Strategic Transformation of Ford Motor Company

A project submitted in partial fulfillment of the requirements for the degree of Master of Science (Natural Resources and Environment) at the University of Michigan

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Strategic Transformation of Ford Motor Company

From Understanding New Mobility to an Analysis of Five Urban Markets

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Executive Summary

New Mobility is a relatively new term used to represent an exciting and imminent reality. Our individual and societal transportation needs are complex and rapidly-evolving, while being shaped, constrained, transformed, and defined by a host of global pressures and trends. Within this context, New Mobility offers a fresh understanding of how we can meet transportation needs for both people and goods through an integrated network of products, services, and information technology.

As the concept of New Mobility begins to take root, certain human-induced trends are putting unprecedented pressures on our global society. "Megatrends" such as climate change, increasing social disparity, shifting demographics, urbanization, and congestion are affecting the rate and degree to which populations, regions, and economies can grow and prosper.

This project builds on the work of previous groups, including the Canadian think-tank *Moving the Economy*[i] and a group of three University of Michigan graduate students who, in 2005, produced a report for Ford Motor Company entitled *New Mobility: Future Opportunities for Ford as a Mobility Integrator*.

Our team consists of eight MS students at the School of Natural Resources and Environment at the University of Michigan. Through a combination of primary and secondary research, we surveyed the current and future potential for New Mobility products, services, and technologies in five global cities, vis-à-vis the growing urgency of addressing the aforementioned megatrends. Our results from each city combined a conventional Market Attractiveness Analysis with a progressive New Mobility Market Analysis. We then overlaid these results with Ford's specific strengths, core competencies, and leadership potential in each of the five cities. In so doing, we have created a novel new approach to business project evaluation.

Our results indicate that Bangalore, India is the most attractive New Mobility market, due not only to the overall market size, but also to the transportation infrastructure gap which is rapidly emerging as Megatrend pressures intensify. However, our Discussion & Analysis section identifies a number of other key factors for Ford to consider when selecting how, when, and why to assume a leadership role in the New Mobility Market.

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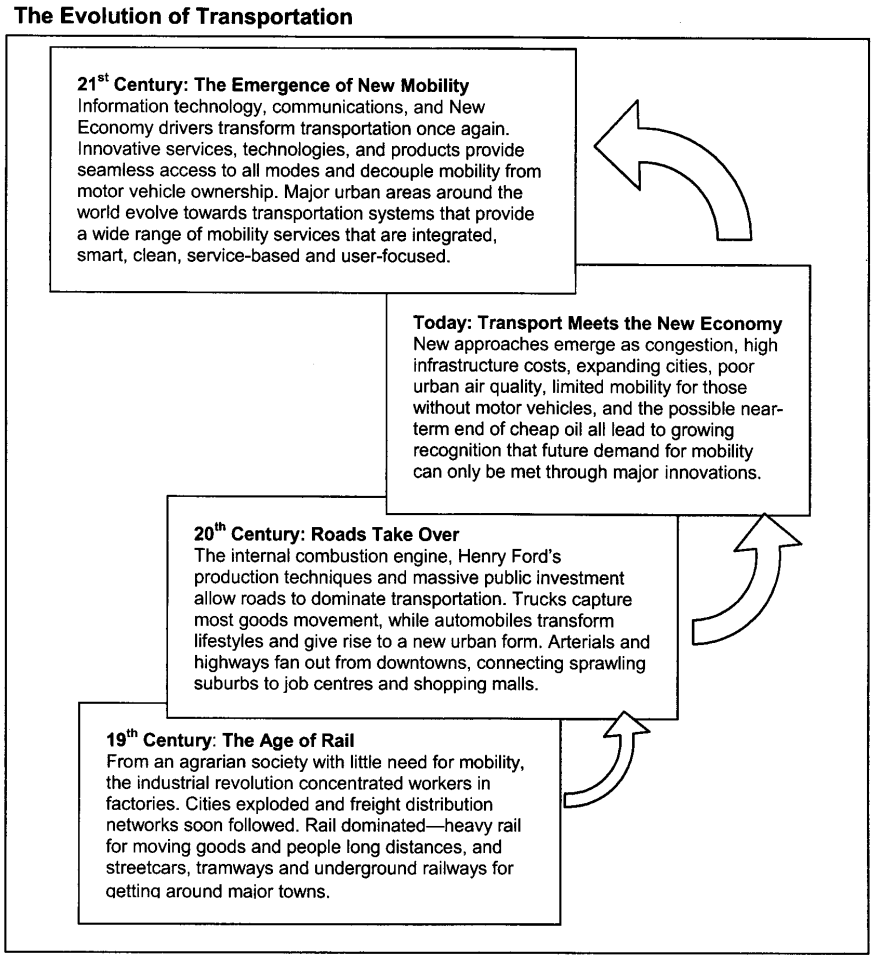
Introduction

Evolving Transportation Needs

At one time, a single transportation system may have been sufficient to meet society's mobility needs. However, rapidly evolving needs and previously unanticipated demands have continued to shape the profile of mobility in both developed and developing countries. Figure 1 details this evolution.

Figure 1.

The evolution of transportation.



What is New Mobility?

New Mobility is a relatively new term used to represent an exciting and imminent reality. Our individual and societal transportation needs are complex and rapidly-evolving, while being shaped, constrained, transformed, and defined by a host of global pressures and trends. Within this context, New Mobility offers a fresh understanding of how we can meet transportation needs for both people and goods through an integrated network of products, services, and information technology.

New Mobility represents a highly-accessible, seamlessly-integrated, multi-modal system that meets individual and societal transport needs while minimizing its negative human and ecological impacts.[ii] The advancement of the principles and partnerships which are beginning to form the basis of the New Mobility industry has been accelerated by "the emergence of new fuel and vehicle technologies, and new information technologies; flexible and differentiated transportation modes, services, and products; innovative land use and urban design; and new business models."[iii]

The New Mobility industry, and the momentum behind it, first emerged in Europe in the mid-1990s, in response to growing concerns that transportation, traditionally a driver of economic growth, had begun to hinder and prevent such growth. As individuals, governments, NGOs, and corporations began realizing that congestion, climate change, and other factors would only continue to restrict economic growth and social well-being, the concept of New Mobility began to take root.

It is important to note that New Mobility is just as much about moving ideas as it is about moving people and goods. Business partnerships and integrated information technology systems form the glue of a New Mobility infrastructure. While it is important to understand this broader definition, in this report we focused exclusively on the benefits that New Mobility could have for the movement of people. We define New Mobility as having the following five key characteristics:

- Reliability
- Affordability
- Accessibility
- Innovation
- Integration and Flexibility

A sixth and overarching component to New Mobility is the concept of sustainability. We examined sustainability in the context of five "Megatrends" which we believe are, and will continue to significantly impact cities, regions, and our global society.

Each of these New Mobility factors and the five Megatrends are defined and explained in more detail below. These components form the basis for our understanding of how well (or poorly) the mobility infrastructure is and will continue to function vis-à-vis Megatrend effects in each city.

New Mobility: Five Key Characterisitcs

Reliability

New Mobility features reliable transportation systems that can be trusted to arrive safely and on time. In Bogota, TransMilenio busses have dedicated lanes and exclusive right of way, which helps to minimize delays. In addition, the bus operations are controlled and tracked in real time with an extensive technology system.[iv]

Exclusive TransMilenio lanes in Bogota, Columbia[v]

Affordability

Mobility options should be affordable to 100 percent of the population of towns and cities. In Quito, Ecuador, where 1.5 million inhabitants live in a slim valley of the Andes, average workers earn US$45 a month and only ten percent own cars. In order to cater to the rest of the population, the city began running the Trolebus system in 1996. Customers are charged US$0.25 which is sufficient to cover all operating costs and most capital costs. The system carries an average of 230,000 passengers on weekdays.[vi]

Quito's Trolebus[vii]

Accessibility

While this factor definition certainly includes and prioritizes accessibility features for elderly and handicapped citizens, it actually encompasses a much broader perspective. In New Mobility systems, accessibility also refers to "what and how much people can accomplish within a given timeframe and budget." Greater accessibility can be achieved not only through seamlessly integrated, multi-modal transportation systems, but also through innovative and progressive urban layout and design, smart land-use practices, and reliance on information technology that can reduce or eliminate the need for mobility. "This approach favors social equity and environmental sustainability over speed and distance."[viii]

Overall accessibility in Amsterdam, the Netherlands.

Innovation

New Mobility is characterized by product, service, and technological innovation. New Mobility systems should capitalize on what is most progressive and innovative about our cultures and societies so as to better design and implement improved infrastructure. For example, Zipcar, the largest car-sharing company in the United States, offers a unique mobility solution; customers in many major US cities can access and use strategically parked cars at their leisure, without purchasing the whole vehicle. Zipcar's business model reduces pollution and congestion and, for many users, eliminates the need to purchase a car. Zipcar estimates that 40 percent of its customers refrain from purchasing a car or sell their car once they join.[ix]

Zipcar parking spot in Chapel Hill, North Carolina[x]

Integration & Flexibility

Integration and flexibility are perhaps the most critical components to a New Mobility system. Integration – facilitated by information technology services – is the "glue" which connects all of the pieces of a New Mobility system into a progressive, flexible transportation infrastructure. In flexible mobility environments, users are able to choose from different mobility options and are able to change from different modes or types of transportation seamlessly. For example, a commuter in Bogota, Columbia can ride one of the city's TransMilenio rapid transit express buses into a large bus hub and transfer to a local bus with an electronic card.[xi]

TransMilenio bus, hub and payment turnstile in Bogota, Columbia[xii]

An example of Bremen's Integrated Mobility Hub. Bremen, Germany.

While each of these factors represents a critical component of New Mobility, it is important to realize that successful New Mobility paradigms require that all of these factors work in synergistic coordination.

New Mobility: Sustainability and the Five Megatrends

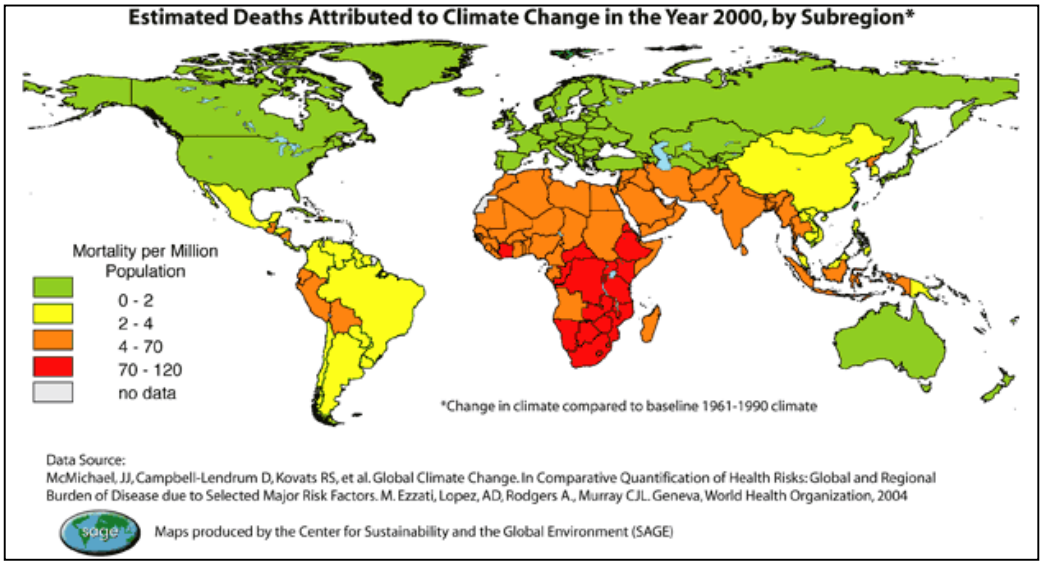
A sixth and overarching component to the concept of New Mobility is the notion of sustainability. Although variably defined, "sustainability" was most famously articulated in 1987 by the UN World Commission on Environment and Development (WCED), chaired by Gro Harlem Brundtland, as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." [xiii]

The business of mobility, as it now exists, is far from sustainable. If the status quo persists, the demand for personal and goods transport will continue to increase, as will levels of transport-related emissions, congestion, vehicle-related deaths, noise pollution, and ecological degradation.[xiv] Although millions of new middle-class consumers in tiger economies such as India and China will increasingly be able to afford access to personal mobility options, a significant portion of the world's growing population of poor will continue to be excluded from mobility options. All of these factors will detract from the ability of future generations to live and prosper in an ecologically healthy and socially stable world.

Our team engaged in multiple brainstorming and systems-thinking exercises to better define "sustainability" as it relates to the five previously-defined components of New Mobility. We generated a list of dozens of factors that either are currently or will imminently affect mobility systems on a personal or societal level. With the help of our advisors, we distilled this list into five factors – or megatrends – which will be most influential in shaping the course of societies and civilizations within the next three decades. We then overlaid our site-specific research with these five "megatrends" to better understand the complicated forces currently shaping the future of the mobility landscape. The five megatrends are as follows:

Climate Change and Environment

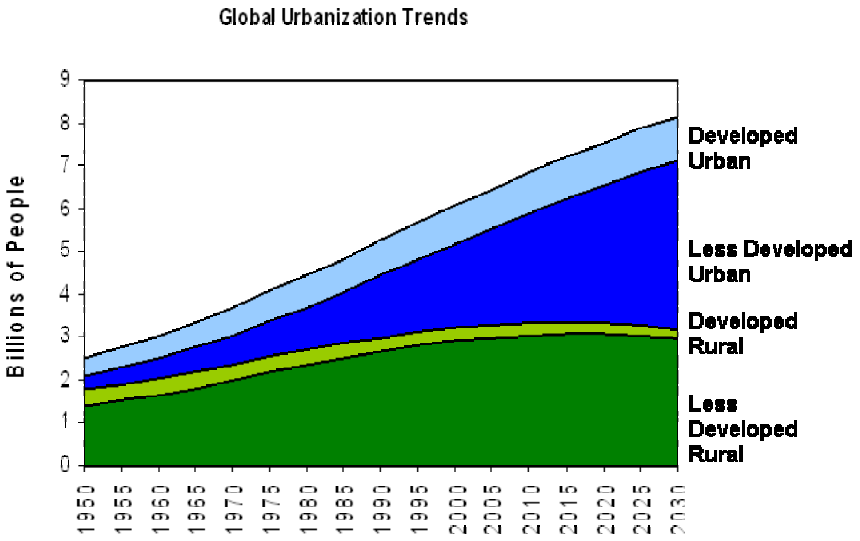
Global climate change – caused by human combustion of fossil fuels and the resulting emission of greenhouse gases (GHGs) – is a critical global issue with a range of potential effects on human health, community infrastructure, ecosystems, agriculture, and economic



activity. There is no longer debate regarding the issue – global temperatures are rising, and will continue to rise if no action is taken. Society faces an urgent and difficult challenge: to protect ourselves, the economy, and the environment from the impacts of climate change we must stabilize concentrations of GHGs in the atmosphere to levels that prevent interference with the global climate system. This requires a change in how we power the economy – away from centuries of fossil fuel use and towards more efficient and renewable sources of energy. There are vast challenges – and opportunities – to adopting this change, which will require engagement by all aspects of society.

Urbanization

The world has experienced unprecedented urban growth in recent decades. In 2000, 47 percent of the world's population – or 2.8 billion people – lived in urban areas. To put this in perspective, in 2000, there were 411 cities with over one million inhabitants, housing 39 percent of the world's urban population. At the same time, 15 percent of the world's urban population lived in agglomerations of five million or more. The number of cities with more than five million residents will grow from 41 in 2000 to 59 by 2015; of these cities, 48 will be located in less developed countries. As this trend continues, megacities (cities with populations of more than 10 million) will become more common, rising from 10 in 2000 to 23 by 2015. The trend toward urbanization is fueled by both population growth in urban areas and migration from the countryside to the city in search of a better life. Nearly all of the expected world population growth during 2000-2030 will be in urban areas.



Source: United Nations *World Urbanization Prospects: The 2003 Revision* Table II.1

There are significant differences in patterns of urbanization between the more and less developed regions of the world. While more developed regions are about 76 percent urban, only 40 percent of less developed regions are urban. However, urbanization is occurring rapidly in many less developed countries. It is expected that 60 percent of the world population will be urban by 2030, and that most urban growth will occur in less developed countries.

In contrast to the rapid rise of the world's urban population, the growth of the rural population has been slowing markedly during the latter half of the twentieth century, reaching 3.2 billion by 2000. There will be no net rural population increase from 2000-2030. Further, the most recent *World Urbanization Prospects* report published by the United Nations in 2005 predicts that the rural population growth rate will begin a slow decline post 2015, which would eventually lead to a net decrease of the rural population post-2030.[xv]

Shifting Demographics

According to the United Nations *Population Medium Growth Scenario*, world population will grow from 6.1 billion in 2000 to about 9 billion in 2050. About 99 percent of these additional 2.9 billion people will be born in the less developed regions. Yet, while world population is expected to grow throughout the 21st century, annual growth rates have slowed substantially, reaching an average of 1.22 percent for the period from 2000-2005, compared to an average rate of 1.76 percent for the period 1950-2000. By 2045-2050, the annual growth rate is expected to amount to only 0.3 percent.

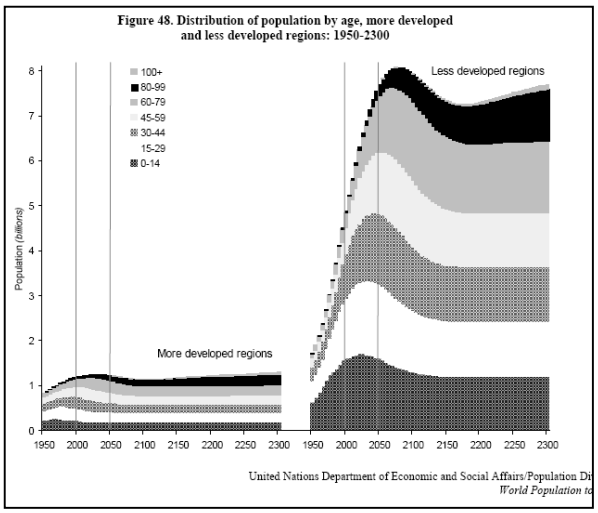


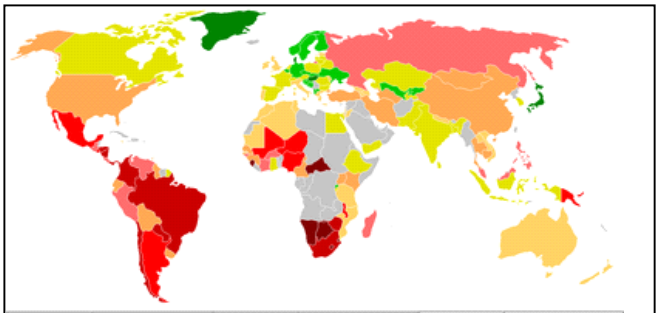
Figure 48. Distribution of population by age, more developed and less developed regions: 1950-2300

United Nations Department of Economic and Social Affairs/Population Di
World Population to

As world-wide fertility rates continue to decrease and life expectancy at birth to increase from 2000-2050 – with the exception perhaps of Sub-Saharan Africa – the world population will continue to age. In 2000, the median age in more developed regions was 37.3 years, compared to 24.1 years in less developed regions and 18.3 years in Africa. By 2050, more developed regions are projected to rise to about 47 years, less developed regions to about 35 years, and Africa to 27 years.

Social Disparity

While significant divides have always existed between rich and poor, many economists and historians believe that global income inequality is currently greater than at any other time in history. Adjusting for purchasing power, the richest 25 percent of the world's population owns 75 percent of its wealth; more significantly, the richest one percent of the world's population owns as much wealth as the amassed wealth



Color	Gini coefficient		0,35 - 0,39		0,55 - 0,59
	< 0,25		0,40 - 0,44		> 0,60
	0,25 - 0,29		0,45 - 0,49		NA
	0,30 - 0,34		0,50 - 0,54		

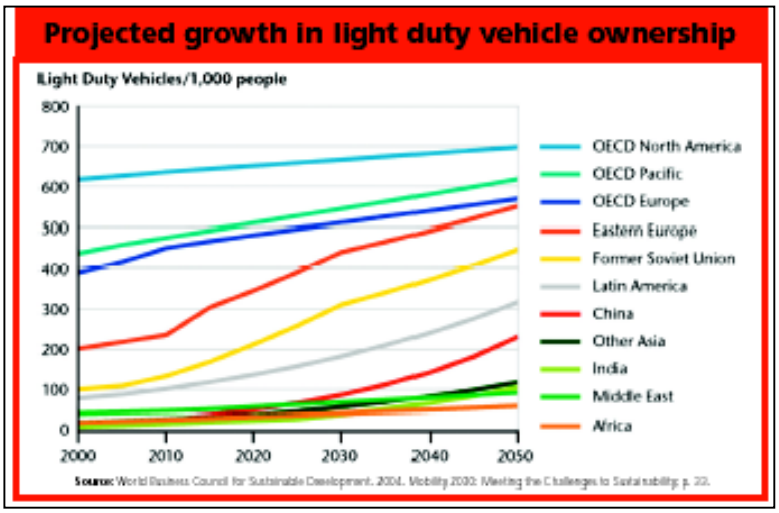
The Gini coefficient is a number between 0 and 1, where 0 corresponds with perfect economic equality, and 1 corresponds with perfect inequality (where one person has all the income, and everyone else has zero income). Countries in red tones have more income inequality than those in green tones.

of the bottom 57 percent of the world's people. In the United States, the incomes of families in the bottom 80 percent of the income distribution have grown at less than one percent annually, while the incomes of the richest 20 percent have grown at three percent, with those at the very top experiencing almost exponential growth – in 1980, corporate CEOs earned roughly 42 times the salary of the average American worker, while today the average CEO earns over 530 times the average worker's salary. Similar extremes are prevalent in other nations – in sub-Saharan Africa and Eastern Europe, real incomes have actually fallen over the past 30 years, to say nothing of purchasing power parity incomes.

Such huge inequalities are beginning to serve as threats to national and global political and economic security. Backlashes toward corporations perceived to be unjust or irresponsible global citizens have begun to occur in the past decade, most notably in the US and Europe, but also in Latin America and Asia. As the philosopher Plutrarch wrote almost 2000 years ago, "An imbalance between rich and poor is the oldest and most fatal ailment of all republics." Ensuring that the world's citizens can achieve the economic means by which to fulfill their basic needs is the most basic insurance policy against instability.

Congestion

There exists a direct correlation between Gross Domestic Product (GDP) and traffic congestion – as countries become wealthier, individual citizens are increasingly able to afford individualized transportation, often in the form of cars. Generally, motorization rates begin to significantly increase once per capita GDP reaches $5,000. Indeed, many countries view motorization rates as a key indicator of development, progress, and economic growth. Yet the capacity of public infrastructure is rarely able to keep pace with motorization rates: building enough capacity to eliminate congestion would, in almost all situations, involve economic and environmental costs that would far outweigh the associated benefits of increased personal mobility. Despite this, governments are either passively or actively supporting policies that encourage individual vehicle ownership. In 2001, the government of China identified auto manufacturing as one of seven "pillar industries" of the Chinese economy, with the goal of producing automobiles at a price that would "encourage widespread ownership." Although China often receives the most attention, other nations in Asia and Latin America also have soaring rates of personal vehicle ownership, even at a time when fuel prices are rising. A 2005 estimate predicts that the number of automobiles in the world is expected to double in the next 15 years, from just over 600 million currently, to 1.3 billion in 2020.



Although individualized forms of transportation will always have a place in our global society, actively defining the role that cars will play is of utmost importance. Congestion pricing is one measure that some cities – including London, Oslo, and Toronto – are using as a means to reduce congestion. By employing recent technology to charge road users a variable fee depending upon the amount of traffic already on the road, the individual driver is forced to pay the full cost that (s)he imposes on other drivers – in this way, price equals marginal cost, and demand and supply in theory reach equilibrium. Other innovative solutions to traffic congestion include creating integrated public-private transportation networks and employing car-sharing, among others.

The Business Case for New Mobility

Innovative companies are realizing that a new, exciting, and relatively untapped market exists around the concept of new mobility. Whereas mobility has traditionally been equated with per capita purchases of motor vehicles, solutions that incorporate mobility services can be just as effective, more flexible, and less expensive. As this sector is yet-untapped, huge business and profit potential exists for any company that is able to access, understand, and adequately serve this market, whether by providing new mobility services, or by acting as the facilitator and integrator of new and existing mobility options.

Meanwhile, if left ignored or unaddressed, the megatrends described above will generate enormous negative consequences for business and society. These negative impacts may not be immediately noticeable on a global scale, but on a local or regional level, certain countries and cities will lose if business if political leaders are not proactively anticipating and responding to trend effects. The consequences of some trends multiply as they are coupled together. For example, the growing trend toward urban living in almost all regions of the world, coupled with increased congestion caused by skyrocketing auto sales has the potential to debilitate more traditional urban transportation infrastructure schemes in just a few short years; the city of Bangalore, India, is just one example of this. Shifting demographics and issues surrounding social disparity make a formidable megatrend couple: as large portions of the population demographic age, less-agile senior citizens - many no longer able to drive - will lack access to suitable forms of transportation; this promises to be one of America's most pressing transportation-related concerns as those of the baby-boom generation become senior citizens.

Finally, and perhaps most significantly, the reality of climate change is quickly being accepted by governments, businesses, and individuals alike as one of the most pressing issues currently facing humanity. Response currently appears to be unhurried and gradual, as consequences remain relatively intangible in the short-term; however, as the scientific data becomes more certain, evidence mounts, and predictions become reality, the reaction from all sectors of society will be swift and revolutionary. Those businesses that have not already begun to incorporate cradle-to-cradle design, carbon credits and trading, and low- or no-emissions products and services into their business models will undoubtedly be left behind in the short-term, and will cease to exist in the longer-term. The long-term health and success of a company greatly depends on its ability to anticipate solutions to tomorrow's problems, and begin delivering them today.

While megatrend effects promise to revolutionize the way many companies do business, they are not the only factors lending credence to the business case for New Mobility. The traditional automobile industry is becoming crowded with low-cost competitors and stymied by overcapacity. Traditional economic theory suggests that as automobiles become increasingly commoditized, profits in the industry will shrink to zero. In the process, companies will have to become ever-leaner and wiser or be forced out of the industry altogether. Profits in the automobile industry, and manufacturing industries in general, are ever-slimmer; consumers are demanding the most value at the lowest cost, have an ever-widening array of choices from which to choose, and will direct their money to whichever company offers the best value proposition at any given moment.

A final factor worth considering involves commodity prices. Commodity prices have always been subject to minor, if not wild, fluctuations in cost. Especially in recent years, uncertainty regarding the current and future supply of oil has caused significant fluctuations in the price of gasoline, thereby affecting consumer purchasing behavior. The price of steel has also been in flux: more stamping plants have opened, thereby increasing capacity, but the future demand and supply equation remains uncertain. Whereas businesses cannot and should not base their business models entirely on commodity forecasts, the increasing prices of these raw materials, especially as they are likely to affect consumer behavior (as in the case of gasoline) is worth considering.

Discovering New Markets: The Expanded Economic Pyramid

Another component to the business case for new mobility is rooted in the untapped potential of markets which include consumers in the “expanded economic pyramid”. The expanded economic pyramid can be thought of as a broader interpretation of the “Base of the Pyramid” and consists of the approximately four billion people worldwide who subsist on only a few dollars per day. Traditionally, these consumers have been underserved at best, and often completely ignored by modern corporations; many companies currently or have previously viewed these individuals – the majority of the human population – as unfortunate or unmotivated “victims” of poverty, with little to contribute to the market economy. Some companies, however, have begun taking a more compassionate, holistic, and accurate view of this market segment. Such companies have begun to understand that many of these individuals are creative and ingenious entrepreneurs who have much to give and gain by being included in the global marketplace, and that they are eager to purchase products and services designed to fulfill their needs. By co-creating mobility solutions based upon the self-identified needs of people in specific cities and regions, companies have the potential to empower and improve the lives of millions of previously ignored individuals while earning access to new multi-billion dollar market segments.

The Business Case for Ford

For the past century, Ford has been a dominant player in the automobile manufacturing industry. However, the pressures facing businesses in the coming century will be completely unlike those conditions that prompted and accompanied the birth of the industrial revolution. While automobile sales in the developing world are rapidly increasing, sales in the developed world have remained relatively stagnant. Even developing world markets are becoming saturated, and many environmentalists and policy analysts bemoan the fact that these

countries are following in the footsteps of developed nations, and making the same mistakes with respect to developing incredibly costly, environmentally destructive, individually-based transportation infrastructure.

There is a huge potential for significant innovation within the transportation industry, and few major companies are seeing the market potential. A recent report of by *Moving the Economy* and the ICF Consulting Company indicates that New Mobility products and services already comprise a multi-billion dollar market. The industry is still nascent, yet beginning to grow rapidly; the value of the integrated technology services market alone is expected to reach US$13 billion by 2010.[xvi] Instead of focusing solely on the battle to sell more personal vehicles, Ford could create and develop entirely new types of mobility markets: Markets designed to serve a greater portion of the economic pyramid, with a greater and integrated array of both individual and group-based transportation products and services that help alleviate negative megatrend impacts. Ford is uniquely positioned to launch into these exciting new markets: With its impressive international presence, unsurpassed human rights code, emphasis on Corporate Social Responsibility and leadership, ability to forge and maintain mutually beneficial relationships with other businesses and leading environmental and human rights NGOs alike, and newly-defined focus on "Bold Moves," it is the ideal time for Ford to transform itself from its current state as a developed-world automobile manufacturer into a leader within the integrated New Mobility market.

Many of Ford's specific organization and managerial opportunities and challenges in the New Mobility market space will be defined vis-à-vis our city research and results. These findings will be discussed in more detail in the Discussion & Analysis section, toward the end of this document.

Methods

Our eight-student team combined secondary background research with on site observations, interviews, and expert consultations in five global cities so as to develop individual case write-ups on the current state of mobility in these areas. Whenever possible, we tried to interview Ford employees and managers in each of these locations. However, because of specific Non-Disclosure Agreements and other restrictions on information exchange, we were not able to conduct very many of these interviews.

Team members spent five to eight days on-the-ground in: Bangalore, India; Hermosillo, Mexico; Istanbul, Turkey; and Shanghai, China. Because of extenuating circumstances, we were unable to visit Camaçari, Brazil, and instead conducted all research remotely. We overlaid Conventional Market Research data with our Mobility and Megatrend findings in each city to determine where the biggest gap exists between current mobility infrastructure and anticipated megatrend impacts. Our Results and Discussion & Analysis sections detail our findings and recommendations.

We chose our five research sites in conjunction with members of the Sustainable Business Strategies Office (SBS) at Ford Motor Company; we chose these particular cities either because of Ford's already strong presence in the region, or due to their potential to become explosive New Mobility markets.

Once we identified our "case study" cities, we engaged in multiple brainstorming and systems-thinking exercises to understand, explain, and define New Mobility and to determine the "Megatrends" that will most affect the future of mobility.

To further our understanding of integrated New Mobility concepts and related business opportunities, we relied heavily on a report entitled *New Mobility* Strategy, which was produced for Ford by a team of three University of Michigan graduate students in the summer of 2005. We also explored successful case studies and previous examples of New Mobility market development and business model approaches; the majority of these were developed by *Moving the Economy*, a Canadian public-private consortium and think tank that catalyses integrated New Mobility innovation and business model development.

To better understand what trends are currently shaping and will continue to shape our global society, we generated a list of over one hundred factors that are currently or will imminently affect mobility systems on a personal or societal level. With the help of our advisors, we distilled this list into five "Megatrends" which will be most influential in shaping the course of societies and civilizations within the next three decades.

In order to give on-site team members a common basis for observation and comparison, we designed New Mobility and Megatrend matrices (Appendix 2) that solicited both qualitative and quantitative research data, and crafted corresponding interview questions. Whenever possible we tried to use standardized data from a common source. For example, we relied on the CIA World Factbook for information regarding GDP and GDP at Purchasing Power Parity (PPP) in each of our focus regions, and we used the Gini coefficient as a means by which to measure regional socio-economic disparity. The Gini coefficient is a mathematical ratio often used to measure the disparity in a system. In the case of income inequality, a "0" represents perfect income equality, whereas a "1" represents perfect inequality.

Once on site, team members had to cope with different languages, logistic challenges, and time constraints. These factors affected our research methods and the amount of information we were able to gather in each city. For example, our Shanghai-based team member spoke some Mandarin and was able to survey approximately 50 individuals; our Hermosillo-based traveler relied on a translator and was able to survey approximately 20 individuals. Although the on-site methods varied slightly, the matrices and interview questions created a strong basis for comparison.

Finally, for each city, we distilled the data from each of the qualitative/quantitative matrices into a multi-dimensional diagram so as to understand the current performance of mobility systems and severity of megatrend impacts. (Appendix 5). We considered the city with the largest gap between current mobility infrastructure and future megatrend effects to have the biggest opportunity for improvement. We overlaid these results with a Conventional Market Attractiveness Analysis. The cases are – and were designed to be – non-company specific. The cases merely represent the size and attractiveness of a generic potential New Mobility market. Overlaying these nonspecific results with information regarding Ford's particular strengths formed the basis for our Discussion & Analysis.

Case Study: Bangalore, India

1 Introduction

Situated on the Mysore Plateau in southwestern Karnataka, Bangalore is the principal administrative, industrial, commercial, educational, and cultural capital of the Indian state of Karnataka. Bangalore enjoys a pleasant climate, making it a desirable place to live in India. Within the past decade, Bangalore has established itself as a leading global provider of information services and technology. As the innovation hub of India, Bangalore has experienced a recent explosion in both population and economic growth. With a population of 6.5 million, Bangalore is India's third largest city and fifth largest metropolitan area. It is one of the 100 fastest growing urban areas in the world, with an expected growth rate of 2.8 percent per year over the next fifteen years; at this rate Bangalore will reach megacity status of 10 million by 2020.[xvii] The average population density in Bangalore is 2,985 persons per square kilometer.

With its US$47.2 billion economy, Bangalore is one of the major economic centers in India. Yet, Bangalore is in many ways a divided city: glass walled computer-ready office complexes, and exclusive shopping malls and entertainment facilities stand in stark contrast to the dense squatter settlements and shanty towns, most of them completely lacking in infrastructure, which lie at the city's center. Estimates suggest that ten to 25 percent of the city's residents live in slum-like conditions.[xviii, xix] Bangalore's per capita income of US$6,460 is the highest for any city in India.[xx]

Prior to 1990, Bangalore was a manufacturing hub for heavy industries such as aeronautics and electronic equipment manufacturing. The liberalization of the Indian economy in the early 1990's catalyzed tremendous growth in the information technology (IT) industry. Adequate infrastructure, a highly-skilled labor force, an established science and industrial base, and an overall favorable climate for living enabled the booming growth of the IT sector in Bangalore. Today, Bangalore is India's IT center, with offices of technology companies such as Microsoft, Intel, Yahoo, Google, Wipro, and Infosys. Bangalore is home to more than 300,000 IT workers, and the city accounts for 38 percent of India's US$22 billion IT and software export market.[xxi]

The Bangalore Mahanagara Palike (BMP, or Bangalore Metropolitan Council) is the municipal corporation responsible for the city's civic and infrastructural assets. The BMP comprises 100 elected representatives, called "corporators," one from each of the 100 wards of the city. Elections to the council are held once every five years, with results being decided by popular vote. Bangalore's rapid growth has created several problems relating to traffic congestion and infrastructural obsolescence that the BMP has found challenging to address. The council coordinates with the Bangalore Development Authority (BDA) to design and implement civic projects and infrastructure systems. The BMP has been criticized by the Karnataka High Court, citizens, media, and corporations for failing to effectively address the capacity-strained and crumbling road and traffic infrastructure of Bangalore.

Bangalore's old reputation as a "pensioner's paradise" has long vanished, replaced by a bustling industrial megacity that attracts thousands of young professionals from all parts of India. Approximately 65 percent of Bangalore's population is between fifteen and 65 years old, with 20 percent below age 15. The median age of the city is just under 25 years.[xxii]

Bangalore's road system is resembles a star-like structure with main arterial roads leading from the outskirts to the center of the city. There is a marked lack of interconnections between these main arterial roads, which is a contributing factor to the gridlock many of the arterial roads and intersections are suffering from during traffic peak hours.

Bangalore's street space provides more than a conduit for traffic; it enables much of the local economic activity on which the majority of the city's population depends. Street vendors of all sorts, small service businesses such as bicycle and motorcycle repair shops are as much part of the street space as a large variety of motorized and non-motorized vehicles for movement of people and goods. Streets are also a social space where many people live and others get together with family, friends and neighbors.

Public transit buses and two-wheelers, primarily mopeds and motorcycles, dominate Bangalore's transportation system accounting for 49 and 36 percent of the city's daily passenger trips, respectively. However, with phenomenal growth in the purchase of private vehicles, estimated at 700 to 900 vehicles per day, and the inability of the city's transit systems to provide adequate services, both the poor quality of roads and problems related to the government bureaucracy will further cloud the transportation outlook for the city in the short to near-term.[xxiii]

The city government has attempted to address these transportation issues with a three-pronged strategy consisting of some elements of public transit expansion, transportation management initiatives and infrastructure improvements and expansion. The bulk of the city's transportation budget has been directed towards improving and expanding roads, building flyovers and adding buses to the city's fleet. Additionally, the government recently approved construction of a US$1.5 billion light rail metro system for Bangalore, which is modeled after the Delhi metro system and would add a second public transit option to the city's portfolio.

Finally, the government is also participating in public-private partnership talks at a summit in January 2007. The goal of these talks is to establish a public-private partnership with participation from government, administrative agencies and business charged with preparing a strategic long-term plan for Bangalore's future growth, which would include a comprehensive plan for the development of the city's transportation system.

2 Current State of Mobility

Introduction

Vehicle ownership in Bangalore has increased tremendously in recent years. A variety of factors, including the growth of IT sector and the associated growth in population and levels of disposable income, have contributed to the dominance of the motor vehicle in Bangalore – automobiles and mopeds are routinely considered the preferred mode of transportation. The size of the registered vehicle fleet in the urban area reached 2.5 million in 2006, up from 685,000 in 1992 and only 236,000 in 1983. A large majority of private vehicles in the city are two wheelers and it is estimated that roughly 700 to 900 vehicles are added to the roads every day.[xxiv]

To date, the overstrained public bus system remains the only inner-city public transit option. The city added more than 1,000 buses between 1998 and 2003, bringing its total fleet size to 3,859. Despite this, however, the public bus system is overcrowded and routinely operates at overcapacity; skipped bus stops and missed schedules are part of the daily routine. Yet, according to the Bangalore Metropolitan Transport Corporation, fleet expansion is limited due to the city's narrow and already congested roads; at best, these roads can only accommodated another 1,000 buses, but even these would likely only contribute to the gridlock. The bus system currently operates over 60,000 trips with 3.5 million passenger trips per day.[xxv] Upper and middle class residents rarely use the public bus system.

Bangalore's rapid automobile growth has caused several significant problems, all of which are of considerable concern to the city's residents, businesses, and local government. These problems include severe air and noise pollution, high levels of congestion, a growing number of often-fatal road accidents, and a severe loss of business productivity due to long commute times.

Bangalore's road systems are star-shaped, with radial roads extending outwards from the city's center; this layout only exacerbates the above-mentioned traffic-related problems. Many arterial roads and intersections suffer from severe gridlock and average journey speeds on the key roads in the central area are below 10 km/h during peak traffic.[xxvi]

In July 2004, Wipro's CEO Azim Premji threatened to move company headquarters out of Bangalore because of the city's poor transportation infrastructure.[xxvii] Also, in August 2005, the Bangalore Forum for IT (BFIT) – which consists of 18 major multinational IT firms including Sun Microsystems, Texas Instruments, Philips, HP and Motorola – threatened to boycott the Bangalore IT convention because of the city's lack of infrastructure-enhancement.[xxviii]

The state government responded to these threats and the problem of traffic gridlock by building flyovers, creating one-way traffic routes, and reducing the size of roundabouts. However, much of inner city is quite built-up and has very narrow roads to begin with, making the construction of wider roads and flyovers very difficult.

Recently the city's bus transit corporation added twenty-five air-conditioned Volvo buses to attract high end commuters who normally rely on car for their transit. Additionally, the city added twelve special, female-designated buses in August 2006 to offer women, who increasingly avoid overcrowded buses, a more attractive public transit alternative. Further, in order to reduce the pressing traffic gridlock problem in the innermost part of the city, the government is building a rail transit system called the Bangalore Metro; the first phase is expected to be completed by 2011.

Current State of Mobility: Summary of Findings

Mobility Factor	Qualitative Insights	Quantitative Data	Overall Ranking
Accessibility	• Because of high density, the general distance between two points is low • For people who rely on public transit system their low reliability reduces accessibility	• 44 cars per 1,000 residents in 2002; 59 cars per 1,000 in 2006 • Car ownership growing at 9.9% per year • Public transport options: 3,859 buses 60,000 trips 60 passengers per trip • 205 two wheelers per 1,000 residents in 2002; 275 per 1,000 in 2006 • Two wheeler ownership growing at 9% per year • Percentage of households with: Two-wheeler: 32.8% Passenger vehicle: 9.2% Bicycle: 29.8%	4
Reliability	• Reliability is very low because of unpredictable traffic and road constructions • People prefer two wheelers because of the low reliability of public transit system	• 9,101 auto deaths in 2004 • 903 traffic deaths in 2004 • Supply-side management practice is employed building flyover reducing the side of roundabouts widening of roads • Emphasis on safety is increasing but enforcement is difficult	3
Integration and Flexibility	• Majority of residents rely on bus and two wheelers • People using the bus have limited flexibility because of low reliability and lack of coordination among different bus transit service	• Many options available: bus, car, auto-rickshaw, two wheelers • Percent of transportation by modes: Bus: 49% Two wheeler: 36% Auto-rickshaw: 7.0% Car: 5.5% Bicycle: 2%	5
Affordability	• Existing public transit system is fairly affordable by all • Rising income levels and greater flexibility and reliability is increasing the attractiveness of two wheelers	• Government subsidizes public transit system and monthly tickets are available at concessional rate • Predominantly low-income people use bus, which is nearly 50% of commuters in the city	4
Innovation	• Summit-level talks in January 2007 • Construction of metro rail	• Bangalore Agenda Task Force (BATF) was formed 2000 to develop innovative solution for transportation problems • Subsequent government change in 2004 led to discontinuation of BATF • Public-private forum will discuss these issues in January 2007	4

Accessibility

High density of inner-city and sufficient bus routes and stops make city's public bus system accessible to most, but access to the eight surrounding, high-growth municipalities remains poor.

Both the city's high density and a large and affordable public transit system make Bangalore highly accessible. However, for the nearly 50 percent of the population who rely on the city's

public transit system, problems with reliability make traveling within the city difficult. Also, public transit system buses often operate at over capacity, which increases the physical strain of traveling in them and becomes a great challenge for women, and the elderly and handicapped who rely only on public transit system. Furthermore, the public transit system does not encompass the eight municipalities surrounding Bangalore, where most economic growth is currently taking place. Thus, a great fraction of the city's workforce has to rely on company bus and private vehicle options for their daily commute.

Reliability

Bangalore's capacity-strained transportation system makes public and private traffic options unreliable.

The reliability of Bangalore's transportation system significantly lags that of other major metro cities. During rush hour, road intersections are often blocked and traffic can be gridlocked for several kilometers. Congestion has reduced the average vehicle speed from 15 to 18 km/h in 1990 to less than 10 km/h in 2001. Bus riders tend to suffer most from this congestion, as they rarely know when to expect a bus's arrival, never mind how to predict how long the journey might take. Because reliability of the bus services is so poor, many commuters prefer other modes of travel - primarily two wheelers.

The city government has numerous planned, ongoing, and completed projects – from widening roads to building flyovers – but these projects have not made a significant impact on traffic congestion. Moreover, these projects take a long time to complete and further obstruct traffic while they are in progress.

Integration and Flexibility

While there are a wide range of options, the majority of Bangalore's population relies on the public bus system due to budget constraints.

The wide range of options ranging from bicycles to private cars provides numerous options to the residents of the city. However, a vast majority of city's population relies on the bus public transit systems and there are constraints that are associated with this option. First of all, there are many state-owned entities that operate buses in the city, but there is very little coordination amongst them which reduces the efficiency of the public transit system in serving the mobility needs of the people. Also, there are no real-time monitoring and display systems at bus stops, hence waiting travelers do not know when the next bus will arrive. These shortcomings reduce the flexibility of public transit systems and increase the attractiveness of private vehicles for the public transit user.

Affordability

Public bus service is affordable for most, but the new metro rail may be out of reach for certain customers.

Both the city's high density and a large and affordable public transit system make Bangalore highly accessible. However, for the nearly 50 percent of the population who rely on the city's public transit system, problems with reliability make traveling within the city difficult. Also, public transit system buses often operate at over capacity, which increases the physical strain of traveling in them and becomes a great challenge for women, and the elderly and handicapped that rely only on public transit system. Furthermore, the public transit system does not encompass the eight municipalities surrounding Bangalore, where most economic growth is currently taking place. Thus, a great fraction of the city's workforce has to rely on company bus and private vehicle options for their daily commute.

Innovation

While the new government recently suspended an innovative public-private partnership, new talks are set to begin in January 2007.

Even though Bangalore is known as “the Silicon Valley of India,” there has been very little innovation on the part of the city government with regard to solving the city’s mobility problems. BATF (Bangalore Agenda Task Force) was formed by the local government in 2001 to encourage innovative solutions that addressed Bangalore’s mobility problem, but the project was discontinued after the change of government in 2004. However, with the ongoing construction of the Bangalore Metro, and public-private partnership discussions set to take place in January 2007, there is opportunity to develop innovative services and solutions that address Bangalore’s mobility challenge.

3 Regional Megatrends

Introduction

Bangalore, the “Garden City” of India, has recently become the "Knowledge City" of India by housing many top research institutes and information, biotechnology, and consulting firms. The population of Bangalore has grown from 4.2 million in 1991 to about 5.7 million in 2001, and it is projected to reach 7.1 million by 2011. Bangalore is often perceived as the city of future in India. The city has grown from 40 square kilometers in 1912 to 531 square kilometers in 2002.[xxix]

The number of vehicles in Bangalore has grown with the city’s population. In 1991 there were approximately 500,000 two wheelers in Bangalore – in 2006 this number has increased to 1.8 million, an increase of fourteen percent per year. The number of four wheelers has also grown in the city, increasing from 100,000 in 1991 to 382,000 in 2006 (an annual growth rate of 9.9 percent).[xxx, xxxi]

The meteoric rise of Bangalore to a globally integrated location of the Indian IT industry has brought profound changes to the metropolitan landscape creating aggravating disparities and a highly polarized urban society. Bangalore is becoming a fragmented city where both social and geographical barriers are reinforced. While the small number of affluent urban elite has benefited from the city’s recent transformations, the urban poor continue to be marginalized. Additionally, Bangalore’s public infrastructure is strained – the city’s rapid growth over the past two decades has crippled its infrastructure and deteriorated its air quality. Moreover, the vast majority of local residents have not yet benefited from the city’s tremendous growth.

Regional Megatrends: Summary of Findings

Megatrend	Qualitative Insights	Quantitative Data	Overall Ranking
Local Pollution	• Mostly rich people complain about the air quality • Government is encouraging LPG driven automobiles especially for auto rickshaws	• PM level is160-180 µg/m3, which is three times above the normal ambient air quality level • Task Force For Control Of Pollution In Bangalore City was formed by the government in 2001	6
Social Disparity	• Social equity is a primary concern of the government – many feel that the last government was ousted because of lack of attention to poor and rural household	• 57% of households earned less than US$1,100 in 2001 whereas average household income was US$2,200 in 2001	9
Shifting Demographics	• Population will remain young as many young people from distant villages are migrating to the city	• 65% of population under 25 • 10% of population over 65	3
Urbanization	• Many new industries have been established on the city's outskirts while workers have remained in the city – this increases demand for travel and increases overall travel time	• Physical growth 446 square kilometers in 1991 to 536 square kilometers in 2001	10
Congestion	• Congestion is severe in Bangalore and is also one of the major constraints to the growth of city • People from all strata of society complain about congestion	• Average vehicle speed in city 9 km/hr • Peak hour traffic volumes in central, intermediate, and peripheral zones were 10,000, 3,000 to 7,000 and 3,000 to 5,000 vehicles, respectively	10

Local Pollution

Strong vehicular population growth and congestion fuel city's local pollution levels.

Current air pollution levels in Bangalore are comparable to that in an industrial-age steel town. Vehicular travel is one of the main sources of air pollution in Bangalore, and has continuously increased during the last decade. Based on data published by KSPCB, concentrations of sulfur dioxide and nitrogen oxides have continuously declined during the last five years, indicating that emissions control measures have been very effective. On the contrary, PM10 levels (a measure of particulate matter, called RPM in India) are almost three times that of the Indian National Ambient Air Quality Standards (INAAQS) of 60 µg/m^3 in Bangalore.[xxxii]

Social Disparity

Overall living standards are rising, but income disparity between the rich and poor remains stark.

Bangalore, Karnataka's "boom city" which is most closely associated with a high tech "silicon valley" image, has also experienced massive urban and economic growth since the mid 1990s. The average household income has increased from about US$1,100 in 1991 to about US$2,200 in 2001.[xxxiii] Meanwhile there has been a large decline in the number of households with annual incomes less than US$1,100, from 87 percent in 1991 to 57 percent a decade later.[xxxiv] Despite Bangalore's reputation as a high tech city it is important to note that the majority of employment growth comes from small scale units: local economies actually form the employment base of urban areas in Bangalore. Bangalore is becoming a multiply divided city where both social and geographical barriers are reinforced. Even more dramatic differences in social equity exist between the urban and rural households of the state of Karnataka; much of the government's attention is now focused on rural development and economic enhancement.

Shifting Demographics

Bangalore – a young city for many years to come.

Nearly 65 percent of Bangalore's population is below 30 years of age and this trend will continue in the near- to mid-term as an increasing number of young people from rural villages migrate to the city to find employment.

Urbanization

Expansion is focused on the outskirts of Bangalore, while population growth is fueled by migration from surrounding rural communities.

The physical growth of Bangalore has increased from 446 square kilometers in 1991 to 531 square kilometers in 2001.[xxxv] Much of this growth is characterized by urbanization of the surrounding rural communities and their incorporation into the city area. The primary impetus for growth has been the creation of industrial parks that house the city's IT industry. One such industrial park is Electronics City, which is spread over 330 acres (1.3 km²) and houses more than a hundred industries, including IT industry leader Hewlett-Packard.

In recent years, the main highway connecting Electronics City with Bangalore has seen a large increase in vehicular traffic, causing traffic jams at several road junctions. Currently, major infrastructure improvements, including road-widening projects and construction of a nine kilometer-long elevated expressway are underway in this area. These improvements are expected to alleviate the congestion, but there have also been suggestions to divert some of the traffic to other highways around the city as a measure to tackle the traffic problems.

Congestion

Rising vehicular population, longer average commutes, and a lack of adequate infrastructure is the main cause of congestion in Bangalore.

Bangalore has a 4,300 kilometer-long road network, 250 kilometers of which are arterial roads and another 100 kilometers are national and state highways. Bangalore is an old city, which has seen haphazard growth and a preponderance of intersections and narrow arterial roads caused by poor city planning. Intersections and narrow roads not only delay traffic, they also contribute to air pollution. The city's vehicular population has been growing at an average rate of 14 percent annually since 1995, which has led to a dramatic increase in congestion levels as many roads are operating beyond their designed capacity. Moreover, the average vehicle speed within the city is only nine kilometers per hour, and peak hour traffic volumes in the central, intermediate, and peripheral zones of the city were 10,000, 3,000 to 7,000, and 3,000 to 5,000 vehicles, respectively.[xxxvi, xxxvii]

In order to reduce traffic congestion the city government has introduced a one-way street system, entry and turn controls for vehicles, intersection improvement initiatives, channeling islands, road signs and road markings, signalization and signal coordination, and mid-block controlled crossings. In the last five years, several streets have been designated as one-way streets. However, periodic changes in one way direction and poor signs have caused many drivers to become lost – ultimately this increases the average distance traveled and adds to the city's congestion woes.

The city government has also removed obstructions and barriers to the free flow of traffic, so as to increase flow and decrease congestion. In many cases, the city has built many over-bridges, but the time required for such tasks varies and is generally very long, on the order of several months. Many of the recommendations have been implemented and some are in the pipeline.

4 Conventional Market Attractiveness

Introduction

An estimate of market attractiveness shows Bangalore to be an appealing possibility. Calculations were based upon 6.5 million in population, US$2,200 in income per household, household size of five, and twenty percent of income spent on transportation in 2006. This yields an estimate of US$572 million spent annually on transportation goods and services. Many IT companies are threatening to leave Bangalore because of its poor transportation infrastructure.

Hence, the government has to take transportation seriously, and has thus agreed to participate in a January 2007 summit addressing transportation and other infrastructural issues with public and private high-level participants. The Sustainable Mobility Accessibility and Research Transformation group (SMART) at the University of Michigan will present a proposal addressing the complex issues of transportation to the participants. If the proposal is approved, Ford, a sponsor of SMART, will be in a good position to further explore business opportunities in Bangalore.

Furthermore, a successful business model in Bangalore will create a huge opportunity for Ford to establish itself in the fast growing Indian mobility market. This assumption is not unreasonable as the example of Delhi's metro rail proves; this success is already being replicated or explored in five major Indian cities.

Conventional Market Attractiveness: Summary of Findings

Market Factors	Qualitative Insights	Quantitative Data
Metro Area Population	• Significant infrastructure constraints • Infrastructure is not keeping pace with population growth	• Population: 6.5 million in 2006 and increasing at 2.8% per year • City population increasing at 2.8% per year
Earning Potential		• (Bangalore) GDP per capita: US$6,460 in 2006 • (India) GDP per capita: US$640 (2005) • (India) GDP PPP per capita: US$3,400 (2005)
Disposable Income	• Estimates range from ten to thirty percent of income spent on transportation	• Average annual household income: US$2,200 in 2001
Reliance on Public Transportation	• Increasing income increases affordability of two wheelers – therefore more people prefer two wheelers over public transit as it offers greater flexibility	• Bus: 49%
Car Ownership	• Car is preferred mode for middle to upper classes, because of comfort and status	• 44 cars per 1,000 people in 2002 • Historical car population growth rate was 9.9% (1991-2002) • Current car population growth rate is 8% (2004-2006)

Findings

Both the government and private sector are interested in developing innovative solutions that address the mobility needs of city residents in Bangalore. There is an opportunity for Ford to explore the possibility of developing new mobility solutions in collaboration with local partners from business, government and civil society. Additionally, all major Indian cities are facing similar transportation crises like that of Bangalore. Thus, Bangalore could serve as a starting point to create India's new mobility market.

5 Conclusion

With more and more IT majors moving into the city, Bangalore will continue to be one of the most important hubs of the IT industry in India, further fueling the city's growth. This tremendous increase in economic growth presents the city with unique challenges. With rising income levels, increasing numbers will prefer private vehicles for meeting their mobility needs, which in turn will put additional stress on the existing transport infrastructure. A comprehensive long-term plan and adequate funding for the development of its transportation infrastructure and systems could help Bangalore overcome its mobility challenge. Yet, at current, the city falls short in both areas, and, the lack of planning and funding has become evident in the daily traffic gridlock during peak hours and the increase in fatal accidents in the past years.

The government responded to the transportation problem by building flyovers, increasing the bus fleet, creating one-way traffic routes, and improving traffic junctions. However, much of the inner city is quite dense and has narrow roads which make additional improvements difficult. In order to reduce the pressing traffic gridlock problem in the innermost part of the city, the government is building a metro rail transit system; the first phase is expected to be completed by 2011. However, with vehicular traffic growing at eight percent per year, any new strategy without inter-modal integration and comprehensive long-term planning could soon become overwhelmed.[xxxviii] Unless the city aggressively addresses its growing transportation problems, the future growth prospects of the city will therefore be constrained.

The city is witnessing tremendous growth in its population and wealth. Moreover, much of the new economic development is taking place at the outskirts of the city creating thousands of new jobs. These factors are increasing the number of private vehicles on the roads and the average distance that commuters travel. At the same time road infrastructure development cannot keep pace leading to alarming levels of traffic congestion, which negatively affect air quality. For example, the PM10 levels are almost three times that of the Indian National Ambient Air Quality Standards (NAAQS) exposing 6.5 million people of Bangalore to unhealthy levels of this pollutant. Further, the number of fatal road accidents in Bangalore increased almost eight percent per year on average between 2001 and 2004.

The increase in traffic congestion levels in the city affects the poor adversely, because these residents rely on the public bus system as their primary mode of transport and the public bus system suffers from decreased reliability as congestion increases.

Bangalore is a very appealing market. It has a large and fast growing population with growing disposable income levels and people spend a sizeable percentage on transportation. Bangalore's transportation infrastructure and systems are increasingly overstrained and cannot keep up with the phenomenal growth of the city's human and vehicular populations. This trend will make the currently in circles of the middle and upper classes favored private vehicle transportation a less practical option in the near future as drivers spend more and more time in traffic, which is time lost for work and other activities.

A great deal of money is being spent on the current, suboptimal solutions; new mobility solutions should be able to steal some of this market share by offering more flexibility, better reliability, and, ultimately, shorter commute times.

Finally, Bangalore's market attractiveness is increased by the fact that it could serve as a jumping board to other markets in India. All major Indian cities are facing similar transportation crises like that of Bangalore. Thus, Bangalore could serve as a starting point to create India's new mobility market.

Case Study: Camaçari, Brazil

1 Introduction

Camaçari is located in the northeastern state of Bahia, near the capital city of Salvador. Bahia is the fifth largest and fourth most populous state in Brazil with a size of 565,000 square kilometers (roughly twice the size of Nevada) and a population of 13.8 million. Conditions in Camaçari are influenced by nearby Salvador, which is the third largest city in Brazil with a population of 2.7 million.[xxxix] Salvador and the surrounding area are rich in cultural heritage; the region's cuisine, artistic expressions, language, and architecture mix local, African, and European traditions. Salvador's historic city center, the Pelourinho, was named a World Heritage Site in 1985 by UNESCO, owing to the area's historic colonial architecture.[xl]

Camaçari is approximately 40 kilometers north of Salvador along via Parafuso. Paradoxically, the city is known both for its industrial development and natural beauty. Camaçari is home to the Camaçari Industrial Complex, the southern hemisphere's largest integrated industrial complex. It houses 60 related industries and provides 33,000 local jobs.[xli] Ford's US$4 billion production facility, which produces the Courier, Ecosport, and Fiesta for South American markets, is located adjacent to the complex. Camaçari is also located proximate to Brazil's Coconut Coast, a prominent regional tourist destination. Various beaches and preservation areas are located within a few minutes of the city.

Camaçari is a relatively small city; it covers 760 square kilometers, and has a population of approximately 192,000.[xlii] While historical population data are limited, evidence suggests that the city has experienced considerable growth in the past several decades. Camaçari is a particularly young city; two-thirds of the population is below age 30. From a socioeconomic perspective, Camaçari residents are more affluent than the state average, but less so than the national average.

Residents in Camaçari rely primarily on personal cars for transportation. The majority of vehicles registered in the city are classified as cars; fewer are classified as motorcycles and trucks. Camaçari is also supported by a local bus network, though its reach is not extensive. As Brazilians continue to immigrate to Camaçari and the surrounding area, the city's transportation network may suffer as urbanization and congestion increase.

2 Current State of Mobility

Introduction

The majority of Camaçari's residents are currently meeting their transportation needs; most residents rely on personal cars, though motorcycles and trucks are also common. Additionally, many companies in the Industrial Complex provide transportation for their employees. Conversely, nearby Salvador is struggling to provide its growing population with affordable and reliable transportation. Many residents either cannot afford the increasing cost of bus travel, or seek other, more reliable forms of transportation. While Salvador is a large city (population 2.7 million), similar problems may arise for Camaçari as it grows.

Current State of Mobility: Summary of Findings

Mobility Factor	Qualitative Insights	Quantitative Data	Overall Ranking
Accessibility	• Camaçari is relatively small, so traversing the city is not difficult • Residents rely primarily on cars, motorcycles, and trucks	• 102 vehicles per 1,000 residents (Camaçari) compared to 192 vehicles per 1,000 residents (Brazil) • 54 cars per 1,000 residents (Camaçari) compared to 135 cars per 1,000 residents (Brazil) • 2.9 buses/minibuses per 1,000 residents (Camaçari) compared to 2.7 buses/minibuses per 1,000 residents (Brazil) • Limited bus network; no train network	7
Reliability	• Road conditions appear to be adequate • Traffic safety may be a concern, particularly for pedestrians • Vehicles are relatively new	• Pedestrian fatalities in Salvador (43% of vehicle-related fatalities) are above the national average (25% of vehicle-related fatalities)[xliii] • 63% of vehicles in Bahia are less than 10 years old[xliv]	9
Integration and Flexibility	• Car, motorcycle, truck, bus, minibus, taxi • Options are not particularly well-integrated		4
Affordability	• Bus system in nearby Salvador is not affordable for all residents	• 68% of Camaçari residents make below minimum wage (US$160 monthly) • Salvador residents pay US$33 per month for bus transport [xlv]	6
Innovation	• Many companies in the Camaçari Industrial Complex provide transportation for their employees • Salvador is currently building a subway system, and has recently invested in other improvements to the transportation system[xlvi]		1

Accessibility

Because most Camaçari residents rely on personal cars for transportation, accessibility is adequate.

Because Camaçari is relatively small, traversing the city is not difficult. Most residents rely on a mix of cars, motorcycles, and trucks: approximately 53 percent of vehicles in the city are classified as cars, while 20 and 17 percent are classified as motorcycles and trucks, respectively. Only two percent of vehicles in Camaçari are classified as buses.[xlvii] Interestingly, data suggest that the city has fewer cars and more buses than the national average.

Vehicles per 1,000 residents[xlviii]

	Total Vehicles	Cars	Buses
Camaçari	102	54	2.9
Brazil	213	135	2.7

Reliability

Use of personal cars enables a reliable transportation network.

Transportation is generally reliable since Camaçari residents rely primarily on private vehicles. Road conditions appear to be adequate, and congestion is not presently a concern. Additionally, data suggest that vehicles are relatively new; in Bahia, 35 percent of vehicles are less than five years old and 63 percent are less than 10 years old.[xlix]

Using Salvador as a proxy, vehicle safety is a concern in Camaçari. Pedestrian fatalities comprise 43 percent of all vehicle-related fatalities in Salvador, compared to only 25 percent nationally.[l]

Integration and Flexibility

Transportation in Camaçari is not well-integrated.

While residents of Camaçari have a variety of transportation options, it does not appear that they are well-integrated. Some companies located in the nearby Industrial Complex have begun to provide daily bus transportation for their employees, making local transportation more efficient and reliable.

Affordability

Transportation in the region is not affordable for all.

Brazil's minimum wage has doubled in the past four years and is currently US$160 per month. Only 32 percent of residents earn at least this amount in Camaçari; 49 percent of residents earn no income.[li] Reports in Salvador indicate that public transportation is a considerable burden in that city. Bus transport is US$0.72 per trip, which equates to US$33 per month, or more than 20 percent of the monthly minimum wage.[lii] Some residents of Salvador have elected to walk rather than take the bus.

Innovation

Private transportation solutions are emerging.

Some companies located in the Industrial Complex have begun to provide bus transportation for their employees, many of whom live outside Camaçari in the greater Salvador metropolitan area. Beyond these efforts, innovation appears to be minimal.

However, extensive transportation improvements are planned for nearby Salvador. Construction of a two-line subway system is nearing completion, and large-scale repairs to the city's roadways, sidewalks, and bus system are underway.[liii]

3 Regional Megatrends

Introduction

For the most part, the five megatrends do not significantly influence daily life in Camaçari; exceptions are social equity and shifting demographics. With regard to social equity, some income disparity may exist between the city's longtime residents and those relocating to the area to work at the Industrial Complex. Additionally, because the population is young, Camaçari's infrastructure will face increasing pressure in the coming years.

Regional Megatrends: Summary of Findings

Megatrend	Qualitative Insights	Quantitative Data	Overall Ranking
Local Pollution	• Possibility of pollution from Camaçari Industrial Complex		2
Social Disparity	• Bahia disparity slightly less than Brazil disparity	• Bahia Gini coefficient of 0.541 (2003) • Brazil Gini coefficient of 0.555 (2003)	3
Shifting Demographics	• Population is young	• 32% of population under 15 • 3% of population over 65	4
Urbanization	• Population is growing	• 19% population growth between 2001 and 2005	2
Congestion	• Not a current concern	• 54 cars per 1,000 residents in Camaçari • 135 cars per 1,000 residents in Brazil	1

Local Pollution

Pollution from the nearby Industrial Complex affects the local community.

While there are no publicly available data concerning pollution levels in Camaçari, given that the Industrial Complex is within five kilometers of the city center, there is likely some local pollution. Over sixty companies, including Petrobrás, Braskem, Monsanto, and DuPont, operate in the Industrial Complex. The companies have combined sales of US$9.4 billion per year and represent more than half of Brazil's chemical and petrochemical demand.[liv] According to COFIC, which oversees development at the Industrial Complex, an extensive monitoring network continuously measures air quality both within the complex and at stations located in the surrounding community to ensure safe levels.[lv]

Social Disparity

While income in Camaçari is above the standard for Bahia, it is below the standard for Brazil as a whole.

Brazil's minimum wage is currently $160 per month. In Camaçari there is significant variation in wages; 49 percent of residents earn no income, 19 percent earn less than the minimum wage, and only 32 percent earn more than the minimum wage.[lvi] This is not surprising given that Bahia is one of the more economically depressed regions in Brazil. The exhibit below shows income distribution data for Camaçari, Bahia, and Brazil as a whole.

Income Distribution in Camaçari, Bahia, and Brazil[lvii]

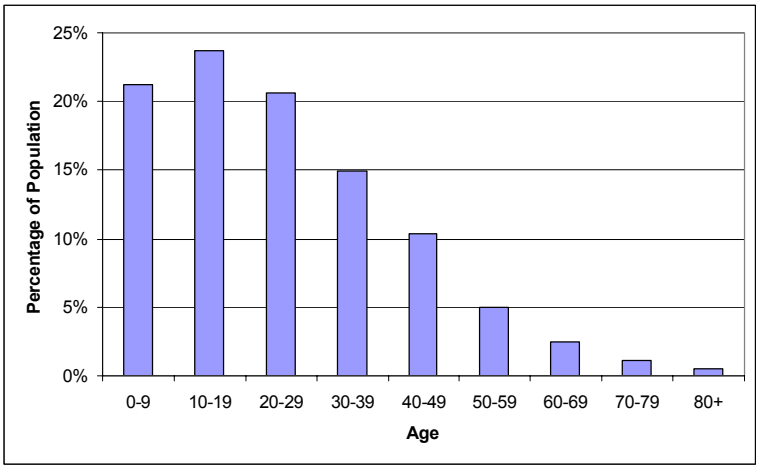
	Camaçari	Bahia	Brazil
No income	49%	48%	42%
Less than minimum wage	19%	27%	18%
More than minimum wage	32%	25%	40%

Since 1978, US$11 billion has been invested in the Camaçari Industrial Complex.[lviii] As employees of the Industrial Complex relocate to Camaçari and the surrounding area, two scenarios are possible. Increased income opportunity will improve the standard of living city-wide; alternatively, workers in the Industrial Complex will earn more than the average local resident, leading to increased inequality.

Shifting Demographics

Camaçari is young and growing.

Camaçari's population has grown from 162,000 to 192,000 residents between 2001 and 2005, an annual rate of almost 20 percent. In fact, qualitative evidence suggests that that the population has grown steadily since the Industrial Complex was completed in 1978.



Urbanization

The future is uncertain for Camaçari.

While urbanization does not appear to be a significant concern in Camaçari, growth of both the Salvador metropolitan area and the Camaçari Industrial Center will likely influence daily life in Camaçari in the coming years.

Congestion

Congestion is of minimal concern in the city.

Congestion is not a pressing concern in Camaçari. Most residents rely on cars for transportation in and around the city, and infrastructure is sufficient to support this activity at present.

4 Conventional Market Attractiveness

Introduction

Camaçari is a small market, with a corresponding level of demand for mobility products and services. However, as Camaçari's already expansive Industrial Complex continues to grow, the city is poised to become an increasingly attractive market, particularly with the presence of Ford and other automotive suppliers in the region.

Conventional Market Attractiveness: Summary of Findings

Market Factors	Qualitative Insights	Quantitative Data
Metro Area Population	• Camaçari, 40 kilometers north of Salvador, is considered part of city's metropolitan area	• Camaçari population 192,000; Salvador population 2.7 million[lix]
Earning Potential	• Transportation appears to be a significant expense	• Residents of Salvador spend 21 percent of their monthly income on bus transportation[lx] • (Brazil) GDP per capita: US$3,300[lxi] • (Brazil) GDP PPP per capita: US$8,460 per capita[lxii] • Annual minimum wage is US$1,940
Disposable Income		
Reliance on Public Transportation	• Bus system is not extensive; few rely on public transportation	
Car Ownership	• Residents rely primarily on cars; also motorcycles and trucks	• 54 cars per 1,000 residents (Camaçari); compared to135 cars per 1,000 residents (Brazil)[lxiii]

Findings

Public planning is necessary to repeat recent successes in Salvador.

While Salvador has had difficulty meeting the mobility needs of its diverse population in the past, it appears that some of these needs are now being met. Since 2002, the city has invested US$140 million in several large-scale improvements: a two-line subway system and repairs to the city's roadways, sidewalks, and bus network.[lxiv] Camaçari can learn from Salvador's recent experience; while cars are the predominant means of transportation in the city, it appears they may not be affordable to all residents. Additionally, because the bus network is limited in Camaçari, city officials should first focus their efforts on improving this system. From that point more innovative solutions are certainly possible.

5 Conclusion

Cars represent the majority of the city's vehicles, outnumbering trucks and motorcycles combined. Camaçari's infrastructure is adequately suited to current automobile demand. Because public transportation is limited, greater breadth in the mix of transportation options would better serve a growing city.

For the most part, the five megatrends do not significantly influence daily life in Camaçari; exceptions are social equity and shifting demographics. Camaçari's population is young and the city is growing rapidly. While these data suggest increasing numbers of wage-earning residents to support municipal programs, the city's infrastructure – both transportation and otherwise – will be impacted as more residents rely on it. Additionally, trends in social equity are uncertain, with the influx of workers to the Industrial Complex either yielding greater wealth for all in the region or heightening the income disparity. Finally, pollution, urbanization, and congestion are not yet pressing concerns.

As indicated above, Camaçari is a small market, with a corresponding level of demand for mobility products and services. However, as continued development of the nearby Industrial Complex fuels the city's growth, innovative solutions may be required to move employees between their homes and places of work. At present, the Industrial Complex employs 33,000 in the region.

Case Study: Hermosillo, Mexico

1 Introduction

Hermosillo is the capital of the Mexican State of Sonora, in northern Mexico.[lxv] The city's climate is hot and dry: average annual temperature is over twenty-five degrees Celsius; average in the summer months is nearer to thirty degrees Celsius.[lxvi] An ongoing drought has magnified the inhospitable nature of this desert environment.[lxvii]

Hermosillo has a population of 700,000 covering 15,000 square hectares, with a population density of approximately thirty-nine people per hectare. [lxviii, lxix, lxx] Over the last two decades Hermosillo has experienced significant growth in its economy, population, and physical size.[lxxi] This growth has been a result of a number of companies, including Ford Motor Company, locating plants within the city. The plants have provided employment opportunities that have expanded the economy, increased income, and attracted migrant workers.[lxxii] Because they are built on the outskirts of the city, these plants have increased the physical size of the city. Despite the economic growth, a significant portion of the population—about thirteen percent—lives in poverty.[lxxiii] Hermosillo's population growth rate has slowed over the last five years; with fewer young people to anchor the population, the average age of city residents is slowly creeping upward.[lxxiv]

Hermosillo's political landscape is changing. Until recently, the governments of Sonora and Hermosillo were in the hands of separate political parties; today, both these governments are controlled by the conservative party. This has been significant for Hermosillo's city planning in general, and for its transportation and infrastructure planning in particular. The previous liberal city government was in favor of implementing public transportation programs such as rapid transit buses, while the State Government was in favor of automobile-based transportation policies. Since the conservatives have come to power within the city, the city and state governments have agreed on pursuing an automobile-based future. While this shift in power has resulted in more governmental action, it has also moved the city farther away from the achieving a sustainable system of mobility.[lxxv]

Cars and buses dominate Hermosillo's transportation system; they comprise 44 and 27 percent of the city's total transportation, respectively.[lxxvi] The ability of the city's transportation infrastructure to handle this traffic is hindered by poor road quality, growing levels of congestion, and problems related to the reliability, cleanliness, and safety of the city's bus system.[lxxvii] The city has attempted to address these issues mainly by expanding or improving the roads and the bus service. For example, in order to ease congestion, the city has constructed a new overpass and currently plans to build another in the commercial district.[lxxviii] Also, in December of 2006, Hermosillo will implement a new bus system, including new vehicles and routes, that officials hope will alleviate some of the inefficiencies and safety issues associated with the current service.[lxxix]

A traditional market attractiveness assessment would reveal that Hermosillo is not a compelling target market. Hermosillo does have transportation problems and a fairly wealthy population that could purchase new transportation services;[lxxx] however, it provides little potential for accessing a large consumer base, and exhibits low to moderate demand for improved transportation. Further, many residents show reluctance or hostility toward new

changes to the transportation system outside of road infrastructure improvements. This sentiment creates a challenging environment for new programs, especially those based upon a public-private business partnership.

2 Current State of Mobility

Introduction

Generally, Hermosillo has followed the American transportation model. The city has concentrated on building new roads in order to accommodate the increasing number of cars in the city, instead of encouraging and facilitating alternative forms of transportation. A number of problems exist with the current system, including a dearth of transportation options, growing congestion issues, and a somewhat unreliable and unsafe public transportation system. In order to alleviate some of these problems, the state is implementing a new bus system in December, 2006, and will further improve and expand the system of roads.

Current State of Mobility: Summary of Findings

Mobility Factor	Qualitative Insights	Quantitative Data	Overall Ranking
Accessibility	• Many families both own a car and use the bus system • The bus routes cover a large amount of the city and are fairly accessible. The exception to this is poor route coverage for the poor people who live on the outside of town. • Currently little handicap access, but the new buses will be handicap accessible	• 222 cars per 1,000 people (150,000 cars, 675,000 people in 2004)[lxxxi] • 440 buses and 19 routes[lxxxii]	6
Reliability	• The poor people in the *colonias* have to walk a significant distance to get to a bus that only comes a couple times a day.[lxxxiii] • Especially during rush hour, buses often skip stops because they are too full • Many people complain that the buses are unsafe, both due to reckless driving and crime • Many vehicles are fairly old because of the high cost of a new car	• Average wait for a bus is about 10 minutes • 1,815 kilometers of roads total • 160 kilometers of primary roads • 9,437 total transit accidents (2003)[lxxxiv] • 6,275 car accidents (2003)[lxxxv]	7
Integration and Flexibility	• Cars and buses dominate transportation. • The poor generally ride the bus, use bicycles, or walk. • Taxis are too expensive for the majority of the population.	• Percent of total transportation: • Cars: 44.03% • Bus: 29.05% • By Foot: 24.51% • Bicycle: 1.54% • Taxi: 0.45% • Motorcycle: 0.29%[lxxxvi]	3
Affordability	• The bus system is affordable for most people within the city • Cars, especially new cars, are expensive in Mexico, so there are a lot of older vehicles in Hermosillo	• New cars are subject to a 10 year tax, paid annually, based on the value of the car[lxxxvii] • Bus: 5 pesos general, 3 pesos for students and the elderly[lxxxviii]	6
Innovation	• Culture does not appear ready to accept New Mobility solutions • Little innovation within the city • New buses will have an electronic payment system[lxxxix] • Traffic lights will soon be synchronized on major streets[xc] • Ford provides its employees with a free bus service in order to get to work[xci]		4

Accessibility

Accessibility is limited during peak commute hours, and is difficult for the poor and disabled

Public transportation in Hermosillo exhibits good accessibility during non peak hours, except for the poor and the handicapped. Most areas of the city have a bus route within a few minutes' walk. The poor neighborhoods on the outskirts of town are exceptions to this; from these areas the nearest bus stop is thirty to forty minutes' walk. This distance increases

overall commute time to an hour and a half in each direction.[xcii] Further, these routes are serviced only three times per day. Other accessibility limitations include the lack of handicap accessibility on current buses and full buses that do not stop for riders during peak commute hours.

The new bus system with planned introduction in December, 2006, will alleviate some of the accessibility challenges by providing handicap access and larger buses. These accessibility gains will be offset by the new system's reduction in the number of lines serving poor neighborhoods.

Reliability

Hermosillo's reliability issues stem from poor infrastructure and government policy.

Transportation reliability in Hermosillo is hampered by the city's poor infrastructure, as well as by problems with the administration and maintenance of the public transportation system. The city has 1,815 kilometers of roads, 160 kilometers of which are highways or large roads. Twenty five percent of roads remain unpaved, and this creates a significant problem for efficient, reliable transportation. Most of these roads lie outside the center of the city and support only local traffic, rather than thru traffic. Hermasillo's major roads are all paved and appear to be in decent condition.[xciii]

Hermosillo has moderate traffic congestion problems. Commute times, even on buses, generally do not exceed 45 to 50 minutes.[xciv] Congestion is usually most severe during the morning and evening commutes and when school lets out, and it is worse in the center of the city where the roads are narrow and land is more densely developed.[xcv] Congestion is exacerbated by the numerous semi-trucks that pass through the city. These trucks often come from, or are bound for, the United States, and pass through the city in order to serve Ford or other industries.[xcvi]

In order to alleviate traffic problems, the city has concentrated primarily on building new roads, highways, and overpasses. An example of this is the new highway and overpass built to reach the southeastern side of the city, the location of the Ford plant. This project is widely seen as a success—the completed roads are well-paved, wide, and largely congestion-free. Further, they have significantly increased the accessibility of this southeastern industrial area.[xcvii] The city intends to implement other similar traffic-reducing projects in the future: First, the city is currently planning to build a new major road along the eastern edge of the city to divert industrial traffic, mainly trucks, away from the city center. In order to further discourage traffic from passing through the city, the local government will implement a toll along the previous major industrial route.[xcviii] Second, the city plans to build a new overpass within the city in order to allow vehicles to bypass current intersections. The construction of the overpass has been controversial: City planners feel that building larger roads is only a temporary remedy, rather than a long-term solution for congestion problems. These dissenters claim that the overpass funds would be better spent on improving the public transportation system. Specifically, they point to a rapid bus system, similar to the one found in Curitiba, Brazil, as a better solution that would meet both present and future transportation needs.[xcix] Third, the city plans to synchronize the traffic lights along major streets to improve the flow of traffic. This program may reduce congestion as much as twenty percent along affected routes.[c]

The public bus system in Hermosillo is fairly reliable, despite a number of widely perceived problems. Positive aspects of the system include the wide coverage achieved by the city's nineteen bus routes, the reasonable waiting time for a bus, and the relatively short amount of

time it takes to commute by bus—usually fifty minutes or less.[ci] On the other hand, private ownership of bus routes has significant negative effects on the system as a whole. Different and competing bus companies drive the city's buses, with drivers maximizing ridership with little regard to the overall quality of the service. Some drive dangerously fast, some drive too slow, and some skip stops entirely to reach a more lucrative stop more quickly.[cii]

The reliability of the bus service is further compromised during rush hour, when buses become extremely crowded. To limit overcrowding, the drivers stop picking up additional passengers; this significantly increases wait time for passengers at bus stops. Causes for this problem include the small size of the buses, the lack of an adequate number of buses during peak commute hours, and each bus driver's profit-driven tendency to overfill individual buses instead of allowing an efficient distribution of riders across the entire system.[ciii]

In December of 2006, the state of Sonora is going to implement a new bus system to address the problems described above. First, the state is going to consolidate the bus service into one company so that each bus operator receives a fixed share of the overall profits. This will discourage competition among the drivers and will allow the system to function better as a whole. Second, the new service will have more routes and larger buses, reducing some of the overcrowding during peak hours. Third, each new bus will be equipped with a sensor that will automatically deduct the fare from the rider's card as the rider boards the bus. Finally, the new service will include fines and drug tests for the drivers, which will increase their obedience of speed limits and traffic laws.[civ]

Safety is also a concern with Hermosillo's transportation system. The two major safety concerns are reckless driving and crime.[cv] In 2003, there were 9,437 total transit accidents, of which 6,275 were car accidents.[cvi] The people with whom we spoke frequently commented that the people of Hermosillo - including both bus and automobile drivers - tend to drive carelessly and do not obey traffic laws. The bus system appears to be particularly dangerous- most people preferred to drive themselves instead of taking the bus because of concerns over reckless bus drivers. Certain bus routes, especially those going into poor neighborhoods, also appear to be subject to a substantial crime risk.[cvii] The new bus system attempts to address these safety concerns by reducing the incentive for bus drivers to drive irresponsibly and by limiting bus routes to larger streets where the police can better prevent crimes from occurring. This latter adjustment, however, will reduce transportation accessibility for the poor.[cviii]

Integration and Flexibility

Private cars and buses dominate Hermosillo's transportation; there is little flexibility in the system as a whole.

Transportation in Hermosillo is not very flexible or integrated. The major forms of transportation, not including walking, are public buses and private cars, and the little flexibility that does exist in the city grows from the use of these two forms. Automobiles account for about 40 percent of the city's transportation and buses account for about 29 percent.[cix] For a single trip, individuals are most likely to use only one form of transportation.[cx] In fact, no local resident reported using multiple modes of transportation on a single trip. There are a number of explanations for this: First, there is little parking infrastructure near bus lines that would encourage multi-modal trips; second, there is no rail system in the city for which people might take a car or bus; finally, the city is relatively small and without physical barriers, such as a bay or river, that would create a strong demand for multi-modal options.[cxi]

For the individuals and families that own a car, Hermosillo's transportation system is more flexible. Car owners can take the bus; families with cars can allocate the car to commuting family members, lessening the commute time for those individuals.

Affordability

Transportation is affordable for most residents, but not for the very poor.

Transportation within Hermosillo is affordable for the majority of the city's residents. Economic growth over the last two decades has increased the amount of money available for transportation. The rate of car ownership in Hermosillo is closer to those of more developed nations than to that of Latin America as a whole.[cxii] There is a tax on new cars purchased in Mexico which requires the payment of a fee every year for ten years, but many residents circumvent this cost by importing used cars from the United States.[cxiii] Overall, the cost of driving a private car is low enough that it has become the major form of transportation within the city, accounting for about 44 percent of transportation services.[cxiv]

Buses are also reasonably priced for most residents. A normal bus trip costs five pesos (about US$0.50), but discounts mean that students and the elderly only have to pay three pesos.[cxv] Still, almost thirteen percent of greater Hermosillo's population lives in poverty.[cxvi] For these individuals, the cost of the bus is high, and some choose to ride a bike or walk. This solution is not usually practical for children that have to commute across town to reach their secondary school or to get to the doctor's office.

Innovation

Hermosillo follows the American transportation model, with some local innovations.

Hermosillo is following the American model of road building and city expansion, with some innovative aspects. First, the city is implementing an electronic form of payment for its bus service.[cxvii] Second, the city will install synchronized traffic lights to facilitate traffic flow.[cxviii] Finally, the Ford Motor Company has a free private bus services that brings many of its employees to work. This system has 28 buses, each following its own route, which pick up and drop off workers for each of Ford's three shift changes. Each bus takes a maximum of 45 to 50 minutes to complete its route and no employee has to walk more than a few blocks to reach the bus stop. This service is very popular amongst the Ford employees; an estimated 90 percent use the service. Benefits enjoyed by the employees include a quick, cheap, and safe commute, and freeing up a car for other family members.[cxix]

3 Regional Megatrends

Introduction

Although Hermosillo is a city that is growing in size and wealth, a number of problems remain, including particulate matter pollution, poverty, an aging population, sprawl, and traffic congestion. The government is attempting to address these challenges by updating the city's infrastructure, but governmental funds are insufficient to implement the full range of desired improvements. Additionally, recent shifts in political power have eliminated some of the enthusiasm for these projects. Demographic trends indicate that these problems will worsen without proactive investment.

Regional Megatrends: Summary of Findings

Megatrend	Qualitative Insights	Quantitative Data	Overall Ranking
Local Pollution	• Particulate matter pollution: dust due to unpaved roads, mostly in poor neighborhoods[cxx] • Air pollution is not as large a concern as water conservation		4
Social Disparity	• Large shanty town population on the outside of Hermosillo • Access to education and health care for all	• 13% live in poverty[cxxi] • 31% earn at least 2 times the minimum wage[cxxii] • Mexico Gini-Coefficient—0.546[cxxiii]	4
Shifting Demographics	• There will be a rapid increase in the number of elderly and a decrease in the number individuals in younger age groups over the next 20 years[cxxiv] • The increased proportion of elderly will burden the city	• 31% population is under 15[cxxv] • 4% of the population is over 65[cxxvi]	5
Urbanization	• The city has a large proportion of migrant workers, many of whom settle there • Immigration may increase if industries within the city expand • The city center remains densely populated, but sprawl has developed away from the center	• Individuals who have migrated to the city constitute 42.8% of the total[cxxvii] • Population density has dropped from 68 people per hectare in 1980 to 39 people per hectare in 2000[cxxviii]	5
Congestion	• Congestion is heaviest for streets connecting the northern and central parts of the city • Traffic is especially bad between the hours of 6am to 10am and 12pm to 3pm[cxxix]	• Distribution of traffic across major roads (north to south): Blvd. Solidaridad 38%; Blvd. Morelos 25%; Fco. Monteverde 22%; López del Castillo 15% • Distribution of traffic across major roads (south to north): Blvd. Morelos 35%; Av. de la Reforma 27%; Blvd. Solidaridad 25%; Dr. D. Olivares 13%[cxxx]	3.5

Local Pollution

Dust kicked up on unpaved roads is Hermosillo's most significant local pollution problem.

Dust caused by traffic on unpaved roads is the major pollution problem in Hermosillo. Around 25 percent of the city's streets, mostly those in poor neighborhoods around the outside of town, remain unpaved.[cxxxi] Cars and trucks passing over these streets kick up a significant amount of dust, and this has resulted in high rates of respiratory problems, including asthma, in poor neighborhoods on the outskirts of town. The city's dry climate makes it easier for dust to become airborne; the city has begun to address the problem by paving remaining dirt roads.

Climate change is particularly salient for Hermosillo because of its desert location and decade-long drought. Climate change is not to blame for either the desert or the drought, but residents are attuned to global warming and worried about its regional effects. On a state level, Sonora has entered into a climate change agreement with Arizona state to facilitate cooperative actions to deal with climate change.[cxxxii]

Social Disparity

Recent economic growth in Hermosillo has benefited many residents.

Much of Hermosillo has benefited from recent economic expansion. As a result, many people have money for some luxury goods in addition to basic necessities. This increase in income is seen in the proliferation of restaurants, and in the arrival of stores like WalMart and Costco, all of which cater to the new middle class. Many residents own private cars: in 2004, the total population stood at 600,000, and there were roughly 150,000 registered cars;[cxxxiii] private automobiles account for over 44 percent of transportation in the city.

Still, a substantial portion of the population—close to thirteen percent—lives in poverty.[cxxxiv] Many live just outside of town in *colonias*, shanty towns constructed from various scraps like metal sheets or crates. These people have almost no disposable income, and while the government attempts to provide certain basic necessities like health care and education, the *colonias* often fall outside the government's reach. Nintey-nine percent of Hermosillo's homes have electricity, 95 percent have piped water, and 91 percent have drainage.[cxxxv] However, homes in the *colonias* have little access to piped water: Many residents keep their store of water in old metal barrels near their home. This can be problematic as standing water is a breeding ground for disease-transmitting mosquitoes. As is the case with many poor neighborhoods around the world, the *colonias* can be very dangerous and have a number of gangs that roam the streets.

Shifting Demographics

Hermosillo's population growth has slowed in recent years and the population as a whole is aging.

The population of Hermosillo is growing more slowly since 1995, with the average age increasing since then.

In 1970, the population of Hermosillo was 176,598. By 2000, the population had grown to 545,928. Between 1970 and 1990, the population grew at a rate of 4.2 percent per year; between 1990 and 1995, the population grew at a rate of 3.9 percent; between 1995 and 2000 the growth rate dropped sharply to 1.9 percent.[cxxxvi] Thus, Hermosillo's population is growing, but at a diminishing rate. The city's population is expected to reach approximately 733,000 in 2020 and approximately 813,000 in 2030. Less conservative estimates predict the population will exceed one million inhabitants by 2030.[cxxxvii]

As the population is expanding, it is also aging. The proportion of individuals younger than four is already starting to decrease. By the year 2025, the number of individuals ages five to fourteen is expected to have decreased by 9.18 percent, and the number of individuals between the ages of 20 and 29 is expected to have decreased by 0.42 percent. Conversely, the number of individuals over 70 is expected to increase by 492 percent, from 11,854 to 58,235 individuals between 2000 and 2025.[cxxxviii] This trend will result in more elderly with special needs and a proportionately smaller work force to support them, and thus will likely create future problems for the city.

Urbanization

While Hermosillo's population, fueled by immigration, has been increasing, the city's population density has been decreasing.

While the population of Hermosillo has been growing, the city's population density has been decreasing. This is because the city's total area has increased significantly since 1970. In 1970, the city's size was 3,000 hectares; in 2000, the city's size was 14,000 hectares. Thus, over the last three decades, the city's size grew by 466 percent. This expansion has been

more than enough to offset the 310 percent increase in population. As a result, despite the density of the city's core, urban sprawl has become increasingly widespread.[cxxxix]

Immigrants constitute much of Hermosillo's population and population growth. A recent census estimated that immigrants constitute 42.8 percent of the population of Hermosillo.[cxl] These immigrants come from the surrounding cities and countryside, seeking employment in one of the local industries. Thus, another significant expansion of industry in the city would result in an immigration boom and another sharp increase in population growth.

Congestion

Traffic in Hermosillo is increasing as the number of registered cars in the city climbs.

Congestion is currently only a minor problem within most of Hermosillo. Commutes within the city take less than 45 to 50 minutes, even during peak traffic hours. While traffic originates in the north of the city, its effects are felt most in the central district. Streets such as Boulevard Solidaridad and Boulevard Morelos that link the north to the central district experience the heaviest congestion.[cxli] Timing of commutes to and from school or work determine the peak traffic hours.[cxlii]

The number of cars in Hermosillo is growing rapidly. Between 1999 and 2004, the number of registered automobiles more than doubled, from 72,397 automobiles to 150,553.[cxliii] This perceived rise is partially due to improvements in information gathering, but it is nevertheless clear that vehicle ownership has increased. These new vehicles threaten to add significant pressure to the local infrastructure.

4 Conventional Market Attractiveness

Introduction

For a Latin American city, Hermosillo is fairly wealthy and depends heavily on automobiles for transportation. Still, a large portion of the population, mainly the poor and working class, is reliant upon buses, the city's only significant form of public transportation. Due to public resistance, the city has had difficulty implementing new transportation programs, so New Mobility providers will need to work with local stakeholder groups to mitigate resistance to systemic change.

Conventional Market Attractiveness: Summary of Findings

Market Factors	Qualitative Insights	Quantitative Data
Metro Area Population		• 700,000
Earning Potential	• Hermosillo enjoys higher employment and a higher PPP than the rest of Mexico	• (Mexico) GDP per capita: US$6,450 • (Mexico) GDP PPP per capita: US$10,000[cxliv] • 13% of Hermosillo's population lives in poverty[cxlv]
Disposable Income	• There are a number of retail stores and fast food restaurants in the city, showing that individuals do have disposable income • A high percentage of income is spent on cars, including aesthetic improvements	
Reliance on Public Transportation	• A large portion of the population uses the bus system. Many families and individuals that own cars will regularly use the bus • Buses are generally used by individuals who are less wealthy, including the very poor	• 27% of transportation is bus transportation[cxlvi] • 300,000 bus passes have been issued[cxlvii]
Car Ownership	• Car ownership rates are increasing • Ownership rates are not as high as in other developed countries, but are higher than in most of Latin America	• 222 cars per 1000 people (150,000 cars, 675,000 people in 2004)[cxlviii]

Findings

In Hermosillo, automobilies and buses dominate transportation, with the city's poor relying on buses; New Mobility providers will need to engage local residents to successfully implement new programs.

Hermosillo has a population of 700,000.[cxlix] The city covers 14,000 square hectares and has a population density of 39 people per hectare.[cl] In Hermosillo, about thirteen percent of the population lives in poverty, but over 30 percent makes at least twice the minimum wage.[cli] Significantly, the city is also home to a number of companies, including Ford, that provide employment opportunities. The relatively high rate of employment has created disposable income that local residents spend on goods and services other than the bare necessities. This is illustrated by the proliferation of supermarkets, mega retailers, and fast food restaurants.

Increased employment and a subsequent demand for goods and services is resulting in a higher demand for transportation in Hermosillo. While data on disposable income were difficult to find, customized pickups and SUVs were common, many of them with stylistic alterations and accessories. Additionally, automobile ownership rates in Hermosillo are higher than most cities in Latin America, even approaching levels found in major industrialized nations.

The bus system is Hermosillo's only significant form of public transportation and accounts for approximately 29 percent of total transportation services.[clii] City records indicate that roughly 300,000 bus passes have been issued, which translates to one bus pass is issued for every two residents.[cliii] Clearly, not all bus pass holders rely strictly on the bus service—many residents own cars—but this statistic illustrates the importance of the system to residents.

There are a number of reasons why the poor rely more heavily on the bus system than the wealthy. First, cars are a quicker way to move around the city, so residents will drive a car if they are financially able to do so. Second, the perception that Hermosillo's buses are unsafe and unclean drives away some potential users. Finally, there is a perception among wealthier residents that the bus system is for the poor.

Any attempt to integrate New Mobility solutions with Hermosillo's existing transportation system must include local stakeholder engagement, as there has been public resistance to changes in the past. For example, when new buses were recently tested on a few routes within the city, the buses were vandalized to the point that the government decided to suspend use of the buses and end the test run. This vandalism was not only a reaction to rate increases, but also a result of some residents' desire to destroy new public property. A second example is the challenge the city faced in implementing a smog certificate program. The public's widespread refusal to comply with the program caused it to fail. Thus, new transportation programs should better incorporate the concerns of local residents.[cliv]

5 Conclusion

As described, Hermosillo has various transportation problems, including pollution from dust and limited flexibility. However, its small market size and extensive public bus system may minimize the positive impact a New Mobility system could have on the city. In order to maximize the benefits that New Mobility can bring to the region, solutions should focus on developing systems accessible to all residents of the community, including those that live in *colonias* throughout the city. Moreover, New Mobility solutions should focus on reducing traffic on Hermosillo's many dirt roads to eliminate local dust pollution. These solutions should be implemented with full engagement from the local community to ensure long-term success.

Case Study: Istanbul, Turkey

1 Introduction

Istanbul is the meeting point of Asian and European cultures. Modern Istanbul straddles the Bosphorus, the meeting point of two continents. It also connects the Black Sea to the Sea of Marmara and the Aegean and Mediterranean beyond. No longer the nation's capital, Istanbul has remained Turkey's economic hub and is home to 20 percent of the country's people. Central Istanbul is located at the Bosphorus' southern extent, where a mild climate makes living more attractive than areas further to the north. However, a deadly earthquake struck İzmit – 100 kilometers east of Istanbul – in 1999, which has encouraged sprawl towards the north and away from a prominent fault line.

Turkey's economy was hard hit by the fall of the USSR and subsequent regional depression in the early 1990's. However, the opening of the economy in the 1990's prompted rapid growth in the local economy, causing Turkey's per capita income to rise from US$1,640 in 1988 to US$3,025 a decade later; at Purchasing Power Parity, the 1988 and 1998 figures are US$3,729 and US$5,901, respectively.[clv]

Turkey's accession into the EU is currently being stymied by the military, which heavily influences national politics and also permits human rights abuses. In Istanbul, the next mayoral election is in early 2009 and the current mayor is resistant to any significant infrastructure improvements that would inconvenience voting citizens without providing benefit before the voting begins. The next national election is in 2007. The Istanbul mayor's office is often a stepping stone to national office; as a result Istanbul can rely on the national government for infrastructure help.

From a demographic perspective, Istanbul is a young city; it is about to enjoy a decades-long demographic window of opportunity. Much of the population is under 35, and the workforce will outnumber its dependents for many years.

Istanbul has a modern infrastructure. The city's transportation offerings include cars, buses, boats, a metro system, and light rail. These modes are integrated at many connection points

throughout the city. Road infrastructure is overwhelmed by the amount of traffic, leading to bottlenecks on the Bosphorus bridges, and congestion throughout the day.

Istanbul's mobility is split – the non-road modes of public transportation (e.g. boats, light rail) efficiently serve a large portion of the city, whereas road-based travel has become increasingly frustrating and unreliable. Among megatrends, congestion is the most acute problem – it is already choking efficient movement throughout the city. Urbanization is increasing, though at a slower rate than for the past half century. Pollution and issues resulting from social inequity and shifting demographics are poised to have a large impact on Istanbul, but not for many years to come. There is a strong demand for better mobility products and services; however, because public capacity for private transportation is already overwhelmed, the solutions will not be as simple as cleaner cars or trucks. Effective solutions to Istanbul's transportation problems will require both public-private partnerships and a sound knowledge of local politics.

2 Current State of Mobility

Introduction

Istanbul is struggling to keep pace with its citizens' demands for mobility. Some decisive steps have been taken – the reach of public transportation extends every year – but no real effort has been made to address the congestion that limits Istanbul's efficiency. In fact, personal cars are entering Istanbul's roads at an ever faster clip, even as the marginal benefit to each car owner shrinks. The modes of transport that are immune to congestion work efficiently and are well-liked; however, Istanbul's current transportation system does not cater to the elderly, the handicapped, or the poor.

Current State of Mobility: Summary of Findings

Mobility Factor	Qualitative Insights	Quantitative Data	Overall Ranking
Accessibility	• Good reach of network • Only a short walk is required to reach various transportation options • No ramps or lifts for elderly and disabled	• 47% of respondents within five minutes walk of transportation option • 74% of respondents within 10 minutes walk of transportation option • 94% of respondents rate transportation in Istanbul as extremely difficult for elderly / disabled	7
Reliability	• Impossible to predict arrival time if transportation mode is required to cross one of the bridges • Dolmuş drivers are criticized for recklessness • Seatbelts unavailable in taxis, dolmuş • Disparate rates of reliability; road-free travel is reliable while road travel is unreliable	• 22% of respondents mentioned unsafe or aggressive dolmuş drivers • 31% of respondents rate Istanbul reliability "very poor" overall (worst rating available) • Respondents estimated Istanbul runs on-time 20-25% of the time	3
Integration and Flexibility	• Bus, metro, dolmuş, taxi, funicular, tramway, minibus, personal car, ferry • Options are well-integrated; mobility hubs integrate several options	• 41% of respondents have three or more modes available to them • 63% of respondents use bus as their primary mode of transportation	7
Affordability	• Little freeriding observed • 1.3YTL (US$0.90)per single ride • Free transfer with Akbil (smart chip) • Options are decreasing for low-income residents as Istanbul expands (trips are further) and affordable options (dolmuş, bus) impeded by congestion	• Respondents estimated city residents spend 21% of income on transportation (range was 10-30%)	6
Innovation	• Government innovation includes construction of high speed rail; Akbil smart chip; and 500 new buses • Private innovation: Dolmuş		7

Accessibility

Transportation options cover a large area within the city. Residents have a short walk to the nearest option, though most of these are poorly equipped for the elderly and disabled.

Istanbul's transportation options provide good reach throughout the city. With public transport lines radiating in all directions from the city's center, most areas can be reached by combining trips on boats, ferries, the metro, tram, and bus. Transportation options beyond the public transport system include minibuses, dolmuş, taxis, or walking. Seventy four percent of surveyed commuters walk ten minutes or less to access transportation.

In general, transportation capacity is struggling to keep pace with demand. Road capacity does not meet current demand and creates congestion at any bottleneck (particularly bridges). Public transportation capacity adequately serves off-peak demand but is inadequate during rush hour. In the mid-morning and on weekends, trams, metros, and other options are relatively empty while during rush hour these options are extremely crowded. Eleven percent of surveyed residents complained about overcrowded conditions.

Accessibility is mostly for the able-bodied, as there are few ramps, lifts, or elevators to accommodate the elderly or disabled.

Reliability

Increased congestion means decreased reliability; reports of poor safety are not confirmed by country-wide traffic deaths.

Roads are well-maintained, with working traffic lights, underpasses, and overpasses. It is obvious when driving that Istanbul pre-dates the automobile. Older roads are one or two cars wide, which leads to backups at entrance and exit points from through-roads. Also, a single double-parked vehicle can create traffic back-ups for many blocks. Several survey respondents offered 'outdated buses' as a transportation problem- Istanbul has already responded to this shortcoming by adding 500 new buses in the past year.

As with the case above, timeliness divides into peak and off-peak travel hours, and road and non-road transportation. Cars and buses are wholly unreliable during peak hours. One Istanbul resident mentioned that no one makes hard commitments to meetings across town anymore, because it is no longer possible to predict how much time it might take to arrive at a cross-town destination. In stark contrast, the ferries and metros arrive and depart reliably and on time. Survey respondents indicated that they experience transportation delays for 75 percent of all trips. Thirty-one percent of interview respondents rated Istanbul's transportation reliability as "very poor" overall (the worst rating offered).

Dolmuş drivers were singled out for their poor reputation. One resident described after-market side bumpers that dolmuş drivers install to allow them to drive recklessly; another described dolmuş drivers causing accidents and then cajoling the other party into not calling police. Taxi drivers were also accused of unsafe driving – one taxi was observed entering a throughway by going the wrong way down the off-ramp. Despite these anecdotal complaints, traffic deaths per 100,000 are only 7.5 in Turkey compared to 14.9 in the U.S., 15.7 in Slovenia, and 20.1 in Greece.[clvi]

Integration and Flexibility

Istanbul offers a wide range of well-integrated transportation options.

Ease of movement differs depending on the time of day. During peak hours, personal cars, taxis, buses, dolmuş, and minibuses vie for the little road space available, and movement grinds to a halt. In desperation, vehicles sometimes utilize the track dedicated for the tram, making travel by tram during such occasions useless. Off peak, traffic on roads moves fairly quickly. In all cases, metros, ferries, and funiculars are immune to road delays.

Istanbul's seaside location both creates water-based transportation options and frustrates road travel. Among the many options available to commuters are buses, metros, dolmuş, minibuses, taxis, funiculars, trams, and traditional and high speed ferry boats. For an increasing number of residents, private vehicles are also an option – they are being added to Istanbul's roads at a rate of 640 per day, thanks to zero-percent financing from local car dealers.

On the whole, integration among these options is excellent. Hubs are increasingly developing where multiple options connect, and lines have been extended to meet at common points. An example of this is Taksim Square, where one can find metro, dolmuş, buses, and a recently-added funicular that connects to the seaside hub Kabataş, a termination point for ferries and tram.

Affordability

Transportation is affordable for many city residents, though not for Base of the Pyramid customers.

Much of Istanbul's population can afford public transportation. Residents can also afford personal automobiles in growing numbers, as reflected in the aforementioned statistic that car ownership is increasing at a rate of 640 cars per day. Children, especially women, often live at home until marriage. This higher occupancy rate decreases average cost of living. In addition, different ticket prices for students, teachers, and veterans represent a built-in sliding scale for public transportation prices. While affordable, cost is certainly not trivial; respondents estimate that most residents spend approximately 20 percent of their income on transportation.

At a cost of US$0.90 per ride, Istanbul's public transportation is too expensive for Base of the Pyramid customers. It is difficult to say how great the latent demand is in this segment – ten percent of Turkey's 70 million people live on less than US$2 per day – but given the relative poverty in eastern Turkey, it is likely that a disproportionately small number of these people are in Istanbul. Nevertheless, as Istanbul expands north, east, and west, commuting becomes longer and more expensive, an effect felt most by Istanbul's poorest.

Innovation

Local innovations such as the Dolmuş, MarmaRail, and Akbil have been introduced to keep pace with quickly rising demand.

A dolmuş is a minivan operated by a private driver, on a specified route. The driver accepts only cash, and he does not leave the departure point until the dolmuş is full. He stops upon request to let off riding passengers, and to pick up new ones.

MarmaRail, the high speed metro under the Marmara Sea, is being planned to provide another alternative to the crowded Bosphorus bridges. The endpoints will be at Yanikapı and Üsküdar, and the capacity is projected to be 140,000 passengers per hour, fourteen times that of the first (southern) Bosphorus bridge. This innovation is regarded as either a huge event in the history of the city or a hopeless blunder for a city where priceless archeology lies underground and new 'finds' will stop the project indefinitely. Forty-seven percent of respondents listed past metro extensions as successful examples of the city's innovative capacity.

A smart card called "Akbil" is available for the public transportation system. It reduces hassle and offers a discounted fare (fifteen percent) compared to the purchase of individual tickets. Additionally, Akbil allows for one free transfer ("aktarma") per paid segment. Akbil comes either in the form of a keychain or ID card; the latter form is designated for those users (students, teachers, and veterans) who receive a more sizeable discount. Twenty-one percent of respondents listed aktarma as another successful innovation.

3 Regional Megatrends

Introduction

Istanbul suffers from afflictions common to most modern megacities. Local pollution is bad and getting worse; the severity of the problem is often ignored or unnoticed, as Istanbul lacks smog-trapping mountains and other geographic features that can make megacities more succeptible to lingering pollution. Social inequity between rich and poor is large and growing; this social tension is hidden by greater social tensions around religion and ethnicity, though

this may change with the end of the Kurdish nationalistic effort. Turkey is a young country, so it will be decades before Istanbul confronts an aging population; by that point it should have a successful example or two for how to cope. Istanbul's population is increasing. Thus far sprawl has radiated from the southern mouth of the Bosphorus, but it is threatening to expand north toward the Black Sea and out in both directions from the Bosphorus. Congestion has a stranglehold on the city and its efficiency - without immediate action the problem will only worsen.

Regional Megatrends: Summary of Findings

Megatrend	Qualitative Insights	Quantitative Data	Overall Ranking
Local Pollution	• Coastal location, susceptible to emissions from tankers, less likelihood of smog because of winds and no mountains • Low observable smog, air quality problems	• 86% of respondents said citizens are not aware of or concerned with issues of pollution and climate change • 84% of respondents said the same about politicians • Turkey emits 12 times as much CO_2 as in 1960 • Per capita SO_2 emissions 115% of world per capita • Per capita CO_2 emissions 2.98 metric tons, 75% of world per capita	5
Social Disparity	• Social equity not as pressing as other social concerns	• Istanbul Gini coefficient of 0.47 (1994) • Turkey Gini coefficient of 0.436 (2003)	5
Shifting Demographics	• Window of opportunity • Istanbul does not have good options for the elderly, partly because they are a small proportion of population	• 25.5% of population under 15 • 6.8% of population 65 and over • Median age 28 years	3
Urbanization	• City boundary increasing • Sprawl increasing northward	• 4% historical population growth in Istanbul • Slowing to projected 2- 3%	6
Congestion	• Choosing university based on ferry location • Two bridges are a bottleneck, but resistance to a third	• Congestion all day, worst in the mornings and evenings • 66.5 cars per 1,000 people (Turkey, 2003) • Istanbul adding 640 cars per day	9

Local Pollution

Local pollution is increasing rapidly, though geography prevents the effects from being felt locally.

Istanbul's location on a major waterway brings heavy traffic from highly polluting tankers. Turkey cannot limit access to the Bosphorus, so this portion of Istanbul's emissions is outside the city's control. Istanbul's waterside location, with no mountains to trap smog, allows its emissions to be blown downwind, keeping air quality problems in the city relatively mild.

Adding to emissions from passing tankers, increased automobile traffic adds ever more carbon dioxide, sulfur oxides, nitrogen oxides, and particulates into Istanbul's air. Turkey's total and per capita carbon dioxide output have risen steadily since 1960—total carbon dioxide emissions are at 1,200 percent of 1960 levels and per capita emissions are at 500 percent. A disproportionate amount of this increase comes from Istanbul, the nation's industrial and commercial center.

Social Disparity

Income inequity is increasing in Turkey and in Istanbul, though this is not a primary social concern.

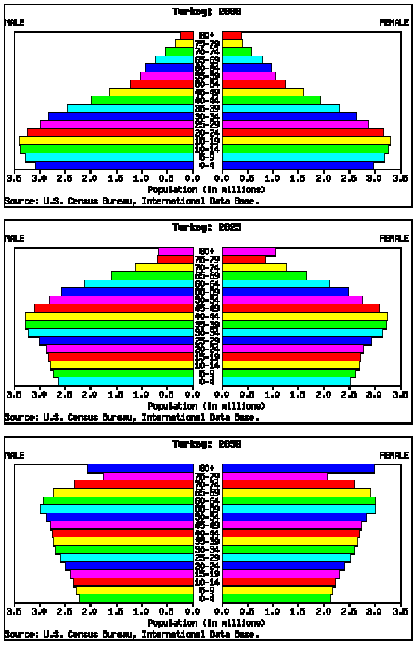
Istanbul's income inequality has increased in recent years, as seen in the increase in Gini coefficient from 0.38 in 1978 to 0.47 in 1994.[clvii] This citywide Gini coefficient is higher than Turkey's—which was 0.436 in 2003—as a result of Istanbul's economic success in the 1980s and 1990s.

Opportunities for creating greater social equity are built into public transportation. With one version of Istanbul's Akbil, or smart card,, the government can price discriminate on the basis of age, occupation, or military status. Students with an Akbil pay slightly less per use, teachers pay half-fare, and veterans pay half-fare or less.

However, residents do not rate tension between rich and poor as a concern—it appears that Turkey has enough social tension as it is. In the 1990s, internal strife ended with the military waging a total war against Kurds in eastern Turkey. These and other atrocities are not often discussed in Turkey, as any documentation by journalists is politically risky. Moreover, the secularist-religious debate remains a lively one in turkey. When Istanbul residents are asked about these two issues are more pressing than what tension may exist between rich and poor.

Shifting Demographics

Istanbul's working age population provides a window of economic opportunity.



Over the past 50 years, Istanbul has seen a tenfold increase in population even as the overall country population has increased by a factor of only two and a half. Approximately one-third of this shift is explained by mortality rates decreasing quicker than decreasing fertility rates. Across Turkey, the demographic bulge is centered about the late teen age group; it will progress to middle age by 2025 and then to old age by 2050.

Istanbul's life expectancy will rise steadily over the coming decades. However, the current population distribution indicates that planning for an elderly population is a distant concern. Similarly, there is not an overpopulation of dependent young people. The concentration of population in productive young and middle age has been called a window of opportunity for Istanbul's development.

Urbanization

Immigration represents the majority of Istanbul's population growth, pushing city boundaries and sprawl outward.

As mentioned above, demographic changes were responsible for one-third of Istanbul's growth from one million to ten million between 1950 and 2006. The remaining two-thirds is attributable to net migration into the city. Immigration was highest from the eastern part of Turkey, where standards of living were worst. In each generation, a large proportion of young easterners came to Istanbul in search of opportunity. Those too old or too young were left behind. Presently, the system has reached the natural limits of its fast growth, with few

remaining to immigrate. The overall level of population growth in Istanbul has slowed to three percent annually; despite the decrease, this still amounts to one million additional city residents every three years.

Istanbul's functional unit is constantly being expanded. The core city of Istanbul contains eight million residents. Expanding outward, Istanbul province encompasses 5,000 square kilometers and ten million people. Further expanded is the Marmara region, an area of 18,000 square kilometers with an estimated population of closer to seventeen million. This is more than a nominal change. As city planning and administration moves outward, the location of industrial centers—and therefore the movement of people—will be spread around the larger Marmara region.

Congestion

Congestion is a central culprit for Istanbul's mobility inefficiency – infrastructure limitations and increasing population are causes.

Istanbul is choked by traffic congestion throughout the work week. The commuting hours in the morning and evening are particularly busy, while congestion in the midday hours is somewhat better. City residents lament their inability to get across town reliably; in fair traffic the trip might take 45 minutes, but in bad traffic this becomes two hours or more. With roads becoming intolerable for efficient movement, the metro and ferry become more attractive. One university student admitted choosing his university based on its location next to a ferry hub- he knew he could get to classes easily and reliably.

Istanbul is nearly symmetric with respect to the Bosphorus. There is a high concentration of residences on the Asian side, and a high concentration of business centers on the European side. Along its length of a few dozen kilometers, the Bosphorus is crossed by only two bridges. This under-capacity causes nearly constant congestion in both directions across the bridges. A third bridge has been proposed –farther North- but NIMBY reactions have so far prevented progress on the project.

4 Conventional Market Attractiveness

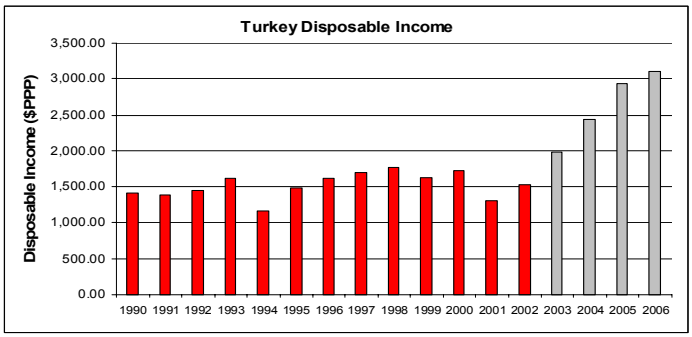
Introduction

An estimate of market attractiveness shows Istanbul to be an appealing possibility. Calculations were based upon 10.35 million in population, median per capita annual income of US$8,400, and fifteen percent of income spent on transportation in 2006.[clviii, clix] This yields an estimate of US$11.5 billion spent annually on transportation goods and services. Market demand for better service is clear from the stories of frustrating congestion and unreliable cross-town trips. This demand is slightly mitigated by Istanbul's operating public transportation system and the lack of crisis-level urgency assigned to megatrend factors other than congestion. Business entrants will most likely need to partner with other sectors to work on solutions such as increased inter-mode coordination, congestion pricing, and bus rapid transit.

Conventional Market Attractiveness: Summary of Findings

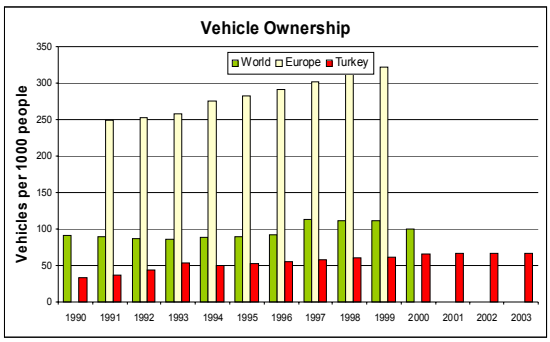
Market Factors	Qualitative Insights	Quantitative Data
Metro Area Population		• Istanbul Population: 10.35 million (2006)
Earning Potential		• GDP per capita in Turkey at PPP: US$8,100 (2005) • GDP per capita in Turkey: $US4,950 (2005)
Disposable Income	• Youth living at home • Rising median age and economic growth increase disposable income • Estimates range from ten to thirty percent of income spent on transportation	• Disposable income per capita in Turkey: US$3,055 (2005)
Reliance on Public Transportation		• Bus – 14%
Car Ownership	• Congestion makes car ownership unattractive • Anecdotal reports of zero percent financing on purchase of new cars increasing Istanbul car purchases	• 66.5 cars per 1,000 people in Turkey (2003)

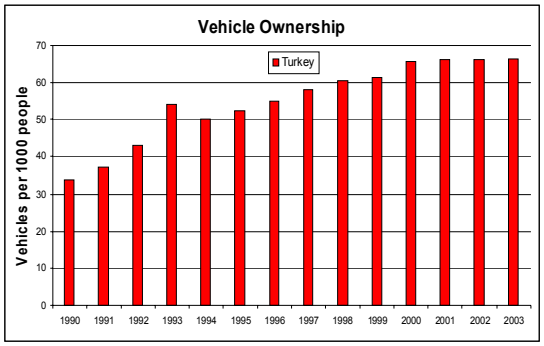
Findings



It is common for young women to live at home until married. This is partly cultural, but it is also based on the expense of living alone. This practice increases per capita disposable income among youth. As Turkey's demographic bulge grows up, a large class of students will graduate and begin earning; this will drive up per capita disposable income. Istanbul's growing economy lays the foundation for this continuing growth in disposable income. The pattern of disposable income highlights the financial crises of 1994, 1999, and 2001; these were partly based on poor policies. Looking forward, surer macroeconomic footing suggests strong growth—grey bars are estimates.

Turkey's level of car ownership doubled between 1990 and 2003, from 33 to 66 per thousand people. However, growth has leveled off in recent years.





5 Conclusion

Istanbul's current state of mobility is a study in opposites. The public transportation coverage of the city center is excellent, with many interconnected options. Trips are generally affordable, the many options available are fairly reliable, and there is a significant degree of recent innovation in offering additional options or expanding existing ones. Public transportation is accessible to any citizen who can walk five or ten minutes and step up onto a bus, or down an escalator to a metro. It is fairly inaccessible to elderly and disabled, with no special accommodations for boarding and exiting.

However, private car usage far outpaces road infrastructure development, leading to choking traffic in all directions during peak hours. This effect is felt most acutely between the Asian and European halves of Istanbul, where just two bridges accommodate the entirety of traffic between the two sides. This traffic determines the upper bound for efficiency of road-based transportation, greatly limiting the usefulness not only of taxis and personal cars, but of buses and light rail, creating bottlenecks where the light rail system crosses or runs on top of the road.

Istanbul suffers moderate to severe effects from megatrends. Congestion and urbanization are the primary culprits; Istanbul has too many people driving too many cars, and road infrastructure development cannot keep pace. This effect would diminish modestly with aggressive public works, but the twin bottlenecks of Bosphorus bridges and narrow city streets impose an upper limit to the efficiency of auto movement. Pollution and climate change are not top of mind concerns to Istanbul residents – this will change over time as an increasing number of vehicles and increased industrial production degrade city air quality.

Further down the list are social equity and shifting demographics. Istanbul exhibits a large and growing income gap among its citizens, though the social tension from this is not yet apparent. It is overshadowed by more pressing issues such as the role of religion in an ardently secular state or the still-recent internal conflict with Kurdish nationalist factions. As other social tensions are resolved, Istanbul's growing wealth disparity should become more relevant. Istanbul's demographic profile is young and stable. Although there is some pressure on the urban system from having so many mobile youth, there is no demographic-specific pressure yet. Istanbul will eventually need to address the needs of an aging population, but this is several decades off.

On the one hand, Istanbul is a very appealing market. It has a large population with growing disposable income that is spending a fair percentage on transportation. A great deal of money is being spent on the current, suboptimal solutions; new mobility solutions should be able to steal some of this market share by offering better reliability.

On the other hand, there is not much room for private-only solutions. The local government controls the road infrastructure and the public transportation, with input from the national government. MarmaRail and other large scale public efforts are already under way, but political leaders have shown little willingness to address the congestion that is the root cause. Any solutions will require knowledge of the political power structure in Istanbul, and a clear sense of what change is possible at which points in the election cycle. Overall, there are grounds for a cautious and well-networked entry into Istanbul mobility.

Case Study: Shanghai, China

1 Introduction

Shanghai, China's largest city and the world's eighth largest city, sits along the east coast of China on the East China Sea. The city, which is officially a municipality with province level status, is divided into eighteen different districts and is bisected by the Huangpu River. The urban areas of the city are scattered across the districts. Lujiazui on the east bank of the River and The Bund and Hongqiao areas in the west bank of the River are three of the most commercially active districts.

With 17.78 million people, Shanghai accounts for only 1.6 percent of China's total population, but it attracts 10 percent of foreign investment and generates as much as five percent of the gross domestic product. This means that relative to the rest of China, Shanghai's population is very well off: the annual income of a Shanghai resident is US$1,000 while rural residents earn US$370 per person.

Shanghai's wealth was historically heavily taxed by the communist regime while little investment was returned to it, stymieing urban development. This trend changed in 1992 when the tax burden was reduced and the government began to promote Shanghai as an industrial center. Since then the city has experienced economic growth between nine and fifteen percent annually. Part of this growth is undoubtedly from China's accession into the WTO in 2001. Shanghai's current government is working to promote transparency but strong ties between the government and business remain, resulting in some corrupt activities. In 2006, over 50 people from both government and business were detained for misusing pension funds. The politics of mobility within the municipality of Shanghai are determined by four entities: the Bureau of Urban Planning, Bureau of Transport, Bureau of Civil Construction, and Bureau of Public Security. These four organizations are not effectively integrated, delaying public action on mobility solutions.

Shanghai's population of 17.78 million people is divided between a natural population and a migrant population that does not hold legal permanent residence status. Although data differs, most estimate that around four million of the 17.78 million are migrants who have been in the city for over six months. The migrants are driven to the city through the promise of an increased income but some studies suggest that their standard of living remains below average. The migrants, ignored by municipal statistics and policies, also put a strain on the city's infrastructure including schools and transportation. The non-immigrant population is experiencing shrinkage due to reduced birth rates; this trend coupled with the inflow of migrants is keeping 75 percent of the population within an age range of sixteen and 64 years old.

Infrastructure growth in Shanghai is booming. High rise buildings are being built at an increasingly fast pace with a focus on reducing pressure on some of the city's more densely populated areas. In addition, city planning includes the creation of green spaces to help the residents maintain a good quality of life. The city has two main airports, two main railway hubs, and one of the largest ports in the world. In order to support the increasing levels of commerce, roads are constantly being maintained and expanded. Additionally, the first magnetic levitating trains to connect the city to its airport began running in 2002.

Shanghai has one of the most extensive public transportation systems in the world with expanding bus and metro systems. Although banned on some main roads, many residents rely on bicycles to meet their mobility needs and private car ownership is expanding as income increases. Congestion and pollution on the roads is severe and there are a limited number of options for residents who are low-income, elderly, or handicapped.

2 Current State of Mobility

Introduction

Within Shanghai, trains, buses, and bicycles serve the majority of transportation needs for both low and high income customers. In particular, the bus system has an extensive network throughout the city with over 1,000 lines. However, because of an overwhelming number of people migrating to Shanghai from all over China, the capacity of current mobility solutions is constrained, resulting in road congestion and long travel times. The transportation system also suffers from limited safety mechanisms and no transportation options for the disabled and elderly.

Current State of Mobility: Summary of Findings

Mobility Factor	Qualitative Insights	Quantitative Data	Overall Ranking
Accessibility	• Bus network is well distributed throughout Shanghai • The capacity of public transportation is not meeting the growing demand • Shanghai is currently banning the use of bicycles on major roadways, threatening to limit accessibility • There are no modes of transport or services for the disabled and elderly	• There are approximately 12,000 km of roadways in Shanghai and more are being built • 1,000 bus lines • Five metro lines being expanded to eight	6
Reliability	• Capacity on the rail and bus system is limited but the city is investing in future expansion projects • Safety is a concern for all transportation modes: o On the train, interviews reveal that there are accidents caused by firecrackers and cooking knifes o Bicyclists do not wear helmets o Car passengers do not wear seatbelts o High number of bicycle and pedestrian deaths o Timeliness is low, caused by congestion o Road maintenance is maintained at a minimal level	• Last year there were 760,000 road accidents throughout China resulting in over 150,000 deaths • Bus delays are often 20 to40 minutes due to heavy congestion	2.5
Integration and Flexibility	• Public transportation options include rail, bus, and subways • Private transportation options include bicycles, and cars to a lesser extent • Parking in the city is severely limited • .	• In Shanghai there are 45.8 cars per 1,000 residents, significantly more than China's average of ten cars per 1,000 residents • Within the city there are approximately thirteen buses for every 10,000 residents, over 18,000 buses in total • There are nine million cyclists in Shanghai	5
Affordability	• Low-income customers are able to partake in the public transportation system and utilize their bicycles • Low-income customers have no financial services to assist them in the purchase of private transportation • Freerider problems are decreasing by strict management	• 75,000 RMB –low-end car cost/income of poor: 800-1000RMB per month • Cost of public transport: 2-4 RMB per ride for bus /income of poor: 800-1000 RMB per month • 94% of low-income interviewees said that they use public transportation on a daily basis	7
Innovation	No special unique mobility in Shanghai Internet service to provide car sharing is getting popular		4.5

Accessibility

Shanghai's public transportation system lacks capacity and is not accessible to handicapped and elderly populations.

Shanghai has been making efforts to expand the capacity of its public transportation systems while trying to control the onslaught of automobile ownership. According to Shanghai officials, the city has increased capacity on its five subway lines and is going to develop three more in the near future. The city is also regulating the number of cars on the road by

charging high premiums for car registrations and limiting car access in the center of the city. In spite of the efforts, the capacity of the public transportation systems is still constrained due to the explosive inflow of migration from all over China to Shanghai that is helping Shanghai maintain a growing population.

When it comes to mobility options for handicapped and elderly, Shanghai has not taken any effective actions. People with disabilities such as blindness, hearing impairment and gait disorders are unable to use current mobility options; there is no textured yellow line for blind pedestrians, no elevators in stations for people with wheel chairs, and no priority seating for the elderly.

Reliability

Shanghai has serious congestion on roads, resulting in low timeliness and unsafe conditions.

While Shanghai has a well-maintained and often separate road system for cars, buses, and bicycles, congestion and safety create unreliability in the system. Interviews with taxi drivers revealed that serious congestion occurs during rush hour periods between 7:00am and 9:00am, and between 4:00pm and 6:00pm. Bus riders take from 40 to 90 minutes to get to work by bus. Although using the rail would take one-third of the time, it is both inaccessible for many residents, and is more expensive. Additionally, there is almost no flexibility in work time, so many employees are unable to avoid peak traffic hours.

Commuters also face high safety risks. China has a poor record of road safety that is getting increasingly worse. Across the country, 760,000 road accidents occur each year resulting in 106,000 deaths. The accident rate is expected to increase with continually increasing car ownership rates.[clx] Many accidents involve bicyclists who ride with no helmets and cross multi-lane roads in busy traffic conditions with merchandise goods loaded onto their bikes. The government of China has recognized the high incident rate and is actively involved in the Asia Highway Network, a group of Asian countries, organized through the United Nations Economic and Social Commission for Asia, that share infrastructure investment and road safety strategies.[clxi]

Integration and Flexibility

Shanghai has a high level of integration among transport options, specifically its extensive public bus system.

Locals in Shanghai use an integrated and flexible mobility system to travel throughout the city. On an average day, a Shanghai resident will travel to work or shop by rail, bus, bicycle, or walking. All are affordable options, even for low-income customers. By public bus, most residents can reach any point within the city and some residents are able to utilize corporate buses to travel to work locations located in the outer loop of the city. However, bus timetables are inaccurate, so passengers cannot estimate arrival times or plan their day accordingly. A random survey at select bus stops revealed that about 20 to 40 minutes late is quite common. While wealthier customers can bypass bus delays by traveling via taxi or private car, low-income consumers cannot afford this option.

Affordability

Low-income consumers can afford to take the bus, train and ride bicycles but cannot afford personal vehicles.

While low-income consumers are able to take advantage of the city's buses and railways, private motorized transportation is often too costly for them and credit is difficult to secure. The public bus costs 2-4 RMB per ride, making it affordable for a resident earning 800 – 1000 RMB per month (around US$100). Whereas, a low-end automobile costs 75,000 RMB (around US$9,500) and city registration fees are higher than comparable Chinese cities. According to a random 50 person survey, low-income consumers cannot afford to have a car, license plates, or take a taxi ride. Financing the purchase of a vehicle through micro-lending is not an option for Shanghai's poor and it is also not a priority. Low-income customers interviewed said if they had such financial assets, they would save the money for education, housing, food, and clothing.

More than half of the city's 17 million residents rely on bicycles for mobility. Historically, China was the largest bicycle manufacturer in the world. But in 2003 the Shanghai Municipality limited bicycle access on major roadways in order to reduce congestion. Although it is not clear how strictly these rules are enforced, some local Shanghai groups are rallying against these restrictions that disproportionably affect the poor who rely on bicycles to commute to work.

Innovation

The development of Shanghai's transportation systems is mirroring traditional western mobility solutions.

There are no more rickshaws in Shanghai. Transportation innovation has focused on traditional western modes of public and private transportation; personal cars, buses, trains, and bicycles. The automobile market is expected to continue its fast growth with cheaper models being introduced and local earning power on the rise.

Recently, a car sharing system has started to develop. Locals can log onto FF Car (http://www.ffcar.com.cn/) to rent their cars to others or reserve someone else's vehicle in real-time. The service, which charges no fee, is growing in popularity because it offers a cheaper alternative to taxis and is only slightly more costly than the bus.

3 Regional Megatrends

Introduction

The total population in Shanghai continues to grow as migrants from other parts of China move to the city looking for work. This urbanization is coupled with an increasing GDP for Shanghai residents that is helping fuel growing congestion and its associated pollution.

Regional Megatrends: Summary of Findings

Megatrend	Qualitative Insights	Quantitative Data	Overall Ranking
Local Pollution	• Low-income consumers may live in poor conditions with polluted air and water • Some low-income residents use charcoal for cooking indoors, which has significant health problems • The municipal government started to take actions to mitigate local pollution		9
Social Disparity	• Shanghai has the smallest income disparity of any large Chinese city – however, as urbanization continues, the gap is gowing • According to an informal survey, low-income consumers do not perceive an increase in their own purchasing power over the past ten years	• In 2004, China's overall Gini Coefficient was 0.45, greater than both the US and Europe	6.5
Shifting Demographics		• Shanghai's non-immigrant population is declining: natural population growth rate at -0.146%	4
Urbanization	• Shanghai's total population is projected to increase due to the constant migration • Majority of low-income residents reside in the center of Shanghai while the city's middle class was relocated to the outer loop	• Population density in the city is 2,145 people per square kilometer • The urban area has grown from 781 square kilometers to 2,386 square kilometers since 1995	4
Congestion	• Worst rush hour routes are mainly the tunnels crossing Huangpu River • Municipality made an increase in car licensing fee in an attempt toreduce car ownership rates	• The average travel distance in Shanghai is on the rise: People now travel 49% longer than they did in 2000	9

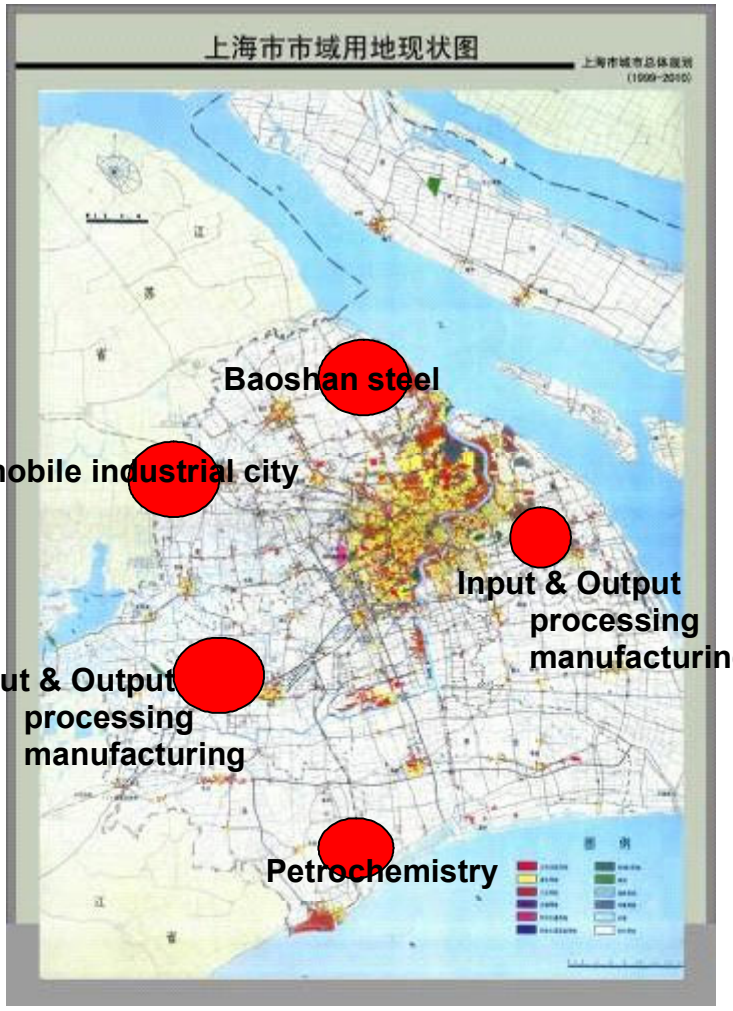
Local Pollution

Shanghai has high levels of air and water pollution that are expected to worsen over the next decade.

Automobiles are a major contributor to the increasingly poor air quality in Shanghai. Although the country has been slow to introduce environmental transportation standards, Shanghai and Beijing have begun to introduce pollution-minimizing regulations in the face of serious urban pollution problems. Since October 2006, the Shanghai municipality banned heavily polluting vehicles from the downtown area.[clxii] This ban is an attempt to reduce emissions which now run rampant. By 2010 automobiles in Shanghai are expected to account for 75 percent of total nitrogen oxide emissions, 94 percent of total carbon dioxide emissions, and 98 percent of total hydrocarbon emissions.[clxiii] In addition, fuel efficiency standards and vehicle taxation have been adopted over the last two years.

One of the most challenging air pollution issues in China is sulfur dioxide, the main ingredient in acid rain. The sulfur is emitted from vehicles and coal burning plants. New measures to reduce these emissions include the promotion of low sulfur coal and alternative fuel vehicles.[clxiv]

Although current regulations will eliminate some of Shanghai's pollution impacts, increasing private vehicle ownership rates and longer distances traveled will mean that mobile source pollution will remain high. As for water supply, the Shanghai area has an abundant surface water supply; however, due to the growing population and extensive economic development, water contamination has become a great risk. For low-income residents, many of whom rely on subsistence farming irrigated by the local rivers, the contaminated water presents a threat to their well-being. In order to minimize this threat, Shanghai is encouraging polluting industries to both utilize pollution-minimizing technologies and relocate from Shanghai to Pudong, outside the city. Although this may help reduce local pollution, it may mean increased traffic flow for commuters who now have to travel to the outskirts of the city.



Social Disparity

Shanghai is China's richest city with an equity gap between the local and migrant populations.

Although there are limited data on equity issues within Shanghai's population one fact remains clear: the largest equity gap in China is between the rural and urban populations. This gap is the main driver behind the urbanization of Shanghai and the relocation of millions of migrant workers every year. Within Shanghai income hovers around US$1,000 per person while rural incomes are US$370 USD per person.[clxv] Many workers who relocate are able to find employment in the booming construction industry and earn a living.

However, some studies show that there is a gap in living standards between the migrant population and the local residents.[clxvi] Education, housing and employment are not secured and migrant workers are often ignored in public policy initiatives.

Shifting Demographics

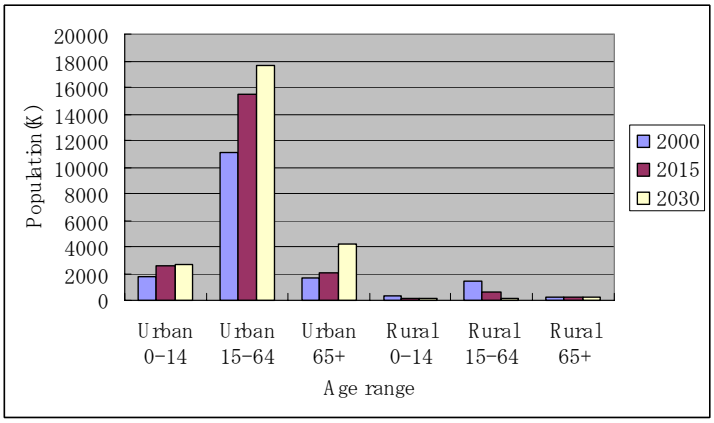
Shanghai's non-immigrant population is in decline

Shanghai's permanent resident population is in decline. The city is China's first to register a negative non-immigrant population growth rate for thirteen consecutive years. In 2005, the

city's population of permanent residents saw a birth rate of 0.608 percent, mortality rate of 0.754 percent and non-immigrant population growth rate of -0.146 percent.[clxvii]

The falling birth rates are being supplemented by heavy migration from China's rural areas.[clxviii] These two trends are causing the age dynamics of Shanghai to shift: for the next 24 years, it is expected that the city will have significantly more 15-64 year old people than any other age range.

Age Distribution of Shanghai's Population[clxix]



Urbanization

Although Shanghai's native population is in decline, the population is on the rise from migration.

China has gone through phases of fast urbanization and anti-urbanization over the past half century. The urbanization process in Shanghai has been heavily regulated and has always been under strict government control. The result of these tight policies is a relatively under-urbanized Shanghai in comparison to other developing countries at a similar stage of socioeconomic development.[clxx] Due to Shanghai's complex residential permit scheme, residents have a difficult time obtaining permits to change residencies, or "hukou," resulting in high levels of illegal but tolerated migration.

This tolerated migration is causing an increase in Shanghai's population. When Shanghai was liberated in 1949, the city had a population of 5.2 million. By 2005, Shanghai's official population totaled 13.6 million, or fully one percent of China's population. Additionally, in 2005 Shanghai housed 4.3 million residents who did not posses permanent residential papers, for a total of 17.8 million. The city's population density is currently 2,145 residents per square kilometer.[clxxi]

Congestion

The rapid increase in ownership of vehicles and under-capacity of the public transport system results in serious congestion.

Along with urbanization, Shanghai has been experiencing a serious congestion problem. The demand for mobility has been skyrocketing since the 1990s. The urban area has grown from 781 to 2,386 square kilometers since 1995 and the average travel distance in Shanghai is on the rise: people now travel 49 percent longer than they did in 2000.[clxxii] This increase in

demand is not being met or is being met by an increase in personal vehicle ownership, congesting the streets.

Public transportation has been lagging behind the increase in mobility demand. However, the municipality recently committed to investing heavily in new transportation systems. The commitment is born out of a drive to have Shanghai become and international metropolis with an integrated mobility system. The Shanghai municipality committed to investing in rail transit to make it a mainstay of city transportation by 2020. The service will offer 12 million trips per day, or meet 50 percent of public demand.

In addition, regulatory actions have been taken to minimize traffic. The numbers of car licenses issued by the city are restricted and the cost of car registration is high, deterring potential new drivers. Bicycles have also been banned from main streets to reduce congestion.

It is yet to be determined if these new investments and regulations will meet the changing travel patterns around Shanghai. More and more people are traveling from inner Shanghai to peripheral towns. If the current reactionary approach to congestion continues, these new patterns will result in more traffic before a public solution is identified.

4 Conventional Market Attractiveness

Introduction

In general, Shanghai's large population has a growing amount of disposable income, both for the relatively wealthy and the relatively poor, making it an attractive market for alternative mobility solutions.

Conventional Market Attractiveness: Summary of Findings

Market Factors	Qualitative Insights	Quantitative Data
Metro Area Population		• Shanghai has population of 17.84 million
Earning Potential	• Low-income customers do not sense that their purchasing power has increased over the past 10 years	• US$17,378 GDP at PPP in Shanghai, compared to $6,820 in the remaining coastal region[clxxiii]
Disposable Income	• Disposable income is increasing for Shanghai's population but there is still a gap between rich and poor	•
Reliance on Public Transportation	• Public transportation and bicycles are the main modes of transportation for the poor	• 100 percent of interviewees heavily depend on public and corporate buses.
Car Ownership	• Car ownership rates are low for the general population • For the low-income residents car ownership is not feasible	• In Shanghai there are 45.8 cars per 1,000 residents, significantly more than China's average of ten cars per 1,000 residents

Findings

Lower income residents cannot afford automobiles and have other expenditure priorities such as housing and education. If we assume that all of the 4.38 million migrant workers are of lower income (i.e. that they earning 800-1000 RMB per month and spend 4 RMB on two bus rides per day), collectively they are spending approximately US$65 million each month to fulfill their transportation needs. This money is being spent on mobility solutions that are often not reliable in a city with profound congestion. If a solution could be found that

increases reliability and integrates into the currently flexible system, there may be a market opportunity for a private business.

5 Conclusion

Shanghai's municipal mobility policies seem to be at a crossroads. Short term policies are promoting the purchase and use of personal vehicles for the wealthy while long term strategies are focused on increasing capacity and reliability in the public transportation systems. The history of reactionary investment and regulatory measures suggests that congestion and negative megatrend shifts will continue as mobility patterns shift, leaving room for alternative mobility solutions if offered at a price commensurate with public transportation options. There also seems to be an unmet need for accessible solutions for the elderly and handicap populations.

Results

The results presented in this section are objective and represent only the first two layers of our overall analysis. In this section, we overlay our Conventional Market Analysis (Layer 1) with Future Megatrend Effects vs. Current Mobility Infrastructure (Layer 2), to determine "New Mobility Market Attractiveness" for each city. While these results are critically important and indicative of market potential, they do not take into account the strengths, assets, and potential shortcomings of any company considering market entry. In the Discussion section, which follows, we overlay our generic results with Ford's specific strengths, capabilities, core competencies, and leadership potential. In so doing, we gain critically important insight as to where and how Ford Motor Company can create a significant, meaningful, and potentially profitable impact on New Mobility in the 21st century.

Layer 1: Conventional Market Attractiveness Analysis

	Bangalore	Camacari	Hemosillo	Istanbul	Shanghai
Population	6,500,000	192,000	700,000	10,350,000	17,840,000
Annual income spent on transportation	1,292	693	1,290	1,260	157
Annual BoP expenditure on transportation	70	194	73	73	74
Projected usership of New Mobility option (as a % of total population)					
BOP Share	68,250,000	0 7,077,120	1 5,110,000	1 75,555,000	295,600,000
Low Share	3,359,200,000	0 39,916,800	0 90,300,000	0 3,260,250,000	0 2,800,880,000
Medium Share	4,199,000,000	1 66,528,000	0 270,900,000	1 7,824,600,000	1 1,400,440,000
High Share	5,878,600,000	1 104,315,904	0 397,320,000	1 9,650,340,000	1 2,352,739,200
Average Market Size	4,478,933,333	70,253,568	252,840,000	6,911,730,000	2,184,686,400

The Conventional Market Attractiveness analysis was performed using data that we gathered from both on-the-ground and secondary research sources. We used this data to perform a conventional "bodies to bucks" analysis to assess how large the market for New Mobility solutions is within each city. Based upon the total population size, the average GDP per capita, the average percent of income currently spent on transportation, and current car ownership data, we calculated 'low,' 'medium,' and 'high' values for projected usership of New Mobility options so as to more accurately represent potential market scenarios (see Appendix 2). We considered per capita GDP to be superior to per capita GDP PPP; while using the latter has its benefits, using the former yields more objective financial results.

We averaged these low, medium, and high values to derive a single, average value for financial attractiveness of each market. Embedded within our Conventional Market Analysis is a decidedly less conventional component; in addition to calculating the low/med/high/average market values, we also created a separate Base of the Pyramid category. Traditional market analyses often neglect or ignore base of the pyramid consumers (because they often lie below the relevant income threshold). However, we wanted to be sure to include the BoP demographic in our holistic analysis, as we believe that this will give Ford a better basis for designing projects that place priority on traditionally underserved markets. We will discuss this aspect in more detail in the Discussion & Analysis section.

According to our traditional market attractiveness analysis, Istanbul was the city with the greatest market potential ($6.9 billion). Bangalore and Shanghai also have promising $4.5 billion and $2.2billion markets, respectively. Hermosillo ($253 million) and Camaçari ($70 million) are significantly less attractive from a financial perspective.

Layer 2: Future Megatrend Effects vs. Current Mobility Infrastructure

The next step in our analysis was decidedly forward-looking. By comparing the current mobility infrastructure to the severity of future megatrend effects, we sought to anticipate the size and severity of the gap which will emerge if cities continue to ignore the future impacts of megatrends in a mobility context.

Severity of each megatrend was ranked on a 10-point scale, with 1 representing a situation in which a particular megatrend will have little to no impact on the individual city, and 10 representing the opposite extreme. We then charted the confluence of megatrends on a multi-dimensional diagram; we calculated the area of the resultant pentagon to determine the overall future severity of the five megatrend factors.

We took a similar approach to calculating a numeric value to represent the current state of mobility in each city. For each city, we ranked each of the five mobility factors on a 10-point scale, with 1 representing a very poor situation and 10 representing an ideal situation. For each city, we charted the confluence of the five mobility factors on a multi-dimensional diagram; again, we calculated the area of the resultant pentagon to determine the overall quality (“excellence”) of the city’s current transportation infrastructure.

As a final step in this portion of the analysis, we calculated a “multi-dimensional mobility” [MDM] value for each city. This value was derived by subtracting the “current mobility infrastructure” value from “severity of future megatrends” value. The larger this number, the greater the severity of the emerging gap between current mobility solutions and future megatrend impacts. For example, a high or positive value represents a city facing significant megatrend pressures, yet with poor existent mobility infrastructure. The relative size of this emerging gap allowed us to assign each city a relative “priority ranking” based upon its “multi-dimensional mobility” value.

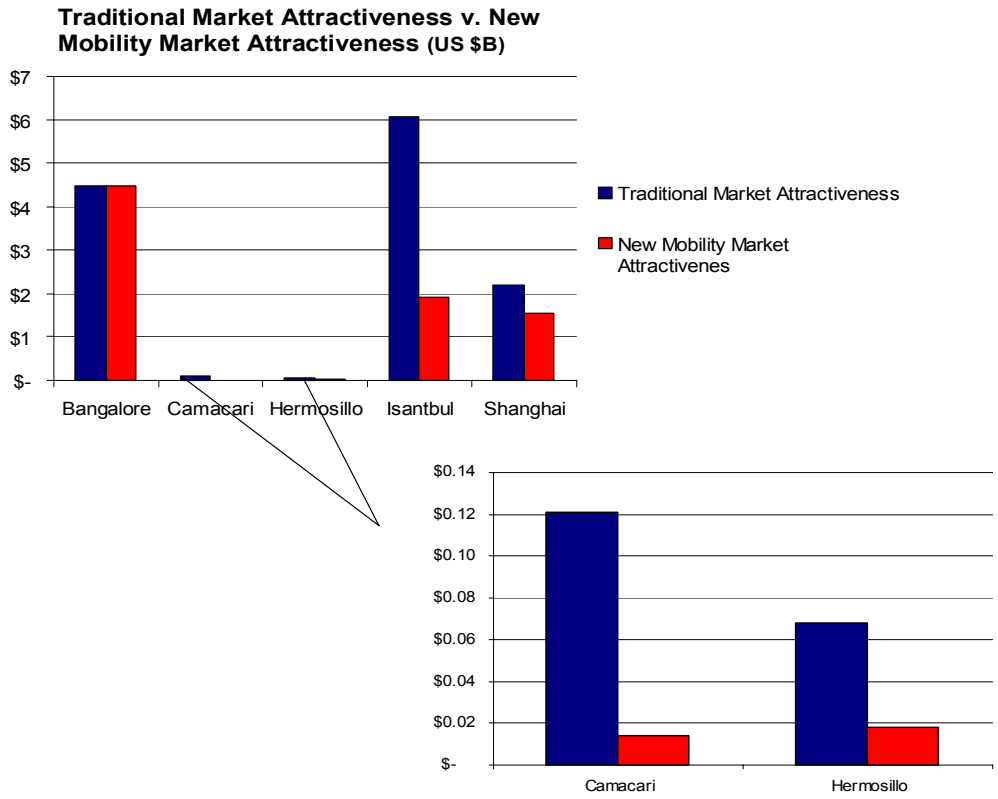
According to our analysis in Layer 2, Bangalore was the city with the most severe combined megatrend / current mobility prospects, and thus most in need of New Mobility solutions. Because of similarly severe pressures, Shanghai was not far behind Bangalore, and ranked second in terms of requiring New Mobility solutions. Istanbul, Hermosillo, and most notably, Camaçari, lagged significantly behind, representing the fact that their need for New Mobility solutions is, comparatively, not as severe.

Results: An Innovative New Approach to Assessing New Mobility Markets

	Traditional Market Attractiveness	Traditional Market Ranking	Multi-Dimensional Mobility Ranking	Percent Priority Ranking	New Mobility Market Attractiveness	New Mobility Market Rating
Bangalore	$4,478,933,333	2	88	1.0000	$4,478,933,333	1
Camacari	$70,253,568	5	-48	0.1180	$8,289,921	5
Hermosillo	$252,840,000	4	-17	0.2650	$67,002,600	4
Istanbul	$6,911,730,000	1	-10	0.3140	$2,170,283,220	2
Shanghai	$2,184,686,400	3	47	0.7130	$1,557,681,403	3

In order to develop a meaningful and holistic approach to assessing New Mobility Market Attractiveness, we created a “discount factor.” This discount factor is a way to modify the Conventional Market Attractiveness financial results to better reflect the positive impact New Mobility solutions can have on eliminating the MDM gap while generating revenue for the mobility provider.

In order to calculate a suitable discount factor, we turned to the raw data embedded in our Layer 2 analysis. As described above, each city was assigned an MDM value. We calculated the spread between the minimum and maximum MDM values, and converted this into a 100-point scale (for example, the min/max “spread” of 136 units was converted into a 100-point scale, with each unit representing a 0.7 unit difference in priority ranking). We then mapped the differences in priority rankings between each individual city onto this 100-point scale. This gave us an objective method by which to discount Conventional Market Attractiveness financial rankings. Because Bangalore had the highest (most severe) MDM value, it represented our standard (1.00). Cities with less severe/lower ranking MDM values were discounted according to their “distance” behind Bangalore. Discount factors are as follows: Shanghai (.713); Istanbul (.314); Hermosillo (.265); and Camaçari (.118). We then multiplied our Conventional Market Attractiveness results by these city-specific discount factors to create an adjusted, final “New Mobility Market Attractiveness” comparative ranking.

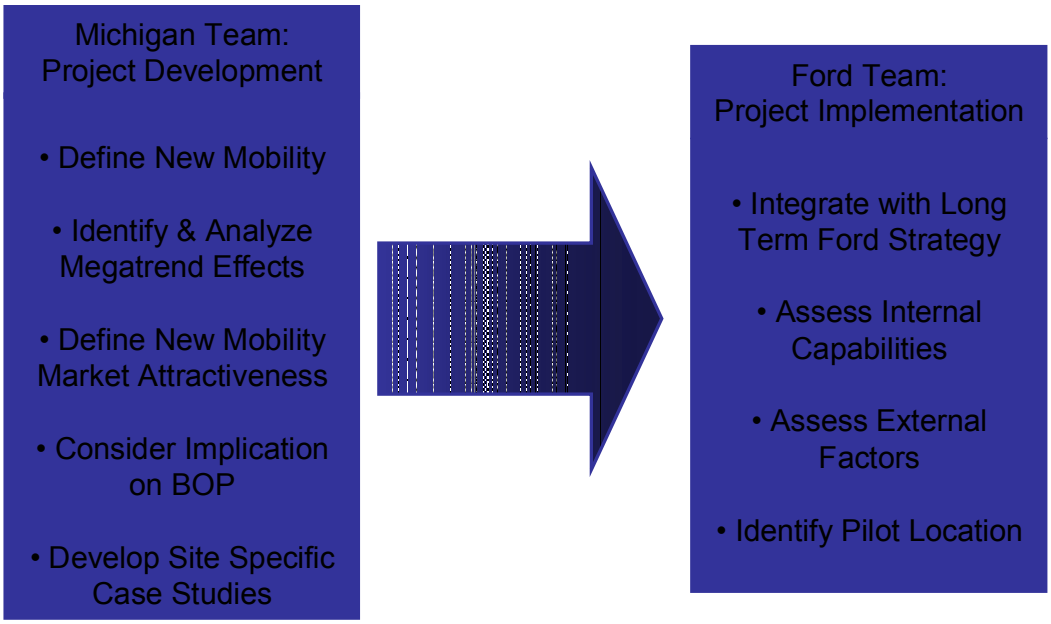


New Mobility Markets for Consumers in the Expanded Economic Pyramid

	BoP Market Analysis	BoP Market Ranking	Multi-Dimensional Mobility Ranking	Percent Priority Ranking	New Mobility Market Attractivenes	New Mobility Market Rating
Bangalore	$ 68,250,000	3	88	1.0000	$ 68,250,000	2
Camacari	$ 7,077,120	4	-48	0.1180	$ 835,100	5
Hermosillo	$ 5,110,000	5	-17	0.2650	$ 1,354,150	4
Isantbul	$ 75,555,000	2	-10	0.3140	$ 23,724,270	3
Shanghai	$ 295,600,000	1	47	0.7130	$ 210,762,800	1

As mentioned above, we also considered the size of the traditionally-overlooked Base of the Pyramid market in each city. We defined Base of the Pyramid rather broadly; as such, it includes most consumers traditionally excluded from the mobility market, whether they earn $1 per day, or $5-10 per day. We calculated a separate New Mobility Market Attractiveness ranking for each city, based solely upon the size of the potential base-of-the-pyramid markets which could be served. Our results for this section indicate that, because of its large poverty-stricken immigrant workforce, Shanghai is the most attractive New Mobility Expanded Economic Pyramid Market.

Discussion and Analysis



While the results section indicates that significant market opportunities for New Mobility projects exist in several of the cities that we researched, these results are hardly meaningful until we begin to consider them within the context and culture of Ford Motor Company. With this in mind, the Discussion & Analysis section is divided into three related components. Part one considers our results within the context of Ford's specific capabilities, strengths, past accomplishments, and its global and regional reputation; part two considers specific organizational and managerial opportunities and challenges that will arise if Ford embraces a position as a New Mobility leader and integrator; part three considers Ford-specific opportunities and drawbacks related to creating and integrating New Mobility markets in each of the five cities that we examined.

Part One: Strengths and Core Competencies of Ford Motor Company

The Sustainable Business Strategies (SBS) Office

The SBS office at Ford Motor Company is among the most forward-thinking organizations within the automobile industry. In the summer of 2005, the SBS office released a report detailing the role that Ford Motor Company could play as a "mobility integrator" in the coming decades. Competition in the traditional car market is intensifying: low-cost producers are entering, causing industry profits to fall to zero; overcapacity is a major concern in the industry; and high fixed costs and lengthy product-design timelines leave traditional automobile manufacturers unable to respond quickly enough. Instead of battling more nimble

competitors and new entrants for market share within this over-crowded "Red Ocean," the report suggests that Ford become a leader in a new, completely uncontested market space. This "Blue Ocean" is a nascent but incredibly promising market. As consumers begin to realize that the value of certain products derives not from the product itself but from the services it provides, an entirely new market space emerges. This is especially true within the transportation sector. Congested, polluted, and unsafe highways and city streets throughout the world have left individuals and governments alike struggling to find mobility solutions that will continue to allow their economies to grow and their citizens to prosper. Ford can become the leader in this New Mobility market space. By serving as the facilitator and integrator of many different, various, and flexible forms of transportation, Ford can create and define a flexible, integrated transportation infrastructure, and create a competitive advantage for decades to come.

The SBS Office has also played a critical role in creating the automobile industry's most progressive human rights code. Due to Ford's human rights code, and the company's continuously-reinforced 100-year reputation of being a responsible, community-oriented corporation, the Ford brand is recognized the world-over as being among the industry's best. This has allowed Ford to gain the trust and respect of many local and national governments. Ford has brought economic stability, better health, and a higher standard of living to thousands of families in emerging economies of Latin America, South Africa, and Asia.

Community and stakeholder engagement are also among the company's strengths. Ford's annual Corporate Social Responsibility Report, consistently recognized by the Dow Jones Sustainability Index as one of the industry's best, is one such example. Ford proactively solicits and gathers comments, criticisms, and feedback from all stakeholders during the process of creating and publishing the report.

Finally, the SBS office at Ford is not only familiar with, but could potentially be a leading practitioner of the Base-of-the-Pyramid methodology. The Base of the Pyramid Protocol, a document created through a collaboration of academics, corporate professionals, and representatives of the NGO community, outlines a process by which individuals and corporations can gain a deep and meaningful understanding of a community and its needs by living, working, and researching within that community.[clxxiv] The soon-to-be-released Base of the Pyramid Field Guide promises to provide valuable insight into key lessons learned from the on-the-ground experience of a BoP project pilot team.[clxxv] The Base of the Pyramid Protocol and Field Guide, and the expertise gained by individuals in the SBS office can serve as invaluable tools for Ford as the company strives to understand New Mobility needs and design site-specific solutions.

Part Two: The Organizational and Managerial Opportunities and Challenges of New Mobility

Exciting and profitable business opportunities exist within the context of the five New Mobility markets that we researched. However, determining New Mobility solutions, and creating and implementing a successful business plan based upon these solutions presents a unique set

of managerial opportunities and challenges. We have classified and detailed these opportunities below.

Strategy

Designing and implementing a robust, flexible, and successful long-term strategy is one of the most difficult and important tasks within any organization. Ford is currently at a critical juncture with respect to its long-term strategy. Although the company has risen to great success by manufacturing safe, reliable, and affordable cars and trucks, questions exist as to whether the company can continue to be successful by manufacturing cars and trucks alone. Internal tensions exist with respect to whether Ford should continue to pursue its more traditional strategy, or reposition itself as a New Mobility transportation provider and integrator. Ford can create a distinct competitive advantage by applying its manufacturing and design core competencies to new settings and situations that stretch beyond traditional product offerings. Cars and trucks will always be centrally relevant components of some New Mobility markets, while others may rely more heavily on other transportation products and services. The key for Ford is to understand how to seamlessly integrate these many components into a highly-accessible, multi-modal transportation system that meets individual needs while minimizing negative human and ecological impact. As the demand for integrated mobility services grows, Ford will be uniquely positioned to capitalize and further drive change within this market.

Finance

As our results demonstrate, New Mobility markets cannot be accurately identified and evaluated using conventional financial analysis methods. Although evaluating projects based upon the “triple bottom line” is an imperfect science, our methods can provide Ford with a framework to start thinking about project evaluation methods in other markets. New financial lenses will allow Ford to gain a more holistic understanding of the economic, social, and environmental costs and benefits associated with entering new markets or launching new business projects.

Marketing

The New Mobility market is oriented not around products themselves, but rather around the benefits and services derived from those products. Emphasizing these benefits will promote the growth and popularity of New Mobility markets. The growth of these markets will have positive impacts for Ford in some developing mega-cities where the blue-oval may not yet have extensive recognition, and in other developing countries where Ford vehicles are already well-known. In addition, New Mobility markets include consumers that may have been previously excluded from the transportation services market. This presents exciting opportunities for the creation of new marketing strategies, messages, and channels of communication.

Operations

Ford continues to pursue strategies that will generate value for its stakeholders. One of Ford’s greatest strengths, however, is that it considers the entire community – and not just its

stockholders – to be among its many stakeholders. As Ford looks to create and enter New Mobility markets, Ford can leverage its excellent community and stakeholder engagement techniques and processes to truly understand what a particular community, city, or region needs in the way of transportation services. Public-private partnerships, and partnerships among product, service, and content providers can enhance business plan development the value of a New Mobility system while creating new and untapped revenue streams. By maximizing stakeholder engagement and creating dynamic partnerships, Ford will be able to create valuable and customized integrated mobility solutions.

Government Relations

While New Mobility systems should be designed to satisfy the needs of individual consumers, their multi-modal, well-integrated nature implies that they also require the support of NGOs and government organizations. It will be essential for Ford to further develop mutually beneficial partnerships with the governments that regulate those emerging markets that are attractive to Ford. From another perspective, Ford might consider initially entering only those markets where they already have a well-established presence and a strong relationship with local, regional, and national governments. Ford's decision with respect to this issue should be based not only on the perceived market opportunity, but also on the strength of their in-country government relations vis-à-vis their competition.

Product and Service Development

New Mobility presents an exciting opportunity for Ford to rethink and recreate the process through which it designs products and services. Drawing on lessons from the Base of the Pyramid Protocol and tapping into the expertise of the SBS office, Ford can draw together multi-disciplinary teams of individuals from various departments, including engineering, strategy, and marketing, whose task it will be to live among and attempt to fully understand the mobility needs of members of a target community. Through this process, these Ford teams can begin to develop and design the products and services that will contribute to or further integrate an emerging New Mobility infrastructure. In just several days of conducting on-the-ground research, some of our team members gained critical insights into the types of benefits that local populations would value in their transportation options.

Part Three: Ford-Specific Opportunities and Challenges in each of the Five Cities

Bangalore

According to our analysis, Bangalore is the most attractive of the potential New Mobility markets that we examined. Bangalore's government and private sectors realize that congestion is seriously damaging economic growth and efficiency and are striving to find and create integrated New Mobility solutions. However, predominant cultural values in India suggest that automobile ownership is a socio-economic status symbol, and many Indians strive to achieve this standard. Meanwhile, Tata Motors and other low-cost automobile manufacturers have become very successful by re-enforcing this cultural value and enabling vehicle ownership. If Ford believes its position and relations in Bangalore to be sufficiently

strong, the company may be able to partner with high-tech corporations and local government, and succeed in overturning, or at least muting this cultural value through the development and creation of an efficient, safe, reliable, and economically beneficial New Mobility infrastructure. Cars and trucks would likely play a roll in such a context but would not dominate the landscape, thereby creating an opportunity for Ford to build its strength as a mobility integrator.

Camaçari

According to our New Mobility Market Analysis, the market size and megatrend threats in Camaçari are relatively small. However, these results do not reflect the fact that Ford has a very significant presence and an excellent reputation in the region. Ford's US$4 billion production plant is located in Camaçari's Industrial Complex and, despite recent losses in several of its other markets, Ford's South American division remains quite profitable. Though Camaçari is relatively small city (740 square kilometers), it is considered a suburb to the much larger and more populous city of Salvador. Furthermore, it is centrally located along Brazil's eastern seaboard, and could serve as an excellent hub of a regional or national New Mobility network, aimed at more cheaply and efficiently moving goods from ports or factories, and workers from their place of employment back to their homes or larger metropolitan cities. Because almost half of Camaçari's residents live in relative poverty, the region is in desperate need of more flexible and affordable transportation services.

Hermosillo

Hermosillo is another relatively small New Mobility market.. Much like Camaçari, however, this Mexican city has a significant population that is currently excluded from the mobility market. In addition, Ford has a recent though well-rooted and respected presence in the area, enhancing the likelihood that Ford could use its political capital to affect the creation of New Mobility partnerships and opportunities. Recent shifts in political power, however, suggest that the local government may not be interested in mobility solutions that fall outside the traditional realm. Much of Hermosillo's New Mobility potential is likely tied to the momentum, local knowledge, and ideas of Ford's significant local employee and managerial base.

Istanbul

Istanbul is one of the larger New Mobility Markets and, though it is facing significant pressures from megatrends, these pressures are not as severe as those anticipated in Shanghai and Bangalore. Despite this, Istanbul has the potential to be a very attractive market from Ford's perspective. The multi-modal infrastructure common to New Mobility solutions already exists in Istanbul; however, seamless integration remains the crucial lagging factor. In this sense, Istanbul could prove to be a perfect forum for Ford to become the expert and leader in New Mobility integration possibilities. However, this opportunity should be considered alongside several other factors, including the current and potential future strength of Ford's on-the-ground government and public partnerships, and Ford's human capital within the city. Ford's relationship with WRI's EMBARQ could be an incredible asset should Ford decide to move forward with creating New Mobility infrastructure in Istanbul.

Shanghai

From a Base of the Pyramid New Mobility perspective, Shanghai is the most attractive of the markets that we examined. However, current local and regional political pressures in China may be most at odds with the tenants of New Mobility, and this has the potential to preclude Ford from this market. Like people in India, individuals in China are rapidly beginning to associate car ownership with success, and consider motor vehicles to be socio-economic status symbols. The government is actively promoting this idea, while it struggles to build the roads necessary to accommodate skyrocketing rates of car ownership. At the same time, the government is taking an active position toward eliminating more traditional – and sustainable – forms of transportation; walking is becoming an increasingly hazardous pastime on many city streets, and some local governments have gone so far as to ban bicycles from roadways. Such constrictive policies promise to worsen the plight of Base of the Pyramid residents in Shanghai and other cities.

Appendices

Appendix 1: Background Materials

Ford Motor Company

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Appendix 2: Matrices

Matrix: Current State of Mobility

Mobility Factor	Definition	Quantification	Overall Ranking (1-10)
Integration and Flexibility	• Ability to chose from several transport options • Level of integration between transport options • Walkability	• Percent of transport market for each option • Ease of transferring between bus routes • Well-maintained sidewalks, pedestrian access ways, bike paths/routes • Qualitative	Based on qualitative and quantitative findings
Reliability	• Breakdowns • Timeliness • Degree of congestion • Safety	• Average bus / train delay (wait time) • Auto deaths per year • Traffic deaths per year • Traffic management practices currently employed • Emphasis on safety? (safety standards – helmets for mopeds/motorcycles; pedestrian crossings, use of seatbelts?) • Average age of motor vehicles in use • Qualitative	
Affordability	• Ability of BOP to afford readily available transport options • Freerider problems	• Cost of car/income of poor • Cost of public transport/income of poor • Percentage of BoP consumers (<$2/day) who use public transportation on a weekly basis	
Access	• Ease of moving from point A to B • Capacity	• Cars per 1,000 people • Public transport: no. of buses & bus routes, frequency of offering; (buses per 1,000 people)	
Innovation	• Development of unique local products and services	• Qualitative	

Matrix: Megatrend Effects

Megatrend	Definition	Quantification	Factor Rankings (1-10)
Local Pollution	• Quality of local atmosphere	• Measure of average air quality in the city • Geographic location, and associated vulnerabilities	Based on qualitative and quantitative findings
Social Disparity	• Income inequality	• Gini coefficient	
Shifting Demographics	• Trends in population profile over the next 30 years	% population under 15 % population over 65 Life expectancy at birth Trend line Population pyramids	
Urbanization	• The proportion of residents who live in a major city; the rate at which this proportion is changing	• Urabanization trends over time • Qualitative – the rate of growth of city infrastructure, and whether this growth is keeping pace with population growth	
Congestion	• The intensity of traffic within a city	Congestion profile of a city Worst rush hour routes • Current rate and projected growth of car ownership	

Matrix: Traditional Market Assessment

Market Factor
Population
Income
Disposable Income
% of population that depends on public transportation
Car ownership rates

Appendix 3: Interview Questions

General

Would you mind describing a typical day for you and your family, including how each family member moves from place to place? [Note, where commute is used, can use something like 'run an errand across town' if commute is not applicable]

Describe, and give impressions of, your city's transportation system as a whole.

What about the current transportation system works well?

What does not work well?

Accessibility

How usable is the city's transportation system? Specifically…

Does the system run 24 hours? Or is it only useful during business hours?

Which parts of it do / do not?

How easy/difficult do you think it is for someone who is not familiar with the city transportation system to access it and use it?

How easy is it once you are familiar with the system?

How far does the average person need to walk in order to access any form of transportation?

What do the elderly, youth, disabled do for transportation, generally?

Integration and Flexibility

How many different modes of transportation are available to you?

What kind do you currently use and why?

How much longer would your commute be if your primary option were unavailable?

Reliability

How much time do you spend commuting on average? How much variability is there / what is the range of times it takes over a normal month?

How much time would it take you in the fastest manner possible, with no congestion?

Timeliness of public transit schedules? Are buses frequently skipping stops when they run late?

How safe to you perceive the city's transportation system to be? Does the level of safety depend on the time of day?

How clean is the transportation system in your city?

Affordability

If more appropriate… What is an average salary for people who live in this city? What form of transportation is most popular for an individual who makes an average salary? How much does it cost to use the mode you use?

Do you think the transportation options available to you are fairly priced?

For each of the other transportation options available (other than your primary / preferred option), how much would you pay (or have to be paid) to use that option?

When traveling, would you say the other people sharing the mode of transportation are 1. very much like you 2. somewhat like you 3. neither like you or unlike 4. somewhat different from you 5. very different from you

Are there socio-economic differences in terms of what modes are used? I.e. is public transit used by every group or specific groups only?

Innovation

What successful attempts to improve transportation have been made in the past 5, 10, 20 years?

What flops have there been in transportation?

What are city, country, or cultural strengths that are not yet incorporated into transportation?

What innovations have there been in non-transportation areas in this city / country?

What models have been useful for transportation; specifically, are there any public-private partnerships addressing transportation needs?

What is your vision for the mobility future of X city?

Pollution and Climate Change

How does the transportation in your city affect pollution and climate change?

How would you rate the average air quality (1-10; or excellent/good/fair/poor/very poor) in the city? Are there any direct and noticeable health affects from pollution?

What are attitudes in the city towards the importance of pollution and climate change? Attitudes of…

Citizens

Government policy

Regional

National

How do those attitudes and the levels of pollution and climate change affect transportation if at all?

Social Equity

Is economic opportunity widespread in your city? How important is an individual's social class or status in determining economic opportunity or life success?

Are there signs of social tension? If so, between / among who? (Rich vs. poor, various ethnic groups, young vs. old?)

Demographics

What makes it difficult for old / young people to get around your city?

Is it getting better or worse? Why and how?

Urbanization

Are many people moving into or out of this city right now?

Where do new immigrants to the city live? Do they come alone, or with their families?

How do people find jobs?

How does the rate of urbanization in your city affect you personally?

How is immigration/urbanization affecting the city as a whole?

How is immigration/urbanization affecting transportation?

How is urban/metropolitan growth regulated/managed/ encouraged?

What is the local land use policy?

What determines where people live? Proximity to good schools? Proximity to work? Other?

Congestion

How bad do you think your city's rush hour is, from 0 being efficient movement and 10 being can't get worse?

How far must you commute from home to work, and how long does this take you during rush hour? How about your friends?

Is congestion being eased or worsened this year? in the last 5 years? in the last 10 years? over the next 5 years? over the next 10 years?

What is the current debate regarding the city’s transportation infrastructure and traffic experience?

Appendix 4: Methods Table

	Bangalore	Camaçari	Hermosillo
Days on Site	5	0	5

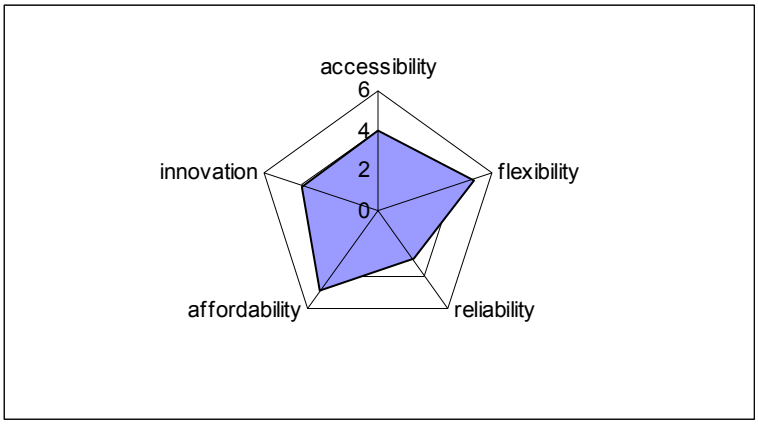
Experts Consulted	• Swati Ramanathan, From NGO Janaagraha, working with SMART
	• Ravichander- B2B consultant
	• Jude Fernades- Infosys employee.
	• R.S. manjunath- Tyco electronics
	• Murilidharan – MICO Bosch
	• Kumar- MICO Bosch
			• Employees from the Hermosillo Ford plant;
			  o Evert Gutierrez
			  o Karem Pacheco
			  o Cesar Bacerra
			  o Rafa Salazar
			• Rodolfo Lopez and Juan Najar, bus contractors from the Hermosillo Ford plant
			• Carlos Gabriel Labrada from the State government office for the modernization of transportation
			• Jose Carrillo Atondo and Angel Lopez Guzman from the office of the State Subsecratary who works in Urban Planning and Design;
			• Jesus Cazares from IMPLAN, a city planning group

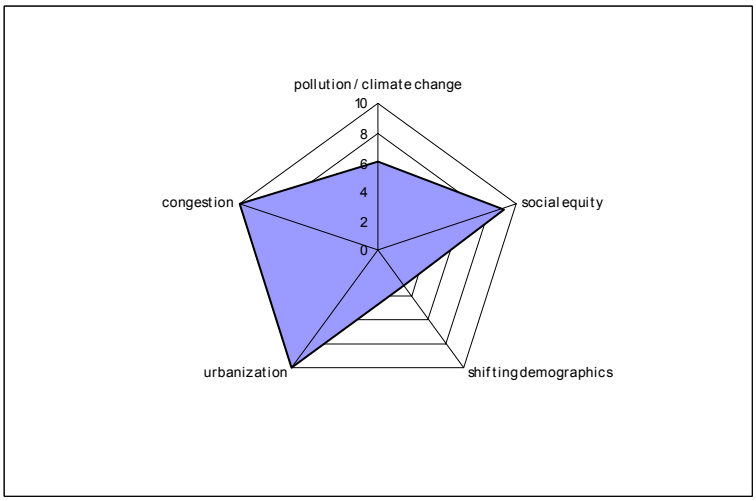
People Surveyed	Pedestrians at random		20 including; taxi drivers, people waiting for the bus, pedestrians, residents of a shanty town
Major Sources of Background Information	Reports from NGO Janaagraha, including: • Bangalore Master plan • Feasibility study on bus rapid transit system • Bangalore Agenda task force report Other information sources including: News papers, journals, visual media	• Government statistical databases at the local, state, and national level • Local Tourism Bureaus • Local Tourist Websites • Local Newspapers and Magazines	Government statistical databases, Survey information, photographing
Notes	Two Masters Project members visited Bangalore		Data maybe skewed to favor higher-income people due to the individuals surveyed

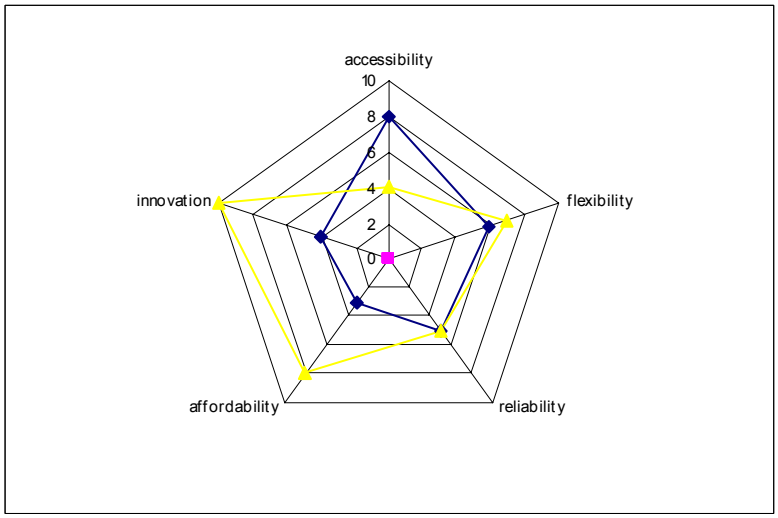
	Istanbul	Shanghai
Days on Site	6	8
Experts Consulted	Meetings in Ann Arbor, Michigan • Ann Larimore, Professor of Geography / Women's studies, Turkey expert, • Necat Sehun, Professor of Finance, Turkey native, lived in Istanbul Meetings in Istanbul • Nazmiye Özgüç, Professor of Geography / Women's studies • Arda Ibikoğlu, PhD Candidate, Political Prisoners in Turkey • Murat Guvenç Professor of City and Regional Planning • Elif Ozgen , PhD Candidate, Planning and Development • In addition; • Sibel Koyluoğlu, 17yrs at Ford • Barış Yazıcıoğlu, DAP Marketing Research	• Haixiao Pan, Professor of Urban Planning, Tongji University • Chen Xiaohong, Professor, Tonghi University • Wei-Shiuen Ng, EMBARQ, Center for Sustainable Transport, World Resources Institute
People Surveyed	• 22 including; bus and ferry riders	50 including; taxi drivers, bicyclists, riders of the bus and subway, pedestrians and residents of the inner and outer loop of Shanghai
Major Sources of Background Information	• Economic Intelligence Unit database • World Resource Institute Trendbook • CIA Factbook	Newspapers and magazines, including: • Shanghai Daily • BBC
Notes	• Bias toward public transportation due to individuals surveyed	Data maybe skewed to favor lower-income people due to the individuals surveyed

Appendix 5: Multi-Dimensional Mobility Diagram

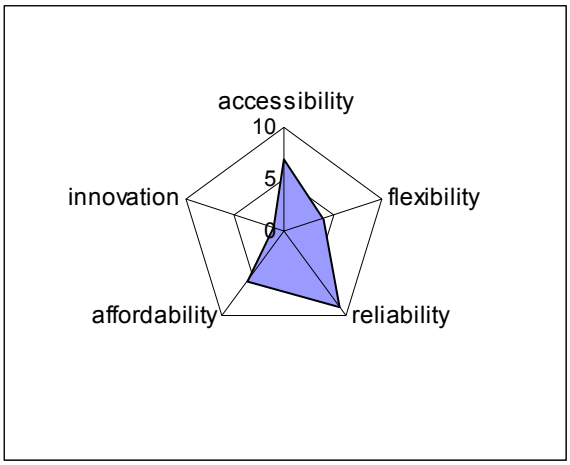
Bangalore







Camaçari


accessibility
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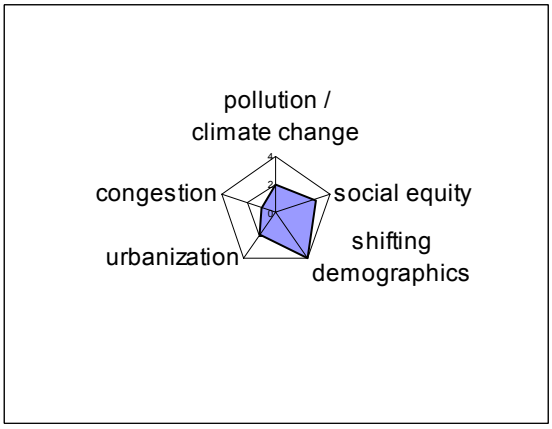
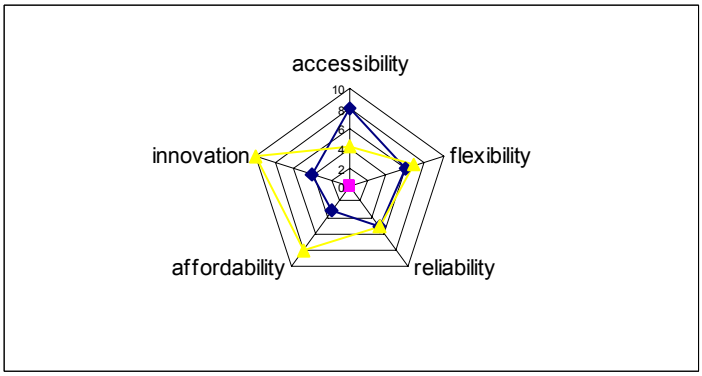
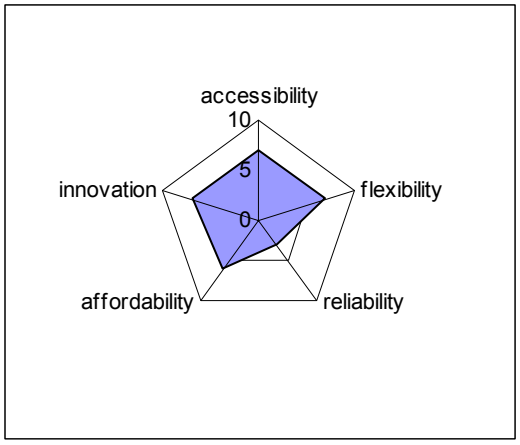
flexibility
reliability
affordability
innovation


pollution /
climate change
social equity
shifting
demographics
urbanization
congestion


accessibility
flexibility
reliability
affordability
innovation

Istanbul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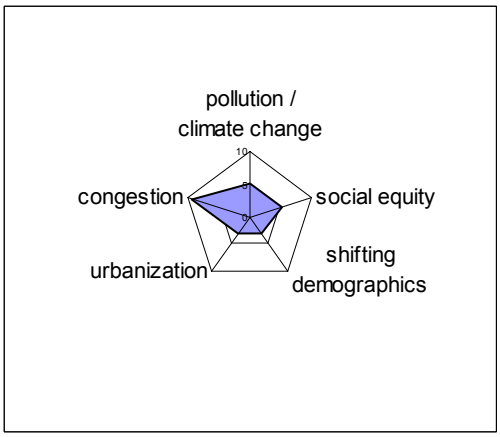
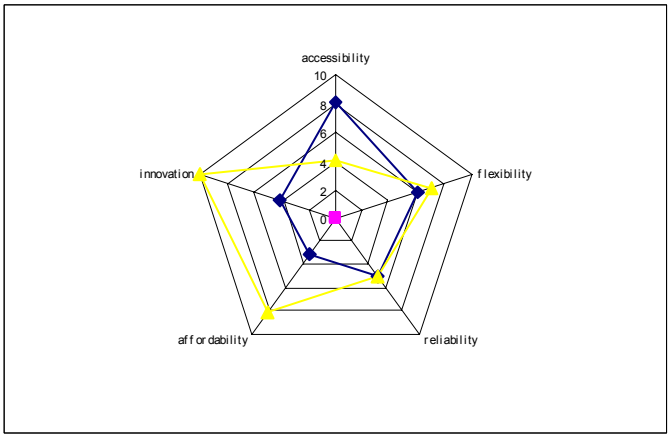
innovation
flexibility
affordability
reliability


pollution /
climate change
congestion
social equity
shifting
demographics
urbanization


accessibility
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2
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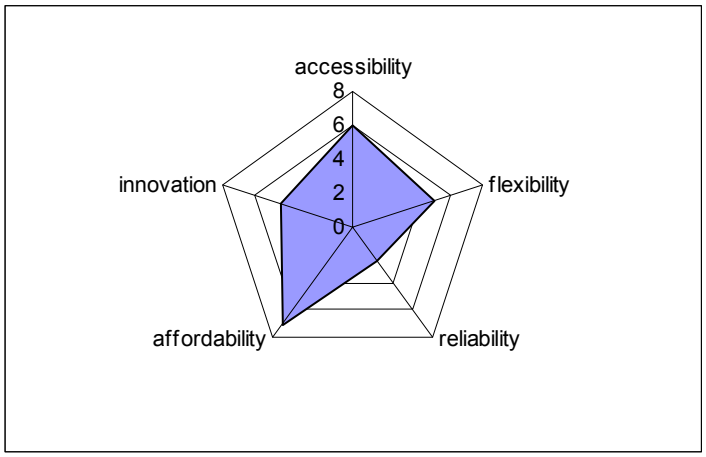
innovation
flexibility
affordability
reliability

Shanghai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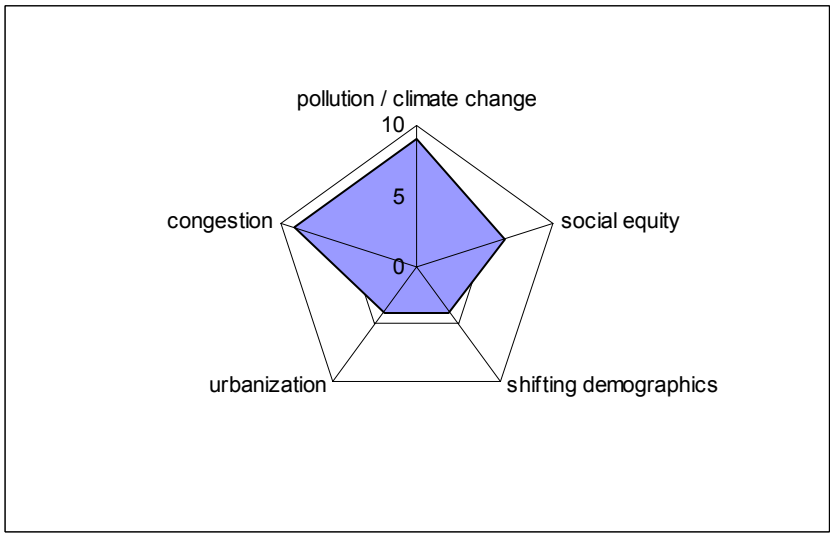
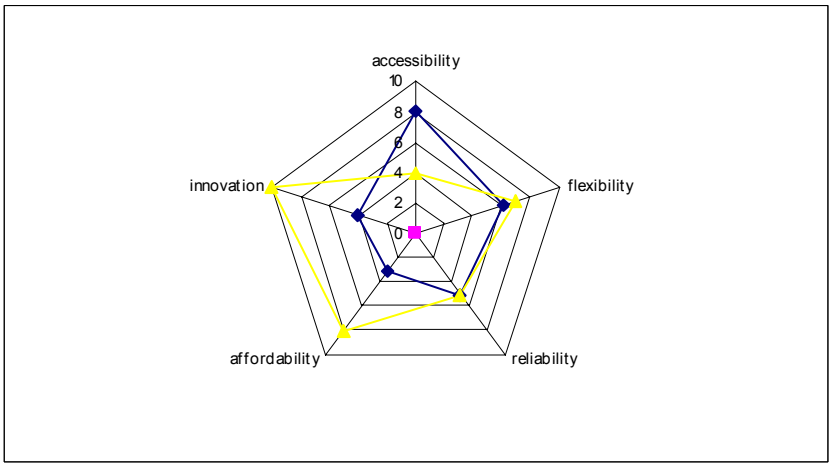
flexibility
reliability
affordability
innovation


pollution / climate change
10
5
0
social equity
shifting demographics
urbanization
congestion


accessibility
10
8
6
4
2
0
flexibility
reliability
affordability
innovation

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