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**“Urban Sustainability in the Global South and the Role of Integrated
Transport Solutions – Experiences from Latin America
with a Focus on Chile’s TranSantiago”**

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“Urban Sustainability in the Global South and the Role of Integrated Transport Solutions – Experiences from Latin America with a Focus on Chile’s TranSantiago

Abstract

Achieving urban sustainability will be a major challenge in the coming decades. Especially in the Global South the dramatic increase in urban population is demanding intelligent policy solutions in order to prevent urban collapse. Integrated urban transport systems that provide for intelligent mobility solutions play a key role in the search for sustainability. Latin America in particular has seen the implementation of visionary urban transport systems in the cases of Curitiba and Bogota, where Bus Rapid Transit has emerged as a promising transport mode for developing cities with limited funding opportunities. This research thesis portrays and analyses Santiago de Chile’s new integrated transport system, TranSantiago, and identifies three key components, which have been neglected in the case of Santiago and that are essential in the context of achieving urban sustainability - visionary leadership, institutional stringency and widespread public participation. TranSantiago must be considered a total failure when compared to the initial aims and objectives, taking into account the huge social cost and the lack of environmental or economic benefits that the system overhaul has created.

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Chapter 1 – Introduction, Aims and Objectives

1.1 Introduction

We live in the age of urbanization, absolute urbanization, as some would argue. By the middle of this century our planet will have to cope with at least 9 Billion human beings, whereas more than 60 percent of us will live in urban centres (van Dijk, 2006). In particular the metropolises of the Global South will experience a further drastic increase of their urban population, while social and environmental challenges for governments and local authorities will also multiply and accelerate.

Over the last three decades the paradigm of sustainability has emerged as the key concern in regard to our common future. Sustainability, in the sense of economic stability, social equity, environmental sensitivity and cultural diversity, wants to be achieved in particular in the world's urban centres if our wish for a better future with a higher quality of life aims to come true (Nadarajah & Yamamoto, 2007). All aspects of urban sustainability are affected by the ability of citizens to move, as mobility and the way we travel are at the heart of urban reality. How a city chooses to enable and facilitate the movement of its population is of paramount importance, and has an impact on all facets of urban life. Looking at the example of cities that have chosen the individual automobile over public and non-motorized means of transport we can see the irrationality of that approach in regard to sustainability. Inspiring examples do exist, however, and this thesis aims to look at the way that we manage urban transport solutions in our cities in the light of the principles for sustainability. The need to drastically reduce green house gas emissions is the most significant reason why cities should opt for an integrated transport concept that encourages walking and cycling primarily, while a convenient public transport system coupled with intelligent demand management should motivate citizens to switch from using private cars to public transport. In addition to reducing air pollution, an intelligent urban transport concept would give the answer to the question in what kind of city we want to live by turning public space into parks and playgrounds, building bicycle paths throughout its network and generally re-create the city in order to provide space primarily for people instead of cars. In particular, this thesis will focus on examples from Latin America and at its core will portray and analyse the design and implementation of the new urban transport system TranSantiago in Santiago de Chile.

1.2 Research Rationale

Many researchers have studied and analysed urban transport systems around the world in terms of their technical processes. This thesis, however, aims to base its analysis on several other aspects also, namely the socio-political dynamics, the institutional setup and the role of public participation. It is hoped that by applying a more holistic approach in this analysis the complexity of urban politics and the socio-cultural conditioning will become evident while the findings are based on a much more profound examination and will therefore be more valuable in the larger context.

1.3 Research Aims and Objectives

Central Aim:

To examine and analyse integrated urban transport efforts in the context of achieving urban sustainability with a special focus on Latin America and Chile's TranSantiago.

Objectives:

1. to portray current urban reality and future challenges for urban centres around the world with special regard to the role of integrated transport solutions.
2. to identify the legitimate requirements of a modern integrated transport system as well as current global trends within the context of urban sustainability and a focus on the Global South.
3. to portray and analyse the experiences of Curitiba and Bogota in regard to their urban transport efforts, especially the role of organisational leadership and the importance of stakeholder participation.
4. to describe the design process of the TranSantiago as well as the underlying dynamics during its implementation in the context of the historic conditioning and the institutional setup.
5. to assess the outcome of the TranSantiago so far in regard to the initial aims and objectives, as well as portray and analyse the economic, social and ecological change that it has brought about.

1.4 Structure of the Thesis

In chapter 2 I will describe the philosophical background of my research approach. I will also describe the methodology that I have chosen and write about the methods that I have used in my field research and throughout this thesis process. Why I have chosen Latin America in general and Santiago de Chile in particular will also be portrayed. In the final part of this chapter I will give an outline of the research process and my reflections on it.

Chapter 3 is the first of two background chapters in which I describe the current trend of urbanisation, the challenges that lie ahead in particular for developing countries as well as the latest transport trends around the world. The emergence of a concept for urban sustainability will be reviewed and the key components of it characterized.

Chapter 4 is the background chapter on integrated urban transport and will portray and analyse the role of integrated transport solutions within a concept for urban sustainability. After speaking about current issues in urban transport, I will in detail explain what transport integration principally means and why Bus Rapid Transit (BRT) plays such an important role for urban transport in the Global South.

In Chapter 5 I will then portray two inspiring urban transport solutions. Curitiba and Bogota will serve as an example of the importance of visionary leadership and public participation in regard to urban politics in general and urban transport in particular. Analysing the TransMilenio in Bogota will especially help to prepare the reader for the TranSantiago chapter.

Chapter 6 then deals with the actual field research and portrays the process of Santiago de Chile's urban transport overhaul TranSantiago. While considering in detail the institutional setup and socio-political dynamics as well as investment priorities of the project I will also describe the historic component of transportation in Santiago. The final part of this chapter contains the findings of my embodied observation and I discuss my own perception with the material of the interviews conducted.

In chapter 7 I will summarise my findings by revisiting the objectives set out at the beginning. Finally I will identify areas where future research could be meaningful.

Chapter 2 - Epistemology, Methodology and Methods

2.1 Introduction

Philosophy, the love of wisdom and truth, determines the guiding principles for any endeavour in life. Even more so, the application of a distinct philosophical perspective characterizes the nature of social science research. As Sayer has argued, there is now widespread recognition that social science is somehow different and requires differentiated foundations and tools from the natural sciences (Murray & Overton, 2003, p. 5). The philosophical basis for research in development studies and its limitations are subject to a contentious debate, and it is beyond the scope of this thesis to comment on it.

In this chapter I attempt to outline my own philosophical and theoretical perspective and I will explain the epistemology that I have used for my research and how it has influenced the methodology chosen. After explaining the choice of setting and detailing the different methods used to gather data and experience, I will conclude this chapter by reflecting on the research process.

2.2 Philosophical Background and Epistemology

I have never believed in the existence of what is called the ‘homo economicus’, or in any other claim that humans are purely rational beings. In my own experience at least this is not the case, and in that sense I agree with Hoggart et al. (2002) that there is no such positivist ideal of value-neutral or theory-free observation, rather value structures and belief systems within the researcher do influence the research process at every stage. In this light, it is generally agreed on that each endeavour for knowledge production is subject to a “familiar Foucauldian nexus of power/knowledge, and its implications for understanding both researcher and researched as implicitly located within, and maintaining, power relationships with all the attendant exclusions and privileges, establishes responsibility as a critical dynamic of research praxis” (Brockington & Sullivan, 2004, p. 5). Out of this contextual understanding my central aim was to conduct my research as integral and responsible as possible, while being aware of my own inherent limitations and possible biases.

In philosophical terms my research approach could be broadly summarised as historical-hermeneutic (Habermas, 1978), in the sense that it aims to acknowledge the complexity, interdependence and unpredictability of social reality, as well as critical realistic in the

context that it is necessary to identify underlying social structures by practically engaging with the world out there (Kitchen & Tate, 2000) and critically listening with reflexivity and self-awareness (Brockington & Sullivan, 2004). However, I do not believe myself to be post-modern in the sense that every point of view is to be considered equally legitimate, as I do believe in a hierarchy of evolution and values in which subjects are spiralling up and down and within which an assessment and evaluation is possible (Beck & Cowan, 2005; Wilber, 2001).

It was my aim to briefly describe my philosophical point of view, but whether the expressed paradigm has significantly influenced my writings will have to be decided by the reader.

2.3 Methodology

In terms of methodology, I have used a mixture of quantitative and qualitative research in my dissertation. These two approaches are not mutually exclusive and have certainly complemented each other in a positive way, a belief also stated by Murray and Overton (2003).

Most of my actual field research in Santiago has been of qualitative nature, mainly due to the fact that I was trying to become explicitly aware of the socio-political dynamics that were involved in the TranSantiago process. As Angrosino (2007, p. 53) has stated, “our human ability to observe the world around us forms the basis for our ability to make commonsense judgements about things” and I have used this ability to observe and to judge, alongside my study of written material, facts and figures. Of course, the interpretations that follow the practice of observance are rarely confirmable and there has to be a basis for trusting the observation, which results if one observes systematically in order to achieve a certain degree of scientific reliability.

Qualitative research, which starts from the notion that all realities under study are socially constructed, aims to analyze experiences and interactions and “is no longer just simply ‘not quantitative research’, but has developed an identity (or maybe multiple identities) of its own” (Angrosino, 2007, p. 52). I have used quantitative research mainly to identify the historic, and political component of urban transport in Santiago. Furthermore, most of the theoretical background chapters on urban sustainability and integrated urban transport have been composed by applying quantitative research skills. The interviews I conducted gave me qualitative as well as quantitative data on the TranSantiago. As far as the quantitative data goes I always tried to verify the statements with published data.

2.4 Choice of Setting

Latin America is the most urbanized region in the developing world (van Dijk, 2006) and for that reason it represented an excellent setting for my research on urban sustainability and the role of integrated transport solutions. Santiago de Chile, where more than 40 percent of all Chileans live and work, was the right place to focus my research on as it had just undergone a major and comprehensive overhaul of its transport system. The TranSantiago, which was inaugurated on February 10th 2007, was considered a total failure in the eyes of the public. The reason for the wide criticism was simple, but the underlying causes wanted to be found in deeper institutional mismanagements as well as political-economic dynamics and needed to be analysed comprehensively. The troubled implementation, which plagued the city with an uncertain and infrequent bus service, increased travel and wait times with longer walking distances, a failing GPS satellite-navigation system to control buses and an insufficient public information system, had resulted in public protests, riots and general frustration and anger among the public (Bolf, 2008c; B. Vincent, 2007). This was the scenario in August 2007 at the beginning of my research when I started to do a literature-based preparation for my fieldtrip.

Chile in particular has had a political and economic history that has attracted many researchers and resulted in a multitude of academic studies and reports. Not only has Chile been portrayed as an economic ‘wunderkind’ among developing nations, but it has also witnessed most of the extremes of political leadership within the last 50 years, from communist populism to a military dictatorship and neo-liberal capitalism. Some argue that Chile finally finds itself in a ‘third way’ democratic development; others argue that it is really a kind of new developmentalism that is being shaped (Riesco, 2007).. Whatever perspective one takes, the country certainly has one of the most interesting political and economic settings in terms of social science research opportunities, and I felt privileged to be able to conduct my research in Chile.

2.5 Methods Used

In researching this thesis I have used a mixture of primary and secondary data. The main component of my secondary research was a literature review in which I studied current urban transport developments around the world. I also aimed to come to terms with the nature and

challenge of urban centres in terms of sustainability and quality of life before I went to Santiago. Of course I had read about the difficulties of the TranSantiago and was aware of the range of opinions about it. I also collected and summarized all the articles of the Santiago Times covering the TranSantiago, a process that helped me enormously to start to understand the broad range of issues involved. This preparation helped me to not only formulate my aims and objectives for the thesis but also allowed me to define the kind of questions that I wanted to ask my interview partners as well as what details I should watch out for in my embodied observation.

2.5.1 Primary Research: Semi-Structured Interviews

A broad range of key informants from different backgrounds was used as my primary source of research data. It was important for the analysis of the design and the implementation of the TranSantiago to get the opinion of people that were involved in the process, academics and transport engineers that were familiar with the context, activists in the political sphere that would know about the institutional side to it, as well as members of the public and concerned citizens of Santiago. Using semi-structured interviews allowed me to prepare a set of questions while at the same time upholding a degree of flexibility helped me to avoid an overly rigid approach and narrow focus (Murray & Overton, 2003). Although I asked the same core questions to all interview partners, I allowed myself the flexibility to follow through on some of the answers given and generally tried to adjust my interview style and content to the particular knowledge and experience that my partners had in order to fully benefit from the opportunity. Therefore, I met with transport engineering students in cafes and facilitated a casual sharing of ideas and knowledge, while I met with officials and academics in a much more formal way and with a greater degree of preparation.

2.5.2 Finding Interview Partners

Although I arrived in Santiago without a single interview confirmed, I was absolutely positive that my research efforts would bear fruit due to the momentum that had been building up around the TranSantiago issue. Indeed it did not take long until I had my first interviews, and then a typical ‘snowball’ process set in. Unfortunately it proved extremely difficult to get interviews confirmed with government officials and people that were directly involved in the design and implementation process of TranSantiago as the investigative commission had just

started its hearings when I arrived and nobody was prepared to say anything outside of that commission. Nevertheless I was able to speak to some very knowledgeable people, some of whom were consultants to government officials. All in all I had the opportunity to interview the following participants, either in person or via telephone or email correspondence¹:

¹ Most of my interview partners were met in their offices, only a couple of interviews were conducted in public cafes. Thirteen of the interviews were in person, the others via telephone or email.

Figure 1: Interview Partners for TranSantiago

Name	Position / Institution
Oscar Figueroa	Director of Urban Development programme at Universidad de Catolica, Santiago.
Juan-Carlos Munoz	Professor in the Transport Engineering and Logistics Department at Universidad de Catolica, Santiago
Juan Enrique Coeymans	Professor in the Transport Engineering and Logistics Department at Universidad de Catolica, Santiago
Felipe Sandowal	Master Candidate in Transport Engineering at Universidad de Catolica, Santiago
Louis de Grange	Lecturer at Universidad Diego Portales, Santiago and Civil Engineer. Involved in TranSantiago Design Process
Rodrigo Henriquez	Transport Engineer and Consultant for Transport Projects in Santiago. Co-Author of Independent TranSantiago Report
Rodrigo Quijada	Transport Engineer at Universidad de Chile, Santiago. Co-Author of Independent TranSantiago Report
Patricio Lanfranco	Head of transport division at Chilean NGO Ciudad Viva in Santiago
Lake Sagaris	Director of Ciudad Viva and Key Promoter of Pro-Bicycle Policies in Santiago
Sergio Jara-Diaz	Professor at the Universidad de Chile, Santiago and Expert in Transport Economics
Hugo Fazio	President Centre for the National Studies of Alternative Development (CENDA)
Manuel Riesco	Vice-President Centre for the National Studies of Alternative Development (CENDA)
Loreto Rojas	Student at Universidad de Catolica, Social Activist and Promoter of a Pro-Bicycle Culture in Santiago
Elizabeth Hernandez	Santiago Citizen and Concerned Mother of Two
Carola-Marcela Celis	Santiago Citizen and Daily User of TranSantiago

Source: The Author

2.5.3 Primary Research: Embodied Observation

Embodied observation is only a recently developed and used term in regard to academic research methods. It is mainly used in the cognitive sciences, but is more widely applicable than that (Varela & Shear, 1999). The methodological framework, ‘experiential cognition’, is based on Francisco Varela’s enactive approach of cognition² and points to a methodology that incorporates consciousness and experience in a mind-body-environment-other setting (Varela, 1999; Varela, Thompson, & Rosch, 1991). The central aspect of this method is the conscious experience of the subject studied in the first person mode. It is an attentive and open approach by the researcher that is the key and principal tool for the evaluation of quality of the respective subject (Alcantara, 2007).

Embodied observation as a method for my research in Santiago wants to imply the direct personal experience of the TranSantiago as a scientific object. More specifically it means that I travelled extensively in Santiago with public transport and consciously observed and analysed with as much attention as possible the travel times, waiting times, availability of seating and general quality of travel, method of payment and other aspects of public transport usage. Not only did I use public transport wherever I went in Santiago to get a general feel for the situation, but also, and in order to get a representative picture of journeys on the TranSantiago, I spoke to a number of Santiago citizens to suggest me where to go. A detailed report of my embodied observation is included in the chapter on the TranSantiago.

2.6 Reflection on the Research Process

Doing field research in a Spanish speaking country without the necessary language skills was bound to lead to some profound challenges. Although I had taken Spanish lessons in Wellington, I was by no means prepared enough to conduct my interviews in Spanish. Therefore I knew I would have to find interview partners that were either fluent in English or in French, or German for that matter. At the beginning I was a bit worried that the language component would be seriously detrimental to the quality of my field research, but very soon I realised that many professionals, academics and government officials were speaking English fluently. My Spanish was good enough to converse in shops and to get the gist out of some

² Varela’s embodied philosophy argues that human cognition and consciousness can only be understood in terms of the enactive structures in which they arise, namely the body and the physical world with which the body interacts.

articles, and with the help of some translation efforts I was able to include a few important reports in Spanish into my thesis also.

Travelling to Santiago was my first trip ever to Latin America. Since I had been travelling extensively in Europe, Asia and the Pacific and had worked in a developing country before I was not worried at all about a possible culture shock. In fact, when I first arrived in Santiago I was rather amazed by the level of development I observed, the brand new airport, the number of new cars, the modern buildings and the wide motorways. Of course I recognised the poor parts of Santiago also, and was reminded immediately that Latin America in general and Chile in particular is ranked very low in terms of social income equality.

Before I went to Santiago I had arranged for an interview with the Chilean embassy in Wellington and was very grateful for the advice and the contacts that I received from Rodrigo Nieto. I also contacted several transport engineers at different Universities in Santiago but without any luck of response. Therefore, I basically went without any confirmed contacts and without a single scheduled interview. I had an idea whom I was going to approach, but that was about it.

When I finally arrived in Santiago, I first of all took my time to get to know the city and its transport system by travelling extensively to different parts of the city. I had already arranged for a cheap apartment close to the city centre and was therefore able to settle in immediately. After a few days of contacting potential interview partners I met up with another student from Victoria who was currently doing his PhD research in Chile. Ed Challies and I spent a good many hours discussing the Chilean economic and political system as well as our individual research aims and objectives and we exchanged our own ideas about it. Not only did those sessions help me a great deal in refining my own research approach, but Ed also introduced me to some colleagues of his at the Universidad Catolica de Chile in Santiago. With the help of those contacts, and the invaluable advice I received from Dr. Jonathan Barton I was able to proceed more hopefully with my search for interview partners. From there, it was a typical snowball process.

Looking back on my research in Chile I must say that I genuinely enjoyed every single part of it. Although it was mentally stressful to not be able to guarantee that the research would lead to tangible results that I could use in my thesis, the big lesson I take out of the experience is that as long as one is prepared to put the necessary effort into it the result will always turn out to be at least satisfactory. In my own case at least I couldn't have wished for a better and more rewarding fieldtrip.

Chapter 3 - The Concept of Urban Sustainability in the 21st Century

“Urban sustainability is arguably the most critical environmental issue facing humankind.”

Garry W. McDonald

In this chapter I will portray the current and future trends of urban development in terms of population growth and migration to urban centres. I will explain why a concept of urban sustainability, not only in the Global South but also in all urban centres, is so vital to the sustainability of the whole of humanity, and show the key components, challenges and trends in urban sustainability. The role and impact of urban transport, globally and in Chile, will be considered in particular.

3.1 The Context of Urbanization and the Future of Urban Centres

“We are headed irrevocably into a century in which the world’s population will become, in some fundamental sense, completely urbanized.”

John Friedmann (2002, p. 8)

We live in the age of urbanisation. With the ability to use fossil fuels as a means to power the era of industrialisation and the green revolution, the world’s population not only increased from around 1 billion at the beginning of the 19th Century to now over 6.7 billion³ (UN, 2007), but also, our civilisation started its epic march from rural to urban, from the villages to the city. The Brundtland Report of 1987 observed in a chapter entitled ‘The Urban Challenge’ that “the future will be predominantly urban, and the most immediate environmental concerns of most people will be urban ones” (WCED, 1987, p. 271). Twenty years later, the 2007 State of World Population Report similarly concludes that “the confluence and inertia of at least two dominant processes—globalization with its many economic and social ramifications, and population growth in rural and urban areas—make urban growth ineluctable during coming decades” (UNFPA, 2007, p. 1). These statements become even more relevant when we take into account the recent United Nations Population Fund report which states that at present

³ World population did not reach one billion until 1804. It took 123 years to reach 2 billion in 1927, 33 years to reach 3 billion in 1960, 14 years to reach 4 billion in 1974 and 13 years to reach 5 billion in 1987, and only 12 years to reach 6 billion in 1999 (UN 2007).

nearly 3.3 billion people, about half of the world's population, live in urban centres⁴ across the world (IRIN, 2007). This number is predicted to reach 5 billion by the year 2030 (a percentage of 60% of the world population then), whereby 95 percent of that growth will happen in the Global South. All three mega cities of 1960, with more than 10 million inhabitants, were located in the Northern Hemisphere, whereas 18 of the 25 mega cities at present are located in the Global South⁵ (van Dijk, 2006). Latin America will see a relatively slower rise compared to Asia or Africa, still more than 200 million people are expected to move to the cities of Latin America and the Caribbean in the next two decades (IRIN, 2007). The difficulties associated with this densification process that awaits urban centres in the coming decades are beyond comprehension. Sanitation, health care, education, water provision and above all, housing in general, these aspects of daily life will represent a major challenge not only for the countless slum dwellers in this world but also for the urban lower middle class (Whitehead, 2007). Urban planners and local officials will have serious difficulties in providing basic facilities and services for the growing masses. In summary, the urbanisation of the world will formulate a key challenge for local and national governments as well as multinational institutions for decades to come.

Satterthwaite (2007) portrayed two possible scenarios at the 2007 World City Forum for the future of urban development. The first, familiar scenario, where cities expand and governments seek new investment, where the poor are considered a problem and the affluent urban society lives in segregated areas, and the second scenario, where urban poverty is diminishing by the practice of true partnership between the urban poor and city governments. In a way he mentions further, it is as if we have been given a second chance to practice urbanization, and this time we should get it right. Indeed, there is an urgent need to get it right this time. The trend of the expansion of urban areas is clear. In 1900 there were only 10 cities in the world with more than 1 million inhabitants, compared to 440 cities in 2000 (van Dijk, 2006), and by some estimates, two-thirds of the world's urban areas to cover the planet in 2030 have not yet been built (Steffen, 2006). Considering the example of China, where three hundred million rural peasants are expected to move to cities in the next twenty years making the construction of three to four hundred brand new cities a necessity (O'Reilly, 2006), we get an idea of the enormity of the task at hand.

Most newcomers to urban places in the developing world will initially find themselves on the streets or in squatter towns, mainly at the rim of the city area. Cameron Sinclair, co-founder of

⁴ Urban centre is defined by the UN as counting at least 5000 inhabitants (van Dijk 2006, p.3).

⁵ The population of the world's 50 least developed countries is likely to double from currently 0.8 billion to 1.7 billion by 2050 (UN 2007).

Architecture for Humanity reminds us that by the middle of this century, one in three people on the planet will be living in inadequate, often illegal housing (Gabbay & Shrestha, 2004; Steffen, 2007b). That means adding another two billion people in the next forty years to the already over a billion people that make their homes in urban squatter settlements at the moment⁶. The world's population might eventually stabilize somewhere between nine and ten billion, but the rural poor will most likely continue to flock to the city in hope of a better future. And despite the daunting problems that await them they will consider themselves better off than if they had stayed back in the villages (Lewis, 2007). Again we come to understand that poverty is the world's greatest ailment, as well as threat to the sustainability of life, and ever changes societal patterns as human beings, discontented and marginalized, are fighting for a better future.

⁶ Even in cities that are growing as much as 10% per year, in many instances the percentage of slum dwellers and squatters is growing at twice that rate" (Choguill 1996). According to the Mumbai city housing authority, eight million out of the twelve million people in Mumbai live in the slums. And Mumbai is not alone. Slums are a global problem. They are home to one billion people, one in six of the world's population. UN-Habitat predicts that by 2030, one in every three people in the world could be living in a slum (Gabbay and Shrestha 2004).

3.2 Transport Trends in Urban Centres - The Global Perspective

Unfortunately, the transit system we've designed our communities around is the individual automobile, and the results are pollution, congested roads, rambling retail districts, and isolated, unsustainable housing developments.

Stefan Jones (Steffen 2006, p.266)

3.2.1 Trends in the Global South – Example India

Assuming the unevenly distributed benefits of globalisation will continue, a considerable amount of established urban residents will simultaneously move up the development ladder and gain access to moderate wealth. In India alone, consulting firm McKinsey predicts that the size of the Indian middle class will grow from 50 million now to 583 million by 2025 (Attewill, 2008). Housing, sanitation and other basics of citizen life will be easily met by this middle class, and therefore, they are very likely to spend the remainder of their income on private means of transport in form of motorbikes or cars, nearly all of which will be powered by the burning of fossil fuels. This challenge of future urban growth, the exponential increase of private transport, must not be neglected in view of other, non-transport and more substantial challenges. Heavy congestion and bad air quality are one aspect; the change of the global climate is another. Bangalore is a good example for this development trend, as the south Indian Metropolis, already suffocating under extreme traffic both metaphorically in terms of tremendous traffic congestion as well as literally in terms of very bad air quality, has to deal with more than one thousand new vehicles every day (Shankar, 2007). This calculates to more than one million new automobiles (motorbikes, cars, light trucks) on the streets of Bangalore every three years. With the introduction of the Tata Nano car, a four seater available for under US \$ 2500 that is expected to sell at the rate of at least 250,000 cars a year (with a middle term annual sales target of 1 million), India's already underdeveloped urban transport solutions are expected to face a further, drastic increase of car ownership (Attewill, 2008). Consequently, a number of transport engineers fear urban transport collapse in some Indian cities, especially Delhi, Calcutta and Bangalore.

A similar picture, though not as extreme, can be painted in regard to nearly every urban centre in the developing world: more and more people simply change to private means of transport.

3.2.2 The Trend in Chile

Latin America and the Caribbean is the most urbanized region in the developing world with about 75 percent of the population living in cities (Onursal & Gautam, 1997; van Dijk, 2006). Apart from an ever-increasing urban population, the rapidly growing motor vehicle fleet exacerbates the situation. In Chile for instance, one of the most urbanized countries in Latin America with 87 percent of the population being city-dwellers, new car sales including trucks increased 18 percent in 2007 as compared to the year before (Andersen, 2008; Bolf, 2008b). Applying the ‘rule of seventy’⁷ and assuming a steady 18 percent annual increase into the future, Chile’s new car sales would double about every four years. Between 1991 and 2001 the growth rate of the number of cars in Santiago was about 10.5 percent per year (Mahendra, 2008).

Most of this growth will naturally have happened in the political and economic centre of Chile, it’s capital Santiago where 44 percent of all Chileans live (Cacciari, 2008) and where 47 percent of the Chilean Gross Domestic Product (GDP) is generated (Gschwender, 2007). The two main reasons in that regard are certainly the failure of the TranSantiago public transport project and the rise of the world copper price, Chile’s main export revenue that fuels the growing income level of the upper-middle class. A recent newspaper article summarized the situation stating that “in Santiago, noted for some of the worst air quality in the world, more cars on the road mean more environmental and health problems in the near future, as the TranSantiago public transport system struggles to keep its head above water and bike culture remains marginal” (Bolf, 2008b, p. 1).

3.2.3 Issues of Urban Transport Development

Not only does this ever growing private car fleet worry urban planners and transport engineers in Santiago, Bangalore and worldwide, but also, as a consequence, the environmental and social impacts of urban transportation are increasingly being seen as a menace to the sustainability of the global ecology (Himanen, Lee-Gosselin, & Perrels, 2005). Keeping in mind that cities are responsible for over 75 percent of the world’s energy consumption, and that 80 percent of global greenhouse gas emissions happen in cities (C40, 2008), it is obvious that urban centres will get the biggest attention in terms of policy change for sustainable development and climate change mitigation. For that reason in particular the metropolises of

⁷ Basic arithmetic shows us that if a figure is increasing exponentially, the result of dividing 70 by the annual percentage of that exponential increase will give the number of years that it takes for the figure to double (Sachs 2007).

the developed world will have to face a growing challenge in terms of reducing air pollution as well as CO₂ emissions, while at the same time being vibrant places of economic resilience, societal participation and cultural exchange. In fact, ‘advanced’ nations have so far failed completely to achieve the goal of environmental balance, and continue to prove ecologically unsustainable in vast resource usage with extremely high levels of waste production (Sorensen, Marcotullio, & Grant, 2004). Challenges for cities of the Global South, from Kolkata to Karachi, from Lagos to Lima, from Manila to Mexico City, will of course be even greater considering that those places are facing further drastic population growth while the city’s officials are planning to catch up economically with the ‘Western World’. How to handle all these challenges? In deep consideration of a concept for sustainability would be the answer. Securing smooth traffic flow, particularly by the provision of an integrated public transport plan that promotes mass transit systems in preference to private motorcars, and enables citizen’s easy access to all parts of the city is essential in this regard, while the encouragement to choose non-motorized modes of transport such as walking and cycling should be strengthened by the provision of an integrated transport concept of cycle and pedestrian paths that transect urban centres. Those zero-emission modes of transport are of paramount importance if societies aim to live up to a paradigm of sustainability. An integrated urban transport plan must be embedded in a wider plan for urban design that supports the main pillars of sustainable development, i.e. economic stability, environmental sensitivity, social equity and cultural diversity in the community.

3.3 Urban Sustainability

“Yet something has gone wrong in the Promethean myth of liberation. The quality of the habitat has gradually worsened. The ‘Metropolis form’ – with its tendency to devour environmental, human and territorial resources in the processes of accelerating the urbanization it has induced – is one of the main culprits for the environmental degradation of the planet and the exponential growth of ‘new poverties’ in the so-called ‘periphery’ of the world.”

Alberto Magnaghi (2005, p. 3)

3.3.1 What Exactly is Urban Sustainability?

As mentioned at the end of the previous paragraph, sustainability⁸ will be used in this thesis as meaning a balanced approach to development considering the aspects of economic stability, environmental sensitivity, social equity and cultural diversity. This is in line with the historical and current writings on sustainability and sustainable development (McDonald & Patterson, 2007b; WCED, 1987; Whitehead, 2007; Williamson, Radford, & Bennets, 2003). My own preferred interpretation defines sustainable development as “the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems” (Agyeman, Bullard, & Evans, 2003, p. 78). It should be noted, however, that ‘sustainable development’ has come to have such a variety of meaning and as a term has become so stereotyped that it is often a source of widespread confusion (Campbell, 1996). In addition, vested political interest and profound public resistance to necessary follow-up actions, a typical ‘not-in-my-backyard’ (NIMBY) reaction, make sustainability a truly controversial issue. Nevertheless, a helpful process-oriented definition of sustainable urban development is given by Wheeler: sustainable urban development “improves the long-term social and ecological health of cities and towns” (S. Wheeler, 1998, p. 436).

Very often we might think of sustainability as closely related with nature and the environment, seldom do we think of an urban Metropolis in that regard. In reality, however, sustainability is a way of thinking, a paradigm emerging in the individual and group mind, rather than a nostalgic ‘back to nature’ attitude. Einstein said, “we cannot solve the world’s problems with the same level of thinking that created them”, indicating that we must embark upon a journey into new territory of systemic thinking and truly sustainable development. I will further elaborate the topic with this principle in mind.

3.3.2 The Emergence of Urban Sustainability

Up until the mid 1990s, much had been written on sustainable development, but remarkably little attention had been given to cities in the sustainability debate (Charles L. Choguill, 1993). This has clearly changed over the last few years, with conferences and summits on the future of cities and the acknowledgment of world politics, mainly in circles of the United Nations, that sustainable urban development is a key factor for our civilisation’s health in the near future. The two most important events in this regard were arguably the 1992 Earth

⁸ The word sustainable actually derives from the Latin word *sustinere*, which denotes a sense of support in both physical and emotional terms (Whitehead 2007, p.9)

Summit in Rio de Janeiro with its global action plan Agenda 21 (although international in perspective, it emphasizes that implementation of sustainability solutions is critical at the local level, see Chapter 28) and the adoption of The Habitat Agenda by 171 countries in 1996, a document stemming from the Habitat II Conference held in Istanbul (UN-HABITAT, 1998; United Nations, 1992). Charles Choguill (1993, p. 3) concluded that “there is little doubt that in the coming years the nature of human development will change and that urban sustainability will become much more central to national development programmes”.

Kofi Annan, then Secretary General of the UN, reminded the world community again in 2005 that our “world is becoming more urbanized, and as the World Summit on Sustainable Development underscored, we must make sure that this urbanization is sustainable. Indeed, the success of our collective efforts for economic growth, social justice, biodiversity and climate protection depends in large measure on how well we protect and manage our urban environments” (Nadarajah & Yamamoto, 2007, p. 3).

3.3.4 The Paradigm of Urban Sustainability

Since more than half of the world’s population now live in urban centres, sustainability has to be very much focused on the urban context. The study of urban systems must understand and capture the complex interactions between urban society, economic development and the environment as recognised by authors such as Alberti and Kaye et al. (Alberti, 1996; Kaye, Groffman, Grimm, Baker, & Pouyat, 2006). However, and in spite of the increased awareness of environmental issues over the last 20 to 30 years, urban planners are still acting out of the anthropocentric worldview that has dominated the social sciences over the last two centuries (McDonald & Patterson, 2007a). This anthropocentric worldview heavily emphasizes the social, political and institutional dimensions of urban development, barely mentioning ‘ecology’ or the ‘environment’. In contrast to traditional approaches to urban planning, emerging approaches have a distinct focus on ecological principles and consequences. McDonald and Patterson (2007b) argue that these emerging approaches to understanding the dynamics of cities acknowledge that humans, like any species, are constrained by ecological limits, and hence they reflect what Catton and Dunlap named the ‘New Ecological Paradigm’. Although the author of this thesis strongly promotes principals of ecological sensitivity and subscribes to the ideas set forth by the Club of Rome’s ‘Limits to Growth’ report (Meadows, 1972), he also beliefs partly in the ‘Human Exemptionalism Paradigm’ which argues that human beings are equipped with special qualities of culture and ingenuity, and therefore will

find solutions for most social and environmental problems (Catton & Dunlap, 1978). Nevertheless, there cannot be any doubt about the unsustainability of the current economic growth paradigm promoted by politicians and industry leaders across the globe. Daly (1996), for example, criticizes heavily the continuous usage of the ‘growth ideology’ within the notion of sustainable development. He reminds us that the current levels of per capita resource consumption in the USA and Western Europe cannot possibly be followed by all nations without destroying the ecological sources on which economic activities depend. Daly also calculated that world resources must increase some sevenfold for all the world to enjoy the level of resource use currently enjoyed by the USA and concludes that continued consumption growth is impossible, although development in a qualitative sense can continue (Rana & Piracha, 2007). Similarly, Wackernagel and Rees (1996) have calculated that we will need the resources of the equivalent of three planet earths, if the world’s current population continues to live at the OECD average of today. These views remind me of E.F. Schumacher’s seminal work “Small is Beautiful: Economics as if People Mattered”, and in particular the chapter on Buddhist Economics (Schumacher, 1973). In conclusion, the Western model of techno-economic development, a model Lester Milbrath calls the ‘Dominant Social Paradigm’ (Milbrath, 1996), which was transferred to developing countries in the 20th century, is certainly not going to be sustainable.

Furthermore, political economy sees cities mainly as nodes and hubs of commodity-based and consumption-driven economic activity. This view is of course dangerously limited. The ecological footprint concept, linking consumerism to its ecological consequences, is starting to enter the scene, but should be implemented much quicker. And most importantly, whatever development model is to be applied, citizens have to feel empowered by it and naturally develop a sense of commitment. This can only happen if the model is integrated in the historical and cultural social dynamics of the place. The here-described multi-dimensional approach to development is what will be referred to as urban sustainability in this thesis.

3.4 Aspects and Trends of Urban Sustainability

“Is the modern city a hopeless case in our search for sustainability?”

Rodeny R. White in (Devuyst, Hens, & De Lannoy, 2001)

3.4.1 The Compact City

At first sight, urban sustainability might appear to be an oxymoron: urban as industrial, crowded and busy; sustainability as eco-friendly, peaceful and balanced. Looking closer, however, we will discover a promising partnership. It turns out that the city setting, with densely populated neighbourhoods, is much more environmentally friendly and less resource and energy consuming than the average suburb or village⁹. Access to proximity is the keyword. The grocery shop around the corner instead of the supermarket at the far end of the suburb; the employer in the same neighbourhood instead of the firm in the distant CBD; the medical centre in town instead of miles away from the village; hence, walking, cycling and public transport rather than individual car use. Not only do transport habits change with proximity, but also provision of public services like heating, sewage management and electricity supply are significantly cheaper (Steffen, 2006). In conclusion we can say that density is efficient. In fact, density is crucial as sprawl does not allow low cost high frequency public transport (Diaz, 2006). This is also the common tone in the European Union’s Green Paper on the Urban Environment, which promoted back in 1990 the vision of compact, transit-oriented urban development that would reduce car use and served as a platform for the support of many environmental groups since (Sorensen et al., 2004).

In a similar vein, the American urban development program ‘Smart Growth’ promotes compact neighbourhoods, open space protection, transit orientation, revitalized downtowns and finds widespread support from local and regional governments, urban planners and civil society. Newman and Kenworthy (1999) argue that in an urban context, sustainability and compactness, as well as less automobile dependence, go typically hand in hand. In the same context David Owen (2004) concludes in his article that, since New York City is more populous than all but 11 states, and if it were granted statehood, it would rank only 51st in per-capita energy use, the residents of Manhattan, 82% of which travel to work by public transit, should arguably be considered the most energy efficient Americans.

⁹ The Global Ecovillage Network GLEN would certainly disagree, and rightly so. However, there are still very few Ecovillages in the world and the generalization that compact urban communities are less resource and energy consuming than the average suburb or village is legitimate.

In addition, neighbourhood proximity fosters human wellbeing and inspires creativity and reduces a nation's per capita footprint drastically. Still, thinking of sustainability I'm sure that very few of us would actually think of dense urban centres first. Of course density in urban centres has its own downsides, and claims that the compact city can be a 'panacea' for urban problems should be viewed as rather romantic and lacking in profoundness. Martinez-Alier argues in that respect that the unplanned spatial expansion of cities makes them a fundamentally unsustainable form of socio-economic development (Martinez-Alier, 2003). One lesson to be learned from Asia for example is that high population density does not necessarily mean sustainability (Sorensen, 2004). Extreme density, designed in an unsustainable way, creates significant problems and risks such as concentrated pollution, noise, traffic, lack of open space, and lack of privacy (Grant, Marcotullio, & Sorensen, 2004). Nevertheless, and despite the fact that cities demand ever-greater quantities of food, material commodities, and energy, current movements such as urban agriculture, community gardening, car sharing, greening of public space, local council action for energy efficiency and urban neighbourhood development schemes are all very promising initiatives that help transform cities into sustainable living communities¹⁰. Wright reminds us that, "while mixed use, high density planning does not always guarantee a sustainable urban environment, as many Asian cities demonstrate, integrated planning efforts between land use and transport can provide a win-win situation for municipal officials, commercial developers, and residents" (L. Wright, 2001, p. 11). And the bonus of dense, well designed compact communities; the countryside would mainly be left unspoilt by urban sprawl, representing, in the ideal case scenario, a pristine farming, and recreational as well as educational destination.

3.4.2 Eco-Cities and the Scale of the Challenge

A city could broadly be characterized as a populated place that exceeds the caring capacity of its local environment. There are initiatives and movements working to change this eventually self-destructive definition to a form that implicitly caters for sustainability. As an example, the most recent trend in global urban planning is the creation of Eco-Cities¹¹, urban centres that are built on principles of ecological sanity and balance.

¹⁰ The author's choice for the most inspiring and promising civil society group working for urban sustainability is a movement called Transition Towns, which originated in the UK and is also increasingly present in New Zealand (www.transitiontowns.org.nz) and around the world.

¹¹ The first Eco-City conference was held in Berkeley in 1990, with proposals toward the goal of shaping cities upon ecological principles.

China is partnering with London based engineering consultants Arup to build several Eco-Cities in the country, starting with Dongtan, a large island close to Shanghai at the mouth of the Yangtze River. Arup's website states: "Dongtan will produce its own energy from wind, solar, bio-fuel and recycled city waste. Clean technologies such as hydrogen fuel cells will power public transport. A network of cycle and footpaths will help the city achieve close to zero vehicle emissions. Farmland within the Dongtan site will use organic farming methods to grow food" (Arup, 2007). Whether this ambitious project will set an example and start the case for Eco-Cities all over China is rather questionable, considering that building the city is horrendously expensive. Taking into account that China must build 400 new cities to host nearly 300 million rural migrants by 2020 (City, 2007), it will certainly be impossible to manage the necessary massive urban expansion to cater for the rural new arrivals with big scale Eco-City projects (O'Reilly, 2006). Other examples of large Eco-City projects are the proposed \$22 billion project Masdar City in Abu Dhabi, the world's first zero-carbon, zero-waste, car-free city (Kumar, 2008). And Russia's future Eco-City Akademia at the foot of the Urals, one of the biggest new ecological urban development schemes in the world. Whether these projects represent a genuine new approach to international urban design or are merely designed as a hype to attract global attention will remain to be seen.

Despite all these noble efforts, the enormous rate of worldwide urbanization with annual growth rates ranging from 3 to 10 percent will not slow down for us to find an overall sustainable solution. Dhaka, the capital of Bangladesh, now counts about 12 million inhabitants, and the population is expected to increase to 18.5 million in the year 2015 (Hossain, 2006). Taking Lagos as another example, a city that has grown from 300.000 in 1950 to 10.9 million today, and the UN projecting that it will have expanded to 16.1 million residents by 2015 (Lewis, 2007), that is more than 5 million new residents in less than a decade, it should be readily apparent that sustainability is extremely difficult to achieve in such settings.

3.5 Key Components of a Concept for Urban Sustainability

It is now more than 30 years since the concepts of sustainable development and sustainability have been presented to the world community with the Brundtland Report. Since then, a wide consensus has been developed on the guiding principles for sustainability. In terms of sustainable urban development, I will briefly mention the key guiding principles of ecological, social, economic as well as managerial aspects, drawing heavily on the work of Haughton and Hunter (1994) and Devuyst and Hens et al. (Devuyst et al., 2001), which is also reflecting the essence of the 'Rio Declaration'.

Figure 2: Overview of the Principles for Sustainable Urban Development

Ecological Principles

Precautionary principle – in the face of irreversibility, lack of full scientific certainty must not legitimize to postpone preventive measures

Prevention is better than cure – environmental impact assessment and ecological footprint measurement

Public trust doctrine – governments must act to prevent ecological damage even if a specific law is not in place

Interdependence and vulnerability of the global eco-system – understand the ultimate bottom line

The three R's of waste management – reduce, reuse, and recycle

Renewable energies – invest in research and subsidize cutting edge technology use

The virtue of variety – natural, cultural and economic diversity

Understanding research, and educate the community – informed decision-making will follow

Social and Economic Principles

Appropriate technology, materials and design – re-localize expertise and economic activity

New indicators for the measurement of wealth, wellbeing and productivity – Genuine Progress Indicator (deducts negative impacts of growth) instead of GDP, must include environmental 'capital stock'

New standards for eco-conscious production – markets need legislative regulations

Internalize environmental costs – polluter and user pays principle

Ensure social justice of environmental policies – protect disadvantaged groups

Intra-generational equity – all people have the right to benefit equally from the exploitation of resources and to a clean and healthy environment

Public participation as a backbone – in strategy formulation, policy implementation and project management

Managerial Principles

Subsidiarity – design, implement and manage programmes at the lowest feasible level

Flexibility in approach – legislation, market and society

Long-term vision as a must – encourage residents to 'think globally; act locally'

Improved cross-institutional cooperation – government, business and civil-society

Transparency and availability of information – make use of new technologies

Source: Adapted from Haughton and Hunter (1994) and Devuyt and Hens et al. (Devuyt et al., 2001)

For the purpose of this thesis I will only elaborate on a few principles, namely on the importance of citizen participation, the formulation of a coherent vision and what we can learn from history.

3.5.1 Importance of Citizen Participation

Citizens, the ancient Athenians realized, are the best people to identify priorities for action in their own cities. It is by reaching consensus through wide participation that solutions can be implemented rapidly and are highly successful.
Molly O'Meara (2008, p. 1)

Since Robert Chambers first spoke about 'putting the last first' and 'handing over the stick' in terms of participatory approaches to poverty alleviation and development work in the 1970s (Chambers, 2005), scholars around the world have picked up on the importance of participation and ownership in relation to political and economic frameworks.

Charles Choguill (1994, p. 937) writes about this in relation to the urban setting: "A shift has taken place from the traditional approach of centralised, top-down decision-making to one in which government's role involves the creation of an environment which enables urban residents to solve many of their own problems". Nevertheless, during a seminar on urban planning in 1993, the speakers concluded on the importance of local government dealing with local problems with the involvement of the people in the process if Latin-American cities are to prove sustainable: "Latin-American governments have usurped the people of their right to citizenship and have not provided, as in established welfare states, their most essential needs. The problems that result from the negligence in considering people's needs were highlighted as problems that result from the lack of people's involvement in policy elaboration" (Guaraldo, 1993, p. 97). Of course, however, there is a big difference between urban planning in the developed and the developing world. John Friedmann's vision of his ideal urban protagonist as "an autonomous, self-organizing civil society, actively making claims, resisting, and struggling on behalf of the good city within a framework of democratic institutions" (Friedmann, 2002, p. 108) reminds us mainly of a post-modern western middle-class approach to shaping urban politics. But the general notion of the essentiality for citizen participation and ownership, including the benefits of a graded shift to bottom-up policies, should be recognized and acted upon worldwide.

Especially during the Earth Summit in 1992 the delegates were aware of the vitality of community participation, which resulted in the recommendation that local authorities should develop and implement their own Local Agenda 21 action plan¹² (United Nations, 1992). Programs for local government capacity building and public participation in planning have thus spread widely (Friedmann, 2002; E. Newman, 1999; Sorensen et al., 2004). Friedmann (2002, p. 11) commented on this saying that “evidently, there is something very attractive about this devolution of powers to the most local of local levels – the neighbourhood, the street”.

3.5.2 Formulating a Vision

“It is perhaps to be expected that the future will not be crafted exclusively by the microchip, but rather by human will and simple ingenuity.”

Lloyd Wright (Lloyd Wright & Hook, 2007, p. 26)

A concept for sustainability must be guided by a clear vision of sustainable development that includes goals, which define that vision. It is a simple project management fact that a project's results and impact can only be as successful as the vision and objectives that were set intentionally at the beginning of the project cycle. Without clear goals and indicators, a project is doomed to be lost in insignificance.

Furthermore, Friedmann (2002) reflects on two principles of what he envisions to be the ‘good city’: First, human flourishing - every human being has the right, by nature, to the full development of their innate intellectual, physical, and spiritual capabilities in the context of wider communities - as a fundamental human right, and second, multipli/city - an autonomous civil life substantially free from direct supervision and control by the state - as a primary good. Introducing his reflection he argues that process and outcomes, as well as means and ends, cannot be separated. In this foundation for his principles of the good city we are reminded of Amartya Sen's general approach to any kind of development work, the ideal of freedom being the primary end as well as the principal means of development (Sen, 1999). We will see in the example of Curitiba and Bogota in Chapter 5 which power a clear vision exudes and how it inspires stakeholders to take positive action.

¹² “Each local authority should enter in to a dialogue with its citizens, local organizations, and private enterprises and adopt ‘a local Agenda 21.’ Through consultation and consensus-building, local authorities would learn from citizens and from local, civic, community, business and industrial organizations and acquire the information needed for formulating the best strategies.” (Agenda 21, Chapter 28, Section 1.3)

3.5.3 The Historical Perspective on Urban Sustainability

If there is one thing that we can learn by looking at history it should be about the failures that we made. In relation to urban design, history reveals that the key factor in the decline of most cities is ecological unsustainability (Grant, 2004). In the long run, urban livelihoods will not sustain themselves by the look at a new shopping mall, but are heavily dependent on basic human necessities such as clean water, healthy food and good shelter. The current rate of urban growth and industrial development, coupled with individual resource consumption and waste production that is spiralling out of control, seems to indicate that we are on a guaranteed path into oblivion. We will certainly reach the limit soon. In fact, looking at it from a global perspective, we might have already reached the limit. This is actually what the recent policy report of the Intergovernmental Panel on Climate Change indicates (IPCC, 2007). Still, and although the world community has been reminded about its unsustainable practices many times before, we are not really changing. George Monbiot's disillusioned statement comes to mind, which points in the wording to another global issue, the depletion of oil reserves: "Global supplies of political courage appear, unfortunately, to have peaked some time ago" (Monbiot, 2008). Nevertheless, "we will keep working towards the ideal of sustainability because the alternative", as Grant and Marcotullio (Grant et al., 2004, p. 307) remind us "– unsustainable lifestyles – is no choice at all".

In this chapter we have explored three very important issues: First, the future of urbanisation and the challenges that lie ahead; second, current trends in urban transportation worldwide and the related issues; and third, the key components of a concept for urban sustainability. Together those three issues represent a significant dimension to the future of our civilisation and should be carefully studied and managed. The enormity of the task at hand, and the speed at which current population growth and urbanization is happening especially in the Global South, does not give us much time to change to a development pattern that features those key components of sustainability. While it is clear that a concept for urban sustainability involves several interdisciplinary elements, the rest of this thesis will focus on the importance and the role of an integrated transport solution.

4. Intelligent Urban Transport Solutions – Key to Urban Sustainability

In this chapter I will first look at current urban transport issues in terms of air pollution and carbon dioxide emissions, as well as the automobile dependence that has been developed over the years and, with the help of inspiring examples from around the world I describe how it will be possible to change to a sustainable transport paradigm. The rest of the chapter will explain in detail what is understood by integrated urban transport and I will demonstrate the important role of a Bus Rapid Transit system for sustainable transport in the Global South.

4.1 Current Urban Transport Issues

4.1.1 Air Pollution – General Observations

“Without wishing to be over-dramatic, it is nevertheless true to say that the ‘cocktail’ of pollutants found over our cities kills and injures people, causes and aggravates chronic diseases, damages buildings and other structures, and damages or kills vegetation.”
(Haughton & Hunter, 1994)

According to the World Health Organisation, traffic fumes now kill more people than traffic accidents (Potter & Skinner, 2000). There are around 800.000 premature deaths worldwide due to particulate urban air pollution, of which 35.000 occur in Latin America alone (Walsh, 2008). In Dhaka, Bangladesh, air pollution causes more than 10.000 premature deaths and 6.5 million extra cases of sickness every year (Hossain, 2006). Furthermore, according to the UK Department of Health’s figures, up to 24.000 people die every year in Britain from traffic pollution (Monbiot, 1998). And even in New Zealand it is estimated that around 400 people over the age of 30 die prematurely each year from exposure to vehicle emissions (Fisher et al., 2002). Additionally, we are reminded of an American expert’s estimation that breathing the air in New Delhi on a normal day means the equivalent of inhaling two packages of cigarettes (van Dijk, 2006).

Numerous studies over the years have clearly revealed that spending time in close proximity to heavy traffic is associated with a wide range of morbidity effects, as well as increased mortality (Walsh, 2008). Research has also confirmed that there is a direct relationship between the level of air pollution and the transport system in place in a city (Padam & Singh, 2001). In general, the main reason for high levels of air pollution in cities around the world is

private transport, especially the increasing rate of private automobile usage.

4.1.2 Carbon Dioxide Emissions

The transport sector accounts for 26 percent of all carbon dioxide emissions in the European Union, and its contribution is rising (Haines, 2000). In the U.S., the transportation sector accounted for 27 percent of total greenhouse gas (GHG) emissions in 2003 (W. Vincent & Callaghan, 2006). In some Latin American countries it accounts for nearly a third of the total GHG emissions (J. Rogat, 2007). Worldwide this figure is estimated to be around 20 percent, while passenger cars and light duty trucks are the single most significant source. Overall, the transport sector is currently one of the most rapidly increasing sources of GHG emissions (Potter & Skinner, 2000; J. Rogat, 2007).

In coming years the pressure on governments to implement regulations to curb carbon dioxide emissions will surely increase, and the transport sector will be one of the most immediate to experience policy change. Without the development of an appropriate integrated urban transport system that serves it's citizens and encourages them to successively trade their private means of transport for public means, large cities in this world will most certainly not be able to provide a sustainable level of transport reality that simultaneously helps preserve an ecological balance. Rather, cities that fail to prepare transport solutions for future development must fear urban collapse, as can be seen in cases such as Nairobi, Bangkok and, as mentioned before, Bangalore (Barter, 2000; Reuters, 2007; Shankar, 2007).

In fact, one of the single most effective ways to cut individual carbon emissions is switching from cars to public transport, which is reflected in the findings of the American Public Transportation Association's report that states; "when compared to other household actions that limit carbon dioxide, taking public transportation can be more than ten times more effective in reducing this greenhouse gas" (Steffen, 2007a). Transport systems that give an alternative to the usage of private cars are able to create an urban setting that is more suitable for people, and focuses on mobility and access solutions for pedestrians, cyclists and passengers of public transport (Thomas & Fordham, 2003; Stephen Wheeler & Beatley, 2004). Pedestrian orientated neighbourhoods encourage physical activity and create an atmosphere of community, which has its very own positive side effects.

4.1.3 How to Do It the Wrong Way – Development of and for Automobility

"In reality, the automobile – and the infrastructure that supports it – continues to warp the

face of our cities and the structure of our lives.”

Stefan Jones (Steffen, 2006, p. 266)

The increasing availability of motor vehicles in the 20th century made governments shift from a focus on mass transit infrastructure to a concept of building roads for the masses. This shift, to an extensive and a priori catering for individual car owners by spending public funds on roading projects, has brought along particular negative impacts that include: high levels of congestion; noxious emissions and air quality deterioration; global warming (CO2 emissions); use of non-renewable resources; road casualties; health and safety; noise and vibration; and social polarisation (Potter & Skinner, 2000).

Still, the automobile is on the rise. More and more people in countries that are subject to large population increase fulfil themselves the dream of a private car. And from the perspective of fundamental human rights, this is absolutely legitimate, if not favourable. Why should developing countries sacrifice their potential for modernisation and convenience, when the highly developed nations refuse themselves to act on recommendations given by the scientific community and common sense? However, and in spite of the personal convenience that private cars offer, there is an immense downside to the widespread usage of the automobile, first and foremost the aspects of air pollution, road congestion and fuel-inefficiency.

All over the world, the remnants of pro-suburbia thinking of the 1960s and the obsession with individual automobile usage for the sake of personal freedom can still be witnessed in unsustainable urban transport plans. Even in the developed world the aforementioned threat of potential urban collapse must be taken serious, especially if urban planners still insist on the creation of more motorways as the primary solution for intelligent traffic management. The failure of the British Labour Party to reduce private car use and promote public transport is but one example (Monbiot, 2000). The State of California has attempted for decades, through regulatory models, to curb automobile pollution without much success¹³. Rajan (2007, p. 69) concludes the case of California by saying: “The contradictions in this model have become increasingly apparent, but it is by no means obvious that these will yet give root to a new form of democratic and pluralist politics around automobile pollution, given the institutional embeddedness of automobility in daily life”. Reflecting on over a century of the automobile, we can confidently say that in places like the United States automobility is no less than a personal obsession fuelled by the industry’s vested interest. A very good, if not the best,

¹³ For a comprehensive documentary of California’s attempt to curb automobile emissions with state regulation see <http://www.whokilledtheelectriccar.com>

example for an unsustainable urban transport design that has been going on for decades is Auckland City in New Zealand. In the 2006 documentary titled “Auckland. City of Cars” Professor Peter Newman, the director of the Institute for Sustainability and Technology Policy at Murdoch University Perth introduces us with the words: “It is a continuing story, a saga in fact, as to how Auckland has failed to develop a decent public transport system” (Tritt, 2006). The results of that failure can be experienced daily by commuters caught up in traffic jams and average travel times for one way trips within the Metropolitan area as high as three hours. In his study on public transport commissioned by the World Bank, Newman found that Auckland spends around 16 % of the city’s wealth on moving people around, which is one of the highest expenditure in the world and four times higher than Denmark’s capital Copenhagen (Tritt, 2006). Still, and in spite of a global consensus on the fact that building roads simply contributes to congestion rather than solving it (Sorensen, 2004), in a city totally dependent on the use of cars and no reliant rail or bus network in place, the government pledges for the construction of even more motorways while expenditure for public transport is actually declining (Tritt, 2006). Trying to solve traffic jams building more road infrastructure is like trying to put out a fire with gasoline. Interestingly, out of a sample of 100 cities, rail-orientated cities were found to be 43 percent wealthier than car-oriented cities (Kenworthy & Laube, 1999).

4.1.4 Sustainable Transport Initiatives from other Cities

Auckland stands in stark contrast to examples of cities of other highly developed nations that are on their way to a sustainable urban transport paradigm. Paris and London for example were given the 2008 Sustainable Transport Award by the Institute for Transportation and Development Policy, honoring their innovative citywide programs to improve public transit and reduce traffic congestion and greenhouse gas emissions (Johnson, 2008). Awarded in previous years to cities like Bogota and Seoul, the jury was very pleased with London’s congestion pricing, funding for better public transit and improved space for walking and cycling, as well as Paris’ very effective bicycling scheme, bus rapid transit, and street space management. London claims that since introducing the cordon pricing scheme, congestion levels have decreased by 21 percent, the number of car trips into the zone has fallen by 150,000 per day, average traffic speeds have increased from 13km/h to 17km/h, carbon dioxide emissions are down 16 percent, while the number of Londoners that are riding buses and bicycles in the British Metropolis is up 45 and 43 percent respectively and excess waiting

time for buses in the city centre has been cut by 46 percent (BBC, 2007; Defense, 2007; B. London, 2007; Mayor, 2007; Quddus, Carmel, & Bell, 2007). Michael Repogle, member of the selection committee added that not only do the selected programs reduce the impact on climate change, but also, and maybe even more importantly, they “improve the quality of life and delightfulness of the cities” (Johnson, 2008, p. 1). Additionally, the Mayor of London Keith Livingston announced in February this year the world’s most ambitious scheme to reduce the contribution of urban traffic to greenhouse gas emissions. Cars with high CO₂ emissions, which currently make up 17 percent of all cars in central London, will be charged £25 instead of £8 at entering the congestion cordon (C. o. London, 2008). Such political action is the minimum requirement if officials are going to be serious about the recommendations given by the IPCC to avoid a possible climatic catastrophe (Chapman, 2008). Although new technology will certainly play a role in the creation of sustainable forms of transport, the greater contributor to sustainable change will come from demand management strategies.

4.1.5 How to Change to Sustainable Urban Transport Habits

Sustainable transport can be seen as a combination of *technological improvement*, such as fuel efficiency and development of alternative fuels; *pricing schemes*, including congestion and parking charges as well as emissions fees and the cancellation of all subsidies to cars; *institutional integration*, in terms of linking regional and city planning with transport strategies that enable the development of compact, mixed-use and accessible cities as well as road space allocation to walking, cycling and public transport; and *demand management*, which influences the pattern of demand for transportation by encouraging voluntary changes in habits and lifestyles

Reducing car dependency, however, requires bold political will. Most importantly, it requires serious infrastructure investment and integration of transport planning and land use management (P. Newman & Kenworthy, 1999). Unless the speed of public transport is not faster, and local options based on walking and cycling are not more attractive than car trips, it will be very difficult to stimulate a change in transport habits. Furthermore, public transport must be affordable, possibly considerably cheaper than using a private car, highly reliable and frequent, and finally be accepted as a modern, appropriate way of travelling. In terms of walking and cycling, personal safety, provided by segregated bike lanes and safe pedestrian paths, is probably the single most important factor that comes to mind. The creation of the

right infrastructure like bike racks in buildings and on buses and trains, as well as showers for cyclists at workplaces is also important. Solutions are plentiful, but without the will for change they remain lying idle in the heads and hearts of few.

Now that the urgent need for managing urban transportation in a sustainable way has been identified, I will portray, within the context of urban sustainability, what the key characteristics of an integrated transport model are.

4.2 Integrated Urban Transport

“Integrated transport is not about what sort of transport people want, it is about what sort of city and countryside they want - close-knit friendly streets or suburban sprawl. It concludes that if we continue to see major road projects as the natural order and all other transport projects as too small, too green or too unworldly, we will be left behind and will have missed the point”

S. Joseph (2000, p. 41)

4.2.1 Mobility as a Fundamental Aspect of Society

Padam and Singh (2001, p. 40) argue that “among various factors affecting the quality of life and safety in a city, the transport system is among the most important”. A city’s status, efficiency and quality of living are indeed readily assessed by a look at the mobility and access solutions it offers to its citizens. An image of permanent traffic congestion and constant air pollution impedes a city’s ability to attract investment, tourists, and professionals. Urban social capital and creative citizen interaction are significantly dependent on opportunities of convenient movement. In addition to the environmental costs, high levels of congestion are not only damaging to economic competitiveness, but also represent a major detriment to citizen’s psychological health and work-life-balance. Furthermore, recent studies have repeatedly shown that constant exposure to high noise levels leads to severe anxiety and restlessness in the human psyche, culminating in insomnia and the necessity of treatment. The issue of particulate air pollution from transport and its effects on human health, vegetation and buildings have been portrayed before. Considering all this, the importance of a good integrated urban transport solution as a way to improve life in cities cannot be overstated. Taking into account the enormous population growth rates, it is understandable that mobility and accessibility are declining in most of the cities in the developing world (Gakenheimer, 1999), as public transport solutions cannot possibly keep up with ever increasing demand mainly due to poor governance and the lack of strategic funding schemes for essential infrastructure projects.

In fact, Padam and Singh (2004) conclude that the economic efficiency of cities and the well-being of urban inhabitants are directly influenced by mobility and accessibility, or the lack of it. Fernandez and Munoz (2007, p. 26) similarly conclude that “urban transit plays an essential role in the economic development of modern societies and the quality of life of their citizens”.

Reflecting on it, we can actually see that movement and mobility are at the centre of how our societies, economies and ecosystems operate (Whitehead, 2007). In essence, motion is central to human existence (Cresswell, 2006). However, there is more to transport integration than just providing citizens with a transport system that lets them travel from A to B in a reasonable amount of time. The majority of urbanites do travel with public transport every day, hence it is a major source of either desperation or satisfaction.

According to Brebbia and Wadhwa (2004), customer satisfaction depends heavily on the aspects of reliability, affordability, convenience, safety and security, cleanliness and comfort, as well as understanding and empathy of service. It is very reasonable to expect a safe, comfortable, friendly serviced and on time ride to and from work, cultural activities or educational purposes travelling on a city's transport system. Fulfilling these expectations is the bottom line goal of an integrated transport strategy.

4.2.2 The Meaning of Transport Integration

“While technical solutions that reduce the impact of individual journeys have a place, it is unlikely that they alone can reduce the impact of transport to a sustainable level. Only the development of highly integrated strategies have the potential to improve sustainability“

(Potter & Skinner, 2000, p. 275)

First of all, integrated urban transport should be exactly that: integrated. The word's original meaning from the Latin *integrare* -‘to make whole’ – has deep implications. In a sense, it should describe a process where all the various means and existing modes of transport - private cars and motorbikes, commercial lorries and public buses, underground Metro and surface light rail, bicycles and walking – are brought together in a grand plan that gives each mode it's appropriate share in the city's transport scheme so that a holistic and sustainable, non-fragmented urban transport experience is realized. Whitehead (2007, p. 181), reflecting on different transport strategies in the world, argues that “what many of these strategies have in common – whether it be road tolls, congestion charges or increased investment in public transport – is that they don't approach issues of congestion in an integrated way; that is to say that they don't consider the implications of congestion from the perspective of sustainable urban development”.

Keeping in mind that in many urban centres around the world it is still the building of highways, fly-overs and tunnels, hence the use of private cars that is favoured in policy

statements and development models it is clear that hardly any urban transport system is truly integrated according to the original meaning of the word. The academic literature helps to give a more detailed picture of the meaning of transport integration. Simpson (1994) remarks that integration is about the speedy, convenient and economical connection of services to make up complete journeys for passengers from their origins to their final destinations. Integration of timetables, ticketing and provision of facilities such as parking spaces for park and ride, and also special services for the disabled or elderly are vital in that regard. Richards (2001) argues that public transport must be better and easily accessible, ticketing systems should be compatible with all modes, and interchange stations should be planned at local points in the community rather than outside at park-and-ride stations.

An important aspect of a truly integrated transport solution is to give each mode of transport the role that it is best equipped to play so that all can be easily integrated. Dewar and Todeschini (2004) point out that one dimension of achieving the quality of integration and more efficient integrated settlements is to link different modes such as railway, bus, Metro and taxi, as well as cycle lines and footpaths, in a system in which each lower order system feeds higher order ones. As an example a city should use mini-buses, ideally combined with a footpath network and cycle lanes, to feed the Metro and bus trunk lines. This view is in line with the thinking of Potter and Skinner (2000, p. 280) who, putting the ecological dimension at the centre of their argument, state that transport integration should provide “a hierarchy of choice, ideally making the first choice for a journey the most environmentally benign, such as walking and cycling, through public transport options, and finally use of a car when there is no practical alternative”.

The long term goals for any integrated transport policy that supports the implications of sustainability are to reduce travel times and costs, improve the economic and environmental performance of each mode of transport (including private cars), restore a balance of modes re-emphasizing mass transit and integrating the various systems (World Resource Institute, 2002). To realize this, a mixed-approach to sustainable transport planning is necessary, involving policies for vehicle and fuel standards, land use control, prioritizing bus systems, and economic stimuli (Whitehead, 2007). Finally, it is essential to use a common institutional framework that enables to link and integrate land-use planning with public transport services (Luk & Olszewski, 2003).

The following model, drawing heavily on the scale of integration levels proposed by Potter and Skinner (2004), will use specific aspects to clarify the scope of transport integration.

Figure 3: Four Levels and Respective Aspects of Transport Integration

Source: Adapted and extended from Potter and Skinner 2004.

The European Commission's guidance on the preparation of Sustainable Urban Transport Plans includes a useful distinction of different forms of integration, which help to design a transport strategy that serves agreed on objectives rather than being an objective in its own

right (May, Kelly, & Shepherd, 2006). The distinction is between horizontal integration between agencies and departments within a city administration; spatial integration between adjacent local authorities; and vertical integration between local, regional, national and European administrations (DGEnv, 2004).

As we have seen, integration is a major aspect of sustainable transport solutions. The model of integration explained before gives an idea of the multiple levels and forms of potential integration, and points to major benefits for the wellbeing of urbanites.

4.3 Integrated Transport in the Global South – The Key Role of Bus Rapid Transit

“Bus Rapid Transit (BRT) is increasingly recognised as amongst the most effective solutions to providing high-quality transit services on a cost-effective basis to urban areas, both in the developed and developing world”
(Lloyd Wright & Hook, 2007, p. 4)

Generally we can observe that the more per capita income a country has, the more developed and sophisticated the transport solutions in its major cities are. Building an extensive Metro network is very expensive, and most cities in the Global South do not have the financial capacity to deliver the initial investment that would pay off over a few decades. Similar to Metro, a Light Rail system requires a lot of initial investment. Although it is widely assumed that investment in heavy and light rail is the ‘best’ solution, this popular perception has been profoundly challenged in recent years by the successes of what is known as BRT, Bus Rapid Transit (Hensher, 2007).

The main reason behind the many success stories of BRT projects around the world is the comparable low cost, first to implement it and second the potentially lower maintenance cost. Before I go on to explain in detail what BRT is and how it works, I want to briefly expand on the cost advantage, since affordability is arguably the most important criteria for urban decision makers in the Global South. Hence, I want to clarify the reason that caused BRT to emerge as an economically self-reliant mass transit system with significant potential for budget-constrained developing cities.

As Wright (2005) conclusively demonstrates, US\$ 1 billion typically buys 400 km of dedicated BRT in contrast to 15 km of elevated light rail or 7 km of underground Metro rail¹⁴. Moreover, and with a similar stark difference in comparison, experience from implementations in Latin America concludes that, carrying the same number of people, the cost of a BRT system varies between 1 and 5 million US\$ per kilometre, while the cost of a light rail train may be around 30 million US\$ per kilometre, and the cost of rail-based Metro¹⁵, by far the most expensive, may vary between 65 and 200 million US\$ per kilometre (GTZ, 2002). Carey’s statement that depending on the design, the cost of a BRT system can be as low as 10 percent of a Light Rail system (Carey, 2002) is not as sharp in contrast, but

¹⁴ Hensher (2007, p.99) argues that “even if these numbers are debatable and subject to error, the differences are sufficiently stark to be worthy of note”.

¹⁵ A well designed BRT system can carry around 35,000 passengers per hour and direction, which is half what metro systems can carry (Rogat and Hinsostroza 2007).

still supports the notion that there is growing evidence in the field pointing to the cost-benefit advantage, at least significantly in the first years, of well-designed BRT systems over light and heavy rail solutions in high density contexts (Levinson, Zimmerman, Clinger, & Rutherford, 2002; W. Vincent & Callaghan, 2006). Moreover, “the lure of constructing underground systems is too often derived from perceived status rather than objective financial analysis” (L. Wright, 2001, p. 16). Paying tribute to these conclusions, the International Union of Public Transport Operators (UITP) in Europe has recently stated that BRT is increasingly preferred over fixed rail systems for cost-benefit reasons (Hensher, 2007).

The next section, apart from introducing the key characteristics, will try to answer the question if BRT could be the low-cost, easy to implement solution to developing cities’ challenges in terms of providing sustainable urban transport¹⁶.

4.3.1 The Story of BRT – Bus Rapid Transit

“Margaret Thatcher once declared that ‘if a man finds himself a passenger on a bus having attained the age of 26, he can account himself a failure in life’. The words were uttered in the roaring, revving Eighties. But the bus is suddenly back – the fashionable centrepiece of an integrated transport policy”.

The Observer, 26th July 1998 (Lindau, 2008, p. 6)

The easy way to explain what BRT stands for would be to say that it is just like a Metro, but with stations on the surface and the train being a rubber-tired articulated bus, in other words a ‘surface subway’. In fact, a comprehensive BRT solution would be exactly that, only with the benefits of costing a fraction of what the Metro would cost and that it allows for much more flexibility. In reality, however, it is not that simple. In order to get a clearer picture of what BRT means and how it came about, I will present the gist of the respective transportation literature and sum up the key characteristics of BRT systems in the rest of this chapter. In the following chapter I will then portray the two main examples that come to mind when talking about BRT, two examples from Latin America, namely the system in the city of Curitiba in

¹⁶ Sustainable refers among other aspects to the fact that BRT can provide significantly greater CO2 reductions than Light Rail solutions. The main reason appears to be the generation mix of electricity used to power Light Rail (Vincent and Callaghan 2006).

Brazil, the first ever BRT solution, and the Transmillenio in Colombia's capital Bogota, the most famous and arguably successful approach.

4.3.2 Key Characteristics of Bus Rapid Transit Systems

BRT can be a very effective transformative agent that helps turn cities into more liveable and appealing environments. Especially low-income cities are very attracted to BRT solutions due to their ability to deliver a high-quality mass transit system at a fraction of the cost of light- or heavy-rail projects. However, Wright and Hook (2007) have identified the principal ingredient as simply being the political will to make it happen, which adds a different parameter to the story and shifts it to the political sphere where vested interest appears to be the commanding entity.

Transport engineers and city planners have now widely agreed that what could be considered a comprehensive BRT solution must consist of at least a mix, if not all of the following key characteristics (Jarzab, Lightbody, & Maeda, 2002; Levinson et al., 2002), while, as Carey (2002) argues, the first characteristic, exclusive rights-of way should at minimum be included on a major part of a city's corridors:

Figure 4: Seven Key Characteristics of Bus Rapid Transit

1. Dedicated rights-of-way and segregated bus lanes

The provision of exclusive and limited use bus lanes enhances speed and reduces travel times, increases reliability and fosters identity of BRT systems. This characteristic represents what could be called a 'killer criteria' as without it a BRT system is bound to fail in one way or the other.

2. Off-vehicle fare collection

Not only is it more convenient for customers, but also permits multiple-door boarding, thereby reducing station dwell times, passenger travel times, and bus operating costs. Designated pre-pay waiting stations also increase the level of security and safety.

3. Unique station design and suitable amenities

Uniqueness in terms of passenger shelter design, logos and special paint schemes help to enhance the profile and public image as well as increase passenger acceptance and distinguish it from conventional bus services. Safe pedestrian and auto access to stations is critical. Real-time vehicle arrival information significantly increases passenger satisfaction as reliability of the service can be expected. Stations should also be integrated into commercial developments with community involvement that will deliver suitable passenger amenities. Designing the passenger boarding area at the same height as the bus increases passenger comfort and reduces waiting times at stations.

4. Special Vehicles

BRT vehicles should have low-floors and multiple doors to allow fast and convenient boarding, wide aisles to provide ease of passenger movement, comfortable seating, good ventilation and be distinctively designed with colour and graphics to again provide a unique identity with the look of the buses supporting the overall image of the operation. Articulated buses with a carrying capacity of between 150 and 185 passengers, or bi-articulated buses with a carrying capacity of around 270 passengers should be used. These high-capacity vehicles, coupled with other effective measures, allow a BRT system to match or exceed the passenger volumes of the busiest light rail systems.

5. Coordination with land-use planning

Designing compact neighbourhoods and allowing for access to proximity will reduce travel requirements and increase the quality of transit services.

6. Usage of Intelligent Transportation Systems (ITS) technology

Applications to provide a maximum of passenger information like bus arrival times and estimated travel times to destination will significantly increase passenger satisfaction and perceived reliability. Technology helps monitor and control bus operations, provide priority at signalized intersections and enhance safety and security on board vehicles and at stations as well as provide guidance for vehicles.

7. Design for direct routing

Put in place simple and easy-to-understand route structures with useful maps and guidelines for convenient usage

Source: Adopted and expanded from Jarzap and Lightbody et al. 2002, and Levinson and Zimmerman et al. 2002

There is one other important characteristic of successful BRT systems, which I would not want to miss here: profound citizen participation in the process. Carey (2002) reminds us in this respect that it is essential for the public to participate from the very beginning of a BRT project, primarily in order to have citizens realize that BRT is not just another additional bus service but a totally new transport concept with big implications for mobility and access, therefore wellbeing and prosperity in the city.

In this chapter we have looked at the core concept of transport integration, as well as at the key characteristics of BRT systems. In order to portray some of these characteristics in more detail, and to reflect on the lessons we can learn from successfully implemented BRT systems, we will take a look at two examples from Latin America in the following chapter; briefly Curitiba in Brazil and more in detail Bogota in Colombia.

5. BRT Success Stories from Latin America – Curitiba and Bogota

In this chapter I will portray two success stories of integrated transport and BRT system implementation that helped transform the quality of life in the cities of Curitiba in Brazil and Bogota in Colombia. I will focus on three main aspects of implementing a new urban transport system, first the importance of political will and leadership with a strong vision, second the vitality of widespread stakeholder participation, and third the principle of institutional integration. Before BRT systems were implemented, these cities had been characterised by a large number of traffic accidents, severe air contamination and high levels of congestion. However, by relying on the concept of moving people rather than cars and starting to challenge cultural barriers, these two cities managed to bring about significant benefits for the environment, the economy and society (Jorge Rogat & Hinostroza, 2007). Both systems have served as a source of inspiration for other cities in Latin America, Asia, Europe and the USA¹⁷ (Goodman, Laube, & Schwenk, 2005; Pienaar, Krynauw, & Perold, 2005; Jorge Rogat & Hinostroza, 2007). In Chapter 6, while portraying and analyzing the TranSantiago project in Chile, I will also use the initiatives of transport integration in Curitiba and Bogota to reference my evaluation of the TranSantiago.

¹⁷ Rogat and Hinostroza thus argue that it represents a unique example of South-South, South-North technology transfer.

Figure 5: Urban Transport Solutions in Selected Cities in South America

Source: The Author

5.1 Curitiba – A Masterpiece through Leadership and Citizen Participation

“But how did Curitiba manage to become a positive example for cities in both developed and developing countries? In part, the city’s success can be attributed to strong leadership – city officials focused on developing simple, flexible, and affordable solutions that could be realized at the local level and adapted to changing conditions.”

(Devuyst et al., 2001, p. 98)

As we have seen, the main ingredient for creating a successful urban transport solution is leadership through political will. This aspect is certainly epitomized by Curitiba, the city that initiated the first ever Bus Rapid Transit system back in 1972. Although these were the times of ‘wide motorways are the way to go’ propaganda and when car-free streets were nearly unheard of, the then recently appointed mayor Jaime Lerner had a different vision for Curitiba. His was a truly participatory approach to city planning with the vision to making the city a place designed for people not for cars. The first step towards the realization of his vision was taken when he managed to fight the plans to obliterate Curitiba’s central street with an overpass, and arranged, over the course of a weekend and in guerrilla style, to turn the street into a pedestrian mall with tens of thousands of flowers, kiosks and streetlights, representing his drive for a human-scale city (McKibben, 2005). Ever since that first bold and audacious step, he had the support of the city’s community and turned citizen participation and local ownership into every day urban political reality. Lerner served 12 years and helped, not only due to the creation of an extensive park and public open space network¹⁸ and the fact that a municipal shepherd with his flock of sheep mows their grass, to create the Ecological Capital of Brazil while making history in urban planning for initiating the world’s first Bus Rapid Transit system. Curitiba’s BRT has since been used as an example to show the possibilities of transforming a city’s transport system into a sustainable operating mode and simultaneously increasing access and mobility for its citizens with the help of intelligent, and affordable public transport solutions that are based on appropriate rather than capital-intensive technologies and the positive impact of public participation (Demery, 2004; Devuyst et al., 2001; Rabinovitch & Hoehn, 1995; Jorge Rogat & Hinostroza, 2007).

The BRT system in Curitiba was and still is used worldwide as an inspirational example for managing urban transport. Lerner proved that the ‘holy trinity’ of mass transit is speed, reliability and high frequency (Leonard, 2007). The success story is simple. Through Lerner’s

¹⁸ Curitiba created a strategy called ‘Design with Nature’ and managed to increase the amount of green space per capita from 0.5 square meter in 1970 to 50 square meters in 2003 (Wheeler and Beatley 2004).

visionary leadership, the city introduced bus only lanes along the main corridors, constructed the world famous ‘tube’ bus stations where passengers pay before they enter the same-level-boarding area and introduced a simple, hierarchical bus system based on an integrated low fare scheme¹⁹ with double-articulated buses that run along the main arteries into the city-centre in red, feeder buses in yellow, inter-neighbourhood buses in green and rapid buses in silver, which allows citizens to easily identify and change to the right bus and enhances the system’s public acceptance.

Although the city grew from only 200.000 at the beginning of 1950 to nearly 1.8 million today with the usual increase of private car ownership and worsening of traffic flow and air quality, the simplicity and adaptability of it’s public transport system integrated with land-use planning helped to create one of Brazil’s most enjoyable places to live in.²⁰

Today, the integrated transport system with its 2000 buses and 340 routes, 60 km of which are dedicated exclusively to bus use, serves 1.9 million passengers per day, three quarters of all commuters (Jorge Rogat & Hinostroza, 2007). Although Curitiba has one of the highest car ownership rates in Brazil, the city uses 25 percent less per capita fuel than the average Brazilian city, hence the significantly reduced automotive emissions²¹ and one of the lowest levels of particulate air pollution. Curitiba has more than 120 km of dedicated bicycle paths, which are primarily used for leisure and access to parks as commuting to work by bike is not facilitated by the system at the moment (Macedo, 2004).

Levinson and Zimmerman (2002, p. 21) have identified twelve key attributes (see Figure 6 for pictorial details) of Curitiba’s BRT system, which can be used as a good guideline for any integrated urban transport initiative, and they are: simple route structure, frequent service at all times of day, headway-based as opposed to time-point schedules, less frequent stops, level boarding and lighting, colour-coded buses and stations, exclusive lanes, higher-capacity buses (bi-articulated bus / 260 passengers), multiple-door boarding and alighting, off-vehicle fare payment, feeder bus network, and coordinated land-use planning.

Indeed, transport in Curitiba is not planned in isolation, it is coupled with land use policy, employment, education and local neighbourhood schemes, representing a systems approach that not only enhances the environment, but also the social and economic viability of the city. With its efficient station design and high-capacity buses, Curitiba has revolutionized the way in which municipalities around the world view public transport (L. Wright, 2001). The lesson

¹⁹ The average low-income family spends only around 10 percent of its income on transportation, which is relatively low in Brazil (Rogat and Hinostroza 2007).

²⁰ 99 percent of Curitibaans said that they were happy with their town; and 70 percent of the residents of São Paulo said they thought life would be better in Curitiba (McKibben 2005).

²¹ Twenty-eight percent of direct route bus users previously travelled by car (Rogat and Hinostroza 2007).

we can learn from Curitiba is certainly one that indicates the key role of visionary leadership and citizen participation.

Figure 6 : Features of the BRT system in Curitiba

Left: Exclusive 'Bus Only' Lanes,
Right: Double-Articulated Buses along Main-Arteries - "Above-Ground Subway",
Bottom: One of 350 'Tubes', Pre-Pay Same-Level-Boarding Bus Station.

Source: IPPUC, Curitiba, Brazil/Carlos Ruggi

5.2 Bogota's TransMilenio – Bus Rapid Transit At Its Best

“Peñalosa's urban planning efforts as mayor of the Colombian capital helped transform the city of 6.7 million from a snarled, toxic and crime-ridden mess into an inclusive and clean Metropolis marrying the best of buses, parks, bikeways and libraries“.

Carolyn Whelan (2007, p. 1)

In this section, I will describe the design and implementation process of Bogota's urban transport system, TransMilenio, as well as analyse the key characteristics that led to the system's worldwide acclaimed success. Bogota, the capital of Colombia with its nearly 7 million citizens provides a good background for the analysis of Santiago de Chile's transport system in chapter 6.

Although the initial plans at Enrique Penalosa's start as mayor of Bogota were to introduce an integrated transit system with both heavy rail Metro and a network of busways, it became clear over time that the necessary funds to build a Metro were missing in the national government's budget. As I have portrayed in the previous chapter, the high capital expenditure of heavy or light rail systems (up to 50 times as expensive as the same amount of transport kilometres for buses) make it very difficult for developing countries to follow them through. Penalosa knew that additionally, in Bogota's case, the completed Metro solution would only serve around eight percent of the city's public transportation demand, and that the rest of the people would still be reliant on buses. Hence, with or without Metro, the main mode of transportation in the city would have continued to be a network of buses. Not only for this reason, but also in order to redesign public spaces and enhance the quality of living in a city that had been plagued by economic difficulties, crime and inequality, Penalosa decided to completely revise Bogota's urban development strategy, a move that was desperately needed in regard to urban transport in Bogota that was characterized by severe congestion, high levels of pollution, poor road conditions, incredibly long travel times and human fatalities due to traffic accidents and on the street fighting for customers²².

When Penalosa took office, he did not ask how transport and life could be improved for the 30 percent who owned cars, but wanted to know what could be done for the wellbeing of the

²² Hidalgo summarizes the system before TransMilenio presenting the following facts: weak control and supervision, oversupply of buses with high congestion levels, inadequate vehicle size, obsolete fleet management, long and winding routes with inefficient operation, lack of vehicle and infrastructure maintenance, high number of accidents and high level of emissions, very low travel speeds and high competition in the market with on the street fighting - penny war or *guerra del centavo* (Hidalgo 2007)

70 percent who did not own cars. TransMilenio, a comprehensive BRT system, became the backbone for his urban renewal initiative. Together with integrated land-use planning and schemes to restrict private car use and stimulate public space improvements by creating a large number of parks, pedestrian avenues and crossings, as well as dedicated cycle pathways, TransMilenio would completely change urban living in Bogota.

As Cain et al. (2006, p. 9) point out, “he envisioned the new bus system as being the centerpiece of an overarching mobility strategy that would encourage non-motorized travel, discourage private vehicle use, and facilitate urban renewal through the redevelopment of the city’s public space”.

The TransMilenio design was basically modelled on Curitiba’s system, with a significant difference in scale as Curitiba is designed for a peak demand of approximately 14.000 pphpd (passengers per hour per direction), while the TransMilenio design would eventually allow for a peak-hour demand of up to 45.000 pphpd (Cain et al., 2006; Levinson et al., 2002; Menckhoff, 2005). In order to cater for this amount of passengers, Penalosa and his team had to implement very severe changes to the design of the city’s transport network. Essential in this regard was the construction of exclusive bus-only lanes, some of which were designed as double lanes for express buses that would bypass certain stations. Together with same-level boarding stations where passengers pay their fare using a smart card before they enter, hence passengers can board using all doors, this design allows for minimum waiting time at stations while maximizing the speed on the road. In addition, TransMilenio decided to widely use innovative articulated buses that are made to fit up to 160 people, thus further increasing travel speed per passenger.

Angelica Castro who was there from the very beginning of the project, confirmed that a 30km trip in Bogota before the introduction of the BRT system in 1998 would have taken about 2 hours 15 minutes, while the same trip today will take 55 minutes (Eckerson, 2008). After just five months of operation, studies showed a passenger acceptance level of 88 percent and the number of fatalities from traffic accidents had been reduced by 93 percent (Lee, 2003).

Interesting about the fare is that passengers do not pay on the green feeder buses, which are totally free, but only pay by swiping their smart card when transferring to a red trunk lane bus. By the end of 2001, the system carried 800.000 passengers per day with 62 stations on 41 km dedicated busways, using 470 articulated buses and 300 feeder buses operating on a route of 125 km (Jorge Rogat & Hinostroza, 2007). Today, TransMilenio serves 1.4 million passengers per day at 114 stations, using 84 km of dedicated busways and 1071 articulated as

well as 411 feeder buses on a route of 504 km (TransMilenio, 2007). The average travel speed of the buses is 28 km per hour, on some lines however the average speed is up to 40 km per hour (Eckerson, 2008). When it is fully developed in 2020, TransMilenio will serve 5 million passengers per day along 388 kilometres of main lines on 22 corridors, while 85 percent of the area of the city will be within 500 meters distance of any trunk line service and the rest covered with short distance feeder services (Diaz, 2006; Lee, 2003).

Another major component of Bogota's integrated transport solution are the various disincentives to car usage, including higher fuel taxes, on-street parking restrictions, full car-free days, and a scheme that restricts 40 percent of the city's private vehicles during peak demand periods using the last number plate digit (Lloyd Wright & Hook, 2007). The later scheme, with a public support rate of 93 percent, has helped to reduce average trip time by about 21 minutes while gas consumption went down over 10 percent (Diaz, 2006, p. 209). The long-term goal, which is widely supported by Bogota's citizens, is to ban the use of all private vehicles during peak hours starting in the year 2015 (Jorge Rogat & Hinostroza, 2007).

The single most innovative aspect of TransMilenio, and one that is contributing heavily towards a concept of urban sustainability as defined in chapter 3, is however the fact that the city created a 340 km long and growing bikeway system, which is fully integrated into the bus network (Whelan, 2007). Designed as a truly inter-modal transportation feature, the state of the art bike lanes and the various bike parking facilities at major bus stations, some of which have a capacity to securely park up to 750 bikes, allow users to ride their bike from home to the next bus stop and back (Eckerson, 2008). The TransMilenio management believes that for every 25 people biking to a station, one green feeder bus can be taken off the network²³, saving money, reducing congestion and pollution, and enhancing people's health and wellbeing (Naparstek, 2007). Increasing the number of people that are using a bicycle has always been one of Penalosa's principal objectives by redesigning Bogota's transport system, which has been achieved setting an encouraging example for other traffic and pollution plagued cities across the continent and in the world. The percentage of bike riders has increased impressively, from 0.3 percent before 1998 to 4.4 percent in 2006 (Diaz, 2006, p. 219). Moreover, bicycles, considered symbols of equality, connect people and integrate

²³ "For every 25 people who ride bikes to the terminal," Gil Penalosa, the brother of the former mayor says, "that is one less 'feeder bus' we need to run through the neighborhoods. You do the math and pretty quickly you see it makes financial sense to set aside some space and hire a security guard to help people to ride their bikes" (Naparstek 2007, p.1).

citizens, while cars tend to be used as a means for social differentiation. In fact, I want to emphasize here again that making use of human energy in form of bicycle and walking solutions is the ultimate approach for sustainability, both from an energy consumption point of view as well as in terms of social integration. Developing cities that are lacking the funds to finance a capital-intensive Metro or light rail system will certainly be wise to invest in a comprehensive BRT system, but ultimately the labour-intensity of a wide bus network coupled with rising income levels will certainly provoke financial challenges further down the line, while keeping in mind that any sort of fossil-fuel or electricity consuming transport solution appears within a world of finite resources. However, an intelligent BRT system such as the TransMilenio that also redesigns public space and fosters the feeling of community is a very good first step in the direction of urban sustainability.

Looking at the costs of the TransMilenio, we see the assumption confirmed that BRT systems are cheaper than light or heavy rail solutions. The total investment for TransMilenio at the end of 2016 is estimated to be US\$ 1.97 billion, calculating to a total cost of US\$ 5 million per kilometre, a figure that would be around US\$ 100 for a Metro system (Lee, 2003).

Furthermore, the investment for the BRT system includes all of the public space improvement, including pedestrian zones, sidewalks, and plazas, all of which enhance citizen's wellbeing, raise the image of the city and attract talented people. Especially for citizens with poor living standards and little private space in small accommodation, public space is where creativity, freedom and joy are experienced. In parks, people meet as equals and the green open space is essential for physical and emotional health of citizens. Penalosa had primarily the fight against inequality in mind when he started what got called Bogota's 'intellectual renaissance', which saw the city build or improve 1.200 parks, over 100 nurseries, 51 schools and 14 libraries in the process of urban renewal while involving local citizens directly in policies and recovering space for pedestrians, cyclists and people rather than cars²⁴ (Whelan, 2007).

The TransMilenio system has been designed and implemented following a set of guiding principles based on *respect to life* – reducing fatalities due to traffic accidents and minimize harmful emissions; *economise users' travel time* – reduce average trip time by at least 50 percent; *respect for diversity* – enable full access for young, elderly, handicapped and all income groups; *quality and consistency* – deliver a regular and punctual service with the use

²⁴ For a comprehensive presentation of the changes in public space in Bogota with a lot of photographic evidence go to <http://www.itdp.org/documents/Penalosa%20and%20Bogota.pdf>

of advanced transit technologies, new buses and improved stations; *affordability* – government is able to provide infrastructure and the private sector can recover costs and make a profit without subsidies while the users pay a reasonable fare (Jorge Rogat & Hinostroza, 2007, p. 284). As Rogat and Hinostroza et al. (2007) show, the objectives expressed in these principles have already been widely achieved considering the 92 percent reduction in fatalities, the 32 percent decrease in average journey time, the 98 percent acceptance level among the public and the affordable fare at the equivalent of 40 US cents²⁵. In comparison to the year 2000 where 88 percent of citizens argued that personal security on public transport is bad or very bad, and 76 percent complained about the very bad air quality, these figures have been reported to be down to 12 and 19 percent respectively in the year 2005 (Ardila-Gomez, 2008). Furthermore, 15 percent of TransMilenio passengers previously commuted by private car, another prove for the success of the system's schemes (Menckhoff, 2005). These positive results of Bogota's urban renewal strategy have drawn worldwide attention, and the system is now used as an inspiration and benchmark for many urban transport developments around the globe.

Interesting about the TransMilenio is that it is set up as a gradual improvement of urban transport reality in Bogota, with seven project phases over the period of two decades. In the first phase, TransMilenio only served 16 percent of all passengers with new articulated buses on dedicated lanes with electronic ticketing and satellite-based communications. All other public transport still consisted of old, highly polluting buses that were privately owned, the route remained as per choice of the owner without any central planning, there were no time tables and the bus could stop anywhere while the fare varied from one bus to the next (Lloyd Wright & Hook, 2007). In a way, the typical old system of any city in Latin America with on the street fighting for customers, chaotic traffic patterns and high levels of accidents and fatalities in an unregulated market. Step by step, the centrally coordinated TransMilenio will spread to all parts of Bogota's transport network and eventually cover 85 percent of all daily trips by 2020 (Castro, 2008).

The secret to TransMilenio's success is quite simple. If we take a close look, we might identify apart from strong leadership and the formulation of a clear vision that the other essential part is the institutional integration and set-up, which allowed for a successful public-

²⁵ The 40 US cents fare means a cross-subsidisation of long routes, which are used by poorer citizens living on the outskirts, by short routes, which are used by the affluent, a fact that appears socially equitable.

private partnership development and high citizen participation. Mayor Penalosa created a new public sector agency for planning and supervision. This agency, the TransMilenio S.A. is responsible for the selection of private operators that carry out the ticketing, fare collection and operations side of the TransMilenio. A formal tendering process, taking into account experience, financial capabilities, price offer and the capability to maintain vehicles and guarantee qualified bus drivers, enables to choose the most appropriate and reliable partners on a concession contract basis for the public-private partnership initiative. Notably, almost all rail systems in the world require operational subsidies, while TransMilenio's private operators not only recover costs but also make a profit (Lee, 2003). As stated before, the government finances the provision of infrastructure, which is the essential part to any BRT system, while the operational part is financially independent and operators are compensated based on kilometres travelled. It can be concluded that strong supervision as well as effective control and law enforcement mechanisms at a Metropolitan level are absolutely essential.

All of the above characterize and explain the success of Bogota's TransMilenio.

After the TransMilenio photo box below (note the bicycle lanes and segregated busways), I will conclude with the lessons learnt from the experiences of Curitiba and Bogota in the next section before portraying and critically analyzing the TranSantiago system in the next chapter

Figure 7: Features of TransMilenio – Bogota’s BRT System

- Top: Exclusive Bus-Only Lane Double with Same-Level Boarding Bus Stop – Express Buses Need Not Stop at all Stations
Left: Exclusive Bus-Only Lane Single
Right: Bike Lanes and Public Space Redevelopment

Source: (Diaz, 2006)

5.3 Lessons learnt from the experience of Curitiba and Bogota

I believe that in reality, things are quite simple. In relation to urban transport, the kind of system that is implemented depends in its entirety on the underlying intention of the decision makers. Two fundamentally opposite objectives characterize the spectrum of intentions. Will the system be designed and implemented in a way that provides efficient mobility and access options for all, or will it be designed in order to minimize traffic jams and optimize routes and travel times for higher income groups and ‘important’ citizens. According to which of these strategies a municipality and transport committee lies its focus on, the subsequent transport solution will either increase public transit opportunities, create integrated pathways and cycle lanes, and reclaim public space for all citizens, or build more motorways, flyovers and tunnels, ring roads and intersections in order to supposedly decrease travel time for privileged automobile owners. Therefore, transport is not as much a technical as it is a political, a social issue.

The main question that should be asked in any analysis is who, at the end of the day, benefits from the policies adopted (Diaz, 2006). Lee (2003) reminds us that by looking at Bogota in particular, we come to understand that a low cost and less polluting urban transport system is achievable, that efficient and profitable operation can be provided by the private sector and that it is essential to create awareness and get public support for the initiative²⁶.

Wright and Hook (2007) also summarize the positive aspects of TransMilenio, going even as far as saying that Bus Rapid Transit is capable of generating civic pride and making a positive impact on the social capital of a city, and doing so by raising the level of access for all parts of society, but especially including the lower class and people with physical challenges. A statement that is confirmed by Angelica Castro, the general manager of TransMilenio when she says that “the name of our nation now is in the world and for good things, and TransMilenio is one of the best things that we have in the last 10 years” (Eckerson, 2008). Rogat and Hinostroza are in praise of TransMilenio’s contribution to reducing GHG emissions in the city by encouraging a modal shift, renewing the bus fleet, increasing the capacity of buses and the operating conditions for them, centralizing the bus-fleet control management, introducing pre-paid fare technology which streamlines the boarding process and reduces bus idle times and, in the process of all of these measures, also reducing GHG

²⁶ TransMilenio operated free of charge for the first three weeks, so that passengers could become acquainted with the system and develop a sense of ownership

emissions of other vehicles in the city due to improved overall traffic conditions and flow (Jorge Rogat & Hinostroza, 2007). However, and in spite of all the positive attributes of the BRT experience in Bogota and Curitiba, there are major challenges that first need to be considered when embarking on an urban transport renewal strategy with BRT as a key function.

First, buses still remain to have a rather low image in the eye of the general public, with frequently voiced doubts by citizens and urban planners as to the attraction of car users, the slow and low capacity service as well as the pollution factor. Therefore it is absolutely essential that the transport strategy's design plan consists of sound communication with all institutions, state of the art information with facts and details, and profound education of the general public in terms of the real implications of a BRT system. Rapid public acceptance is key to success and will simultaneously lead to positive political benefits.

Second, the implementation is a very complex affair and requires competent planning and, again, very strong political and institutional leadership. Changing a city's transport model can be compared to an open-lung operation of a human being, with a comparable level of impact on the 'organism' as a whole. TransMilenio for example has been carried out as a project in phases, where the old system will be kept in place alongside the new one until the capacity and framework of the BRT mode has reached its final stage covering the whole city in 2020. In contrast, as we will see in the next chapter, Santiago's project approach was designed for a 'big-bang' event, where all of the city's public transport modes were to be changed from the old to the new system literally over night.

6. TranSantiago – Santiago de Chile’s Urban Transport Overhaul

“TranSantiago is widely viewed as one of the biggest crises to strike Chile since democracy returned in 1990”.

Bill Vincent (2007, p. 3)

In this chapter I will portray and analyse the renewal of Santiago de Chile’s urban transport system, a project known as TranSantiago. While looking at the political and institutional setup and implications of the project, I will also consider the technical aspects in detail in order to prepare a comprehensive analysis of the design, the implementation and the outcome of the TranSantiago process. Starting with the history of urban transport in Santiago, I will additionally integrate the role of Chile’s political economy into my analysis. The final part of this chapter will portray my embodied observation findings, which lends this analysis the appropriate balance between a third and first person perspective.

6.1 History of Urban Transport in Santiago

Up until 1979 the Chilean government had operated a state-owned monopoly public transport system where the authority defined bus routes, frequencies and fares, and which was characterized by immense overcrowding and a low diversity of services (Fernandez & Munoz, 2007; Gschwender, 2005). Spatial coverage and accessibility, however, were perceived as reasonably good (De Cea & Fernandez, 1985). In the wake of Chile’s free-market policies that followed Augusto Pinochet’s regime from 1973 onwards, the transport sector was completely deregulated and privatized with the hope that competition in the market would lead to lower fares and higher quality of service. Fernandez and Munoz (2007, p. 27) state that “public authorities believed that free entry and the consequent competition would be an incentive to production efficiency and cost reductions and would therefore lead to fare reductions, with only the most efficient operators able to survive“. As a further result it was hoped that air pollution and traffic congestion would also be reduced. Consequently, the bus sector was liberalized in 1979, private firms were allowed free entry into the market, were able to establish new routes, and in addition were allowed to set fares freely as of 1983. In fact, even the practice that operators had to apply for an authorisation by the Transport Ministry was abandoned in 1988 and any bus passing a mechanical test could compete in the system without any restrictions at all (Gschwender, 2005). For the following two decades

from 1979 the average firm size varied around 1.5 vehicles with several thousand individual operators competing in the market (Fernandez & Munoz, 2007).

In the late 1980s, however, it could be concluded that none of the goals set out in the deregulation policy a decade earlier had been achieved. Although the public transport fleet had increased twofold, actual transport capacity had been reduced. In real terms the fare had more than doubled and traffic congestion as well as air pollution had significantly increased. The public opinion had become totally negative, in spite of the fact that route density and frequencies had increased and walking distances were reduced. An interesting side effect of the government policies was that the group of operators had developed an ever-strengthening position in Santiago's urban political affairs. In 1991, given the poor results, it was decided to no longer uphold the liberalisation experiment and instead implement a concession system that would see a transit authority regulate the routes and frequencies of buses while a competitive tendering would determine the tariffs in an auction system with small operators (Fernandez & Munoz, 2007; IADB, 2003). In a way, an effort was made to move competition from the streets of Santiago to a competitive tendering process (Gschwender, 2005). The operators' cartel, however, had such a dominant position that it managed to counter those efforts with the result that high uncertainty in terms of travel and waiting times remained a reality while the number of accidents on the streets actually stayed the same.

From 1991 onwards the free market tendering of routes led to improvements in relation to frequency and coverage. However, it also resulted in an uncontrolled growth in the bus fleet and the number of operators. By the beginning of the new millennium, Santiago saw over 4000 small businesses compete in the public transport market, with an average fleet of less than 2 buses (Gschwender, 2005; Minteguiaga, 2006). Fatal accidents were still happening regularly on the streets due to bus drivers, who's income depended to a large extent on the revenues generated, competing for customers – the so called “guerra del centavo”.

Furthermore, the mini businesses were not able to guarantee fair employment and social security while compliance with regulations and the law was non-existent. Economies of scale were literally impossible to achieve under such a system, and the city suffered again from high air pollution and tremendous traffic congestion. In the mid 1990s, facing this appalling urban transport situation, the centre-left Concertacion government under President Eduardo Frei commissioned the PTUS, the Santiago Urban Transport Plan for 2010, and although nobody had ever used the issue of sustainable transport as a political platform before, from

then on every presidential candidate had an articulated vision for Santiago's transport system.

Empirically, the case of Santiago shows that deregulation and liberalization provide no guarantee for a public transport success in terms of fare price and service delivery. Estache and Gomez-Lobo (2005, p. 142) remind us of the general perception "that the liberalization experience has demonstrated that there are indeed limits to competition and that the industry is characterized by many market failures that require regulatory intervention". A conclusion that is in line with the findings of the Club of Rome report 'Limits to Privatisation – How to Avoid too Much of a Good Thing' that was published in 2005 and is in favour of private initiatives in the public transport sector but only in regulatory partnership with public institutions (Von Weizsaecker, Young, & Finger, 2005). Since the end of the last century the Chilean state has been returning firmly, making efforts to regulate and facilitate modal integration. These efforts have lead to the PTUS and finally the TranSantiago.

6.2 TranSantiago – Objectives and Challenges during Design and Implementation

*TranSantiago was an unnecessary self-inflicted injury.
Luis Willumsen (2008, p. 23)*

6.2.1 TranSantiago – A Transport Vision for Santiago?

To understand the TranSantiago as a process it will be useful to describe first of all the Santiago Urban Transport Plan (PTUS) out of which the TranSantiago has grown²⁷. In its overall approach the PTUS consisted of a dozen different programs, symbolising somewhat a first attempt to deal with urban transport as an integral system. The programs were meant to re-organise different aspects concerning transport like housing, commercial issues, non-motorized modes, institutional et cetera. In regard to sustainability the most important objectives in the plan were to reduce the number of cars on Santiago's streets (or at least stop the ongoing increase), to encourage and stimulate the use of non-motorized means of transport, to initiate smart growth projects such as relocating schools, as well as to invest primarily in public transport infrastructure and the renewal of the bus fleet (Henriquez, 2007; Lanfranco, 2007). The PTUS aimed to improve the quality of life in Santiago by satisfying the

²⁷ In 1994 President Eduardo Frei already commissioned an Urban Transport Plan for Santiago entitled 'Plan de Desarrollo del Sistema de Transporte Urbano Gran Santiago 1995-2010' but nothing of that vision was actually implemented.

mobility necessity of the people with an efficient public transport system under conditions of fairness, quality and security while being environmentally sustainable (Quijada, Tirachini, Henriquez, & Hurtubia, 2007). Citizen participation was considered a key instrument and essential element of that plan.

As far as the objectives of the PTUS are concerned, the plan sounded truly commendable, to a certain degree even visionary. In 2003 the PTUS disappeared from the public sphere and was changed to TranSantiago²⁸. The plan was based on the metro as the backbone of the system. Supplemented by a quality bus service that would be operated by private companies, with segregated bus corridors and interchange stations as well as user information centres and a smart fare collection system that allowed total fare integration, the system was meant to totally transform public transport in Santiago.

At the end of Lagos' presidency in 2005 it was clear, however, that really only two of the programmes were advanced and promoted; the construction of automobile express-highways in public-private partnerships and the extension of the Metro network. Most plans for a sustainable approach to restructuring urban transport in Santiago like the creation of bike lanes simply disappeared. As Oscar Figueroa told me, the PTUS was fully proposed in August 2000 but then for eighteen months nothing at all happened and none of the programs were implemented (Figueroa, 2007). From a managerial point of view the plan was not very well thought through, as it had all the maths and the engineering models how to set up the system perfectly worked out, but had severely neglected the project management side in terms of how to implement and carry out the plan. Not only was the project always late in regard to milestones, for example the tender for operators was done far too late and too hastily, but the essential investment in surface transport infrastructure was also missing.

6.2.2 Lack of Infrastructure Investment – Reasons and Consequences

Although Lagos proclaimed as Public Works Minister in 1996 that his priorities were first of all to improve public transport and to create exclusive segregated routes for buses along designated corridors across Santiago, and although at the beginning of his presidency in March 2000 there were no budgetary constraints apart from the Costanera Norte highway, President Lagos initiated all the necessary steps to commit most of the available funding for transport projects to the construction of more express-highways and the extension of the

²⁸ Different agencies were hired by the commission to come up with the best name for the plan, and finally, after another name had already been chosen, some Ministers successfully pushed the name TranSantiago.

Metro without leaving any money for building surface public transport infrastructure that is essential for improving the bus service (Henriquez, 2007). President Lagos gave the answer himself in a press interview when he said that it was preferable to invest in the Metro even though it was significantly more expensive²⁹ (Flores, 2008). In fact, it is argued among transport experts in Santiago that the initial design of the TranSantiago, at least the essentially important bus component, was put upside down and changed from an approach of what kind of system is needed in Santiago in order to deliver a quality service, to an approach that dictated what kind of system was affordable with the available limited funding (Figuerola, 2007; Henriquez, 2007; Jara-Diaz, 2007; Lanfranco, 2007; Quijada et al., 2007). Essentially it was the bus component of the integrated system that had to cope with the lack of infrastructure funding. The Metro expansion and the express-highways had been allocated the necessary funding with the bus system being left behind. As a consequence, the original design for the bus component that would mimic the success of European approaches and work like a star pattern of separate bus only corridors transecting the city and a feeder service between the trunk routes had to be reduced to a half-hearted approach with only a fraction of segregated bus lanes put in place due to financial constraints. Following the project through with this paradigm, it was clear that the reduced financial cost would have to be covered by an increase in social costs in terms of higher waiting and travel times, less comfort and more insecurity. As Flores (2007, p. 2) argues, “what Chileans are not paying with a higher fare is being paid in other ways”. Despite the fact that the system was supposed to cater primarily for households with a lower family income, those that were to benefit the most from TranSantiago ended up being particularly disadvantaged. People that have no other choice than using public transport have to pay the additional cost in terms of less comfortable trips, longer waiting and overall trip times as well as long walks to transfer points.

As I have shown in chapter 4, the main components of an integrated urban transport system are physical, operational and fare integration. TranSantiago’s functional scheme only supports some of the necessary integration steps and has therefore major deficits, mainly in the form of missing exclusive segregated bus lanes and the problems related to the bus fleet management and control with a GPS based system. German Correa, the former General Coordinator of TranSantiago, gave a brief outline of the situation at the start of TranSantiago and the main reasons behind the difficulties saying that the system was lacking a sufficient number of trunk

²⁹ Investment necessary to achieve one additional trip stood at US\$ 4.27 while the same additional trip for surface transport required an investment of US\$ 0.65 only, with an additional trip per car, under similar assumptions, needing an investment of US\$ 6.90 (Flores, 2008).

line and feeder buses; had badly designed contracts put in place that contained counterproductive incentives not encouraging bus drivers to actually carry people; had to function without the essential Centre for Bus Fleet Management and Control as this had been eliminated during the final days of the design phase; had to work without an extensive network of exclusive and segregated busways; did not offer intermodal transference stations; hadn't put in place pre-payment bus boarding zones and was generally lacking hundreds of bus stations while an information system for users and operators was missing completely (Correa, 2008). The most critical aspect of an integrated transport system's bus component, which in Santiago's case makes up more than 40 percent of all motorized journeys, is of course bus travel-speed. The faster a bus can travel along its route, the less buses need to be servicing the network and operational costs can be reduced significantly. In that regard segregated bus lanes are absolutely essential, and without them a bus system is bound to fail delivering the service it is supposed to. As Willumsen (2008) concluded, a trunk-feeder service like TranSantiago may only improve services if there is sufficient investment in the trunk infrastructure and good operational design.

In addition, merely 100 of the proposed 1500 points for buying and recharging the contactless bip! smartcard were functioning and all of them in Metro stations only. As we have seen in the section on TransMilenio and the system in Curitiba, pre-payment of fares through designated station infrastructure is of paramount importance for the speed and quality of a BRT system. TranSantiago, in its initial stages, had planned for those pre-payment facilities that would enable the boarding of buses from all doors and result in reduced waiting times, but the investment was discarded before the implementation for various reasons. Therefore, for the first few weeks after the inauguration of TranSantiago, a precarious infrastructure with barriers and card-readers that had to be removed overnight was installed at several overcrowded stations (Flores, 2007). This half hearted payment infrastructure was in fact a good representation of the overall approach with which the TranSantiago project has been carried out.

The failure to build the necessary surface infrastructure in the form of several segregated and exclusive bus lanes as well as pre-payment boarding stations can be seen as the single most important technical reason for the disastrous first year of the TranSantiago. Although German Correa emphasized in a recent presentation that properly speaking TranSantiago is not a Bus Rapid Transit model (Correa, 2008), the bus component of the overall Integrated Public Transport System is of such importance that it has to be subjected to the same principles and scrutiny as if it aimed to be a fully working BRT. The consequence of all this was huge public

discontent due to the doubling of travel and waiting times, the significantly longer walking distance to bus stops and the dramatic overcrowding of the Metro because people were not only charging their bip! cards at Metro stations but were also unsure of the frequency and timing of the surface bus service, which meant they were forced to rely mostly on the Metro. The situation even escalated at certain days and resulted in citywide riots and protests. Furthermore, private car use increased dramatically with congestion levels going up while the average fare evasion amounted to 40 percent and support for the government plummeted down (Correa, 2008). Those immediate consequences stated so far are significant, but the deeper impact of the TranSantiago failure was painfully reflected in people losing their jobs due to work absenteeism or regularly arriving late, as well as in the fact that businesses were losing a large amount of revenue and that people were living generally more stressed and had less time for their family, friends and social activities.

Although the real fare did not increase, taking into account the integrated fare structure, the reality of higher wait times and longer walking distance to bus stops gave a clear signal to Santiago's citizens and indirectly implied that it would be wiser, now that fewer buses were on the roads and congestion levels reduced, to purchase a car in order to avoid having to use TranSantiago. In this context I was challenged by Patricio Lanfranco to find a single transport engineer that claimed that the TranSantiago system would work the way its design had been changed one year before the implementation. As a matter of fact the scenario had changed from initially 6000 buses to then 4000 buses as the available number of buses that the TranSantiago would consist of, a step that was necessary in order to allow the operational level to auto-finance itself without the need for government subsidies. Some of my interview partners even argued that on the day of its inauguration the TranSantiago was actually operating with as few as 2000 buses.

Another mistake can be found in the failure to talk about real goals and measurable indicators. Rene Cortazar, the Transport Minister, as well as other politicians always avoided to mention distinct goals in terms of travel time reduction, decreasing air pollution or any other significant indicator (De Grange, 2008). Rodrigo Quijada even told me that he had been following the news every day but that he "couldn't find a single lie in public announcements as they were as general in nature as possible" (Quijada, 2007). As a consequence, the public and the media were not aware of real indicators that would allow for a sound evaluation of the TranSantiago.

6.2.3 TranSantiago Finances – State Subsidy or Government Bailout?

TranSantiago has been running a monthly deficit of more than US\$ 30 million, and has to be bailed out by government financing schemes on a regular basis. For example, the government had to ask for a US\$ 160 million loan to finance the system from January to April 2008 alone, while the total cost for 2007 is estimated at US\$ 1.2 Billion, a fact that seems to confirm that Transport Minister Cortazar has not yet been able to lower the deficit and plans to improve the system have been a complete failure (Bolf, 2008a). Those bailouts are not considered to be a subsidy, although that is what they are in reality. A recent study has revealed that the TranSantiago would be able to operate without a loss and could keep ticket prices at their current cost of 380 Chilean pesos if the government approved an annual fixed state subsidy of US\$ 250 million (Cabezas, 2008). Looking at the financial loss figures it is no surprise that Oscar Figueroa suggested in my interview to close down the TranSantiago immediately, cancel all the contracts and redesign everything with the help of big infrastructure investment that could be financed with a bank loan³⁰ (Figueroa, 2007). At this stage I would like to remind the reader that most urban transport systems in the world do receive a government subsidy in order to guarantee a high quality service with a reasonable fare structure, and that due to the multiple positive economic, social and environmental externalities of a well-functioning urban transport system these subsidies are fully justified (Gschwender, 2007; Munoz, 2007). It is by no means utopian to expect a public transport system to be auto-financing the operation part, but without the implementation of the necessary infrastructure paid for by the state or at least by public-private partnerships, this expectation is truly impossible to uphold. If however, a sufficient number of segregated bus lanes were to be put in place, and the speed of buses on certain routes could be increased significantly, a large number of buses could be taken off the network and the cost of the system would drop drastically. Due to the financial debacle TranSantiago has turned into a very delicate political problem and the main reason is not technical but institutional. As a result, the government of Michelle Bachelet had to face the lowest approval rating among Santiago citizens with the popularity fallen to a low of 40 percent in February 2008 (Bolf, 2008c).

³⁰ TranSantiago will generate a guaranteed annual income of US\$ 300 million, and therefore it should be easy to get a US\$ 5 Billion loan which would pay for all the infrastructure projects.

In terms of fare prices the TranSantiago is not operating a truly sustainable model. The fare of 380 pesos off-peak and 420 pesos peak does certainly enable low income groups to extensively make use of public transport, however, the fact that all citizens get this low fare, no matter what their income level might be, has serious implications for the financing part of the TranSantiago. Recent studies in subsidy policies around the world have shown that it makes more sense to subsidize individual families and income groups rather than the whole system, in this context the transport system (Munoz, 2007). In a case study presented at the 2007 World Bank Transport Forum Mr. Gomez-Lobo demanded rightly that there should be more cooperation between transport specialists and welfare specialists to enable data based policy decisions and get the transport affordability pricing and subsidy system right (Gómez-Lobo, 2007). In my opinion, and in order to make the TranSantiago financing more sustainable, the financial authority should introduce higher fares in general, but put in place selected subsidy schemes for the lower income segments of Santiago citizens. By doing so, the total revenue created would be considerably higher and the financing more stable while at the same time it would be possible to cater for the ability of low income citizens to use public transport. This scheme is of course only second to the general necessity that I hold uncontestable, which is that the TranSantiago should be adequately subsidised by the government in general, taking into account all the positive externalities of a well-working public transport system.

6.2.4 Automobility and Air Pollution

As mentioned earlier, Santiago's growing upper middle class is spending its recently created wealth more and more on private means of transport as the drastic increase in car sales has shown. This is of course a natural phenomenon of the modernization cycle when governments do not intervene, but also, and in the case of Santiago more importantly, it is a sign of a non-working urban transport model that set itself as one main goal of the initial design plan to strongly encourage the use of public transport. For Santiago, however, this is a much more dramatic fact considering the high level of particulate air pollution. Quite regularly, especially in winter times, it reaches pre-emergency levels (consisting of any reading above 300 micrograms per cubic meter Ug/m³, whereas the WHO guideline for an acceptable level of particulate air pollution is 50 –90 Ug/m³ (Hardoy, Mitlin, & Satterthwaite, 2001; Kahn, 2006)). During these days the elderly and the very young, the two age groups most vulnerable to air pollution, are advised to stay inside. According to research conducted in 2005, the minimum number of deaths each year related to particle air pollution in Santiago is several hundred, with thousands of medical visits due to cardiovascular and respiratory problems (Bell, Davis, Gouveia, Borja-Aburto, & Cifuentes, 2006). One of my interview partners, Patricio Lanfranco from Ciudad Viva in Santiago even used the term 'collective suicide' in regard to the constantly high level of particulate air pollution and the many casualties and deaths directly related to it (Lanfranco, 2007). Although we might perceive the term as being too harsh, it is nevertheless known to all parts of society what the effects of our transport patterns are. On one of those pre-emergency days in May 2007, over 1.000 cars were fined for illegal driving, proving that even with regulations in place, many Santiaguinos do not trust and are not willing to use their public transport system (Hager, 2007).

Of course the extensive use of cars is not the only contributor to the bad air quality in Santiago. Access to clean burning natural gas from Argentina instead of having to use dirty petroleum fuels to power industrial plants, practices of environmental pollution by industrial factories as well as frequency of rain are the other main aspects that determine the seriousness of air pollution in Santiagos geographically unique valley. Nevertheless, the discouragement of private car use for the greater good of it's citizens wellbeing, both in terms of health issues as well as smooth traffic flow and general urban ambience, is a policy tool that is reasonably easy to implement with the necessary amount of political will. Here we come to the key concern in regard to congestion pricing, namely the lack of political will because it is people

with relatively higher incomes and political influence who predominantly own and use cars. A combination of an inner city congestion fee that discourages car usage in the city centre and regulations that gives buses right of way would certainly help reduce automobile air pollution.

The World Bank is also reported to be pressing booming cities in developing countries to use charging to curb exploding traffic growth, calling for cities in the developing countries to use charges to reduce fast-growing car use (Litman, 2006, p. 7). Examples of cities that have successfully implemented policies such as congestion pricing or area licensing schemes for their central business districts include London (details follow later in this chapter), Stockholm, Singapore and Hong Kong among others (Barter, 2000; Qureshi, 2007). Hong Kong and Singapore have started to introduce usage restraints very early in the process of its citizens' increasing private car ownership and restraint measures have been strengthened several times since then (Barter, 2000). The success of congestion pricing in the central cordon of London, which shows that congestion pricing is technically feasible and effective, and that it is possible to overcome the political and institutional resistance to such pricing, has inspired cities around the world to follow that example (Litman, 2006). Congestion pricing is a central instrument for New York City's grand plan to become America's most sustainable and green Metropolis and appears to be a very promising example for future urban development plans around the world (Defense, 2008).

Santiago's political class and urban planners should implement congestion pricing as soon as possible, however, especially when taking into account the recent development of residential towers in the city centre. These skyscrapers, planned for several hundred apartments and with multi-storey parking lots in the basement, seem to be promoting the use of private cars as a means for inner city transport. Where the urban space to cater for these cars comes from appears to be an unsolved question. The general social perception of cars seems to be based on the idea that if one wants to be considered modern and developed one would have to use a car. In contrast, cycling is not considered modern or cosmopolitan at all, though the flat grounds of Santiago would be an ideal place for using bikes. The environmental awareness that has been building up in Western cities over the years, and has even inspired the design of TranMilenio in Bogota with its integrated bicycle infrastructure, still has to emerge in Santiago.

6.3 Weak Institutions and Leadership – The Missing Foundation of TranSantiago

“Starting TranSantiago the way it did, it was a ‘Chronicle of an Announced Disaster’”.

Germán Correa (2008, p. 9), Former General Coordinator of TranSantiago

It is commonly agreed on that key to success in any project lies in the leadership capability and clarity of decision making of the project team. Whether the results and the impact of the project will be favourable in the eye of the evaluators is only of second interest, while the first assessment will be done in view of the structure and set up of the project team in relation to the ability and the actual process of carrying out the project. In this regard, the TranSantiago must clearly be evaluated as a failure from the very beginning. The justification for this statement lies in the fact that neither an institution nor an individual had actually been transferred the status of an authority within and over the project, thus leaving the decision making process in lack of clarity and turning the essential leadership role of the General Coordinator of the TranSantiago into a de facto hypocritical farce. In contrast to Curitiba and Bogota, which have both benefited from highly committed and enthusiastic mayors who made public space and public transport a priority, such a figure has clearly been missing in Santiago. Furthermore, the legal tender process for the important role of the Financial Administrator was very badly conducted, and in a hurry, while the crucial function of the planned Centre for Bus Fleet Control and Management was eliminated altogether at the end of the design process (Correa, 2008, p. 14). In contrast to most European cities, Santiago has no authority comprehensively responsible for public transport, and responsibility for planning, operation and regulation is shared among different ministries³¹, municipalities and technical offices (Gschwender, 2007, p. 95). All this left the TranSantiago without the necessary stringent institutional organisation and resulted in a complicated and mostly missing overall coordination. A fact that epitomizes the aforementioned is that German Correa, the chosen General Coordinator of TranSantiago had no independent power and his signature had in fact no value. Decisions concerning the TranSantiago were subject to the approval of different Ministers that had equal power, and therefore the decision making process was extremely slow and contentious in nature (Figueroa, 2007). As Fernando Bustamante metaphorically put it before the Investigative Commission, “German (Correa) could not even buy a coffee” (Quijada et al., 2007, p. 23).

³¹ Financing of new road infrastructure for example is decided by at least three ministries, namely transport, public works as well as housing and urban planning.

TranSantiago has been administered and controlled centrally, and therefore it has been extremely difficult to respond in real-time to problems such as the wrong predictions of excess demand. In fact, the calculations that were used for the TranSantiago project are based on the modal share survey (Origen Destino) of 2001, and the updated version of 2005, and are considered to have a very high margin of error. Hence, in the first few days the system was heavily underdeveloped with at least a thousand buses missing and people angry and disillusioned as they waited for buses to arrive. There have been major incidences such as waiting passengers simply stopping and forcing not-in-service buses to pick them up, or drivers had to change their route as they were forced by customers to deliver them to a certain bus stop (Flores, 2007).

Speaking about the institutional sphere and taking a lesson from what went wrong at the start of TranSantiago, I totally agree with Gschwender (2007) that it would be immediately necessary to create a regional transport authority that is responsible for the planning and implementation of both public and private transport policies, strategic plans and projects while this authority should also be responsible for the non-motorised modes and for urban planning and land-use issues at the regional level. This would certainly bring some urgently needed clarity and focus into urban affairs of Santiago. At the moment, to repeat it again, no single political authority responsible for transportation in the entire city of 38 municipalities exists (Gschwender, 2007).

6.3.1 Importance of Stakeholder Participation – Simply Ignored

It is also argued that the bad results of the TranSantiago were to be expected from a system that was planned by a group of public servants and transport engineers, all of whom pretended to know what is best for the people of Santiago without even consulting any of the multiple stakeholders involved (Flores, 2008). I have previously explained in detail the importance of widespread citizen participation in and, to a certain degree, ownership of a public transport renewal project if such an endeavour hopes to be a success in the eyes of the entirety of a city. Particularly in a project as comprehensive as the TranSantiago, the outcome and impact of which being felt on a day to day basis by most citizens, continuous stakeholder participation in the planning, design and implementation phase is essential for public support, political stability and overall improvement of life in the city. In contrast to other examples in Latin America, officials in Santiago adopted a top-down approach, designing and planning

TranSantiago without the participation of the population and this might be a significant reason for the lack of acceptance and troublesome implementation (Jorge Rogat & Hinostroza, 2007). Patrizio Lanfranco, my interview partner from Ciudad Viva, proclaimed that most of the people involved in the design and implementation of the TranSantiago had never understood the real nature and challenge of public transport as they themselves had never used it. He said that their only exposure to public transport was through their car windows, and that is how they witnessed the TranSantiago failure also (Lanfranco, 2007). Rodrigo Henriquez argued in the same direction that the people behind the design of the TranSantiago had a wrong conception of transport as they misunderstood the inelasticity of demand and had no experience of what needed to be improved (Henriquez, 2007).

Another interview partner who would not like to be identified in regard to this specific statement criticised the fact that only Chilean transport engineers and public servants were involved in the design and implementation of TranSantiago without consulting foreign experts that had extensive experience. Mr. Lanfranco criticised in the same context that although the Chilean government went to Bogota to have a look at TransMilenio in 2003, they failed to meet and consult with Enrique Penaloza when he accepted the invitation by Ciudad Viva to come to Santiago and share his experience, a fact that shows ignorance and pride on the side of the government. Oscar Figueroa was also amused by the fact that most TranSantiago officials were on a road show in Europe to promote the public tender when the former mayor of Bogota came to share his experience and knowledge.

Finally, the problems that resulted due to the weakness of the institutional setup also point to a general weakness of the democratic structures in Chile. Rodrigo Quijada spoke of a testimony of Chile's weak democracy, not only in terms of citizen participation but also in regard to the failure of the Chilean media to report and analyse the TranSantiago process with more detail and scrutiny (Quijada, 2007). In addition, the media helped to create false and unrealistic expectations by reporting wrong numbers, for example was suggested that TranSantiago would consist only of new buses while it was always clear from the documents and public statements that at maximum 30 percent of all buses would be brand new ones. An investment in public infrastructure and space is always an investment in democracy and equity, and a well-functioning public transport system is of paramount importance for this (Lanfranco, 2007). The central planning of TranSantiago has also led to major difficulties in the way the feeder bus system has been put in place. As a matter of fact, the process did not include a consultation or participation of local mayors and citizens, and consequently the feeder network had severe deficiencies in terms of routes, frequency and location of bus stations, as

it did not reflect the realities of the various municipalities. Again, the centrally administered system was not able to deal with those problems in real time and efforts for improvement take a lot of time and resources.

6.3.2 Difficulties with the Tendering Process

Although various companies including Colombian, French and Spanish firms participated in the 2004 tender for the 14 bus operator concessions, it were the old Chilean operators who secured the concessions. According to Oskar Figueroa the old operators saw their chance to uphold their power by winning the public tender process, and in fact were not really interested in delivering a transport service but were only concerned with getting the contract (Figueroa, 2007). Since the commission gave guarantees in form of minimum income revenue to future operators, and since it was obvious that major infrastructure investment was not going to be available, most of the serious and respected foreign companies were well aware that the system would make losses and therefore their bid was much higher from the beginning. With no investment compulsion and a relatively good income guaranteed, the old operators took the opportunity to keep up their power in Santiago.

The financial administration role AFT was also subject to a public tender, and this badly designed process was also done very late and hastily, resulting in four private banks, one public bank and the private company Sonda winning the bid. The company Sonda also won the tender for the technical project management, or in fact the job was offered to the company due to time constraints. Transport professionals are well aware that fleet management is a very particular business that needs experience and confidence, two skills that Sonda did not possess (Quijada, 2007). The failure to provide a functioning GPS fleet control system is therefore no wonder but a logic result when a company that doesn't know how to do the job is chosen.

Another serious problem lay in the frequency of buses that was agreed on by the operators. Spot measurements carried out by the Ministry of Transportation revealed that on weekdays and rush hours the fulfilment was only at approximately 70 percent and fell to less than 35 percent during the night (Flores, 2007). Not only was the GPS satellite tracking system not in place, a story that could be analyzed separately and reveal a great deal of what went wrong from an institutional perspective in the whole project, but the essential Centre for Bus Fleet Management was not even put in place as it had been cancelled from the project altogether. It could also be interpreted that the operators themselves were in a way boycotting the TranSantiago from day one. Rodrigo Quijada told me that what was seen in the first month of

TranSantiago was a battle for the domain of the city, implying that the power dynamics were being played out between the state, the public and the cartel of operators (Quijada, 2007). Without a working GPS system installed in all buses it was literally impossible to measure the actual frequency and number of buses on Santiago's streets, therefore the fulfilment of contracts could not be evaluated at all. Moreover, there was no incentive for bus operators to reduce wait times at stations as the revenue structure did not include a respective reward mechanism.

6.3.3 Geographical Challenge and Changing the Mindset

Geographically, Santiago suffers many of the problems of sprawling cities around the world: people tend to live in the suburbs, but still, the main commercial, cultural, educational and health care opportunities for the city's more than 6 million citizens can be found in the city centre area that stretches roughly from Las Rejas to Tobalaba station along Metro line 1, shaped in the form of a rectangle. As a consequence, this area is heavily overcrowded during the day and transport demand to and from there is very inelastic with peak hours in the morning and early evening. To change this to a more sustainable way the government should implement integrated transport and land use policies that aim to develop new decentralized urban areas by constructing multiple business districts on the principle of 'Smart Growth'. This development philosophy aims to find a balance between job and residence locations while connecting local centres by multiple traffic modes, in essence, a way of developing systems of land-use planning which reduce transport pressures and the need to travel while increasing economic and social opportunities.

TranSantiago was not a modification of an existing transport system but an inauguration and introduction of a completely new system. Whereas the old system required a transfer from bus to bus or from bus to metro for less than 20 percent of all trips (Gschwender, 2007), partly due to the lack of an integrated fare that would not involve having to pay a second full fare, the new TranSantiago system had a fully integrated fare structure and was essentially designed for a lot of transfers. Therefore, the old habit of boarding a bus and getting off at the respective end destination was impossible to keep up. Although the Chilean government tried to make this transition from one mindset to the other as simple as possible for all Santiaguinos, those efforts ended in a real chaos of wrong expectations and misinformation. All my interview partners confirmed that the citizens of Santiago were not well prepared for

the drastic changes in transport behaviour that the TranSantiago required.

Although the integrated fare made it much easier to travel in Santiago, the bip! smartcard also meant that people were supposed to upload credit and have it stored on the card, a practice that Santiago's citizens were not comfortable with in the beginning as they were used to a pay-each-time-you-board scheme.

In summary it is pretty obvious that politicians alone are to be blamed for the institutional disorder and mismanagement, the delay in the project milestones and the overall hectic and patchwork-like approach to the TranSantiago. Generally speaking, many of the current problems can be attributed to the pressure to rush the implementation due to the electoral cycle. Ex-President Lagos should be held responsible for the TranSantiago disaster according to most of my interview partners, as it would have been very difficult for President Bachelet to announce another delay of the inauguration by saying "let's wait until we have everything in place for a decent system and for the benefit of all". The report of the TranSantiago investigative Commission "criticises the weak economic design, the errors in defining transit zones, demand and number of buses required, and the delays observed in building needed infrastructure" (Flores, 2008, p. 1). It also states that the new system was launched before it was ready.

Before I portray and analyse the underlying investment priorities of the Chilean government it will be useful to mention again at this stage that although the TranSantiago is essentially a state-initiated endeavour, the project has been authorised and controlled by several institutions and ministries with sometimes competing interests. The publicly owned Metro for example is not accountable to any local authority but directly appointed by and accountable to the President of Chile³². In this regard, major decisions on the operational level as well as plans for an extension of the network are eventually authorised by the President alone. In addition, all the ministries (transport and telecommunications, public works, and housing and urban development) as well as coordinating authorities (TranSantiago, SECTRA and CONASET) that are responsible for the implementation of transport policies, plans and projects are directly accountable to the President of Chile, which makes him or her the key figure for all transport initiatives in Chile (Gschwender, 2007, p. 100).

³² Although in 2005 the Director of the Metro initially opposed the TranSantiago model that aimed at integrating the fare and guaranteeing revenues. After the intervention of the President the Metro was ordered to accept the new system.

6.4 Modal Share, Investment Priorities and Social Equity

It will be interesting at this stage to portray the findings of the 1991 and 2001 studies of transport use and modal share in Santiago (EOD, 2001; Minteguiaga, 2006). While more than 10 million daily journeys by motorised mode were made in 2001, this figure was only 5 million a decade earlier. The largest increase was by far the usage of private automobiles, which more than doubled from a share of 18.5 percent to 38.1 percent. At the same time, usage of public buses decreased from 59.6 percent in 1991 to 42.1 percent in 2001. The general pattern was clear: more and more people were changing from public to private means of motorized transport, a fact that is also evident in the continuously rising sales figures of new cars as stated previously and the number of private cars in Santiago having already quadruplicated between 1977 and 2001 (Gschwender, 2005).

Flores (2008, p.2) argues that the “TranSantiago was going to be for the poor inhabitants of the capital what the Costanera Norte expressway was for its rich car-driving inhabitants”. However, US\$ 1.7 Billion were spent on building 200 km express-motorways, which are used by 38 percent of all motorized trips in the city, and US\$ 2.2 Billion were invested in 40 km of Metro subway, which makes up only 7.4 percent of all trips, while a mere US\$ 350 million were invested in the mode that accounts for 42 percent of all trips made in the capital, namely surface public transport (Flores, 2008). Oscar Figueroa confirmed that there has been very poor public involvement in terms of infrastructure investment, as plans to allocate money to surface transport projects were always rejected in the year 2000 when funding was still available (Figueroa, 2007).

Lanfranco illustrates this disparity very sharply, when he compares the per capita public investment for each transport mode (Lanfranco, 2006), see figure 8. He calculated in 2006 that government funds spent on the Costanera Norte expressway amounted to US\$ 320 million, which divided by 195.000 daily users equals a per capita public funding of US\$ 1.641. The Santiago Metro received public funds of US\$ 2.100 million, which divided by 660.000 daily users amounts to a per capita public funding of US\$ 3.182. Finally, the TranSantiago project received government investment of US\$ 66 million only, which divided by 4.3 million daily users equals a per capita public funding of US\$ 15.

Figure 8: Per Capita Public Funding in Santiago per Transport Project

Project	Public Investment US\$	Daily Journeys	Per Capita Funding US\$
Costanera Norte:	320 million	195.000	1.641
Metro:	2.100 million	660.000	3.182
TranSantiago:	66 million	4.300.000	15

Source: Lanfranco, 2007

This obvious disparity becomes even more serious when we take into account the findings of the 2006 CASEN household survey, which showed that 68 percent of households in the Santiago region did not have a car at all (Flores, 2008).

The ten percent most affluent households in Santiago, which make 76 percent of all their trips in private vehicles, benefited the most from the excessive investment in and political momentum around expressway infrastructure projects such as Costanera Norte, while the 50 percent poorest households made 53 percent of their trips by bus and were left with the results of the TranSantiago system that was both substantially under-funded and badly designed (Flores, 2008).

To accomplish a more sustainable urban transport reality and to stop its ongoing decline in the modal split, it is crucial to improve public transport substantially while implementing complementary policies such as car parking restrictions, congestion fees and bicycle infrastructure. Looking at the figures, especially the Concertation government's investment priorities, one could argue that the promise of President Lagos that Chile would grow with equity was never going to be kept. Chile's income distribution remains to be a social challenge with the richest 20 percent of the population receiving 57.5 percent of the total income, while the poorest quintile only receives 3.8 percent of the wealth generated (Gschwender, 2007, p. 4). Another crucial aspect of the failure of TranSantiago is the fact that lower income groups of Santiago had to pay a huge social cost in terms of longer waiting times, longer journeys and general insecurity of mobility options. As a consequence, having to use public buses in Santiago has turned into a sort of stigmata with people waiting at bus stops without information if or when a bus will arrive, in the meantime feeling undignified while cars pass by.

Figure 9: TranSantiago Bus Service

Left: Repainted Old Bus to San Bernardo,
Right: Overcrowded Articulated Volvo Bus – OK?,
Bottom: TranSantiago Bus Caught Up in Traffic along Lira – Missing Infrastructure.

Source: The Author, 2007

6.5 Embodied Observation – First Person Perspective of TranSantiago

As I have explained in Chapter 2, the embodied observation component of my research helped me to generally understand the TranSantiago in an experiential way and brought me in direct contact with reality of the transport system. For a more specific approach to my embodied observation I decided to assume the following:

My journey was meant to represent a typical daily trip of a woman living in the southern parts of Santiago, likely to be from a rather poor background in terms of household income, working as a day care nanny for the children of a more privileged family. I assumed that the family and the children that she had to take care of were living in the northeastern outskirts of Santiago, supposedly a place where the upper class resides³³. Consequently I designed my ‘embodied observation’ around a journey from Primavera Road in the municipality of San Bernardo to the Berna Neighborhood in La Dehesa, municipality Lo Barnechea. This journey cuts across the core of Santiago, through Central Santiago and La Providencia, and helped me get a good picture of everyday commuting reality for hundreds of thousands of Santiaguinos.

6.5.1 From San Bernardo to Lo Barnechea – A Nannies Everyday Journey

My trip started on a Thursday morning from Primavera Road leaving “my house” at 8.15am, walking ten minutes to bus stop Ducaud esq. San Jose. From there I took trunk line bus 301e to La Cisterna Metro station. The bus arrived at 8.28, so a waiting time of three minutes. The journey to La Cisterna took 20 minutes, there was no seating left and the bus was filled to the last place, the roads in a bad condition and the air was very stuffy.

From La Cisterna bus stop I had to walk four minutes to the Metro platform and waited another three to take Metro line 2 in direction Vespucio Norte, getting off at Los Heroes. This trip took me 19 minutes. There was no seating again, the Metro packed to its maximum capacity. Some people were unable to board the train and had to wait for the next one to arrive. The air quality was even worse and stuffier than in the bus. At Los Heroes I took Metro line 1 in direction Escuela Militar. Waiting time for the Metro to arrive was three minutes and the journey to Los Leones took eleven minutes with the wagon being packed again and people literally fighting to get on. From Los Leones I had to walk nine minutes to

³³ The reality of urban segregation in Santiago can also be seen by looking at the motorisation rate per municipality. The Eastern suburbs are the richest in this context with a rate in Vitacura for example of 429.2 cars per one thousand inhabitants, while the Southern suburbs are the poorest with a rate in La Pintana for example of only 52 cars per one thousand inhabitants (the average in all 38 municipalities being 148.1) (Gschwender, 2007, p. 14).

the bus stop of trunk line 411 at Andres Bello esq. Nueva de Lyon. The bus arrived after three minutes and was filled with people so there was again no seating. This bus took me straight to Lo Barnechea bus stop at La Dehesa esq. Raul Labbe, but had to stop several times on the way due to heavy traffic congestion and the lack of a segregated exclusive bus line, so the journey took another 25 minutes. From there I walked six minutes to the bus stop for feeder bus C09 on El Roble esq. La Dehesa and had to wait three minutes for the bus to arrive. Then it took another ten minutes to arrive in the Berna neighbourhood where I assumed the nanny would work, arriving at the designated address after another two-minute walk. Arrival time therefore 10.26am, resulting in a total travel time of 2 hours 11 minutes.

For the journey back I decided to take the same route with the only difference that I would get off La Moneda Metro station to take trunk line bus 301 down to San Bernardo. This journey took 5 minutes longer, but I was able to get a comfortable seat on the old Mercedes bus.

Although this very example, from San Bernardo to Lo Barnechea, is one of the greatest distances possible on the TranSantiago, it is nonetheless a very likely scenario. The bulk of commuters might start a little further downtown and would not travel that far to the East, hence saving one or two transits and considerable time. Having said that, the total journey time that I have experienced and noted for the above case will most probably represent a usual scenario for the average lower class commuter. Juan-Carlos Munoz said in this regard that the main problem of Santiago is urban segregation, with low income groups living far away from where they work, while a reasonable travel time to expect from citizens to anywhere in Santiago would be around one hour (Munoz, 2007).

6.5.2 General Observations

The bip! card is great and makes payment on the TranSantiago conveniently easy. I was quite amazed how well the card worked, and that it always calculated the right amount of permitted transits before a new trip was charged. However, I could only upload credit on the card at Bolleterias in the Metro or designated supermarkets or TranSantiago offices. These TranSantiago Informa offices are very rare in Santiago and so I didn't really make use of them. Practically, I always used the Metro Bolleterias to top-up my bip! card, and nearly everytime there was a long queue taking away space in the underground area and making it complicated for people to move around. On buses there was occasionally some waiting time to get on and swipe the card. Although this waiting time was minimal, it would have

definitely added up from stop to stop to result in a considerably longer journey. Therefore, the introduction of pre-payment bus stop areas is of vital importance. Passengers would be able to board the buses through both doors, front and rear, and buses could reduce their waiting time at bus stops dramatically.

Several times during bus trips I observed that passengers would board the bus, swipe their cards without sufficient credit on them and then just look at the driver semi-apologetically and stay on. Of course it is not very straightforward to upload credit, as it is only possible down in the Metro stations or in designated supermarkets. Yet, bus drivers should definitely enforce payment more strictly and help bring down the reported fare evasion rate of up to 30 percent in April 2007 and around 12 percent in September 2007 (Setterfield, 2007).

At various bus stops, especially at La Cisterna, people simply boarded the bus from the rear doors while passengers were getting off, hence avoiding the obligation to swipe the card altogether. Although the TranSantiago administration announced controls on buses, the lack of a controlling system leads to Santiaguinos boarding buses, especially at busy junctions, through the back doors where there are no smart card swiping devices. This fare evasion could also be avoided by pre-payment bus stops.

The bus ride from San Bernardo was very uncomfortable as there was no chance of getting a seat and therefore I had to stand in the middle, holding on to the ceiling handles. The roads in the southern parts of Santiago seem to be generally in a very bad condition. Since the drivers have quite a speedy approach to their job, I had to hold on real tight to the handles in order to not fall down and there was no way that I would have been able to relax on the ride. The air was very stuffy and after a few bus stops in direction north the bus was completely filled and there was no more space for anybody to come on the bus. The bus ride was quite an exhausting experience.

On trunk line 411 I experienced the same situation as on 301. No seating was available and the bus was filled to its maximum capacity. The driver chased along the roads and there was no apparent system of ventilation and no circulation of air. The service on trunk line 301 was carried out with old pre-TranSantiago buses only, but personally I preferred the old buses to the new Volvo buses because of the cushioned seats, the larger seating capacity and the open window air ventilation. In the articulated Volvo buses the seats were made of hard plastic, seating capacity was very limited and a modern climate technology was in use that didn't seem to help a great deal. Moreover, the Volvo buses were going much faster, especially in the curves, and so it was difficult to remain standing calmly, and certainly impossible to relax.

I once fell over to the side in a moment of absentmindedness while not holding on tight enough to the handles. Patricio Lanfranco even called the new Volvo buses ‘animal wagons’ in comparison to the buses used in Bogota where citizens and experts had been involved in the design and selection process.

Another interesting observation was the fact that only on the old buses going south, the famous ice-cream sellers would come aboard and offer cheap ice cream, a venture that was highly appreciated by most passengers. At one point the 411 bus broke down and we had to get off after the bus driver had tried for a few minutes to restart the engine. However, I suppose this was probably just an unfortunate encounter that can happen on any transport system and was not representative of the TranSantiago as such, not minding the comments of some passengers expressing their anger about yet another break down.

Travelling on the Metro during peak hours, especially main line 1 along the CBD and La Providencia, is quite a challenge. From La Cisterna station to Los Heroes the Metro was completely filled. Changing to line 1, I had to struggle to get in a carrier at Los Heroes station, and found myself being pushed at all consecutive stations when people wanted to get out or in. The carrier was filled at all times to its maximum, with most of the passengers standing. The quality of the air was extremely bad. Getting out at Los Leones was another challenge, since as soon as the doors opened people were trying to get on without waiting for passengers to get off first. Moreover, after a few stops I found myself at the far end of the carrier wagon, and had to fight my way to the door with a determined “permiso” as my guiding expression. In reaction to that situation, the president of the TranSantiago, Clemente Perez, announced as part of the Metro in Action 2008 plan that there will be a ‘model passenger’ reward campaign, giving away 10 bip! cards worth 15.000 pesos each every day for a period of three months to those passengers who let others exit the train before boarding, give up their seats to pregnant and elderly persons, and refrain from sitting on the floor of the trains (Bolf, 2008c).

Having said all that, I must admit that I was highly impressed with the state of the Santiago Metro, especially the cleanliness of all stations and regularity as well as speed of the service.

Referring again to the embodied observation method and the experiential aspect to it, I want to write briefly about my energy constitution and inner condition during and after the journey. Riding on any urban public transport for more than two hours at a time, I naturally expected to feel exhausted in one way or another. However, in the case of TranSantiago I have to say that I felt extremely tired. After arriving at La Cisterna and boarding the Metro a headache

developed and wouldn't leave until after I had arrived at La Dehesa bus stop. Since there was hardly any seating at all, I had to stand upright and hold on to handle bars nearly all the journey long. Metro and buses were always packed with people, so there was no way that I could have possibly relaxed, read a book or just gazed out of the window. My body was constantly in a state of compulsion. Especially in the Metro I had to show a lot of patience with passengers that were pushing hard to either get off or on the train. During the whole journey I was actually hoping for a breath of fresh air.

6.5.3 Summarizing Comments

A system that aims to decrease pollution levels and does not provide facilities for cyclists is missing out on big opportunities, and might even be considered hypocritical in its entire approach from the perspective of an informed 21st century citizen that is legitimately concerned about the state of the environment and the effect on the global climate. Indeed, during my time in Santiago I found no apparent facilities for cyclists at bus stops, major interchange stations or Metro stations. There are very few bike lanes along some main streets in Santiago, but the overall provision of cycle facilities is totally negligible. A capital city of the size, the climate and economic assets of Santiago should certainly aspire for a greener and more people centred transport system than what the TranSantiago currently represents. The special bus only lines along Alameda were frequently used by cars, especially taxis, blocking up space at crossings and delaying travel journeys significantly. For a BRT system to function smoothly, the construction of truly dedicated bus only lanes is absolutely vital. Riding on the TranSantiago, a system that only has a few really segregated bus lanes, I was regularly depressed by the fact that this simple, yet so effective tool of isolating the bus lane has not been put in place, thus slowing down average bus speed considerably.

Speaking of social inclusion, a main consideration of a transport solution should be to cater for the needs of mothers with children, the elderly and of course disabled passengers in wheelchairs. To my own surprise I must say that I have not seen a single wheelchair person on the TranSantiago, not in buses³⁴ and not in the Metro, in the six weeks that I was there. Moreover, there were only very few mothers with buggies, a fact that was confirmed to me during an interview with a mother of two little kids when she said that she literally hated travelling on the TranSantiago with her children and took a taxi to go shopping or visit places

³⁴ Although the articulated Volvo buses now are all low floor and have a ramp for wheelchairs, all novelties for Santiago that have never been in place before.

as often as it was financially possible (Hernandez, 2007). Moreover, she said that she avoided travelling at peak hours altogether as it was a true nightmare for the children.

Although some people warned me prior to my departure to watch out during the evenings and nights in Santiago and generally in the poorer parts of the city, I felt absolutely safe and never encountered any trouble. The Metro is absolutely safe, and the constant presence of security personnel and police, though quite disturbing at times, makes journeys feel secure.

Coming back to the bus drivers, I had the distinct feeling that they were not concerned at all with the condition of the new Volvo buses. The way that these buses are driven through the low quality roads of Santiago, full speed whenever there is space ahead and harsh breaking at congestion points and traffic lights, is both detrimental to the buses' technical condition and also excessively fuel consuming. The extensive driver training that was announced must not have been very fruitful when looking at the buses bought in 2005, which already appear to be in need of comprehensive maintenance and repair.

To summarize my 'embodied observation' I would have to say that I constantly felt that a big opportunity had been missed and that the Chilean capital of Santiago in general, and the low-income households in particular, deserved a much better public transport system. What I experienced with my own mind and senses was actually confirmed by most of my interview partners, that is to say that I was affirmed in my perception that the political elite had simply chosen to cater for the upper class in Santiago by constructing more express-highways and in doing so gave a clear signal to the whole of Latin America that it was not yet prepared to put environmental and social concerns in the centre of its urban management and policies.

6.6 Conclusion and Outlook

In this chapter we have seen how the vision for a renewed urban transport system in Santiago came into existence and what the economic principles and political dynamics behind its design were. We have also seen what the social and political consequences of its too early implementation have been. Although the TranSantiago appears to be a very complex issue, with a range of diverse opinions expressed as to what the reasons behind its difficult start could be, I honestly believe that it is much simpler in reality. As we have seen, the dangerous recipe that resulted in a clear failure of the TranSantiago in the first year of its working consists of the following ingredients: priorities for investment projects that benefit the few rich citizens, ignoring the importance of citizen and stakeholder participation as a key to

public acceptance as well as overall success, underestimating the power dynamics in regard to transport operators that have built up in the city over the past two decades and neglecting the need for profound clarification, expecting citizens to shift from one mindset to the extreme opposite over night, and finally letting several institutions and individuals with vested interest share the decision making process.

As we have also seen, it is now extremely difficult to improve the TranSantiago system step by step, adding a few more buses, re-negotiating contracts and seeking finances for infrastructure projects. The failure of the operational design and the institutional set-up will certainly haunt the system for years to come. The proposition of Oscar Figueroa to cancel all contracts and start the system from scratch seems to make sense in this regard but is highly unlikely to be followed. Most of my interview partners do think that the system will stabilize itself in the coming years, mainly due to the increasing investment in infrastructure that will increase travel speed and bring down operational costs by reducing the number of buses needed to deliver a decent service. There is a debate whether, in the long term, a further expansion of the Metro will be appropriate considering its high cost, or whether an extended network of express buses and an optimal trunk-feeder system will be the better model.

In conclusion it can be argued that the most important step to be taken in the near future is to integrate and harmonize the institutions responsible for public transport and urban development, and eventually put a model into practice that allows all stakeholders to participate while the overall goal must be to make public transport and the use of non-motorized modes of transport much more attractive in order to achieve environmental sustainability while bridging the social divide that has been building up in Santiago over the last decades.

Chapter 7 – Conclusions

In this chapter I will briefly revisit the objectives set out at the beginning of the thesis. A section on possible future research will then conclude my thesis.

7.1 Revisiting the Objectives

Objective 1 - to portray current urban reality and future challenges for urban centres around the world with special regard to the role of integrated transport solutions.

We have seen that the current trend in urban development and the paradigm on which it is based is fundamentally unsustainable. Examples of urban transport trends from India and Chile have simultaneously shown that we are still heading in the opposite direction than the principles of a multi-dimensional approach to sustainable development would suggest. Due to the expected increase of the urban population in the Global South, it is the developing world in particular that will have to face dramatic challenges in terms of providing the necessary infrastructure and support for sustainable cities. Although density is efficient and compact neighbourhoods are key for sustainability, cities will not prove to be striving places of economic activity, social inclusion, environmental sensitivity and cultural diversity if mobility and transport solutions are not aligned with the portrayed principles of sustainability.

Objective 2 - to identify the legitimate requirements of a modern integrated transport system as well as current global transport trends within the context of urban sustainability and a focus on the Global South.

Mobility is a fundamental aspect of any society, and a city's quality of life depends heavily on the mobility and access solutions that it offers. As we have seen, more and more people in the developing world change to private means of motorized transport, with dramatic consequences in terms of air pollution and traffic congestion. In order to live up to a sustainable paradigm, developing cities are facing a paramount challenge: How to integrate an ever increasing urban population that aims to own private means of motorized transport with the absolute necessity to reduce air pollution and promote non-motorized as well as public transport modes for the benefit of all citizens. Cities in the Global South that lack funding for big transport infrastructure projects will find the answer to these challenges in the provision of simple, yet effective transport systems of which Bus Rapid Transit schemes seem to be the

most promising. Key to success in this regard is the formulation of a shared vision under the authority of strong government institutions that allow widespread stakeholder participation.

Objective 3 - to portray and analyse the experiences of Curitiba and Bogota in regard to their urban transport efforts, especially the role of organisational leadership and the importance of stakeholder participation.

Curitiba and Bogota are two positive examples of what can be achieved with the guidance of visionary leaders and the participation of the public. Especially Bogota is seen as an inspiring example of how to transform urban transport reality with limited funding while strongly pursuing the principles of social equity and environmental sensitivity. TransMilenio's BRT system with the integrated bicycle scheme has given Bogota's citizens not only a system that they love to use, but has managed to give the population pride and hope at the same time. The visionary leadership coupled with profound public participation in the design and implementation process of those two cities are the two most important aspects of the success story.

Objective 4 - to describe the design process of the TranSantiago as well as analyse the underlying dynamics during its implementation in the context of the historic conditioning, the institutional setup and the political priorities.

Urban transport in Santiago has been changed from total state regulation until 1979, to a completely free market system until quite recently and a model of state regulation and public-private partnerships now in place with the TranSantiago. The political and social dynamics that have built up over these years, especially the dominant role of the old bus operators, have played a major role in the TranSantiago process, and have been severely underestimated. In addition, the lack of a single authority responsible for transport in Santiago has led to a project approach that allowed multiple ministries and municipal authorities to participate in the decision making process, thus resulting in a constant conflict of vested interests and personal agendas. Finally, the personal priorities of President Lagos to allocate funding first and foremost to the construction of automobile expressways and the extension of the Metro, as well as the political agenda to modernise Santiago has resulted in neglecting the true needs of Santiago's citizens, especially the lower class.

Objective 5 - to assess the outcome of the TranSantiago so far in regard to the initial aims and objectives, as well as portray and analyse the economic, social and ecological change that it has brought about.

The lack of infrastructure investment and the reduced cost of the bus system have been paid for by the citizens of Santiago in the form of longer waiting times, longer travel times and general inadequacies of the public transport system. Social inclusion and equity have not been achieved at all by the system overhaul, and the lower middle class has suffered the most under the TranSantiago failure while automobile users in the richer parts of Santiago have been 'blessed' with a number of express highways in and around the city.

The calculation of the Chilean government, that TranSantiago would auto-finance its operation has turned out to be fundamentally wrong, and the state has to bailout the system on a regular basis in order to maintain public transport in Santiago. The average monthly loss of the system had accumulated to around 30 Million US\$ in 2007. It was calculated that an annual fixed state subsidy of US\$ 250 million would be enough to maintain the relatively low fare and secure a healthy operation of the system. Considering the multitude of positive externalities of a well-working urban transport system, and taking into account that most urban transport systems in the world are financially supported by the state, this subsidy would be fully justifiable.

The TranSantiago has not brought about a change in environmental pollution. In contrast, the number of new cars in Santiago is growing rapidly, and more and more people have chosen to not use public transport. As a consequence, particulate air pollution has at least stayed the same, while incentives to use non-motorized modes of transport still remain absent.

7.2 Future Research

Three key elements of urban transportation in the context of sustainability have been identified in this thesis: The formulation of a vision, the importance of leadership and institutional stringency, and the essential role of widespread public participation. In regard to future research in this field of study, I would recommend to look more deeply at the institutional setup and leadership capability in the urban authorities responsible for transport, while at the same time analysing the degree of public participation in urban politics. My assumption is that the more urban authorities are removed from the eye of the public and the more they ignore the voice and needs of its citizens, the more likely a failure of a project as

comprehensive as renewing a city's transport system is going to be. Especially in the age of information and participation that we live in, where each citizen is able to get informed and empowered about issues with the help of the internet or through civil society groups, urban authorities and municipal as well as central governments that fail to actively involve all stakeholders early in the project process will find it severely difficult to gain public support and will most certainly not achieve commendable results. Furthermore, they are missing out on a huge opportunity to multiply their own resources by engaging citizens that have experience and knowledge in certain areas.

Therefore, the role of the public in urban politics, the involvement of active citizens in design and implementation of not only transport initiatives but all kinds of urban issues promises to be an interesting and multi faceted research subject that will surely become more and more important as we proceed on our quest for sustainability.

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