increasing urbanization*

### Urban sprawl

Urban sprawl stands for a relative shift in the location of activities towards the peripheries of the urban agglomeration. Business activities as well as leisure activities are shifting towards

suburban regions. Urban sprawl is expected to result in increasing travel distance and average length of trips. The challenge for PT is to serve the new mobility destinations in suburban places efficiently and at a reasonable cost. The following statements are related to this concept:

*The trend of urban sprawl causes people becoming car dependent.*

*The trend of urban sprawl increases the demand for public transport facilities and equipments providing connections between sub-centres and the city.*

*In my region, the trend of urban sprawl increases car ownership.*

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#### EFFECTS OF: INDIVIDUAL EMPOWERMENT

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Individual empowerments was defined as ‘citizens becoming more able to reshape economic developments, redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs’ (ESPAS, 2015). Advanced developments in education and technology supported the empowerment of individuals, leading to an increased demand for transparency and willingness to contribute in government and public-decision making. Coordination all stakeholders and get them connected is a challenge for cities but also for public transport providers.

The expectation is that individual empowerment will affect the mobility consumer significantly regardless of his/her location by increasing consumer awareness. Moreover, the expectation is that the population will be information technology and service driven which will lead to more flexibility in working hours (footloose). Moreover, the increasing consumer awareness urges public transport providers to enhance the mobility management on a sustainable way.

According to the literature research, the following statements are conducted:

*The trend of individual empowerment will put a pressure on organisations for being more transparent.*

*The trend of empowerment leads to individuals expecting more en better qualities from public transport providers.*

*In my region empowered individuals have a say about the organisational and operational side of public transport provision.*

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## EFFECTS OF: PRESSURE ON NATURAL RESOURCES

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Due to the increasing global demand for raw materials and other natural resources, commodity markets come under pressure. The challenges of global warming, pressure on natural resources and increasing energy and oil prices are definitely one of the most principal issues on European, national and local policy agendas. These policies will affect the transport industry, as it will have to become less dependent on fossil fuels and rely more on green solutions.

This ecological trend is expected to restructure the modal split, which will move towards a new sustainable mobility concept with travellers' preferences for more active, clean and ecological modes of transportation. The PT sector might largely benefit if providers are able to enhance and communicate its awareness for the environment. Moreover, the expectation is that the use of private cars might decrease as a result of increasing oil prices.

According to the literature research, the following statements are conducted:

*The mobility market should become less dependent of fossil fuels and therefore green solutions are needed to reduce the environmental impact of transport.*

*Due to the pressure on natural resources, public transport providers will put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.*

*In my region, sustainability is a crucial development and the public transport providers will have to deal with it more intensively.*

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## EFFECTS OF INNOVATION AND TECHNOLOGICAL DEVELOPMENT

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Technological development increases and innovations are going to change our lives. Technology and innovation is regarded as a driver of economic growth that will accelerate in the next years. The technological revolution is going to have a deep effect on the society, the individuals, the working life and their social relationships.

These developments affect travellers in the way they are used to access information, pay for services and products and interact with the service provider. This might urge PT providers to enhance communication strategies by finding new ways of information services on new channels and increase the quality of customer care services. Moreover, teleworking<sup>13</sup> might lead to a reduced travel demand, in particular for commuters.

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<sup>13</sup> The use of electronic communication to substitute physical travel (Gillespie, 2000).

On the other hand, technological developments leads to the increased use of eco-friendly vehicles in PT. PT operators are committed to enlarge the percentage of eco-compatibility vehicles: low emissions and electrical vehicles.

*Technological development in the mobility market will enhance and optimize the experience of mobility.*

*Technological development and innovations in the public transport market will lead to the emergence of new electric vehicles (for example low carbon power-trains, hydrogen/bio fuel buses and cars).*

*In my region, technological developments lead to decreasing carbon emissions due to decreasing need to travel physically.*

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### EFFECTS OF KNOWLEDGE SOCIETY

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During the past decades, the economy in Europe has gone through a structural change from production to services. High quality products and research and development are now representing the European economy. All these are made possible by a high level of education and a know-how being built over time. An important note is that the trend of individual empowerment and knowledge society are highly interrelated as so its effects.

*The knowledge society will strengthen the effects of technological development since they will become the intensive users.*

*The knowledge society affects the attitudes, preferences and demands of the public transport consumer significantly on the long-term.*

*In my region, flexibility in working hours increases due to information technology and service driven population.*

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### EFFECTS OF: FLEXIBLE WORKING

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Flexible working is defined as work regardless of time and place in which is controlled by output. Flexible working contains different aspects like flexible working hours as well as flexible working places. Especially the locational flexibility relates to changes in the public transport system. The PT sector may benefit from this development by offering or supporting flexible working spaces near multimodal hubs. Due to the emergence of internet and other ICT-technology, it is possible to work from home and other flexible places. The expected effect on travellers and travel behaviour is less commuting, especially during rush hours, leading to less



congestion. The PT can respond to this development by adjusting the system to the business needs.

*Flexible working will reduce traffic jams which make driving more attractive*

*Flexible working will lead to a more efficient utilization of public transport infrastructure*

*In my region flexible working increases the demand for sharing concepts*

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#### EFFECTS OF: SHARING ECONOMY

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The new generation of consumers seem to be increasingly changing their attitude from ownership to usership. This shift to usership has incentivised behavioural and lifestyles changes. Sharing is a concept explaining the emergence of a sharing economy, which is highly supported by the younger generations. Flexibility is a key topic standing for a flexible lifestyle where having access has a higher priority rather than owning. The rise in popularity of car-sharing and similar business models may create a new set of competitors, as well as opportunities for the automotive industry. There seems to be a need to integrate alternative forms of mobility in the PT system.

According to the literature research, the following statements are conducted:

*Sharing concepts will increase the demand for multimodal transport.*

*Car and bike sharing will decrease the use of public transport because more people have easily access to car usage.*

*In my region, owning or providing a car- /bike-sharing-fleet, will become an important business for public transport providers.*

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#### EFFECTS OF DECLINING POPULARITY CAR USE

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Future generations are expected to have a different set of mobility preferences. It is stated that cars are less appealing to younger generations. The changing social position of young adults, who work on a later age and study more, has supported this trend. Moreover, the living environment affected car mobility behaviour also. The trend of urbanization might lead to a decline of cars. It is indicated high urban densities are associated with lower levels of car ownership and car use, and higher levels of transit use. This is due to the fact that increasing urbanization in cities and the increasing number of vehicles and mobility puts pressure on physical and environmental space. This leads to higher tariffs and restrictions on motorized personal transportation.

*The popularity of a car as a status of symbol is declining.*

*Declining popularity of the car use provides the public transport to increase its share in the modal split.*

*In my region, the younger generation will make more use of the public transport than generations before.*

## CHAPTER 4: DATA & METHODOLOGY

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Questions that arise in practice cannot always be answered by empirical research. An example is the recognition of a future development where its likelihood and its consequences are inventoried. The Delphi method attempts to remedy this by using the knowledge of experts on a systematic way (Dijk & Landsheer, 2003). The original intent of Delphi was as a forecasting technique, designed to predict the likelihood of future events (Yousuf, 2007). By identifying their opinions it is possible to make full use of the collective knowledge of experts.

The experts who will be questioned in this study are working or used to work in or for the transport and mobility sector either directly or indirectly. In a Delphi study the main core is not about facts, but opinions and arguments. These are often to give estimates about future developments. The assumption in this study is that the opinions of experts add value to the available empirical or theoretical data (Dijk & Landsheer, 2003).

There are different types of Delphi studies. Due to the fact that respondents are spread across different regions and/or countries, it was decided to derive a modified Delphi study from a conventional Delphi (Dijk & Landsheer, 2003). A questionnaire is prepared with statements about future developments as derived from the literature review in chapter 3. This research will not be carried out anonymously. By this, the given answers can be compared to the region the respondent belongs to.

Advantages of a Delphi exercise that should be pointed out are, above all, a rapid and relatively efficient way gain opinions of a group of knowledgeable people. In general, it involves much less effort for a participant to respond to a questionnaire rather than, for example, to participate in a conference. A Delphi exercise, when properly managed, can be a motivating environment for respondents. All of these features of a Delphi exercise make this technique efficient (Macmillan, 1971).

Written surveys are one of the most widely used methods of consulting experts. This method has several advantages, such as not having to travel. It is also inexpensive, fast and this method offers the most space for dissent and divergence among respondents. On the other hand, a big advantage of an interview is that it can be asked for arguments underlying a particular opinion (Dijk & Landsheer, 2003).

The questionnaire consists of in total 36 propositions, which utilizes a 5-point Likert scale, which can be defined as an ordinal scale. For each trends some statements were conducted. The first statement test the general view about the trend, the second statement specifically deals with public transport and the third trend investigates the impact of the trend on regional scale.

Respondents can respond to the statements with 'strongly disagree, disagree, neither agree nor disagree, agree, strongly agree'. The final 2 questions are about the most important 3 trends affecting the public transport *positively* and *negatively*. The questionnaire is included in the appendix. This research aims to identify potential future developments where predicting the future, assessing the desirability of future developments and formulate the corresponding objectives.

Since the public transport sector is used to work in teams in decision making, reaching a consensus has become critical. Therefore it is decided to rank the ordinal scales by using the consensus measure. With this measure data on ordinal scales are provided with a theoretical and logical value (Tastle & Wierman, 2007). The consensus measure indicates the degree to which a team is nearing the point of agreement due to shared 'feelings' towards the statement. These 'feelings' are determined by the Likert scale (Tastle, et al., 2005). Tastle and Wierman (2007) consider consensus and dissension as two opposing concepts and defines consensus as "an opinion or position reached by a group of individual acting as a whole" (e.g. a considered general agreement) (Tastle & Wierman, 2007). Dissension indicates to the situation where the opinions are so divergent that conflict is caused within the group which makes decisions (Tastle & Wierman, 2007).

The Consensus Measure (CNS) can be defined by the following formula:

$$CNS(X) = 1 + \sum_{i=1}^n \rho_i \log_2 \left( 1 - \frac{|X_i - \mu_X|}{d_X} \right)$$

**X**= any finite discrete random variable with probability distribution

**P<sub>i</sub>**= the probability of the frequency associated with each X

**d<sub>x</sub>**= the width of the Likert scale

**X<sub>i</sub>**= the particular Likert attribute

**U<sub>x</sub>**= the mean of X ( $\sum_{i=1}^n \rho_i \log_2(p_i)$ )

However, Tastle & Wierman (2007) established a set of rules in order to use the consensus measure as a viable solution (Tastle & Wierman, 2007).

1. For a given (even) number of individuals joining a questionnaire, if an equal number of respondents,  $n/2$ , divide themselves into two disjoint groups, each concentrated on the strongly disagree and strongly agree categories, the group is considered to have *no* consensus ( $CNS(X)=0$ )

2. If all the respondents choose the same category on the Likert scale, regardless of the category, then the value of  $CNS(X)$  (consensus) is considered to equal 1 (stands for 100% consensus).
3. The  $CNS(X)$  must be greater than 0 if the mix of respondents is such that  $n/2 + 1$  respondents assigns themselves to any one category (Tastle & Wierman, 2007).

Likert scales are obviously ordinal. Tastle et al., (2008) gives a measure used to rank and compare ordered categories logically (Tastle, et al., 2008). As stated above, the consensus rate will always be in the interval of 0 to 1. The closer the consensus rate get to 1 (or 100%), the greater the agreement and the less the dispersion. For measuring and comparing the consensus rates the average consensus rate needs to be calculated for each group (total, RET and other) which is respectively 0,72, 0,72 and 0,73. The consensus rates at the lower end of the range (values smaller than the average) are considered to be in less agreement as compared to the consensus rates at the upper range (values bigger than the average). Therefore it is chosen to use an average consensus rate of 0,72 (total and RET) and 0,73 (other) which above this rate is a higher consensus on average and for which lower this rate is a lower consensus on average.

## CHAPTER 5: RESULTS

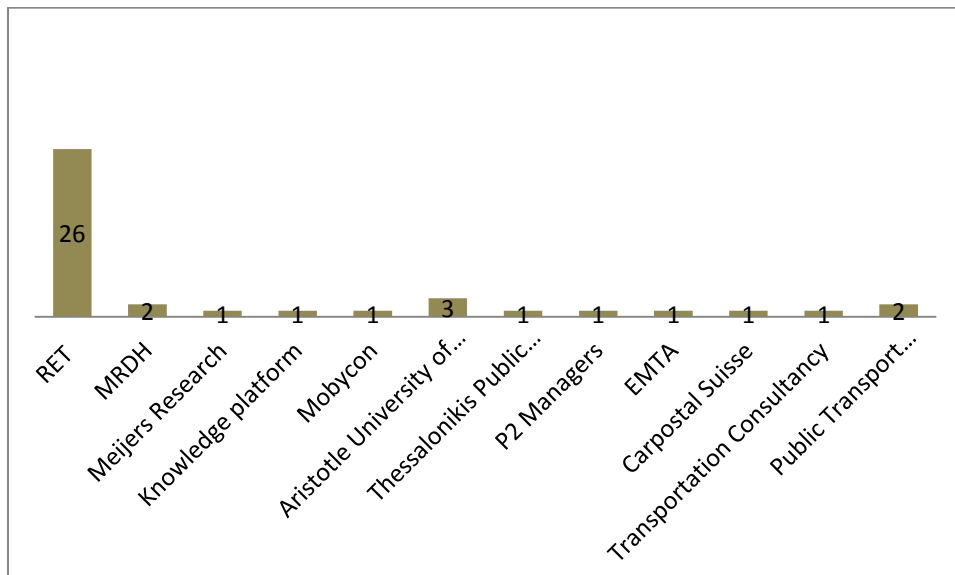
In this chapter the results of the experts' questionnaire will be discussed. All outcomes and data are included in appendix.

The questionnaire is distributed among the consortium of the CIPTEC project (Appendix Figure F), various organizations allied with the public transport sector and intern among the employees at the RET. In the invitation e-mail it is also requested to redistribute the questionnaire to own contacts. As a conclusion totally 44 experts participated to the questionnaire. Their functions differ from project- and product managers to advisors and planners. The specific mentioned functions can be found in the appendix.

The distribution of respondents is quite skewed. There was much more participation from RET employees than the consortium of the European project CIPTEC. This skewed distribution will impact the representativeness of the results to a certain degree. The consequences will be discussed in chapter 8.

Totally 26 of the respondents work for the RET. Other respondents work for different organisations as shown in figure 16. 82% of the respondents works for an organization located in the Netherlands, 12% located in Greece, 2% in Germany, 2% in Switzerland and 2% in France.

FIGURE 16 - ORGANISATIONS



The first trend was ageing. The consensus rate is on average lower for the first and third statement, while it is on average for the second statement. The respondents do not agree with

each other that the elderly population use the car more and that the elderly population prefer to live away from inner urban areas. However, the last statement might have a lower consensus rate due to international and regional differences. On average, the respondents agree with the statement that it is important for the elderly population to have easy access to public transport with step-free access, reduced gaps and low-floor buses.

The second trend is population growth. It is remarkable that, on average, the respondents are in agreement with each other about the statement that a growing population increases the need for investments in public transport. However, on average, they did not reach a consensus about the statement that this trend increases car ownership.

The third trend was transforming families and household sizes. The results show that, despite the fact of regional dispersion, the respondents have, on average, reached a consensus about the statement that in their region the trend of increased single-person families leads to more mobility. The respondents' answers are concentrated at agreeing and being neutral. However, on average, they do not agree with each other whether the single person families will do this by car or by public transport.

The next trend is globalization. Noteworthy is that the respondents are above average in agreement with each other about the statement that globalization will increase the amount of travelling non-nationals in public transport. Moreover, they also have a consensus with each other that due to globalization it is easier to keep up on innovations and technological developments worldwide. For each of the trends the answers are centred at agreeing and strongly agreeing. However, for this trend, regional differences occur, since respondents' consensus was below average.

The fifth trend deals with urbanization. The respondents have reached on average an agreement with each other about the regional statement that urbanization asks for more financial investments in public transport. On average, they agree with this statement. However, remarkable is that on average they do not have any consensus about the increased demand for car ownership and for public transport services in high urbanized areas.

The second part of the fifth trend deals with urban sprawl (table 5). It is outstanding that the respondents reached, on average, a consensus about the statement that in their region urban sprawl increases car ownership but they did not reach a consensus about the statement that urban sprawl causes people becoming car dependent. These results are actually contrary to each other. For the third statement, the most given answer was neutral and agree. However, the

respondents are, with a consensus rate of 82%, in agreement with each other about the statement that urban sprawl increases indeed the demand for public transport services between sub-centres and the city.




<b>Trend: Urban Sprawl</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>5.4 The trend of urban sprawl causes people becoming car dependent.</i>	7	20	14	2	1	44	
<i>5.5 The trend of urban sprawl increases the demand for public transport services between sub-centres and the city.</i>	8	27	8	1	0	44	
<i>5.6 In my region, the trend of urban sprawl increases car ownership.</i>	3	14	21	6	0	44	

TABLE 5 - TABULATED RESULTS: URBAN SPRAWL

The following trend deals with individual empowerment. The respondents have reached both a consensus on average for the first two statements that this trend requires organizations being more transparent and that the expectations from public transport providers are increasing. For both statements the given answers were mostly 'agree'. However, dissention on regional differences among respondents has become apparent with this trend.

For the trend pressure on natural resources, the respondents on average the respondents have the same 'feelings' about the first and third statement. They strongly agree that the mobility market should become less dependent of fossil fuels and agree that sustainability is a crucial development with which public transport providers will have to deal with it more irrespectively the region. It is interesting that de respondents diverge in their opinions about the fact that public transport provider put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.

The eighth trend is innovation and technological development. For each statement of this trend, the respondents have reached a particularly high consensus. The respondents (strongly) agree with the statements that technological development in the mobility market enhances and optimizes the experience of mobility and that technological development and innovation lead to the emergence of new electric vehicles in the public transport markets. On the other hand, the respondents share the same opinion about the third trend namely, that they are neutral or disagree with the statement that technological development decreases the need for physical travel in their region.

The next trend is the emergence of the knowledge society. For the first two statements a consensus rate above average has been obtained. The respondents mostly agree or are neutral



about the statements that this society will strengthen the effects of technological development and that it will affect the attitudes, preferences and demands of the public transport consumer. The given answers on the last statement that in their region, flexibility in working hours is in relation with information technology and service driven society vary. There is on average low consensus, but the most given answers were again 'agree' and 'neutral'.

Trend number 10 deals with flexible working. For the first statement a consensus has been reached among the respondents with a consensus rate of 0,75. The respondents agree with the statement that flexible working reduces traffic jams which make driving more attractive. However, for the final two statements there is no consensus. The regional statement might indicate to regional differences that flexible working increases the demand for flexible transport choices.

The upcoming trend of sharing economy shows some particular and critical results (table 6). For any statement no consensus has been reached among the respondents. Therefore rather low consensus rates have been obtained. The most given answers are "agree", "neutral" and "disagree". The answers strongly disagree and strongly agree are almost not mentioned at all. An important note is that bike sharing as well as car sharing is included in the statements. However, both of these sharing concepts have a low consensus rate. This indicates to divergent feelings toward this trend at general.




<b>Trend: Sharing Economy</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<b>11.1 Car sharing decreases the use of public transport.</b>	1	15	13	15	0	44	
<b>11.2 Bike sharing decreases the use of public transport.</b>	1	10	10	22	1	44	
<b>11.3 In my region, owning or providing a car- /bike-sharing-scheme, will become an important business for public transport providers.</b>	2	15	15	12	0	44	

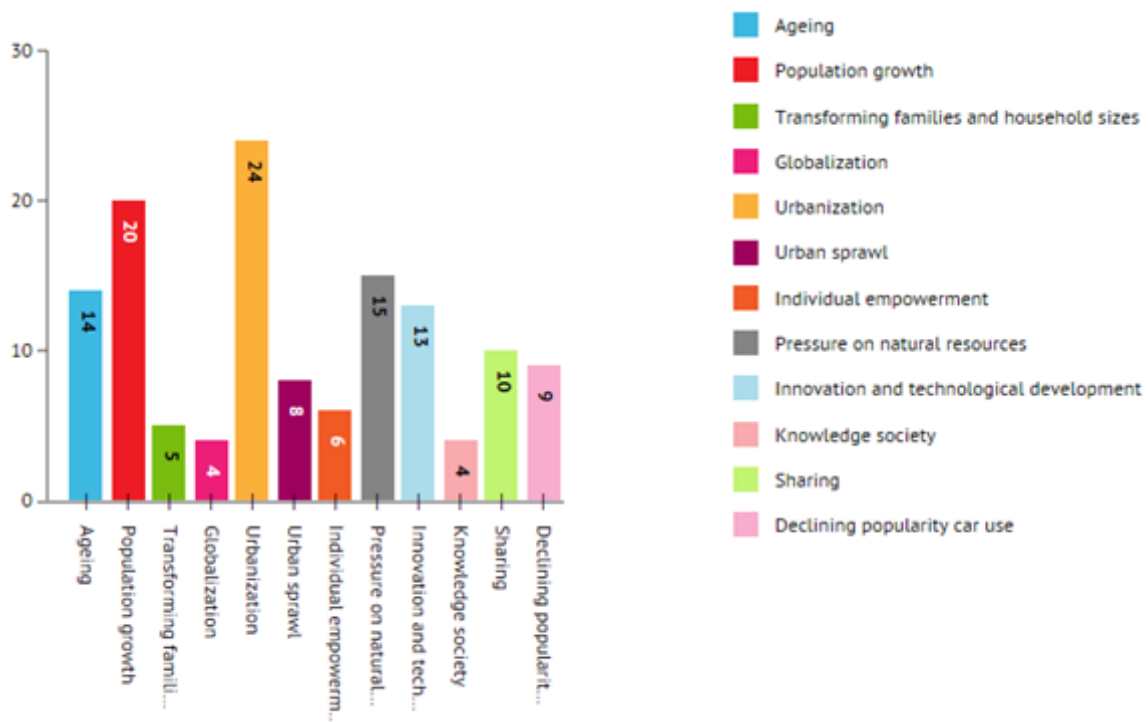
TABLE 6 - TABULATED RESULTS: SHARING ECONOMY

The final trend dealt with the declining popularity of car use. The consensus rate of the statement that the popularity of a car as a status of symbol is declining has a substantially low consensus rate. This indicates that the car remains as a status symbol. However, the respondents have reached a consensus for the statements that declining popularity of car use provides the public transport to increase its share in the modal split and that regionally, the younger generation makes more use of the public transport than generations before. For those two

statements the most mentioned answers of the respondents are agree and neutral. This is a sign that the respondents are uncertain about this trend and its consequences.

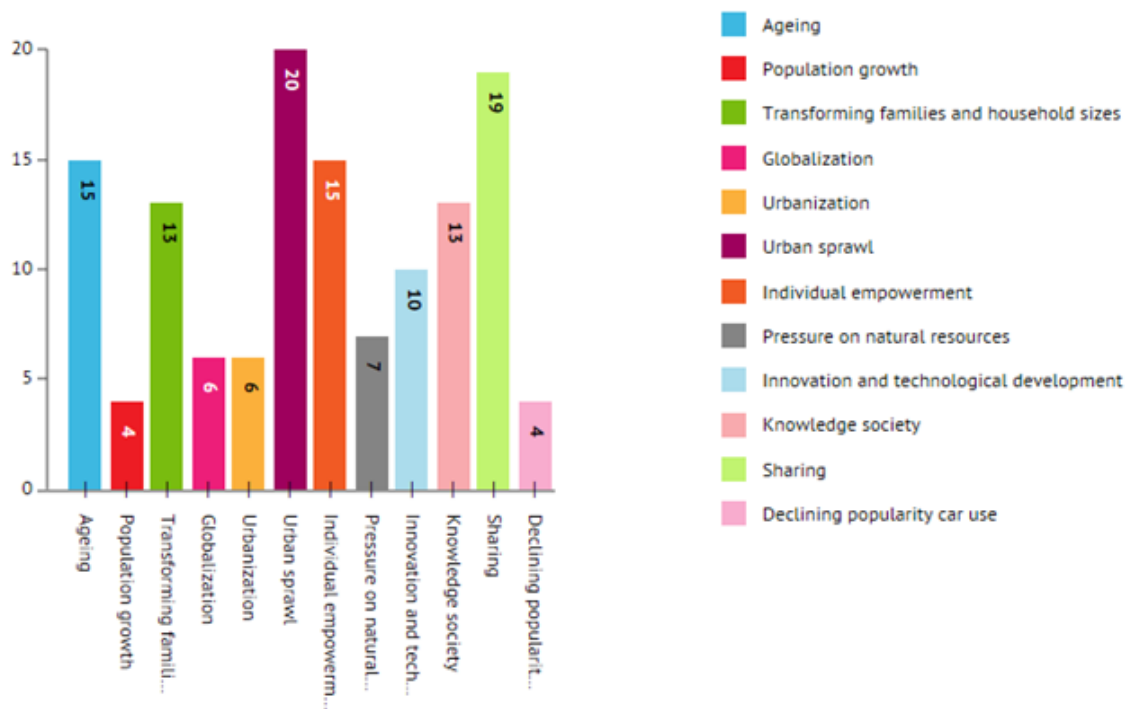
The respondents were asked to select the 3 most important trends they think it will strongly **positive** influence the public transport. The results show that the trends *urbanization* (24), *population growth* (20) and *pressure on natural resources* (15) are the most mentioned options (figure 17). Next to these trends, *ageing* (14) and *innovation and technological development* (13) are often mentioned too. The least cited trends are *knowledge society* (4), *globalization* (4) and *transforming families and household sizes* (5).

FIGURE 17 – TRENDS THAT INFLUENCE THE PUBLIC TRANSPORT STRONGLY POSITIVE



Moreover, the respondents were also asked to select the 3 most important trends they think it will strongly **negative** influence the public transport. The results show that *urban sprawl* (20), *sharing economy* (19), *individual empowerment* (15) and *ageing* (15) are the most chosen trends. Next to these trends, *knowledge society* (13) and *transforming families and household sizes* (13) are mentioned often too (figure 17). *Declining popularity car use* (4) and *population growth* (4) are the least cited trends (figure 18).

FIGURE 18 - TRENDS THAT INFLUENCE THE PUBLIC TRANSPORT STRONGLY NEGATIVE



## RESULTS FOR RET N.V.

RET N.V. is a Dutch transport company providing the public transport in and around the city of Rotterdam. Public transport is carried out by tram, bus, metro and ferry. Since July 2007 provides RET local public transport as a privatized company (RET, 2015). As mentioned earlier, the subject of this thesis is derived from the European project CIPTEC, where RET is also working on. As an intern at the RET it is asked me to analyze the results for RET separately. This is due to the geographic and business relevance.

At this section of the thesis, the results for the RET will be discussed independently from the general results by comparing it with the results of the other respondents (non-RET), which is hereinafter referred to as the control group. The reason for doing this, is due to the fact that the overall results may be highly correlated with the results of RET (60% RET respondents). For this, the cases are separated in two groups, one for which the respondents stated that they work for the RET and the second for which stated else. As mentioned before, the outcome is 26 cases for the RET and 18 respondents who does not work for the RET. The results are shown in the table below (table 7, 8 and 9), and the tabulated results for RET respondents are included in the appendix (appendix figure G).

Population growth (14), urbanization (13), ageing (8) and innovation and technological developments (8) were the trends which are expected to affect the public transport strongly positive as stated by the respondents of the RET. On the other hand, sharing economy (13), urban sprawl (11) and remarkably again innovation and technological development (9) are the trends expected to influence the public transport strongly negative.

As it turns out, is the trend innovation and technological development mentioned positive as well as negative. The results show that there is a significant high strength of consensus among the respondents of the RET for the statement that technological development enhances and optimizes the experience of mobility and that it will lead to the emergence of new electric vehicles in the public transport (0,88 respectively 0,87). These developments may give the public transport a boost resulting in an increase in the use of public transport. However, technological development could also mean the emergence of cleaner and self-propelled cars and faster motorized bikes. These developments may result in a decrease in the use of public transport.

From the results of RET it is observable that the trend ageing is mentioned as a trend affecting the public transport as well as negative as positive. This could be due to the variety in the effects of the ageing trend. In the theoretical part, a distinction was made between ageing and the ageing of already aged society. The latter group will experience probably more mobility limitations as a consequence of health problems. This can therefore lead to a decline in the number of passengers due to this trend while the regular ageing society wants to stay rather mobile in order to maintain social contacts for example. It was also stated that this generation has more time and money available. If the public transport sector succeeds in providing additional facilities fostering the accessibility of public transport, this might eventually result in an increase in the number of passengers.

Another important notion for the trend ageing is that for the statement 'it is important for the elderly population to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses', RET seems to have a much stronger agreement as compared to the results of the control group (0,77 versus 0.66). However, when considering the results, there is one outlier (SD) for the control group, which is the cause for the lower strength of consensus.

The results for the shared economy are fairly consistent with the overall results as discussed above. The results show that sharing economy is seen as a major trend, however, that there is still much uncertainty about the effects on public transport. According to the results, it seems

that RET respondents have reached a bigger consensus as compared to the control group. However, the tabulated results show that the most of the given answers are agree, neutral and disagree, which indicates unclearness about the effects of this trend. This result is comparable to the overall results. Moreover, RET respondents agree with each other for the statement that sharing will become an important business for the public transport sector as opposed to the results of the control group for which the given answers are spread across SD, D, N and A. This might be explained by regional differences.

The last trend which was expected to affect the public transport negatively is the trend urban sprawl. However, for this trend, the given answers fluctuate around agreeing for the statement and being neutral and high consensus rates has been obtained for RET. This is also an indication for a lot of uncertainty among the RET about the consequences of this trend. However, the respondents of the control group mostly agree with the same statements, which indicate to a much clearer image about this trend and its effects. There is an exception for the regional statement, but this might be again explained by regional differences.

Urbanization is a trend that was often mentioned in the literature and is also remarked as a significant trend that is expected to influence the public transport strongly positive. This is reflected in the answers given to the statements. The RET respondents jointly disagree that the demand for car ownership is increasing in urbanized areas. Despite the fact that on average no consensus is reached, the respondents generally agree with the second statement; they believe that the demand for public transport services will increase in densely populated areas. The results for this trend are in general consistent with the control groups' results. However, this group was not able to reach a consensus for the first statement.

A final remarkable result deals with the trend of flexible working. RET respondents have a low value of consensus (0,68) while the control group has a high value (0,78) for the statement that flexible working leads to a more efficient utilization of public transport infrastructure. The difference is significant. An explanation for the low strength of consensus might be that 'flexible workers' will use the car and therefore the effect on public transport will be modest. RET respondents do believe that flexible working will reduce traffic jams, which makes driving attractive (0,75).

As a conclusion it can be stated that the results are reasonably in agreement with the control group. Obviously there are a few exceptions. RET respondents believe that sharing concepts will become an important business for public transport providers, as opposed to the control group. However, there still seems to be an uncertainty about the effects of the trends sharing and urban

sprawl. Moreover, RET respondents believe that urbanization will not lead to increased car ownership, but will lead to increased use of public transport services. Finally, the observation is that the trend flexible working might lead to increased car ownership, while it is not expected to result in a more efficient utilization of public transport infrastructure.

DOMAIN	TREND	STATEMENT		CNS TOTAL		CNS RET		CNS OTHER
Demography	Ageing	<i>The elderly population use the car more.</i>	●	0,61	●	0,62	●	0,60
		<i>It is important for the elderly population to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses.</i>	●	0,72	●	0,77	●	0,66
		<i>In my region, elderly population prefer to live away from inner urban areas. This increases their demand for public transport in rural areas.</i>	●	0,60	●	0,55	●	0,71
	Population growth	<i>The trend of a growing population increases car ownership.</i>	●	0,62	●	0,66	●	0,57
		<i>The trend of a growing population increases the need for investments in public transport.</i>	●	0,80	●	0,80	●	0,82
		<i>In my region, it is hard for public transport providers to offer enough capacity for the growing population.</i>	●	0,65	●	0,68	●	0,65
	Transforming families and household sizes	<i>The trend of increased single-person families leads to increased car ownership.</i>	●	0,66	●	0,69	●	0,63
		<i>The trend of increased single-person families leads to increased usage of public transport.</i>	●	0,69	●	0,70	●	0,69
		<i>In my region, the trend of increased single-person families leads to more mobility.</i>	●	0,74	●	0,72	●	0,79
Economy	Globalization	<i>Due to globalization it is easier to keep up on innovations and technological developments worldwide.</i>	●	0,75	●	0,70	●	0,82
		<i>The trend of globalization increases the amount of travelling non-nationals (work/study/leisure) in public transport.</i>	●	0,85	●	0,88	●	0,81
		<i>In my region, globalization has a considerable impact on public transport.</i>	●	0,66	●	0,67	●	0,68

TABLE 7 - OVERVIEW RESULTS QUESTIONNAIRE PART 1

DOMAIN	TREND	STATEMENT	CNS TOTAL	CNS RET	CNS OTHER
Social	Urbanization	The demand for car ownership increases in areas with high urbanization levels.	● 0,67	● 0,72	● 0,59
		The demand for public transport services increases in densely populated areas.	● 0,71	● 0,69	● 0,74
	Urban sprawl	In my region, the trend of urbanization asks for more financial investments in public transport.	● 0,77	● 0,72	● 0,79
		The trend of urban sprawl causes people becoming car dependent.	● 0,70	● 0,72	● 0,73
		The trend of urban sprawl increases the demand for public transport services between sub-centres and the city.	● 0,82	● 0,76	● 0,91
		In my region, the trend of urban sprawl increases car ownership.	● 0,72	● 0,76	● 0,70
	Individual empowerment	The trend of individual empowerment requires organisations being more transparent.	● 0,81	● 0,74	● 0,95
		The trend of empowerment leads to individuals expecting more and better qualities from public transport providers.	● 0,79	● 0,82	● 0,76
		In my region, empowered individual influence the organisational and operational side of public transport provision.	● 0,66	● 0,61	● 0,72
	Flexible working	Flexible working reduces traffic jams which make driving more attractive.	● 0,75	● 0,75	● 0,76
		Flexible working leads to a more efficient utilization of public transport infrastructure.	● 0,71	● 0,68	● 0,78
		In my region, flexible working increases the demand for flexible transport choices.	● 0,67	● 0,67	● 0,69
	Knowledge society	The knowledge society will strengthen the effects of technological development as people in the knowledge society become the intensive users.	● 0,78	● 0,80	● 0,76
		The knowledge society affects the attitudes, preferences and demands of the public transport consumer significantly on the long-term.	● 0,81	● 0,81	● 0,81
		In my region, flexibility in working hours increases due to information technology and service driven society.	● 0,71	● 0,73	● 0,69

TABLE 8 - OVERVIEW RESULTS QUESTIONNAIRE PART 2







































DOMAIN	TREND	STATEMENT	CNS TOTAL	CNS RET	CNS OTHER
Ecology	Pressure on resources and needs for sustainability	<i>The mobility market should become less dependent of fossil fuels.</i>	 0,75	 0,73	 0,78
		<i>Due to the pressure on natural resources, public transport providers put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.</i>	 0,64	 0,69	 0,57
		<i>In my region, sustainability is a crucial development and the public transport providers will have to deal with it more intensively.</i>	 0,79	 0,78	 0,81
Technology	Innovation and new technologies	<i>Technological development in the mobility market enhances and optimizes the experience of mobility.</i>	 0,87	 0,88	 0,81
		<i>Technological development and innovations lead to the emergence of new electric vehicles in the public transport market (for example low carbon power-trains, hydrogen/bio fuel buses and cars).</i>	 0,85	 0,87	 0,83
		<i>In my region, technological developments lead to decreasing physical travel.</i>	 0,75	 0,72	 0,81
Other	Sharing economy	<i>Car sharing decreases the use of public transport.</i>	 0,69	 0,66	 0,74
		<i>Bike sharing decreases the use of public transport.</i>	 0,66	 0,66	 0,68
		<i>In my region, owning or providing a car-/bikesharing scheme, will become an important business for public transport providers.</i>	 0,69	 0,72	 0,65
	Declining popularity car use	<i>The popularity of a car as a status of symbol is declining.</i>	 0,60	 0,57	 0,63
		<i>Declining popularity of the car use provides the public transport to increase its share in the modal split.</i>	 0,73	 0,73	 0,79
		<i>In my region, the younger generation makes more use of the public transport than generations before.</i>	 0,72	 0,74	 0,71
Mean			0,73	0,73	0,74

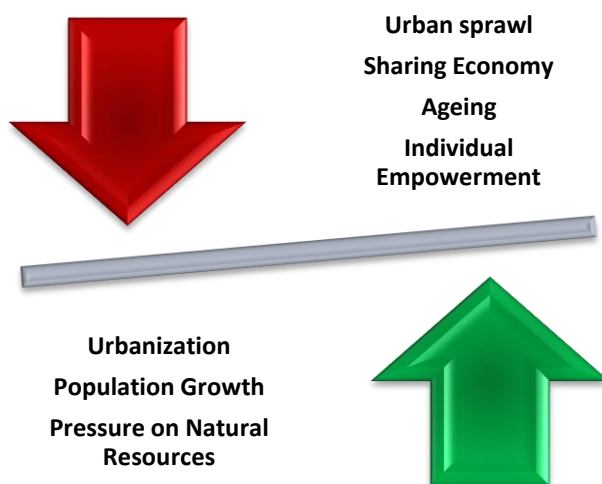
TABLE 9 - OVERVIEW RESULTS QUESTIONNAIRE PART 3



## CHAPTER 6: DISCUSSION

In the previous chapters the results of the questionnaire were presented. The observation was that the trends *urbanization*, *population growth* and *pressure on natural resources* were the trends that are expected to influence the public transport strongly positive, followed by ageing and population growth (figure 17), while the trends *urban sprawl*, *sharing economy*, *ageing* and *individual empowerment* are expected to influence the public transport strongly negative (figure 18).

FIGURE 19 - POSITIVE AND NEGATIVE TRENDS AFFECTING PUBLIC TRANSPORT



The results of the trend of urbanization shows a very low strength of consensus among the respondents that there will be a higher demand for car ownership in urbanized areas and an average strength of consensus that the demand for public transport services increase in densely populated areas. However, when observing the given answers, most of the respondents disagree with the statement that car ownership increases and agree that the demand for public transport services increases in urbanized areas. Remarkable is that the respondents has on average reached a consensus by agreeing that urbanization asks for more financial investments in public transport which indicates that irrespectively the region, the public transport sector needs to invest. However, it should be noted that these result might be biased. The respondents are working in the public transport sector and it is therefore quite logical they think the public

transport sector needs investments. There is always plenty of space to grow. It would be strange if the respondents would think that the public transport sector does not need any investments.

Most of the (core) services of public transport operators are often concentrated in the city centres and other highly urbanized areas. In most of the cases it requires a lot of time and investments to enhance the services and facilities in these areas. For instance, when coping with an enormous increase in the amount of passengers for some stations, a public transport provider might either increase the frequencies or realize an extension of the train/subways/buses. On the other hand, the latter also requires an extension of the stations, which is a (time and financially) costly investment. However, innovations and technological development also enables a higher efficiency by facilitating smart transport combinations and a better use of infrastructure (RAI vereniging, 2014).

Since the core services of the public transport are centred in urbanized areas and the levels of urbanization are increasing, it is important to know what the consequences are of this trend. The importance increases with investments characterized by being significantly expensive. In order to design proper policies and invest appropriately, reaching an agreement is significant.




The second trend that was expected to influence the public transport strongly positive was population growth. The results show that there is a strong consensus among the respondents for the second statement: they mostly (strongly) agree that the trend of growing population will increase the need for investments in public transport. It should be noted that it might be beneficial for public transport providers if they are able to combine the investments for the previous trend of urbanization (ask for investments) and the trend of growing population (ask for investments too). By this way, the public transport providers might be able to respond to two trends with common solutions.

On the other hand, the strength of consensus are on average substantially low for the statements that the trend of a growing population increases car ownership and that regionally public transport providers struggle with providing enough capacity. This might be an indication for public transport providers that with the growing population there occur an opportunity to increase its share in the modal split.

The third most mentioned trend that was expected to influence the public transport strongly positive was pressure on natural resources. There are some remarkable results for the statements for this trend. On average, the respondents agree with each other about the statement that the mobility market should become less dependent of fossil fuels and that

regionally sustainability is an important development which public transport providers will have to deal with it intensively. However, there is a significantly low strength of consensus among the respondents that the public transport providers also put an emphasis on sustainable developments. Despite the fact that no respondent strongly disagrees with this statements, the given answers are distributed among strongly agree, agree, neutral and disagree which indicates towards different feelings. However, it is crucial to be commonly aware of the fact that the combination of the trends of pressure on natural resources and technological development will lead to the fast-growing need for knowledge in technical staff and that these developments might increase the price of mobility (RAI vereniging , 2014).

These results are important and indicate on uncertainty and on lack of clarity about the initiatives taken or that will be taken for the increasingly important aspect of sustainability. It is important for public transport providers to wonder whether they are far too few concerned with sustainability in vehicles (e.g. renewable, low carbon fuel vehicles and fuel technology) or that they are too unclear about the sustainable developments achieved in the organization. Since this trend is remarked as significantly influencing the public transport positively, it is crucial for public transport providers to respond to this trend effectively and on time.

Trend: Pressure on natural resources	SA	A	N	D	SD	Total	CNS(X)	
7.1 The mobility market should become less dependent of fossil fuels.	23		17	3	1	0	44	
7.2 Due to the pressure on natural resources, public transport providers put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.	8		19	9	8	0	44	
7.3 In my region, sustainability is a crucial development and the public transport providers will have to deal with it more intensively.	12		25	6	1	0	44	




The trends urban sprawl, sharing economy, ageing and individual empowerment were stated as affecting the public transport negatively.

Urban sprawl, which was defined as a relative shift in the location of activities towards the peripheries of the urban agglomeration, is expected to increase the demand for public transport services between sub centres and the city. It is important to note that those trips will be mostly for commuting purposes; people who live in urban sprawl areas and working in the city or vice versa. In chapter 3, we discussed different reports and literatures. The observation was that rural depopulation decreased the public transport services in these areas. Therefore, it is

important to note that rural areas and urban sprawl areas differ from each other, since urban sprawl areas are 'edge cities' near to big cities. According to the results it seems that the decrease in services in rural areas might be compensated by this new trend. In order to attract the potential customers living in the urban sprawl, it is highly recommended for public transport providers to offer affordable and appropriate public transport services.

The second trend which is expected to influence the public transport strongly negative is the upcoming sharing economy. Despite the fact that sharing economy is the second most mentioned trend affecting the PT sector negatively, for no statement a consensus have been reached among the respondents. This indicates towards confusion, uncertainty and lack of clarity about this trend and its (potential) effects.

As stated before, the future is unknown and not predictable. Consequently, it is crucial to analyze the trends intensively and to figure out what this development could mean for the public transport sector. The conviction, which was derived from the extensive literature research, was that sharing concepts can be both threatening and promising for the public transport sector. Some public transport operators in the Netherlands are for instance engaged in supplying bike sharing operations en turning the sharing economy into a benefit for them. Also RET N.V. is attempting to provide bike sharing services. The results shows that there seem to be big regional differences for the statement of owning or providing sharing concepts will become an important business for public transport providers. Therefore it is recommended to discuss the shared ideas about the sharing concepts in order to create clarification in this way.

<b>Trend: Sharing Economy</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>11.1 Car sharing decreases the use of public transport.</i>	1	15	13	15	0	44	
<i>11.2 Bike sharing decreases the use of public transport.</i>	1	10	10	22	1	44	
<i>11.3 In my region, owning or providing a car- /bike-sharing-scheme, will become an important business for public transport providers.</i>	2	15	15	12	0	44	

Another trend which was mentioned as much as the trend sharing economy, is ageing. This is a particular result since ageing is mentioned as a trend which is expected to influence the public transport positive as well as negative. This might be very logical. The ageing society is actually dividable in two groups: namely the 'ageing society' (65+) and the 'ageing of the ageing society (e.g. 80+)'. While the first group is characterized by being healthy, mobile and having more time

and money to spend, the second group is characterized by physical mobility restrictions (e.g. disability). The first group has the potential to give the public transport a positive boost, while the second group might affect the public transport negatively.

The only statement, for which a consensus was reached dealt with the elderly population having easy access to public transport for example with step-free access, reduces gaps and low-floor buses. The low consensus rate for the control group (0,66) is caused by one outlier, thus it can be concluded that in general, the respondents has reached a consensus. As a conclusion, a reason for ageing affecting the PT sector positively might be due to offering the ageing society the opportunity to remain mobile easily. On the other hand, as indicated above, it also might affect the PT sector negatively due to the ageing of already aged people, who are not able or have no energy to remain active or mobile.

The trend of ageing indicates to a large group of travellers, and thus also a greater group of potential customers. The ageing society can be characterized as more social and recreational transport which might lead to more trips outside peak hours and less during peak periods. The expectation is that this trend will also create a market for modified vehicles. If the public transport provider is not able to implement the extra facilities for attracting the ageing society, it may result in a decline of passengers.

The final trend which is called as affecting the public transport sector negatively is individual empowerment. According to the ESPAS report (2015), individual empowerment could be illustrated as the situation 'where citizens will be able to reshape economic developments, to redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs' (ESPAS, 2015). The results have shown that the respondents reached a consensus with each other by agreeing that this trend requires organisations being more transparent and enhances the quality expectations of the customer.

Until now, most trends had an impact on the supply and/or demand side of the public transport. However, this trend is expected to influence the internal management. This development indicates that public transport providers need to be more clear and transparent about the incomes, expenditures, policies, etc. Moreover, this trend requires from public transport companies to adopt a more customer-oriented approach. The customer has to take centre stage and customer awareness among the organization needs to be high. This might result in asks for more research and development.

## CHAPTER 7: CONCLUSION AND POLICY RECOMMENDATIONS

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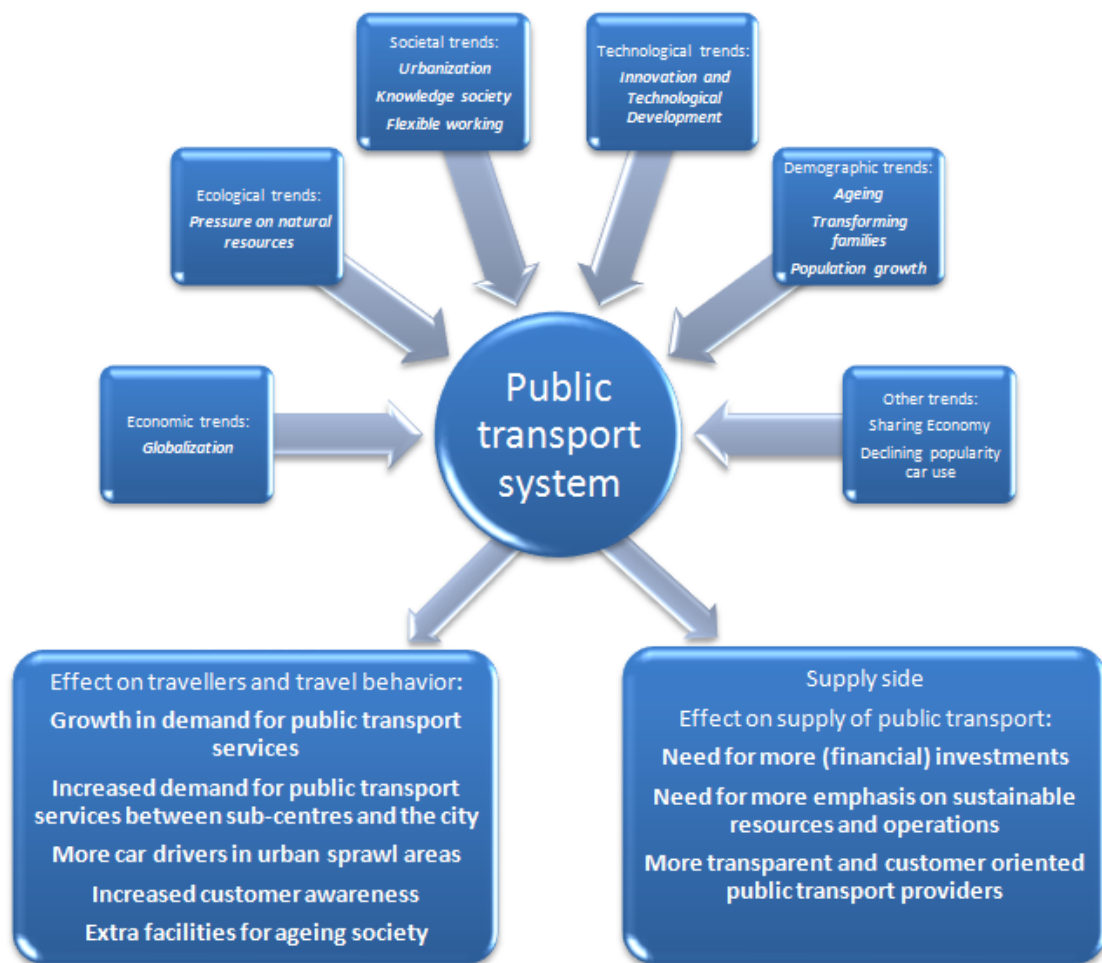
### 7.1 CONCLUSION

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Public transport is facing a number of challenges and opportunities that occur from changes within the sector itself, as well as from external trends affecting its wider socio-economic environment. Before it was concluded that the public transport is able to reduce congestion and emissions substantially in urban areas. However, in order to benefit from these advantages, the use of public transport as part of the modal split should increase. This requires better alignment between the supply of quality of public transport and the wishes of the consumer. Market trends are significant for defining and changing consumer groups' behaviour.

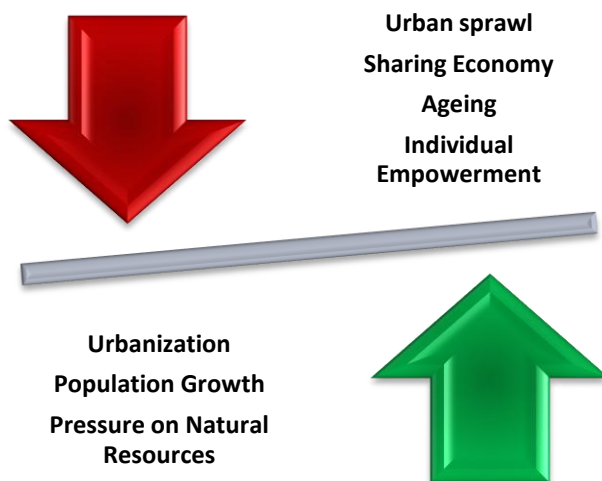
For this research, major trends in society and the transport markets and their impact on public transport has been analyzed by doing an extensive theoretical research. For this analysis, the framework of Van de Riet and Egeter (1998) is used. The identified trends in general and in mobility are subdivided into the domains demography, economy, social, ecology, technology and others (Figure 20). The identified significant trends were globalization, pressure on natural resources, urbanization, knowledge society, flexible working, innovation and technological development, ageing, transforming families and household sizes, population growth, sharing economy and declining popularity of car use.

FIGURE 20 - CONCEPTUAL FRAMEWORK



According to the literature research, tentative statements were conducted dealing with the effects of the trends on public transport. In order to test these statements, a questionnaire was set up. The results of the statements are measured by using the strength of consensus method. This method measures the extent to which respondents agree with each other. Especially in order to define timely and accurately policies, it is important to agree with each other. According to the results of this questionnaire the trends urbanization, population growth and pressure on natural resources were expected to influence the public transport strongly positive. Moreover, the trends sharing economy, ageing and individual empowerment were trends expected to affect the public transport strongly negative. Despite the fact that sharing economy was the most-mentioned trend in this area, there was a significantly low strength of consensus for the statements. This point to a lack of clarity regarding the trend of sharing economy.

FIGURE 21 - TRENDS AFFECTING THE PUBLIC TRANSPORT POSITIVELY AND NEGATIVELY



The main question which is examined in this study was: What are the major trends in the society and in mobility and what is their impact on travellers, travel behaviour and public transport demand? For answering the research question, four sub questions were defined too. After finalizing a detailed analysis on the future of public transport, we will attempt to answer these questions.

*What are the most important economic and societal trends in general?*

According to the many reports and literatures the most important economic and societal trends in general are: rapid ageing of global population, increased global population, bigger middle class, transforming families and household sizes, increased trade and globalization, shift of economic power, urbanization, individual empowerment, pressure on natural resources and innovation and technological development.

*What are the most important economic and societal trends in mobility?*

The theoretical analysis has shown that the most important economic and societal trends in mobility can be defined as: ageing, population growth, transforming families and household sizes, globalization, urbanization, knowledge society, flexible working, pressure on resources and needs for sustainability, innovation and technological development, sharing economy and declining popularity car use.

*What are the effects of such trends on travellers and travel behaviour?*



According to the literature research many different effects of trends on travellers and travel behaviour were found. However, we will discuss only the effects for which the respondents had a high strength of consensus. The expectation is that there will be a growth in demand for public transport services due to several reasons like urbanization, growth in population and transforming families. Moreover, the trend of urban sprawl is expected to cause an increased demand for public transport services especially between sub-centres and the city. Another effect of this trend is the increase of car drives in urban sprawl areas. Moreover, public transport operators will experience increased customer awareness from travellers.

A final trend which is expected to influence the public transport positive as well as negative is ageing. The expectation is that the aged travellers especially will demand extra facilities enhancing the accessibility for public transport services like step-free accesses.

*What are the possible effects on the supply of public transport?*

Also for the supply side of public transport effects were identified. The most outstanding result was that there will be definitely a need for more (financial) investments in public transport to cope with the expected increase in demand and with the needed facilities. Moreover, the results have shown that there is a need for more emphasis on sustainable resources and operations. Pressure on natural resources is remarked as a significant trend which might give a boost to public transport. The results show that the mobility market should become less dependent of fossil fuels but that there is yet no emphasis on sustainable resources and operations like renewable, low carbon fuel vehicles and fuel technology. A final significant effect of the supply of public transport arises from the increased customer awareness. Travellers expect more transparency from the public transport sector and demand the public transport operators to become more customer oriented.

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## 7.2 POLICY RECOMMENDATIONS

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This thesis attempted to inventory various trends affecting the public transport. The trends and their expected effects are discussed in chapter X. However, it is especially important that public transport providers respond in an accurate way to these developments. Therefore, in this chapter policy recommendations will be given.

Initially, the observation is that there will occur changes in the immediate physical environment, caused by the trends of urbanization and urban sprawl. As it is mentioned previously, urbanization ensures a growth in demand for public transport. It is crucial for public transport

operators to properly identify how big this increase will be in the region and to think about how they want to tackle this problem. A well-known method is to increase the frequency of services. However, for some routes it may be that it is already deployed in a maximum frequency. In that case, perhaps extending the vehicles might be an appropriate solution. However, for some stations this would imply that they should be extended, which is a costly investment. A possible third option is the use of smart combinations of public transport, which can be realized and is enabled through innovations and technological developments. For example, one can think of informing about possible alternative routers during peak hours (for example via an application). All of the mentioned options will also provide a solution to the growth in demand for public transport services as a result of the trend of population growth.

While urbanization has a stronger impact on the pressure on public transport, the trend urban sprawl urges the public transport sector more to a change in services. Urban sprawl areas are actually edge cities near to big cities. This causes an increase in the demand for public transport services between the urban sprawl areas and the big city. An example of such an initiative is the “Randstadrail14”. When public transport providers are able to provide a good alternative to the car, especially in the urban sprawl areas, reduces of car use for commuting purposes in these areas can be ensured.

Pressure on natural resources was, according to the questionnaire, a trend that was expected to influence the public transport strongly positive. As a result of increased awareness regarding sustainability issues, people might be more likely to prefer the public transport instead of their car. Therefore, it is expected that this trend will have a positive effect on public transport. This positive effect can even be enhanced if the public transport sector operates even more sustainable e.g. by purchasing cleaner vehicles or by realizing energy savings (use of braking energy). According to the results of the survey, one can conclude that this trend is more considered as an “opportunity” rather than a “threat”. However, it is also the issue to maintain it as an opportunity. The results show that this is not as experienced by the respondents. Their opinion is that the public transport is doing too little with this subject, despite the fact that they find it is of significant importance. The recommendation is that public transport companies should exploit this opportunity well by considering the aforementioned initiatives. Especially since there is a worldwide increasing awareness of sustainability and climate issues. Nevertheless, it is even more important to communicate the initiatives both internally and externally.

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<sup>14</sup> A light rail connection between Rotterdam and The Hague (crosses urban sprawl areas between the two big cities) (RET , 2015 ).

It is unclear what the trend sharing economy, car sharing and bike sharing as well, will mean for public transport. It is recommended to observe other transport companies or even consult together about how to deal with this development and what the results are. It is also important to pay internal attention about the developing sharing economy and its consequences. The results showed mixed feelings regarding the sharing economy: the variety of responses was the greatest.

Finally, there follow some recommendations on the trend of ageing. This target group is already of longer nature; however, the proportion of the population belonging to this group increases. In this thesis a distinction has been made between two groups in the ageing population, namely newly ageing people (65+) and the ageing of already aged people (80+). While the first group is characterized by having a lot of money, time and energy, the second group is characterized by physical (mobility) restrictions and not much energy. Increasing accessibility in public transport might for instance be of more significance for the second group while off-peak discount tickets or combination tickets with an outing might be more attractive to the first group. It is important not to grasp the ageing population with one term and, therefore, not to use one approach. Instead, it is recommended to realize and understand the two groups well and to adopt a more focused approach instead of regarding it as one group as whole.

## CHAPTER 8: LIMITATIONS AND RECOMMENDATIONS

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As any other report, also this thesis contains some limitations which should be considered. A first limitation of this report deals with the modified Delphi-method. Due to time limits and big international distances, an online questionnaire was used to collect experts' opinions. This questionnaire contains statements with response options based on a Likert scale. There was therefore not enough space to gain argumentations behind the given answer. Experience shows that arguments often yield valuable information. Another related limitation is the 'group scope' of the Delphi-experiment. Most often the Delphi-experiment takes place with a group discussion, which might give very valuable insights and argumentations. However, a disadvantage of a group discussion is that others might follow the 'leader' and might conceal their own opinions while an anonymous questionnaire takes this problem away.

A third limitation deals with the respondents. We already stated before that the biggest share of the respondents are from the RET (approximately 60%) and 82% of the respondents works for an organization located in the Netherlands. The results have shown a fairly skewed distribution with the majority of respondents work at RET and/or in an organization based in the Netherlands. This has affected the representativeness of the results. The results might reflect the situation for the Netherlands especially for the city Rotterdam more than the other regions. The results of the group as total might have been affected significantly by the given answers of RET respondents. To mitigate this effect, an analysis has been made of the RET respondents as compared to the control group (group without RET respondents). There were also respondents from other countries. Nevertheless, the fact remains that this point is an important limitation and therefore the results should be interpreted carefully.

Moreover, the results of the questionnaire have been analyzed by using the strength of consensus method. This method does not search the 'truth' or the 'right answer', but measures to what degree the respondents agree with each other. Nevertheless, it may be that an expected result (which had gained a high consensus rate) of a trend does not have to come out because there is a mainstream idea created in the society. Moreover, the consensus rates do not represent which answer is mostly chosen (SA, A, N, D, SD). For considering the given answers, the tabulated results were analyzed. Another limitation to this method is the highly significant impact of outliers. In some cases, one outlier caused a low strength of consensus.

In case of further research, it is recommended to repeat the questionnaire with more respondents throughout Europe in order to obtain a better image about the effect of trends in Europe. Moreover, it is recommended to conduct a Delphi-experiment with repeated group

discussions and/or with an expert panel. By this, it is possible to exchange information, opinions and thoughts. Moreover, it is also advised to collect arguments that underlie the given answers and opinions. The arguments may shed light on underlying thoughts and provide valuable information. In addition, this research could also be done regionally in order to gain more insight about regional differences. This might lead to a different priority list and different strength of consensus with the strongest trends for a particular region becoming visible, since not every trend has to be in the same stadium throughout Europe.

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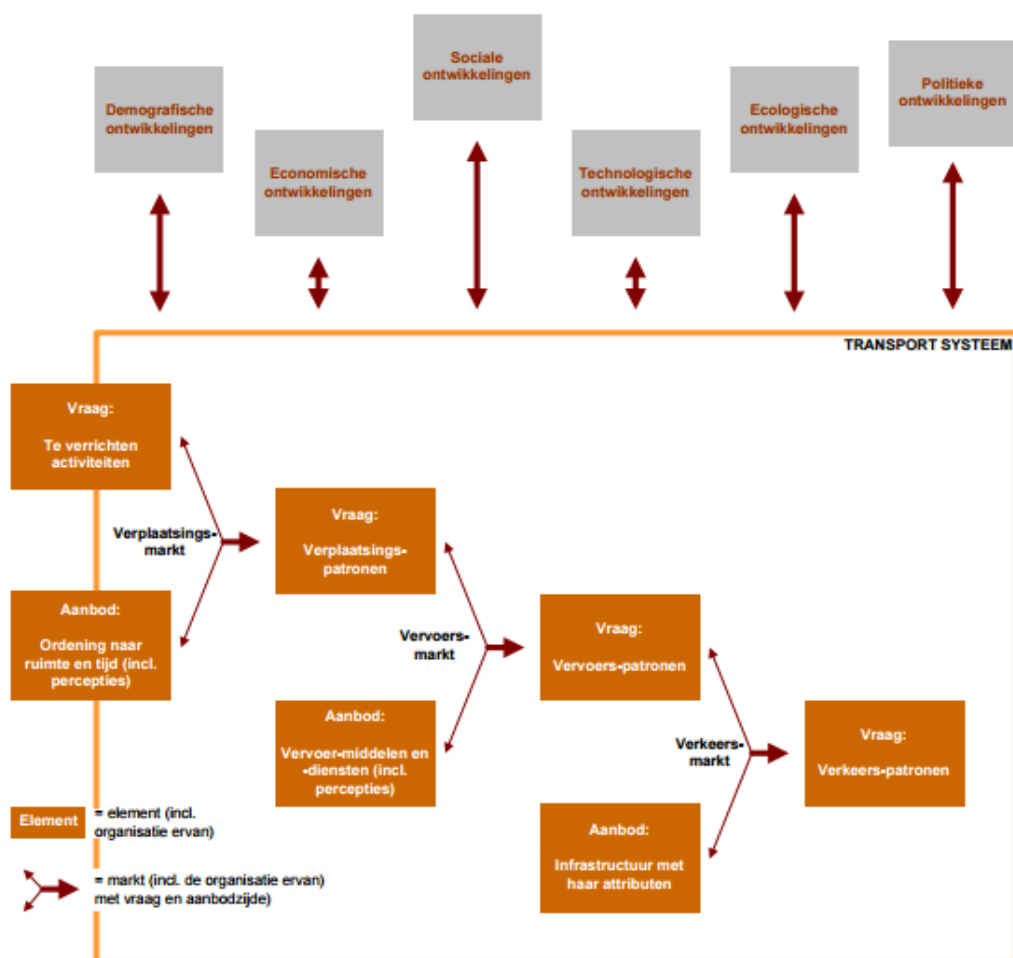
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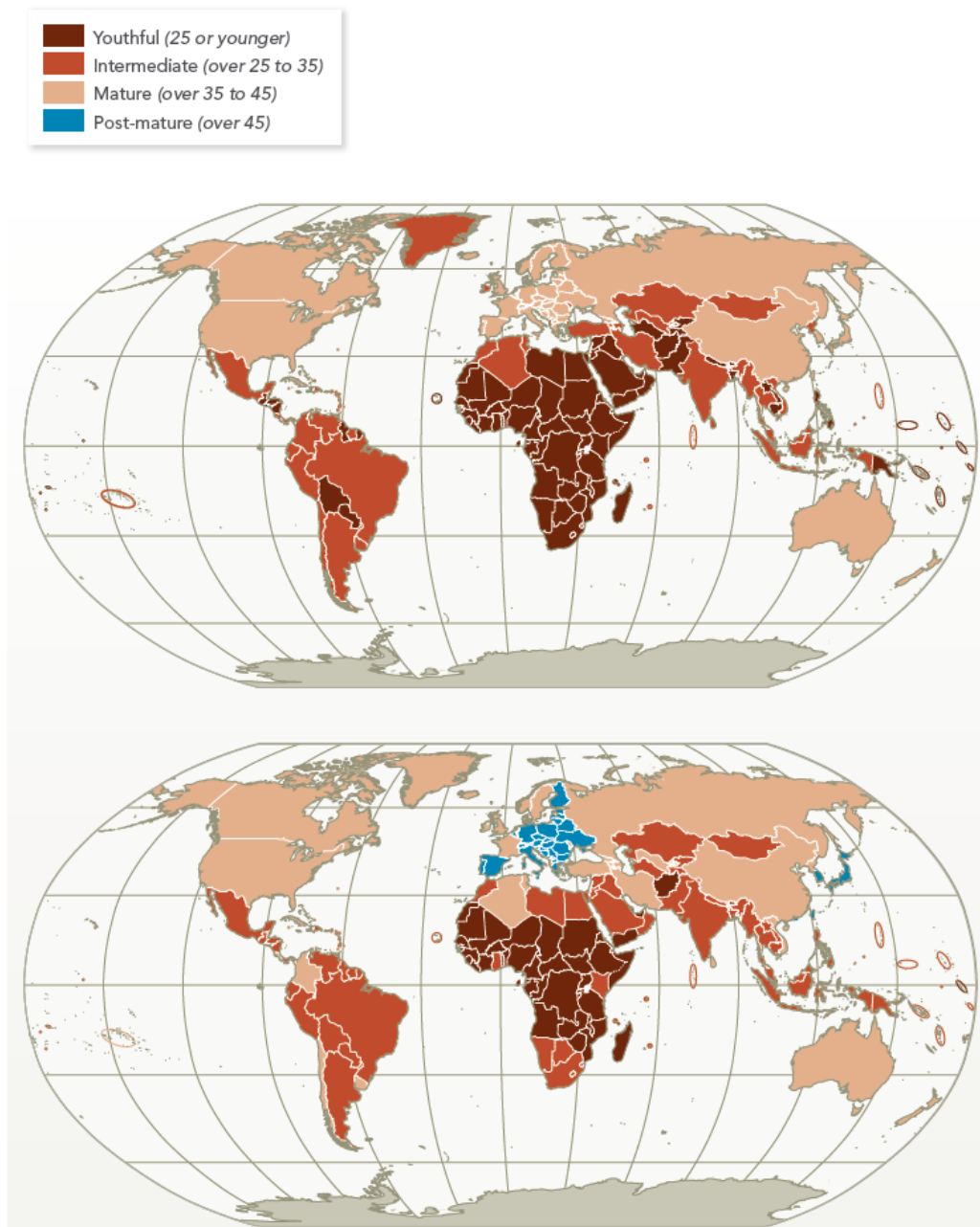
## APPENDIX

APPENDIX FIGURE A - CONCEPTUAL MODEL RIET AND EGETER (1998) SUPPLEMENTED BY KIEL (2012)



APPENDIX FIGURE B - THE MEDIAN AGE OF COUNTRY-LEVEL POPULATIONS, 2010-2030

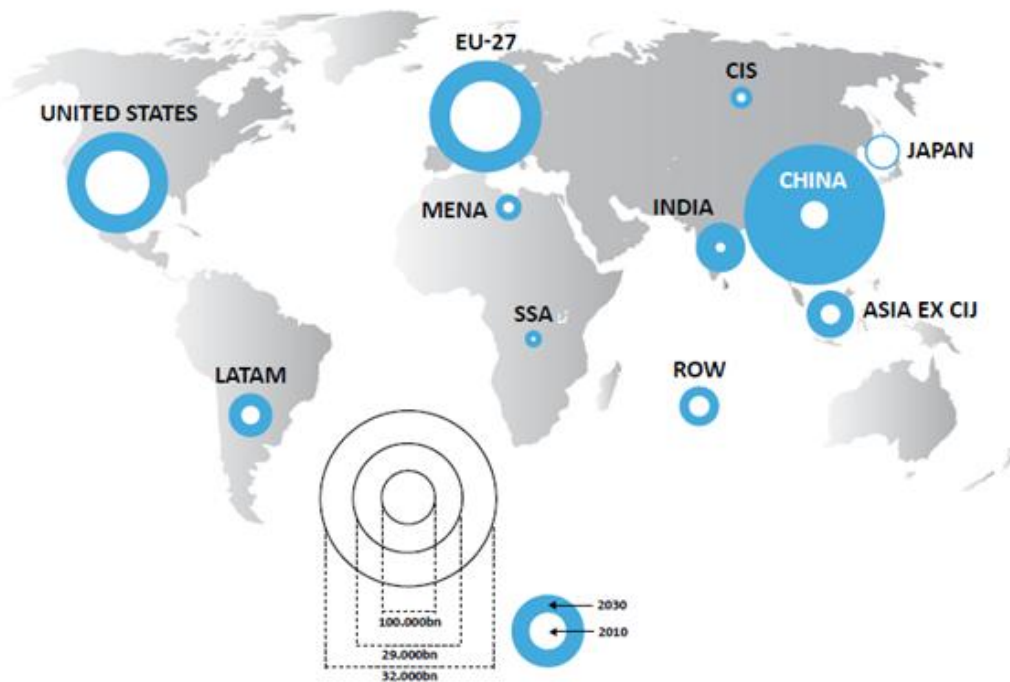
THE MEDIAN AGE OF COUNTRY-LEVEL POPULATIONS, 2010-2030



Source: US Census Bureau's International Database, June 2011. The median ages of Arab Gulf states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE) reflect the age structure of resident citizens, omitting temporary labor migrants.

APPENDIX FIGURE C - MIDDLE CLASS IN 2009 AND FORECAST FOR 2030

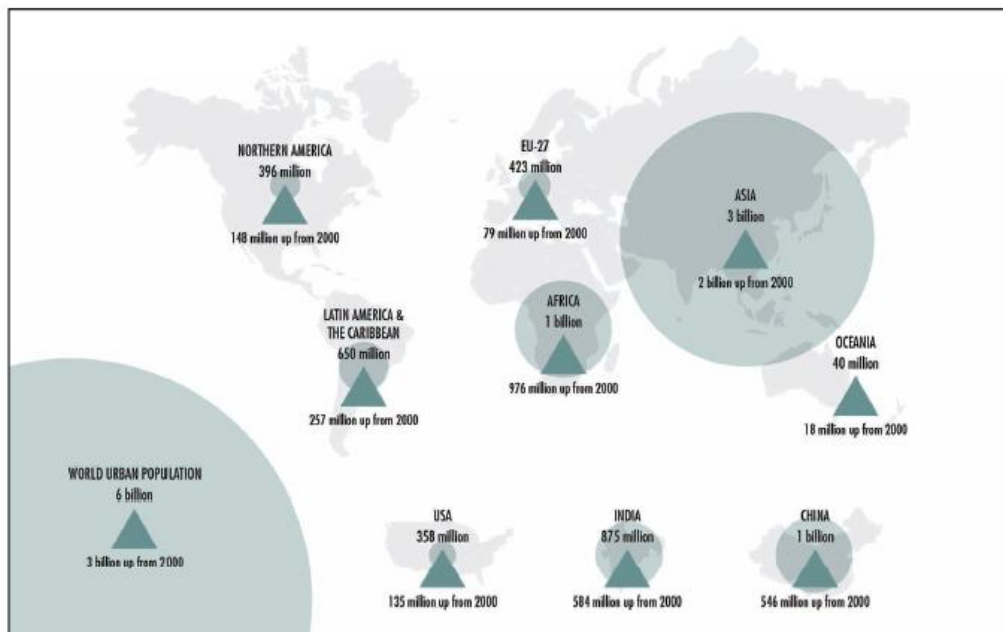
Middle class in 2009 and forecast for 2030



Sources: OECD, Standard Chartered Research.

APPENDIX FIGURE D - PROJECTED URBAN POPULATION BY REGION, 2050

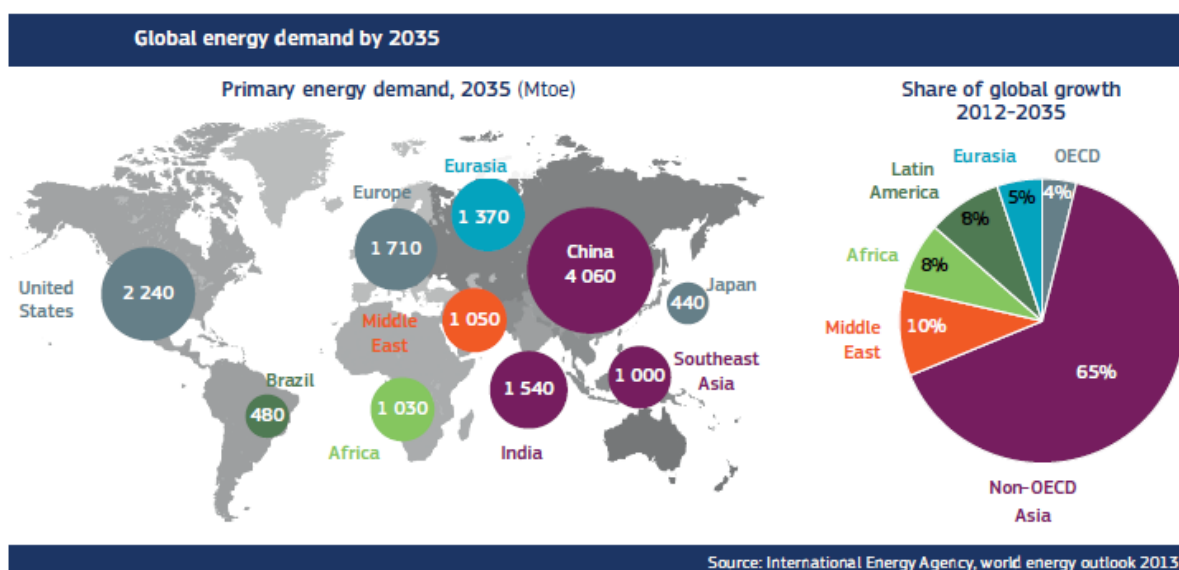
Projected urban population by region, 2050



Source: United Nations, Department of Economic and Social Affairs, Population Division (2012). World Urbanisation Prospects: The 2011 Revision, POP/DB/WUP/Rev.2011/1/F5



APPENDIX FIGURE E - GLOBAL ENERGY DEMAND BY 2035



APPENDIX FIGURE F - LIST OF CIPTEC CONSORTIUM MEMBERS

No	Name	Code / Short name	Field of expertise	Role in CIPTEC
1	Aristotle University of Thessaloniki-Transport Systems Research Group	(GR) AUTH	<ul style="list-style-type: none"> <li>- transport Systems planning, organisation and management</li> <li>- transport-specific and horizontal issues: sustainable development, social impact analysis, new technologies, policy, accessibility, human factors, socio-economic analysis, operational research.</li> </ul>	<ul style="list-style-type: none"> <li>- Coordinator</li> <li>- WP7 Leader/ technical management</li> <li>- WP8 Leader</li> <li>- Organiser of workshops at local – site level</li> <li>- Involved in all WPs</li> </ul>
2	KU Leuven – The Research Centre for Marketing and Consumer Science	(BE) KUL	<ul style="list-style-type: none"> <li>- specialisation in consumers behaviour</li> <li>- extensive experience in behavioural experimental design;</li> </ul>	<ul style="list-style-type: none"> <li>- WP4 Leader</li> <li>- Participation in other WPs</li> </ul>
3	Mobycon Concordis Groep	(NL) MOB	<ul style="list-style-type: none"> <li>- research and consulting</li> <li>- traffic, transport, mobility management</li> <li>- passenger and freight transport, ITS, cycling, parking, road safety and mobility management.</li> <li>- public tendering, setting up new concepts/ policies, monitoring, evaluation and business plans</li> </ul>	<ul style="list-style-type: none"> <li>- WP2 Leader</li> <li>- Participation in other WPs</li> </ul>
4	Tero Ltd.	(GR)	<ul style="list-style-type: none"> <li>- research and development consultancy, business and technology</li> </ul>	<ul style="list-style-type: none"> <li>- WP3 Leader</li> <li>- Financial management</li> </ul>

No	Name	Code / Short name	Field of expertise	Role in CIPTEC
		Tero	<ul style="list-style-type: none"> <li>- intelligent transport, location-based services, decision support systems, online social networks and digital preservation,</li> <li>- management and dissemination activities, websites and online promotion campaigns</li> </ul>	<ul style="list-style-type: none"> <li>- Online dissemination</li> <li>- Sustainability planning</li> <li>- Participation in other WPs</li> </ul>
5	MemEx	(IT) MemEx	<ul style="list-style-type: none"> <li>- Urban Mobility (Integrated Parking Systems, Bus Priority, Traffic Centre, Access control, etc.).</li> <li>- Intelligent Transport Systems and Collective Transport (PT network design Integrated Payments, Infomobility, etc.),</li> <li>- systems analysis, design, introduction and evaluation,</li> <li>- support in procurement related to ITS</li> </ul>	<ul style="list-style-type: none"> <li>- WP4 Leader</li> <li>- Participation in other WPs</li> </ul>
6	White Research	(BE) WR	<ul style="list-style-type: none"> <li>- social research enterprise specialising in consumer behaviour in the ICT, health and transport</li> <li>- modern analytics and marketing research methods</li> <li>- innovation policy, evaluation, impact assessment and management services to public organisations</li> <li>- business, market and user related issues in the ICT, health and transport related</li> </ul>	<ul style="list-style-type: none"> <li>- WP6 Leader</li> <li>- Participation in other WPs</li> </ul>
7	Ortelio Ltd	(UK) Ort	<ul style="list-style-type: none"> <li>- research and innovation management</li> <li>- Transport and Environmental Science</li> <li>- technology and business</li> <li>- support in developing and commercialising new products and services</li> <li>- Information and Communication Technologies</li> </ul>	<ul style="list-style-type: none"> <li>- Manager of EAB</li> <li>- Participation in WPs</li> </ul>
8	City Region Rotterdam	(NL) SRR	<ul style="list-style-type: none"> <li>- partnership of 15 municipalities in the Rotterdam Rijnmond region.</li> <li>- the Cityregion is responsible for PT in the region.</li> <li>- It gives concessions to companies to provide PT and oversees its implementation.</li> <li>- in addition the Cityregion is responsible for metropolitan construction and maintenance of infrastructure for PT</li> </ul>	<ul style="list-style-type: none"> <li>- Organiser of local workshops</li> <li>- Participation in field experiments (WP4)</li> <li>- Participation in WPs</li> </ul>
9	TIEMME	(IT)	<ul style="list-style-type: none"> <li>- is the PT company, operating in the southern-central part of Tuscany</li> <li>- Its activities include: local public transport services, rentals, contract services (school buses, shuttle services), authorized lines, vehicle maintenance activities, and administration.</li> <li>- conventional (with fixed lines and timetables) and innovative services</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation strategy plan</li> <li>- Organiser of local workshops</li> <li>- Participation in field experiments (WP4)</li> <li>- Participation in WPs</li> </ul>
10	traffiQ Local Public Transport	(GE)	<ul style="list-style-type: none"> <li>- Local PT Authority of the City of Frankfurt/M.</li> <li>- part of regional integrated tariff &amp; ticketing</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation strategy plan</li> <li>- Organiser of local</li> </ul>



No	Name	Code / Short name	Field of expertise	Role in CIPTEC
	<i>Authority of the City of Frankfurt am Main</i>	traffiQ	<ul style="list-style-type: none"> <li>system</li> <li>- tendering all local bus services and contracting the light rail system</li> <li>- financial control of the revenue sharing system, managing local tariff and ticketing</li> <li>- PT marketing campaigns, customer information customer relation management, customer counselling, complaints management</li> <li>- mobility research</li> </ul>	<ul style="list-style-type: none"> <li>workshops</li> <li>- Participation in WPs</li> </ul>
11	European Passenger's Federation	(BE) EFP	<ul style="list-style-type: none"> <li>- Is a federation of all major passenger organisations throughout Europe</li> <li>- It has 35 member associations covering 19 European countries.</li> </ul>	<ul style="list-style-type: none"> <li>- Networking</li> <li>- Participation in workshops</li> </ul>
12	European Metropolitan Transport Authorities	(FR) EMTA	<ul style="list-style-type: none"> <li>- EMTA was established in 1998 for the exchange of information, research and experience between the PT authorities in the largest cities in Europe.</li> <li>- it consists of 26 cities &amp; regions</li> <li>- it sets up working groups to: define relevant issues to address; collect and consolidate facts and figures, carry out surveys, conduct in depth research; disseminate the findings</li> </ul>	<ul style="list-style-type: none"> <li>- Networking</li> <li>- Participation in workshops</li> <li>- Dissemination of results</li> </ul>

#### APPENDIX FIGURE G - EXPERTS OPINION QUESTIONNAIRE

This research is carried out for the European project CIPTEC. This project involves a research into various trends and developments in the mobility market that can exert an effect on public transport. With this research it is attempted to highlight the most important trends and their effects.

Completing the questionnaire takes only 10 minutes. The research is completely anonymous and no information is passed to third parties.

This questionnaire contains 12 trends. For each trend, there are three statements given. The first statement has a general scope, the second statement is directly linked to public transport and the third statement concerns this development within your own region. In cases you are not familiar with a trend, we friendly ask you to give your opinion. There are no right or wrong answers.

#### STATEMENTS

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### TREND 1: AGEING

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The first trend is ageing. Please consider the following statements:

- 1.1: *The elderly population use the car more.*
- 1.2: *It is important for the elderly population to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses.*
- 1.3: *In my region, elderly population prefer to live away from inner urban areas. This increases their demand for public transport in rural areas.*

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### TREND 2: POPULATION GROWTH

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The second trend is population growth. Please consider the following statements:

- 2.1: *The trend of a growing population increases car ownership.*
- 2.2: *The trend of a growing population increases the need for investments in public transport.*
- 2.3: *In my region, it is hard for public transport providers to offer enough capacity for the growing population.*

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### TREND 3: TRANSFORMING FAMILIES AND HOUSEHOLD SIZES

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The third trend is transforming families and household sizes. Please consider the following statements:

- 3.1: *The trend of increased single-person families leads to increased car ownership.*
- 3.2: *The trend of increased single-person families leads to increased usage of public transport.*
- 3.3: *In my region, the trend of increased single-person families leads to more mobility.*

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### TREND 4: GLOBALIZATION

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The fourth statement is globalization. Please consider the following statements:

- 4.1: *Due to globalization it is easier to keep up on innovations and technological developments worldwide.*
- 4.2: *The trend of globalization increases the amount of travelling non-nationals (work/study/leisure) in public transport.*

**4.3:** *In my region, globalization has a considerable impact on public transport.*

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#### TREND 5: URBANIZATION

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The fifth trend is urbanization. Please consider the following statements:

**5.1:** *The demand for car ownership increases in areas with high urbanization levels.*

**5.2:** *The demand for public transport services increases in densely populated areas.*

**5.3:** *In my region, the trend of urbanization asks for more financial investments in public transport.*

#### **Urban sprawl**

Urban sprawl is a sub-trend of urbanization. Urban sprawl stands for a relative shift in the location of activities towards the peripheries of the urban agglomeration. Please consider the following statements:

**5.4:** *The trend of urban sprawl causes people becoming car dependent.*

**5.5:** *The trend of urban sprawl increases the demand for public transport services between sub-centres and the city.*

**5.6:** *In my region, the trend of urban sprawl increases car ownership.*

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#### TREND 6: INDIVIDUAL EMPOWERMENT

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The sixth trend is individual empowerment. Rise of the individual i.e. individual empowerment indicates to the situation 'where citizens will be able to reshape economic developments, to redistribute power in politics through increased participation and to propose for innovative solutions to meet social needs'. Please consider the following statements:

**6.1:** *The trend of individual empowerment requires organizations being more transparent.*

**6.2:** *The trend of empowerment leads to individuals expecting more en better qualities from public transport providers.*

**6.3:** *In my region empowered individuals influence the organizational and operational side of public transport provision.*

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#### TREND 7: PRESSURE ON NATURAL RESOURCES

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The seventh trend is pressure on natural resources. Please consider the following statements:

- 7.1:** *The mobility market should become less dependent of fossil fuels.*
- 7.2:** *Due to the pressure on natural resources, public transport providers put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.*
- 7.3:** *In my region, sustainability is a crucial development and the public transport providers will have to deal with it more intensively.*

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#### TREND 8: INNOVATION AND TECHNOLOGICAL DEVELOPMENT

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The eighth trend is innovation and technological development. Please consider the following statements:

- 8.1:** *Technological development in the mobility market enhances and optimizes the experience of mobility.*
- 8.2:** *Technological development and innovations lead to the emergence of new electric vehicles in the public transport market (for example low carbon power-trains, hydrogen/bio fuel buses and cars).*
- 8.3:** *In my region, technological developments lead to decreasing physical travel.*

---

#### TREND 9: KNOWLEDGE SOCIETY

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Trend number 9 is the knowledge society. This refers to a service driven society with a high level of education and a know-how being. Please consider the following statements:

- 9.2:** *The knowledge society will strengthen the effects of technological development as people in the knowledge society become the intensive users.*
- 9.3:** *The knowledge society affects the attitudes, preferences and demands of the public transport consumer significantly on the long-term.*
- 9.4:** *In my region, flexibility in working hours increases due to information technology and service driven society.*

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### TREND 10: FLEXIBLE WORKING

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The tenth trend is flexible working, which is defined as work regardless of time and place in which is controlled by output. Please consider the following statements:

- 10.1:** *Flexible working reduces traffic jams which make driving more attractive.*
- 10.2:** *Flexible working leads to a more efficient utilization of public transport infrastructure.*
- 10.3:** *In my region flexible working increases the demand for flexible transport choices.*

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### TREND 11: SHARING ECONOMY

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Trend 11 deals with a shared economy. Please consider the following statements:

- 11.1:** *Car sharing decreases the use of public transport.*
- 11.2:** *Bike sharing decreases the use of public transport.*
- 11.3:** *In my region, owning or providing a car- /bike-sharing-scheme, will become an important business for public transport providers.*

---

### TREND 12: DECLINING POPULARITY CAR USE

---

Trend 12 is the declining popularity of car use. Please consider the following statements:

- 12.1:** *The popularity of a car as a status of symbol is declining.*
- 12.2:** *Declining popularity of the car use provides the public transport to increase its share in the modal split.*
- 12.3:** *In my region, the younger generation makes more use of the public transport than generations before.*

You have just seen 12 trends. Please select the 3 most important trends you think they will **strongly positive** influence the public transport.

- Ageing
- Population growth
- Transforming families and household sizes
- Globalization

- ☐ Urbanization
- ☐ Urban sprawl
- ☐ Individual empowerment
- ☐ Pressure on natural resources
- ☐ Innovation and technological development
- ☐ Knowledge society
- ☐ Sharing
- ☐ Declining popularity car use

Please select the 3 most important trends you think they will **strongly negative** influence the public transport.

- ☐ Ageing
- ☐ Population growth
- ☐ Transforming families and household sizes
- ☐ Globalization
- ☐ Urbanization
- ☐ Urban sprawl
- ☐ Individual empowerment
- ☐ Pressure on natural resources
- ☐ Innovation and technological development
- ☐ Knowledge society
- ☐ Sharing
- ☐ Declining popularity car use

Is there any missing trend in your opinion?

**Organization:**

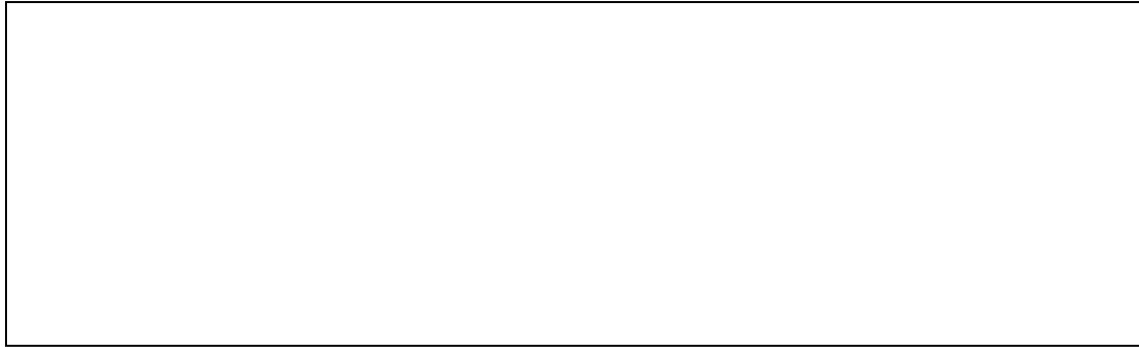
Q1: Which organization do you work for?

Q2: In which country is the organization located where you work for?

**Function:**

Q3: What is your function?

Do you have any questions and/or comments about this survey?



Thank you for your collaboration. The progression of this project and releases can be found on [www.ciptec.eu](http://www.ciptec.eu). For more questions and or comments you can send an e-mail to [g.uysal@ret.nl](mailto:g.uysal@ret.nl).

#### APPENDIX FIGURE H - RESULTS QUESTIONNAIRE TOTAL

Trend: Ageing	SA	A	N	D	SD	Total	CNS(X)
<i>1.1. The elderly population use the car more</i>	5	10	11	17	1	44	0,606613
<i>1.2. It is important for the elderly population to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses.</i>	24	17	2	0	1	44	0,722716
<i>1.3. In my region, elderly population prefer to live away from inner urban areas. This increases their demand for public transport in rural areas.</i>	4	11	9	19	1	44	0,601594

Trend: Population growth	SA	A	N	D	SD	Total	CNS(X)
<i>2.1 The trend of a growing population increases car ownership.</i>	3	14	13	11	3	44	0,6224
<i>2.2 The trend of a growing population increases the need for investments in public transport.</i>	22	21	1	0	0	44	0,79638
<i>2.3 In my region, it is hard for public transport providers to offer enough capacity for the growing population</i>	5	10	16	13	0	44	0,65439

Trend: Transforming families and household sizes	SA	A	N	D	SD	Total	CNS(X)
<i>3.1 The trend of increased single-person families leads to increased car ownership.</i>	1	21	12	8	2	44	0,660273

3.2 The trend of increased single-person families leads to increased usage of public transport.	1	19	15	8	1	44	0,694647
3.3. In my region, the trend of increased single-person families leads to more mobility.	2	20	18	4	0	44	0,741363

Trend: Globalization	SA	A	N	D	SD	Total	CNS(X)
4.1 Due to globalization it is easier to keep up on innovations and technological developments worldwide.	9	27	4	3	1	44	0,745447
4.2 The trend of globalization increases the amount of travelling non-nationals (work/study/leisure) in public transport.	9	30	5	0	0	44	0,849094
4.3 In my region, globalization has a considerable impact on public transport.	3	19	13	8	1	44	0,661203

Trend: Urbanization	SA	A	N	D	SD	Total	CNS(X)
5.1 The demand for car ownership increases in areas with high urbanization levels.	1	5	4	21	13	44	0,665663
5.2 The demand for public transport services increases in densely populated areas.	19	18	4	3	0	44	0,705104
5.3 In my region, the trend of urbanization asks for more financial investments in public transport.	12	22	8	2	0	44	0,765892

Trend: Urban Sprawl	SA	A	N	D	SD	Total	CNS(X)
5.4 The trend of urban sprawl causes people becoming car dependent.	7	20	14	2	1	44	0,695929
5.5 The trend of urban sprawl increases the demand for public transport services between sub-centres and the city.	8	27	8	1	0	44	0,816909
5.6 In my region, the trend of urban sprawl increases car ownership.	3	14	21	6	0	44	0,72483

Trend: Individual Empowerment	SA	A	N	D	SD	Total	CNS(X)
6.1 The trend of individual empowerment requires organisations being more	5	30	7	2	0	44	0,814136



transparent.

6.2 The trend of empowerment leads to individuals expecting more and better qualities from public transport providers.	9	26	7	2	0	44	0,7943
6.3 In my region empowered individuals influence the organisational and operational side of public transport provision.	4	12	18	8	2	44	0,659441

Trend: Pressure on natural resources	SA	A	N	D	SD	Total	CNS(X)
7.1 The mobility market should become less dependent of fossil fuels.	23	17	3	1	0	44	0,746365
7.2 Due to the pressure on natural resources, public transport providers put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.	8	19	9	8	0	44	0,640459
7.3 In my region, sustainability is a crucial development and the public transport providers will have to deal with it more intensively.	12	25	6	1	0	44	0,792807

Trend: Innovation and Technological Development	SA	A	N	D	SD	Total	CNS(X)
8.1 Technological development in the mobility market enhances and optimizes the experience of mobility.	7	32	4	1	0	44	0,867895
8.2 Technological development and innovations lead to the emergence of new electric vehicles in the public transport market (for example low carbon power-trains, hydrogen/bio fuel buses and cars).	9	32	2	1	0	44	0,849795
8.3 In my region, technological developments lead to decreasing physical travel.	0	6	20	17	1	44	0,746481

Trend: Knowledge Society	SA	A	N	D	SD	Total	CNS(X)
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<i>9.1 The knowledge society will strengthen the effects of technological development as people in the knowledge society become the intensive users.</i>	5	27	10	2	0	44	0,783021
<i>9.2 The knowledge society affects the attitudes, preferences and demands of the public transport consumer significantly on the long-term.</i>	3	27	14	0	0	44	0,810693
<i>9.3 In my region, flexibility in working hours increases due to information technology and service driven society.</i>	4	21	14	5	0	44	0,710302

<b>Trend: Flexible Working</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>10.1 Flexible working reduces traffic jams which make driving more attractive.</i>	5	29	5	5	0	44	0,753116
<i>10.2 Flexible working leads to a more efficient utilization of public transport infrastructure.</i>	5	25	8	6	0	44	0,707412
<i>10.3 In my region flexible working increases the demand for flexible transport choices.</i>	3	20	12	9	0	44	0,674435

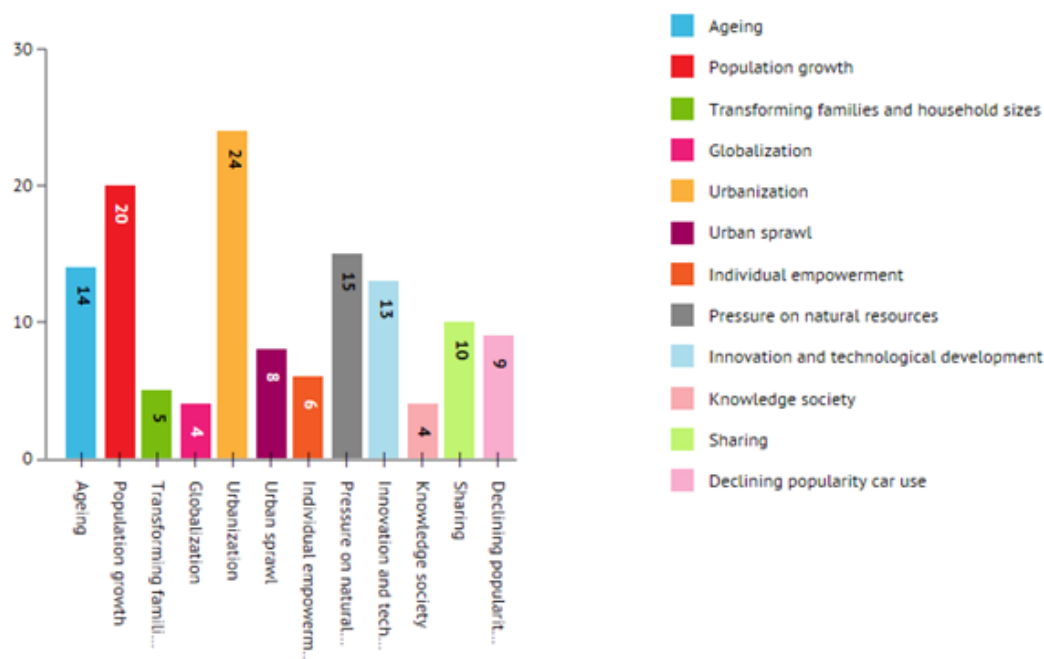
<b>Trend: Sharing</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>11.1 Car sharing decreases the use of public transport.</i>	1	15	13	15	0	44	0,690045
<i>11.2 Bike sharing decreases the use of public transport.</i>	1	10	10	22	1	44	0,660445
<i>11.3 In my region, owning or providing a car- /bike-sharing-scheme, will become an important business for public transport providers.</i>	2	15	15	12	0	44	0,688896

<b>Trend: Declining Popularity Car Use</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>12.1 The popularity of a car as a status of symbol is declining.</i>	4	24	6	7	3	44	0,59789
<i>12.2 Declining popularity of the car use provides the public transport to increase its share in the modal split.</i>	2	22	15	5	0	44	0,729497

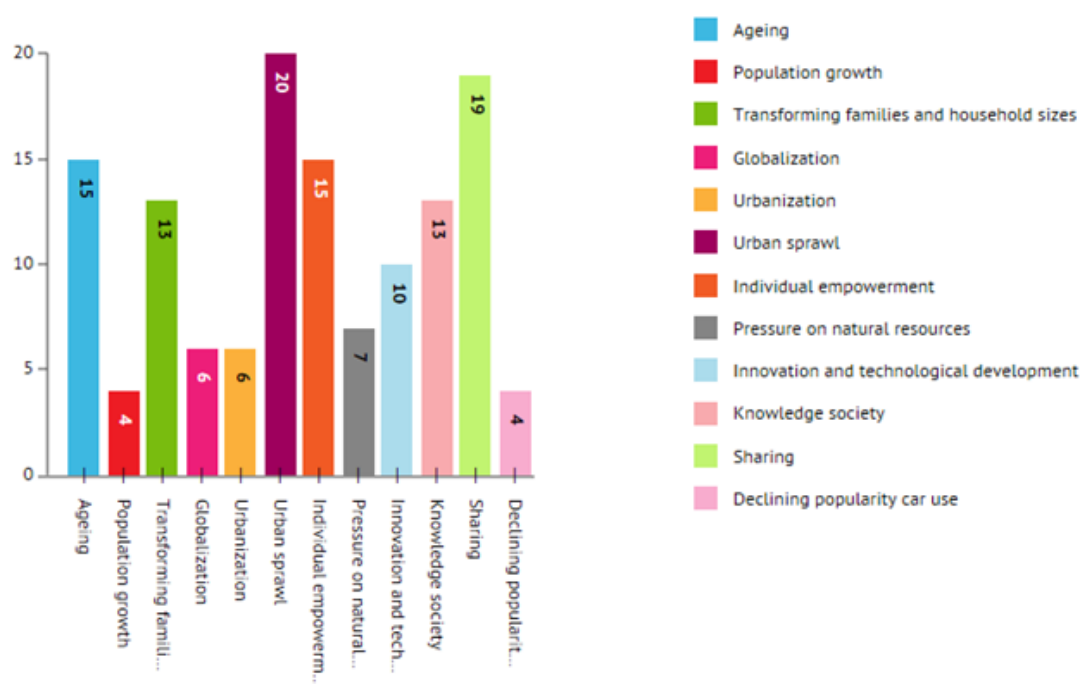
**12.3 In my region, the younger generation makes more use of the public transport than generations before.**

6 23 11 4 0 44 0,722421

APPENDIX FIGURE I - TRENDS EXPECTED TO INFLUENCE THE PUBLIC TRANSPORT STRONGLY POSITIVE (TOTAL)



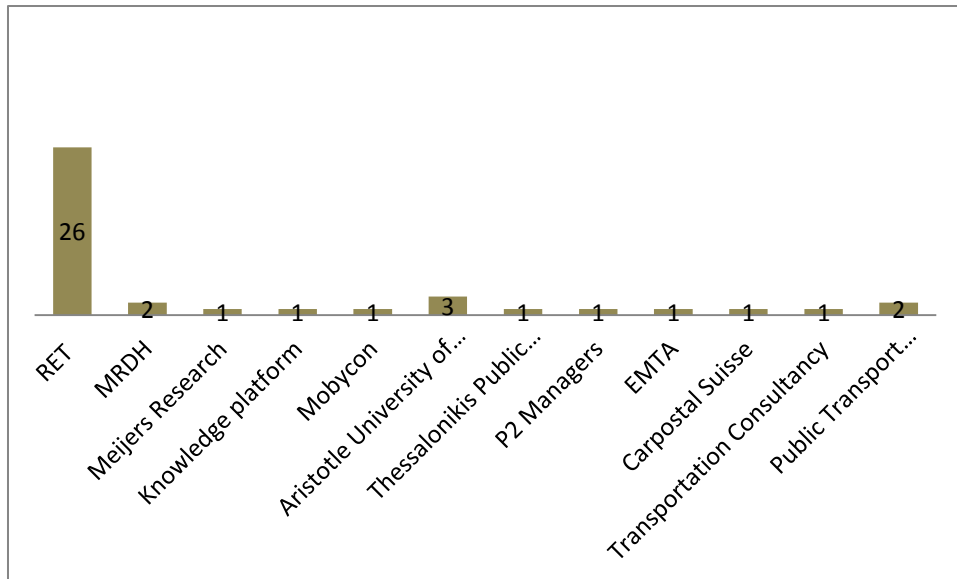
APPENDIX FIGURE J - TRENDS EXPECTED TO INFLUENCE THE PUBLIC TRANSPORT STRONGLY NEGATIVE (TOTAL)



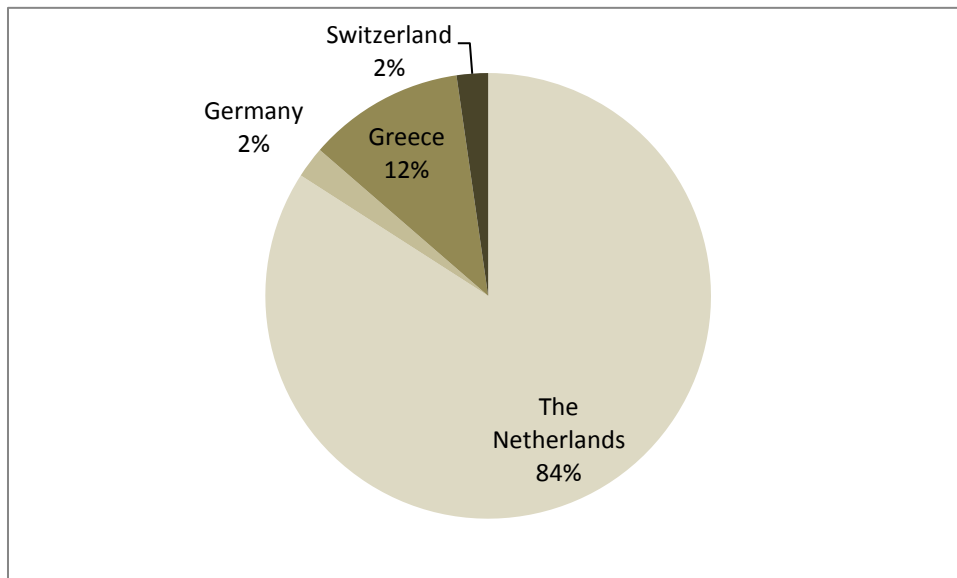
## 15 Is there any missing trend in your opinion?

- 1 increasing tourism
- 2 No
- 3 no
- 4 Multimodality (multimodaliteit in nl). People use different options together when travelling.
- 5 -  
Migration (of foreign people and bringing in of other cultures) Environmental and societal impacts of accelerated climate change Financing/funding of transport infrastructure i.t.o. public budget cuts  
Maybe you can think about gentrification as sub trend of urbanization. Furthermore you should be aware of the scale of spatial developments. I.g. Do you consider Urban Sprawl as a trend on the scale of a city of Rotterdam (people living in Ridderkerk, work in Rotterdam), on the scale of the Randstad (people live in Leiden and work in Rotterdam) or on the scale of the Netherlands (people live in Ede and work in Rotterdam). And what is in this context the difference between urban sprawl and suburbanisation?
- 6
- 7
- 8 Internalisation of transport external costs
- 9 no
- 10 nee
- 11 no
- 12 Increase infrastructure.
- 13 areaaluitbreidingen door bijv. Hoekse Lijn
- 14 nvt  
In my honest opinion I think variable working hours and working from home will be one of the 'hot items'; to which the public transportation companies will have to adapt both in time tables but also with a decreasing (in peak hours) yet more divers people flow. It will be harder to adapt since people flow will be less predictable. This will likely also be the case with urban sprawl.
- 15
- 16 no
- 17 no

## 16 Which organization do you work for?



**17 In which country is the organization located where you work for?**



**18 What is your function?**

- 1 Product manager
- 2 Project manager
- 3 Can't answer this question because of anonymity
- 4 Transit Planner
- 5 Advisor
- 6 IT consultant
- 7 procesmanager
- 8 public transport revenue analyst
- 9 Project manager
- 10 counsellor

- 11 Marketing Advisor
- 12 coordinator innovation
- 13 Policy advisor infrastructure/Secretary gen EMTA
- 14 Researcher
- 15 Project leader stations experience
- 16 consultant
- 17 Laboratory Teaching Faculty
- 18 Transport planning
- 19 Transport engineer - Researcher
- 20 research
- 21 Managing Director Communication & Mobility Research
- 22 Concession developer
- 23 financieel adviseur openbaar vervoer
- 24 Scheduler
- 25 Transport Planner
- 26 Transport Engineer/ planner
- 27 Research director consultant
- 28 Public transport consultant
- 29 Maintenance Engineer
- 30 Intern Communications
- 31 IT
- 32 Project employee
- 33 HR Employee
- 34 Controller
- 35 Process Engineer
- 36 Maintenance / Technical Specialist
- 37 Capacity manager
- 38 Unemployed
- 39 Bus driver
- 40 Controller
- 41 Spare Parts Logistics Officer
- 42 project manager

APPENDIX FIGURE K – TABULATED RESULTS CASE STUDY: RET N.V.

Trend: Ageing	SA	A	N	D	SD	Total	CNS(X)
<i>1.1. The elderly population use the car more</i>	2	8	6	9	1	26	0,624709689
<i>1.2. It is important for the elderly population to have easy access to public transport for example with step-free access, reduced gaps and low-floor buses.</i>	14	10	2	0	0	26	0,769189172

<i>1.3. In my region, elderly population prefer to live away from inner urban areas. This increases their demand for public transport in rural areas.</i>	3	10	3	9	1	26	0,54571967
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Trend: Population Growth	SA	A	N	D	SD	Total	CNS(X)	
2.1 The trend of a growing population increases car ownership.	1		9	8	7	1	26	0,661521508
2.2The trend of a growing population increases the need for investments in public transport.	11		14	1	0	0	26	0,795923919
2.3 In my region, it is hard for public transport providers to offer enough capacity for the growing population	2		4	9	11	0	26	0,676750583

Trend: Transforming families and household sizes	SA	A	N	D	SD	Total	CNS(X)
3.1 The trend of increased single-person families leads to increased car ownership.	0	12	8	5	1	26	0,68567712
3.2The trend of increased single-person families leads to increased usage of public transport.	1	11	10	3	1	26	0,695433689
3.3. In my region, the trend of increased single-person families leads to more mobility.	1	11	10	4	0	26	0,720166809

Trend: Globalization	SA	A	N	D	SD	Total	CNS(X)
4.1 Due to globalization it is easier to keep up on innovations and technological developments worldwide.	6	15	2	2	1	26	0,697502005
4.2 The trend of globalization increases the amount of travelling non-nationals (work/study/leisure) in public transport.	4	19	3	0	0	26	0,878752306
4.3 In my region, globalization has a considerable impact on public transport.	1	10	9	5	1	26	0,674606649

Trend: Urbanization	SA	A	N	D	SD	Total	CNS(X)	
5.1 The demand for car ownership increases in areas with high urbanization levels.	0		3	3	14	6	26	0,720771899



<i>5.2 The demand for public transport services increases in densely populated areas.</i>	10	10	4	2	0	26	0,692750928
<i>5.3 In my region, the trend of urbanization asks for more financial investments in public transport.</i>	4	13	7	2	0	26	0,7237479

<b>Trend: Urban Sprawl</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>5.4 The trend of urban sprawl causes people becoming car dependent.</i>	1	12	11	1	1	26	0,724193713
<i>5.5 The trend of urban sprawl increases the demand for public transport services between sub-centres and the city.</i>	6	13	6	1	0	26	0,757850689
<i>5.6 In my region, the trend of urban sprawl increases car ownership.</i>	1	7	14	4	0	26	0,762193241

<b>Trend: Individual Empowerment</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>6.1 The trend of individual empowerment requires organisations being more transparent.</i>	4	14	6	2	0	26	0,736310449
<i>6.2 The trend of empowerment leads to individuals expecting more and better qualities from public transport providers.</i>	4	17	4	1	0	26	0,817465695
<i>6.3 In my region empowered individuals influence the organisational and operational side of public transport provision.</i>	4	5	10	6	1	26	0,614708729

<b>Trend: Pressure on natural resources</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>	<b>CNS(X)</b>
<i>7.1 The mobility market should become less dependent of fossil fuels.</i>	13	10	2	1	0	26	0,726488559
<i>7.2 Due to the pressure on natural resources, public transport providers put a big emphasis on renewable, low-carbon fuel vehicles and fuel technology.</i>	4	12	7	3	0	26	0,690528805
<i>7.3 In my region, sustainability is a crucial development and the</i>	7	14	4	1	0	26	0,779446594

*public transport providers will have to deal with it more intensively.*

Trend: Innovation and Technological Development	SA	A	N	D	SD	Total	CNS(X)
<i>8.1 Technological development in the mobility market enhances and optimizes the experience of mobility.</i>	2	21	2	1	0	26	0,877080701
<i>8.2 Technological development and innovations lead to the emergence of new electric vehicles in the public transport market (for example low carbon power-trains, hydrogen/bio fuel buses and cars).</i>	4	20	1	1	0	26	0,872035106
<i>8.3 In my region, technological developments lead to decreasing physical travel.</i>	0	4	9	12	1	26	0,71527285

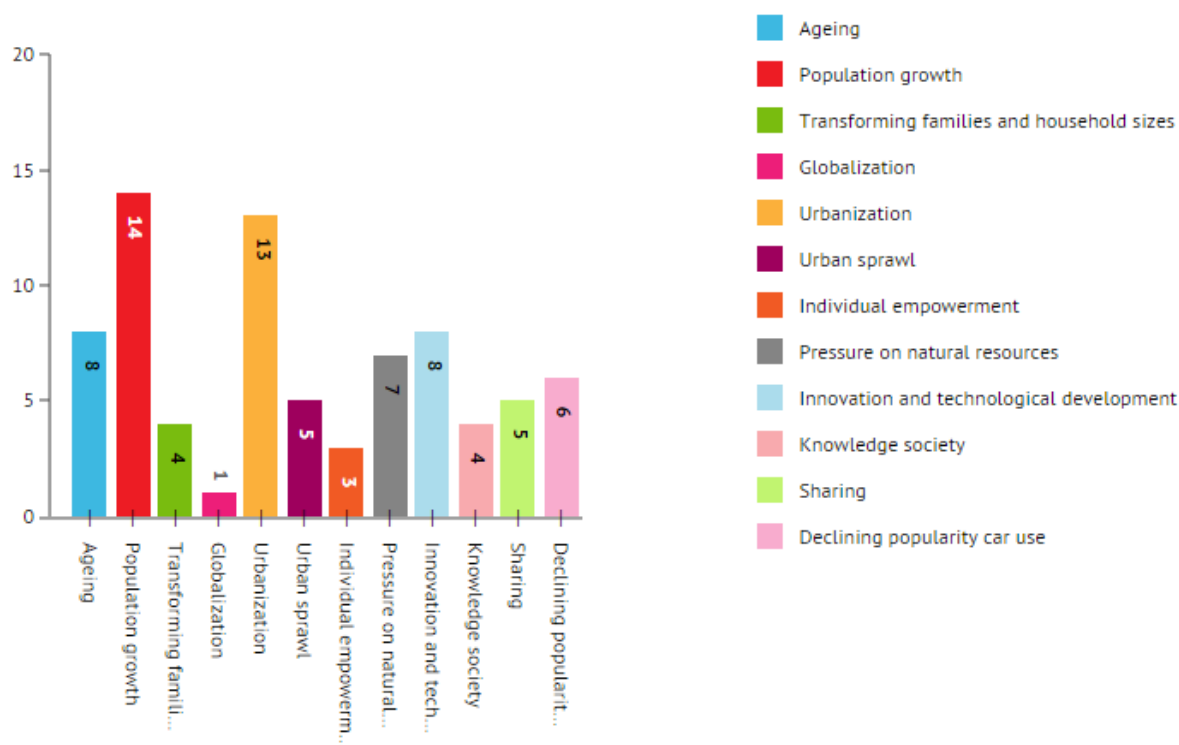
Trend: Knowledge Society	SA	A	N	D	SD	Total	CNS(X)
<i>9.1 The knowledge society will strengthen the effects of technological development as people in the knowledge society become the intensive users.</i>	2	17	6	1	0	26	0,799629624
<i>9.2 The knowledge society affects the attitudes, preferences and demands of the public transport consumer significantly on the long-term.</i>	1	16	9	0	0	26	0,812062813
<i>9.3 In my region, flexibility in working hours increases due to information technology and service driven society.</i>	1	13	9	3	0	26	0,731842213

Trend: Flexible Working	SA	A	N	D	SD	Total	CNS(X)
<i>10.1 Flexible working reduces traffic jams which make driving more attractive.</i>	2	19	1	4	0	26	0,747168027
<i>10.2 Flexible working leads to a more efficient utilization of public transport infrastructure.</i>	3	12	7	4	0	26	0,678748647
<i>10.3 In my region flexible working increases the demand for flexible transport choices.</i>	2	13	6	5	0	26	0,674846151

Trend: Shared Economy	SA	A	N	D	SD	Total	CNS(X)
11.1 Car sharing decreases the use of public transport.	1	9	6	10	0	26	0,655283965
11.2 Bike sharing decreases the use of public transport.	1	5	4	16	0	26	0,658614336
11.3 In my region, owning or providing a car- /bike-sharing-scheme, will become an important business for public transport providers.	0	10	9	7	0	26	0,71971929

Trend: Declining Popularity Car Use	SA	A	N	D	SD	Total	CNS(X)
12.1 The popularity of a car as a status of symbol is declining.	2	15	2	5	2	26	0,573829269
12.2 Declining popularity of the car use provides the public transport to increase its share in the modal split.	1	10	11	4	0	26	0,727300963
12.3 In my region, the younger generation makes more use of the public transport than generations before.	4	14	6	2	0	26	0,736310449

APPENDIX FIGURE L - TRENDS EXPECTED TO INFLUENCE THE PUBLIC TRANSPORT STRONGLY POSITIVE (RET)



APPENDIX FIGURE M - TRENDS EXPECTED TO INFLUENCE THE PUBLIC TRANSPORT STRONGLY POSITIVE (RET)

