

BOGOTÁ²¹

Towards a World-Class, Transit-Oriented Metropolis

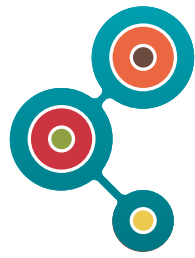


ITS»CONSULTANCY



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Disclaimer:

The development partnership “Bogotá 21” with Siemens is part of the *develoPPP.de* programme that Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implements on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). It is carried out by independent research partners. They are responsible for the methodology, data collection and analysis as well as report edition. Findings, interpretations and conclusions expressed in this document are based on information gathered by the consultants, partners and contributors of the project.

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Partnerships between the private sector and government create sustainable development. This has been shown by more than 1,500 cooperation arrangements implemented with *develoPPP.de* in more than 70 developing countries and emerging markets since 1999.

Sustainable development requires entrepreneurial commitment – not only in Germany, but also in the partner countries of the BMZ. Companies create jobs, secure incomes, transfer technical knowledge and introduce forward-looking technologies.

“Bogotá 21” is executed in collaboration with Universidad de los Andes, Infratrans (ITS) Consultancy Limited, Fundación Despacio and Consultoria Colombiana.

The Government of Bogotá warmly welcomes the Development Partnership “Bogotá 21” and considers its findings as a relevant reference for the city’s long-term and strategic development planning.

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Günter Kniess
Ambassador of the Federal
Republic of Germany to Colombia

I would like to express my congratulations to the successful result of the Bogotá 21 Initiative. This accomplishment is an excellent example of the successful cooperation between Colombia and Germany, and also between the public and private sectors.

Due to its enchanting lifestyle, its unique culture, and its role as a regional hub, Bogotá is one of the major metropolises of the 21st century. I do hope that Project “Bogotá 21” contributes to transform Bogotá into a city of excellence. One important step towards this goal is the recognition of the predominant role of infrastructure in the development of cities and nations alike.

This is true in a wide array of applications, ranging from facilities for education, culture, and sports, to installations for the protection of the environment, waste recycling, flood control, and of course, to transportation infrastructure. The ultimate target would be to develop and improve these many aspects of infrastructure in harmony.

Germany has faced similar challenges and may be able to share some of its lessons learnt. Particularly during times of the so-called “economic miracle” in the 1950s and 60s and again after re-unification in 1990, Germans had to invest heavily into infrastructure. Those investments – in relation to the national economic product – were even larger than the growth rates of our economy. They paid off extremely well.

The project “Bogotá 21” is part of the develoPPP.de programme initiated by the German Federal Ministry for Economic Cooperation and Development (BMZ). It is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, active in Colombia for almost 50 years, and Siemens, a German global corporation present in Colombia for nearly 60 years.

I hope that the planning assistance provided may be useful for developing the roadmap on how Bogotá can progress further by the middle of the century. I wish Bogotá success in developing its potential, to the benefit of both the city and the nation.

Günter Kniess

EXECUTIVE SUMMARY

This book provides strategic advice on development priorities for Bogotá by looking at the metropolis from an angle different than is traditionally used by planners. To do so, we analysed how the city performs across a broad array of criteria defining the quality of urban life. Hence, we benchmarked Bogotá against world-class cities, such as Paris and New York, labelled the “capitals” of the 19th and 20th centuries.

The benchmark provides the background for a SWOT analysis (Strengths and Weaknesses of today and the Opportunities and Threats of tomorrow), and thus forms the basis for proposing the most appropriate direction for the future development of Bogotá. This direction is expressed by the sub-title of the initiative: “towards a world-class, transit-oriented metropolis.”

The initiative identifies priority measures and proposes immediate actions for selected projects, many of them transit-related. This emphasis is because the improvement of the transportation system in general, and the public transit system in particular, contributes the most to the greater good in a megacity like Bogotá.

The Bogotá 21 initiative looks into the budget needed to transform Bogotá into a top-performing metropolis by 2050. After optimising the portfolio of investments, we recommend most suitable budget allocations to the main areas of infrastructure development, in order to identify the minimum investment budget.

This amount, about 4.2% of the national Gross Domestic Product (GDP), needs to be spent annually to develop Bogotá into a world-class, transit-oriented metropolis. However, this cost would not be spent for the development of Bogotá alone, but also for the development and the benefit of Colombia as a whole.

Two guiding principles were applied when carrying out this initiative. The first is to maintain a fair balance of benefits for Bogotá and the country as a whole. The second principle is to practise moderation and avoid any kind of overspending towards luxury, beyond what is sufficient.

About one third of the proposed investment would be dedicated to the development of the nation, especially of the transportation infrastructure, including inland waterways, railways, and roads. This would help Bogotá live up to the needs of the nation as the central logistics hub of Colombia, and also cut the tremendous cost of logistics that prevail today.

* * *

If the investment portfolio proposed by the Bogotá 21 Initiative were to be implemented, then the city would be on par with metropolises such as Berlin, New York and Paris by 2050. It would become a candidate for the honourable title, “capital of the 21st century.” *It is not a dream, it is an option.*

INTRODUCTION

Bogotá, Colombia's capital and prime urban, political, administrative, commercial, industrial, and cultural centre is one of the major metropolises of Latin America and the world. Its population stands at 7.4 million inhabitants (2010), with around 8.6 million living in the *Greater Bogotá* region¹. Greater Bogotá² will grow to a megacity in the middle of the next decade (Box 1), with an expected population of more than 13 million at the middle of this century.³

By 2010, Greater Bogotá was home to 19% of the Colombian population (excluding Colombians living overseas). At the same time, the economic output of the region accounted for almost 29% of the national GDP. The related GDP per capita is about 50% higher than the nation's.

Bogotá is the national primate city (Box 1) with significant national dominance: its share of GDP is 1.5 times larger than its population share. However, this dominance is less pronounced on the level of a city-country comparison than the case of, for example, Thailand; Bangkok's GDP share is almost 2.5 times its share of population. That is good for Colombia and means that the capital is not unrivalled in its own country. There is competition among Bogotá and its fast-growing followers such as Cali, Medellín, Barranquilla, and Cartagena, e.g. in the acquisition of Foreign Direct Investment (FDI).

Colombia's foreign trade is balanced, with exports slightly surpassing imports. Its economic growth was almost constantly higher than the average of Latin America in the past 10 years, with a peak close to 8% in 2007. Average FDI inflow was two times higher in the second half of the 1990s than in the first.

Poverty in Colombia fell from around 54% to 46% between 2002 and 2011 but, according to the World Bank, Colombia has a very high Gini-coefficient (0.559).⁴ Correspondingly, the social divide between rich and poor is huge, certainly one of the root causes of the high rate of violent crime. Even though it reduced significantly in the past decade (by almost 50%), it remains too high.

BOX 1

NAMING BIG CITIES

The United Nations (UN), in *World Urbanisation Prospects* of 2002, applied the term "megacity" to large cities with a population of above 10 million. Bogotá, and also Greater Bogotá, do not yet qualify for this title. In this book, the term is used as defined by the UN if reference is made to cities like metropolitan Jakarta or Manila. The term "primate city" (Mark Jefferson, 1939) is used to indicate that capitals like Bangkok and Paris are by far dominating cities in terms of hierarchy in their countries, "at least twice as large as the next largest city and more than twice as significant" (Mark Jefferson, 1939).

Urban geographers apply the term "World City" (John Friedmann, 1986; - later termed "Global City" by Sassen, 1991), to places that are dominant players in selected areas of global business, such as banking or financing. Cities like London, New York, Hong Kong, even Zürich and Frankfurt are included (all Alpha-Cities in the Globalization and World Cities (GaWC) Index). We do not use this term because it loses the focus on size. The term "Metropolises", however, is applicable to all cities included in the benchmark. The term "Megalopolis" is the ancient Greek word for "very big city", and – at the same time – the name of a very old and very small town on the Peloponnesian peninsula, which still exists today.

The term was introduced into city geography by the French geographer Jean Gottmann in 1961, for the vast metropolitan region stretching from Boston to Washington (BosWash), comprising a multitude of administratively independent cities, however cross-linked and interdependent. It is applied for the Hong Kong – Macau – Shenzhen region. If globalisation and new, cosmopolitan lifestyles were the prime focus of this report, "Cosmopolis" would be a suitable term.

1 The metropolitan region defined as "Greater Bogotá" is understood here to include the following municipalities: Soacha; Facatativá; Zipaquirá; Chía; Mosquera; Madrid; Funza; Cajicá; Sibate; Tocancipá; La Calera; Sopó; Tabio; Tenjo; Cota; Gachancipá; Bojacá.

2 We will refer to the metropolitan región of Bogotá as "Greater Bogotá".

3 Jorge Acevedo e.a., *El transporte como soporte al desarrollo de Colombia*, Bogotá (2009), p. 47.

4 The Gini-coefficient (named after Corrado Gini, 1884 - 1965) is a common measure of inequality of income or wealth. In Colombia, it is the highest among the nations included in the Bogotá 21 benchmark; the lowest is in Germany, standing at around 0.28.



Photo by Clabete Wares Medina.

Figure 1: SKYLINE OF BOGOTÁ.

The number of international visitors to Colombia more than doubled in the same period of time. This can be attributed, at least in part, to the improvement of safety and security. However, in 2000 the amount of visitors was very low compared to a country like Thailand. The current, relatively low, level of international visitors in Colombia still indicates very strong growth potential for in this sector if safety-levels in the country can improve further.

Additionally, during the last decades, Bogotá has attained meaningful progress in terms of urban development. Local authorities have established a more sustainable vision of the city, based on providing high quality public space, promoting the use of non-motorised transport, building bikeways throughout the city and fostering the use of public transport. Particularly, some of these transformations were developed along with the implementation of the city’s Bus Rapid Transit (BRT) system, Transmilenio. This system represents a huge milestone since, besides the undeniable improvement to travel conditions, it has significantly contributed to the city’s urban development.

*Invest in Bogotá*⁵ concludes that the fundamentals of the country – and the city especially – are by far better than the city’s international image. Hence, the agency’s prime focus is targeting the gap between perception and reality. As a reference, it cites the Global City Index 2010 and indicates Bogotá’s 54th rank, behind Bangkok (36th), Manila (51st), and Jakarta (53rd), but ahead of Ho Chi Minh City (61st).⁶

This book aims, not only to point out that Bogotá deserves better, but also to demonstrate that Bogotá is already in a better position than the Global City Index expresses. The book contains a comprehensive analysis of the city’s current strengths and weaknesses, as well as anticipated opportunities and threats. It follows through this analysis with a focus on the development needs of the city’s infrastructure in general and its transit system in particular.

Sustainable urban expansion is focused on improving the long-term social and ecological health of cities and towns. This includes compact, efficient land use; less reliance on private and motorised transport, while, at the same time, ensuring better access; less pollution and waste, along with the rehabilitation of natural systems; and the preservation of local culture and tradition.

THE SUSTAINABLE DEVELOPMENT CONTEXT

Sustainable metropolitan growth, a major touchstone for sustainable development, has been a key for developing policy frameworks ever since the term was applied by the World Commission on Environment and Development (WCED) of the United Nations (UN) in 1987, in the ground-breaking paper *Our Common Future*.

According to the UN, development is sustainable if it “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Figure 2).⁷ With regard to metropolitan growth,

5 Invest in Bogotá is the city’s investment promotion board

6 See the “Globalization and World Cities” Index (GaWC) of Loughborough University (Geography Department), Leicestershire, United Kingdom



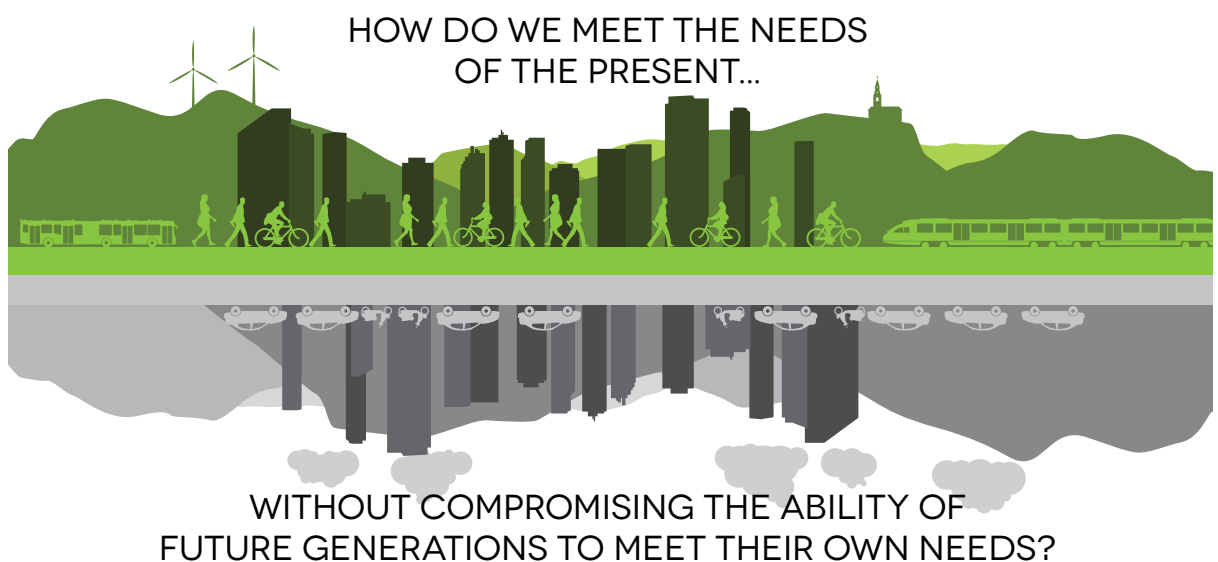
this seems to be particularly true in the 21st century, which has frequently been called the century of urbanisation⁸; as of 2009, more people around the world live in cities than in rural settings (in Colombia, the urban/rural proportion is 78%).

THE NATURE OF THE BOGOTÁ 21 INITIATIVE

As the guiding principle for our work, we formulated the following comprehensive, long-term urban vision for Bogotá in the year 2050:

figure 2

THE SUSTAINABLE DEVELOPMENT CONTEXT



7 Historically, this term “sustainability” was first applied in the field of forestry, in the master plan for the reforestation of the regional woods until 2050 in the German dukedom of Sachsen-Weimar, published in 1763 by Duchess Anna Amalia. This master plan is centred on the German term, *Nachhaltigkeit*, which was later translated into the English term “sustained yield”.

William Duerr finally developed the doctrine of sustained yield (1968) in forestry, in which he states, “Each generation should sustain its resources at a high level and hand them along undiminished” (Grober, 2008). This phrase anticipates the way sustainable development is defined by the UN.

8 Sustainable development is a major challenge for German International Cooperation (GIZ) and Siemens alike. These two global organisations are providing systems, processes and services to initiate and to support the development of nations and cities in a sustainable manner.

1. Bogotá has become a role model for sustainable urban development based on compact growth and polycentric, transit-oriented development. It has become an equitable metropolis with excellent environmental living conditions for all, with clean air to breathe, with green space and clean rivers for recreation, with high-quality pedestrian spaces, and is encircled by a green belt. Such a model would stop urban sprawl and reduce spatial segregation.
2. Bogotá provides equitable access to world-class urban infrastructure and social services: housing, efficient mass transit that is smartly integrated with the region, flood protection continuously adjusted to climate risks, security, and access to health care, education, and culture for all citizens, regardless of age, social standing, and gender. It is the growth engine of

the region and of Colombia, with an expanded role as national centre of service industries.

3. Bogotá's citizens proudly call the city home. It has established rules and efficient tools for citizen participation in policy making and decision making, and citizens have developed a sense of ownership and care for public goods and spaces.

Based on the long-term vision for Bogotá 21, we have studied possibilities for urban planning, transportation and other infrastructure, urban environment and urban management in the city. We then formulated a comprehensive, integrated approach for sustainable urban development, so that growth in the region is no longer driven by the forces of globalisation, but rather by good governance and growth management (Box 2).

BOX 2

GLOBALISATION AND URBANISATION

Globalisation has reshaped the world economy since the 1980s, - and still does. It started with the move of "footloose industries" (Douglass, 1995) from the industrialised world to so-called third-world countries. These industries were attracted by abundant cheap labour and comparatively cheap building plots for factories in relatively close vicinity to international ports and airports.

Facilitators included the high manufacturing cost in the first world, new means of fast and efficient communication, faster transportation, and the decreasing cost of international logistics (Rimmer, Dick, 2009, p. 50). The latter was backed by the highly-efficient transportation networks and by efficient logistics companies in the industrialised nations. These companies replaced some of the job losses in first-world manufacturing by new jobs created in the service industry.

Not only was the world economy shaped anew, but third-world metropolises were as well. Exported manufacturing relocated at their urban fringes and in their hinterlands. Immigration followed, as well as spillover of city boundaries and rapid population growth.

By 2015, more than 50% of the world's largest 25 urban agglomerations will be located in the part of the world that is often called the "Third World".

The contributions of these cities to their respective national economies in terms of GDP are huge. In the World Bank country rankings, Colombia, Indonesia, the Philippines and Thailand would fall by 8, 6, 8, and 16 ranks respectively if the economic contribution of their capitals were subtracted from their national GDP.

This relocation of manufacturing contributed significantly to the rapid ribbon development of metropolises and urban sprawl. Globalisation sparked the development market, and developers adjusted quickly. The trend continued – if not accelerated – market-driven town development (see also Box 3).

The present form of metropolises in developing nations is the result of the lack of spatial planning frameworks, or the lack of plan enforcement, or both, in addition to funding shortages for basic urban infrastructure, the present situation took shape. Restructuring the metropolises of today is a task of gargantuan proportions.

CHAPTER 1
BOGOTÁ:
CHALLENGES
OF AN
EMERGING
MEGA-CITY

1.1 CHALLENGES

Colombia's present share of urban population of around 78% is among the highest in Latin America. It is expected to rise further at an average quinquennial urbanisation rate of 1.2%.⁹ Bogotá is going to face further population influx, for which a systematic concept for sustainable qualitative and quantitative growth is needed. Figure 3, below, presents the city's urban growth map, with an indication of the population in five key historical milestones to be used as reference.

Conversely, because of its significance, Bogotá's growth is vital to the nation's overall and economic well-being. If Bogotá succeeds in realizing its full potential, it may easily rank among the truly global megacities in the future. Much of this will depend upon successfully developing the modern infrastructure that will make Bogotá a world-class metropolis.

Previous plans, as well as the new Land Use Plan for Bogotá (Plan de Ordenamiento Territorial -POT) aim

to promote metropolitan decentralisation via a polycentric pattern, a universal approach that most big cities follow in similar forms. This approach involves the spatial reorganisation of both population and employment, with multiple sub-centres serving Greater Bogotá, and the central business district's specialisation in service industries.

However, land use and transport planning in Bogotá could make better use of this spatial reorganisation. Decentralisation efforts in Bogotá still are, to a very large extent, limited to the administrative region of the capital, and hence do not consider the potential of well-planned metropolitan expansion into the hinterland to prevent urban sprawl.

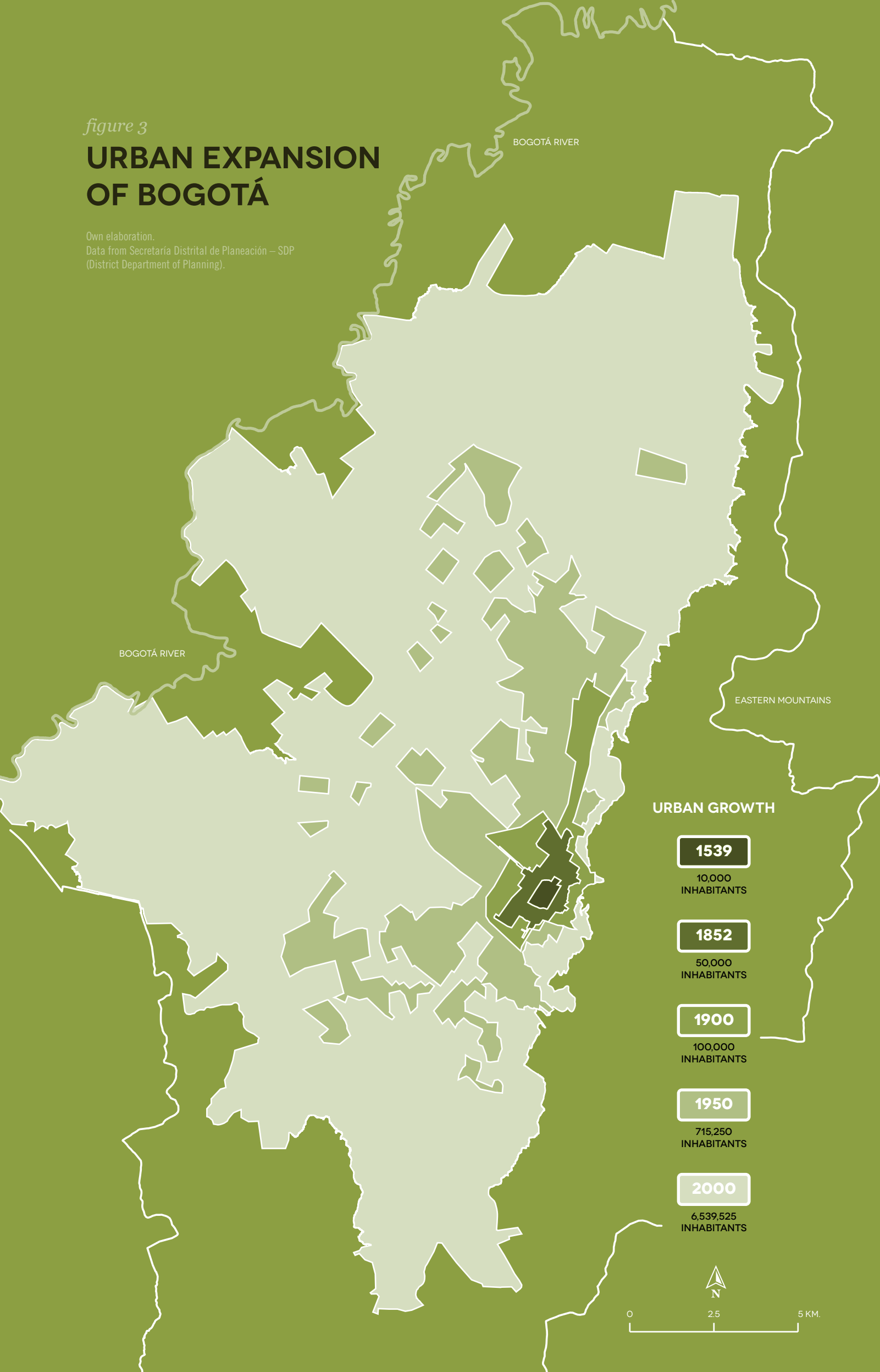
The city needs highly-integrated urban and regional land use and transport planning and development. Of course, this is always difficult to pursue under the conditions of rapid urbanisation that fast-growing metropolises like Bogotá experience.

9 Comisión Económica Para América Latina y el Caribe (CEPAL), Statistical Yearbook of Latin America and the Caribbean, 2010. The average 2010 to 2040 growth rate was extrapolated to 2050.

figure 3

URBAN EXPANSION OF BOGOTÁ

Own elaboration.
Data from Secretaría Distrital de Planeación – SDP
(District Department of Planning).



The Problems Posed

Besides the investments in the urban environment and infrastructure made in the past, many further improvements are needed, including:

- Improvement in coordination between Bogotá and its surrounding region by establishing some form of regional planning authority
- Improvement of waste water purification prior to discharge into rivers,
- Improvement of the urban landscape to facilitate free flow of fresh air,
- Reduction of pollution caused by the extensive use of combustion engines,
- Higher levels of safety and security,
- Improvement of the health care system, in particular public health care,
- Better road infrastructure in terms of road and network quality and connectivity,
- Introduction of traffic management and travel demand management,
- Improvement of the public transport infrastructure by both extension of the Bus Rapid Transit (BRT) system, and urban, suburban, and regional rail.

Of the needs listed above, the improvement of the transportation system in general, and the transit system in particular, most contribute to the quality of life in a metropolis. In a large-scale research project of the Economic Intelligence Unit carried out by GlobeScan and MRC McLean Hazel, mayors of metropolises worldwide were asked to rank the relevance of urban infrastructure sectors that make a city competitive, and 35% of respondents ranked “transportation” first, followed by “safety and security”, prioritised by 11%.¹⁰

Efficient and comprehensive transport systems are essential for effective mobility in a metropolitan area. Further, improving transit is crucial to reducing emissions of CO₂ and other greenhouse gases, and for the creation of sustainable living conditions.

Mass transit helps promote compact urban development, facilitates high population and employment densities, contains urban sprawl and land consumption, reduces infrastructure costs, improves land use capacity, and intensifies urban activities of all kinds.

As in many cities, Bogotá’s failure to plan and to invest adequately in mass transit has created huge traffic management and logistics problems. Since land use planning and public investments did not keep pace with private land development, parts of Bogotá lack an adequate system of secondary roads. Connectivity between secondary roads must also be improved, since main roads are frequently used as connections from south to north and west to east, an issue that further exacerbates traffic problems in the city.

As a result, congestion levels are high in Bogotá, though not comparable to Asian metropolises like Jakarta, Manila, or Shanghai. Given the restricted road capacity and the finite road space, which will be dif-

ficult to redress physically, the future of the city and its hinterland lies in mass transit.

Bogotá and its neighbouring towns and cities behave increasingly as a metropolis (in terms of the integration of urban fabric and the increasing socio-economic interactions between its inhabitants). Despite these dynamics of functional integration, the territory lacks an officially established regional authority, while other regions of the country do have such a body in their Metropolitan Areas.

For more than two decades, Bogotá’s local authority has been working with the Cundinamarca Department (i.e. State Government) on defining how to organise and govern Bogotá and its region. A first step was the creation of the Bogotá-región planning groups (mesas de planificación), followed by the Región Capital (Capital Region) project, each of these with a different nature and different territorial definitions. None of these has been able to create an institutional entity for the goal of territorial integration.

Current discussions are looking to a Special Administrative Planning Region, a body that would coordinate, plan and manage projects at a metropolitan scale. This poses a challenge that must be addressed as quickly as possible to catalyse the proper delimitation, development and integration of this region. Our project has identified this region as Bogotá and 17 surrounding municipalities (our proposed “Greater Bogotá” - see figure 4).

figure 4
**GREATER BOGOTÁ:
PROPOSED PLANNING
REGION**



10 Economic Intelligence Unit, MRC McLean Hazel, GlobeScan: Megacity Challenges. Munich (2007).

THE NEED FOR INTEGRATED TRANSIT PLANNING AND DEVELOPMENT

Another key initiative is the development of a Regional Transit Authority in charge of development of infrastructure and operation of a well-integrated network.

Today, Bogotá is rapidly extending its Bus Rapid Transit system (Transmilenio), and is on the verge of committing major investments for the development of a first rail-based Mass Rapid Transit (MRT) system on a very high demand North-South corridor. We view this as a great opportunity to start the city’s transformation into a world-class, transit-oriented metropolis.

Bogotá took huge efforts to develop long term planning tools. However, development and enforcement of those plans have been difficult to accomplish. Growth in neighbouring municipalities has been weak, in part because of a low-quality regional transit service and deficient road connectivity between them and Bogotá, the main employment and activity centre.

Instead, the city has experienced a densification process, mainly in areas served by the BRT system (this will be described in greater detail in following chapters). The lack of an integrated land-use and transport plan and weak regulations have permitted market-driven urban development (Bocarejo et al, 2012). Essentially, Bogotá remains a “self-organising” system rather than a planned one; in this regard, Bogotá’s urban development is more similar to that of Bangkok or Jakarta than Singapore or Hong Kong (Box 3).

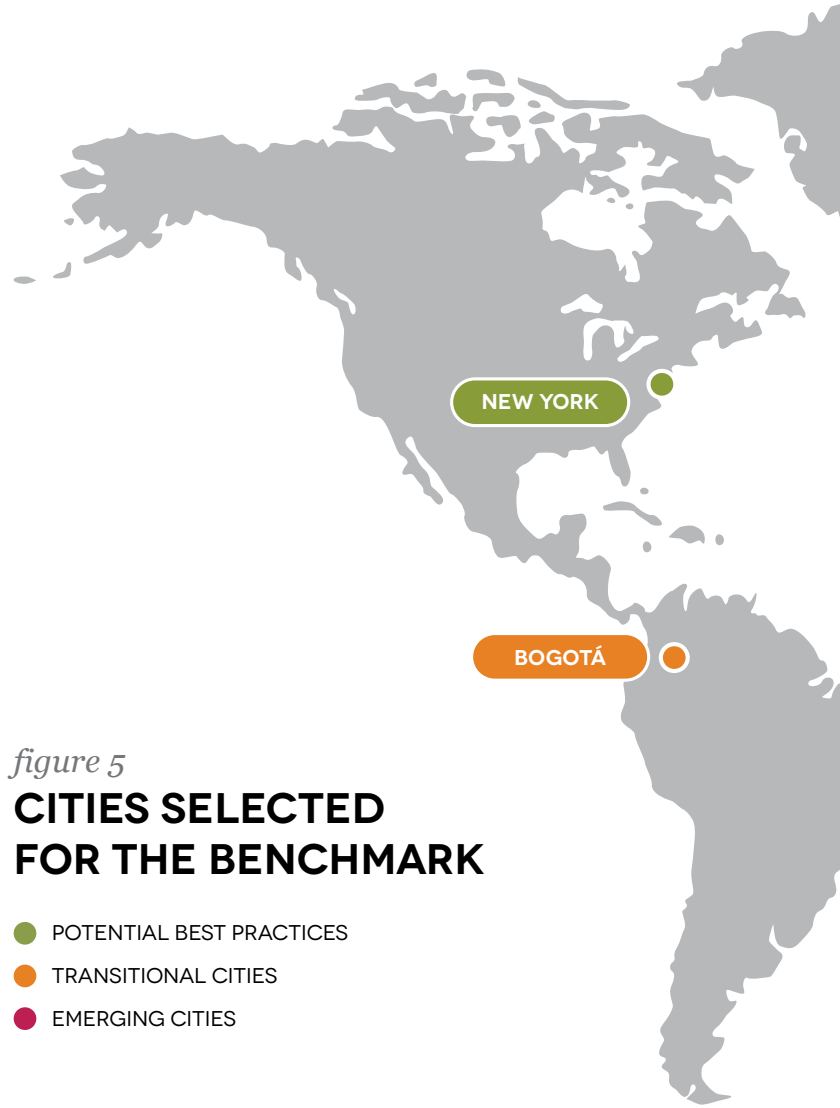
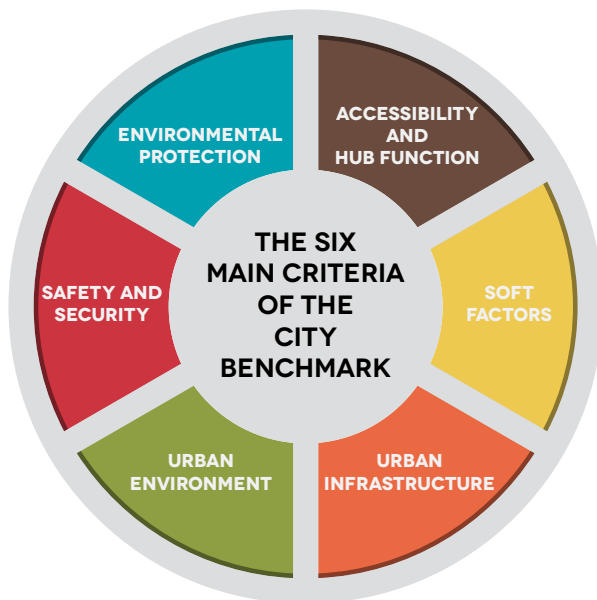


figure 5
CITIES SELECTED FOR THE BENCHMARK

- POTENTIAL BEST PRACTICES
- TRANSITIONAL CITIES
- EMERGING CITIES

figure 6
MAIN CRITERIA



1.2 BOGOTÁ’S RANKING IN THE CITY 21 BENCHMARK

To identify and quantify Bogotá’s point of departure on its way towards a world-class, transit-oriented metropolis, we created a city benchmark that compares the status-quo level of the city’s development with other metropolises around the world.

The scientific approach is based on a comprehensive benchmark of selected cities and covers the entire field of urban quality and liveability. Thirteen cities were selected for the benchmarking: three metropolises from Europe, eight cities from Asia, and two cities from the Americas, representing different levels of development (Figure 5).

The benchmarking was carried out with two distinct data sets: status-quo performance and forecast performance (planning horizon, 2050).¹¹ Therefore, this city benchmark is unique in nature and different from the many other city rankings because it looks also into the potential of cities rather than into the actual performance only.

The benchmarking includes a total of six main criteria, divided into sub-criteria and indicators, creating a total of 74 aspects studied. The six main criteria are:

¹¹ The base year for the status-quo performance is 2010. The benchmark was carried out in 2012. It is based on our own research carried out by the project team. It makes use of planning reports and statistical data as published by local and national authorities, and equally uses benchmarks of other research institutes, such as the Economic Intelligence Unit of The Economist, UITP (International Association of Public Transport), the World Economic Forum, United Nations, World Bank, etc.



BOX 3

MARKET-DRIVEN TOWN DEVELOPMENT

“Over the thirty years to 2000, Singapore, Hong Kong and Kuala Lumpur all experienced rapid socio-economic development. All three former colonial cities were “unbundled” and “rebundled” (...). Transport-land use plans were a key instrument in implementing these new urban visions and strategies. Accessibility is one of the fundamental determinants of urban land prices. The articulation and efficiency of transport networks and systems determine the contours of urban land prices and hence the clustering of activities and socio-economic profiles. These prices are in turn signals to private investors of where to locate development. The governments of Singapore, Hong Kong and Kuala Lumpur did not hesitate to use their autocratic powers to direct and coordinate private investment within an overall planning framework. By contrast, in cities like Jakarta, Bangkok and Manila, where private investment tended to lead urban development, the outcome was a jumble”. (Rimmer, Dick, 2009, p. 65)

Singapore, driven by the vision to become a Global City like New York, followed the most rigid stick and carrot approach, introducing the area licensing system in 1975

to curb traffic congestion through road pricing first, and subsequently to invest massively in an urban metro system that opened in 1984. By contrast, Hong Kong, with the vision to be Asia’s World City and the “Paris of the East,” did not copy Singapore’s strategy but allowed a more free-wheeling development, centred around massive investments in the subway system, which opened in 1979. The new transit lines did the job to impose a structure of development axes in the city on their own (Rimmer, Dick, 2009, p. 66-82).

There are also both positive and negative examples in Latin America: Curitiba (Brazil) fully redeveloped its land use and transportation plan in the decade of 1970, and as a result they improved overall urban quality of life and created an enhanced scenario for private investment. On the other hand, Sao Paulo (Brazil) has had difficulties in implementing an efficient urban development plan during the past decades, and this has generated great social and economic problems related to personal security, social and spatial segregation and a general lack of confidence from the private sector to invest heavily in improved urban development.

- Environmental Protection (air pollution, emission prevention, energy efficiency, environmental legislation, among others)
- Accessibility/Hub-Function (air- and seaports, inland waterway grid, road and rail grid, etc.)
- Urban Environment (metropolitan structure, population and employment densities, open green space, inner city parks)
- Urban Infrastructure (transportation, power, water, sewage, flood prevention, waste management)
- Safety and security (level of violent crime, crime prevention, hostility, road safety and related issues)
- Soft Factors (urban management, administrative efficiency, health services, cultural facilities, facilities for sports and recreation, education and others)

All aspects were carefully selected following the MECE-principle (Mutually Exclusive, Collectively Exhaustive). Taken together, they facilitate a comprehensive comparison of the cities (Figure 6).

The point of departure for the works within the Bogotá 21 Initiative is provided by the status-quo benchmark, with the overall performance of the 13 metropolises summarised in figure 7.

Berlin emerges as the overall best-performing city, followed by London, Paris, and New York. The metropolises from the industrialised countries still form a group of their own, but with a small distinction from

the group of second-best performers only. The very simple reason is that these cities in the first group enjoyed a longer period of time in comparative wealth in their development. They were able to build upon long-term experience and established practices in city and land use planning, and, at an early stage, recognised of the need for infrastructure development. This development served as the prime driver for shaping the physical form of the cities, putting facilities and services in place prior to the development of the urban land (see Box 4).

The specific reason for Berlin’s good performance is the city’s protection from the sometimes insufficiently controlled growth during the boom years in the western hemisphere after World War II. The western part of the city was encircled by an artificial boundary, preventing any kind of spatial growth, and the eastern part of the city just did not participate in the boom.

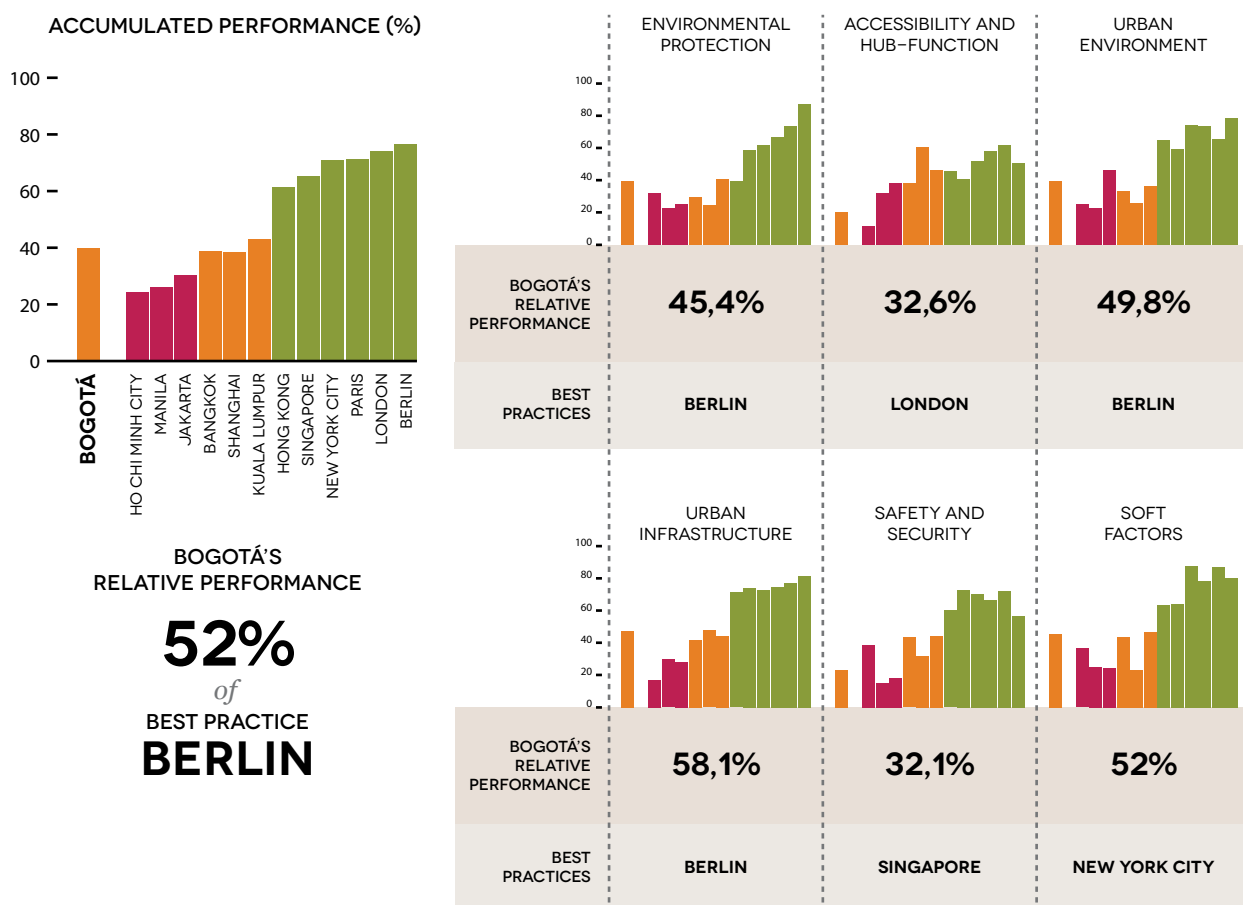
Singapore and Hong Kong are fast followers and second-best performers. In overall performance, these comparatively young cities have almost closed the gap to the “mature cities” of Europe and North America. In the field of safety and security, Singapore even breaks into the ranks of best practices.

The third group of cities is made up of Kuala Lumpur, Shanghai, Bangkok, and Bogotá. A fourth group includes Jakarta, Manila, and Ho Chi Min City (HCMC).

figure 7

STATUS-QUO PERFORMANCE OF BOGOTÁ IN THE CITY BENCHMARK (DATA BASE: 2010)

POTENTIAL BEST PRACTICES TRANSITIONAL CITIES EMERGING CITIES



The overall level of performance of both groups still falls significantly behind the two others. In total, Bogotá achieves 52% of the points of Berlin, and HCMC just one third (32%).

Bogotá shows its weakest relative performance in *safety and security* (32%); this is the main reason for the city's underperformance. The city is still sub-standard with regard to hostility and violent crime. The root cause is the large gap between rich and poor¹². Increasing the citizens' sense of ownership of their city through better community participation and reducing socio-spatial segregation would help to improve *safety and security* in Bogotá.

Bogotá's second worst relative performance is in the field of *accessibility and hub-function*. The city suffers from relatively poor quality hinterland connectivity, despite the recently improved accessibility within Bogotá D.C. As the primate city and service hub of Co-

lombia, Bogotá should perform well in this field; prime attention is to be allocated to performance improvement in *accessibility and hub-function*.

Thirdly, Bogotá also shows a below average performance in *environmental protection*, similar to Asian megacities, such as Manila, Shanghai and Bangkok. The high level of CO₂ emissions prevents better performance, indicating that the city still suffers significantly from the emissions caused by the city's transportation system.

In the remaining three categories: *soft factors*, *urban infrastructure*, and *urban environment*, Bogotá ranks comparatively well. In *urban infrastructure*, Bogotá shows its strongest relative performance. Among its strengths are: good coverage of households in terms of water quality, piped water supply, and sanitation. Also the well-developed bus rapid transit system is a very major plus; it is probably the most efficient bus system in the world. However, system and service in-

BOX 4

ROLE MODELS: PARIS, LONDON, BERLIN – DIFFERENT WAYS TO DEVELOP CITYSCAPE

With Paris and London, this city benchmark includes two old European rivals. With Berlin, it also includes a relatively young Western metropolis that started its growth in the late 19th century, only after it became the German capital in 1871.

Paris is a highly regulated, conservative city, with an outstanding focus on maintaining its urban beauty – however, it lacks the dynamism of London, which also maintains well its heritage landmarks, but places modern high-rises in its neighbourhoods and whose Thames river skyline is astonishingly diverse (London and Paris – The Rivals, The Economist, March 13th, 2008).

Perhaps surprisingly, London's dynamism in new building construction is a recent phenomenon. High-rise buildings were blocked for decades by London's heritage law, and only very few were actually built, such as the new headquarter of *Lloyds of London*, by Richard Rogers, in 1984. The requirement to protect the "St. Paul's Strategic Views" (views along corridors of up to 20 kilometres to the famous dome of Christopher Wren's cathedral) hindered the construction of tall buildings in London.

But with the new millennium, things started to change. The Corporation of London allowed the construction of Norman Foster's *Gherkin* (2004, 180 m tall), of *Tower 42* (183 m) and *Heron Tower* (183 m), and since that time the development of the trans-Thames skyline is in full swing: Nicolas Grimshaw's

Minerva Building (217 m), Richard Rogers' *Leadenhall Building* (225 m), *One Canada Square* (235 m) of Cesar Pelli, Renzo Piano's *London Bridge Tower* (306 m), and *Pinnacle or Bishopsgate Tower* (307 m) of Kohn-Pederson-Fox are under construction.

Berlin started its rise as a European capital in the late 19th century in a manner as rigid and regulated as Paris' development 100 years earlier under Georges-Eugène Baron Haussmann. But Berlin turned to a more adventurous and experimental style after World War II when the city was in ruins, starting during Hans Scharoun's (also the architect of the iconic Berlin Philharmonic Concert Hall) reign as director of the city's building council (1945 to 1947).

Although Berlin is still suffering from the wounds of the Second World War and the following division into East and West, it has successfully built on the strength of the clear-cut planning of the late 19th and early 20th century and capitalized on its cultural diversity since the fall of the Berlin wall. For example, the empty area of Potsdamer Platz developed into a very modern primary centre; it hosts important cultural events, such as the Berlin Film Festival.

That is to say: there is no single path that leads to a city's success, there are many paths. Among the good, the better ones are those that seek balance and avoid extremes, such as extreme regulation or extreme "laissez faire."

12 In its 2010/2011 State of the World Cities, UN has found that Bogotá is one of the cities with considerably bad GINI coefficient, comparable to e.g. Lagos in Nigeria.

tegration among the transit modes and with non-motorised transport needs to be improved. Also, other deficiencies remain, among them the frequency of flooding, the performance in terms of waste handling (waste water and solid waste recycling) and the still unsatisfactory connectivity between the urban core and the remote locations of Greater Bogotá (related to its suburban transportation infrastructure).

In *soft factors*, the city's good performance results from Colombia's rich ecology and culture,¹³ a favourable climate for medium-sized business (opening a business is quite easy, closing it is quite the opposite; tax procedures are cumbersome, and corruption is high), and the rather dense ensemble of cultural facilities (theatres, opera houses, museums, and the like). The relative

performance would have been even more impressive if New York did not dominate this category so significantly, just as Berlin does in *environmental protection*.

In the *urban environment* category, Bogotá shows its third-strongest relative performance. Even though it still lacks a clear-cut urban structure with efficient corridors to connect its suburbs to the city centre, Bogotá offers its citizens a relatively "green" environment, with 13 large parks and more than 1800 smaller community parks in the city¹⁴. Furthermore, Bogotá benefits from its large urban area; this provides plenty of protected open green space. In terms of the city comparison, Bogotá actually performs better than locally recognised, but still falls short of its own ambitious development targets (see Chapter 4.2).

13 Bogotá is the highest city of its size in the world (2,591 m above sea level). Colombia offers a wide range of ethnical and cultural diversity stemming from various indigenous routes (namely the Muisca, Quimbaya, Tairona, and others) as well as from Caribbean, Amazonian, Afro-Colombian, and colonial routes. Bogotá is the melting pot of these rich cultural traditions. Colombia is among the richest countries in the world in biodiversity. Its geographical diversity includes the highlands of the Andes Mountains (up to almost 5,500 m above sea level), tropical rain forests in the Amazon, and tropical grasslands at the coastlines to the Atlantic and Pacific oceans. Taking the cultural, natural, and geographical diversity together, Colombia and Bogotá clearly have the opportunity to become a first class tourist destination, with a focus on eco-tourism.

14 Bogotá has 5 classifications of public parks. The ones larger than 10 hectares are metropolitan and regional parks. The rest are zone, neighbourhood and pocket parks. See http://idrd.gov.co/htms/seccion-definicin-y-clasificacin-de-parques-distritales_32.html

CHAPTER 2
PROSPECTS
AND
ASPIRATIONS

2.1 CITY PLANS FOR BOGOTÁ

Natural urban structures tend to follow the axes of transport infrastructure. The main principle of all transit-oriented cities is to concentrate metropolitan growth along public transport axes, thus maximising access to public modes for all citizens. Complementary, open spaces within urban structures play an important role in the permanent reinvigoration of the urban climate.

Stops and stations of metropolitan transit systems and their surroundings rank among the most accessible areas of a metropolis. High density of population and jobs represents the centrality of these locations (Figure 8). On the other hand, highly dense urban areas guarantee strong demand for high-capacity, public transport modes.

A concentration of population and employment opportunities in centres, sub-centres and satellites is crucial to the development of a sustainable metropolitan area. A functional mix of living, working, learning and shopping helps minimise commuter traffic and strengthen non-motorised traffic for daily travel due to short distances.

Metropolitan decentralisation essentially involves a set of components almost universally applied in world metropolises:

- Instead of uncontrolled suburban sprawl, growth axes direct development along desired lines; these axes also act as principal transit corridors.
- Instead of being dormitory towns, satellite towns at the end points of metropolitan axes absorb overspill population and act as new urban centres, providing urban facilities and employment, thereby promoting the emergence of a polycentric pattern of metropolitan growth.
- Metropolitan green belts contain physical growth and prevent the over-spilling of the metropolis and its merging with the satellites to form one huge agglomeration.
- Metropolitan sub-centres relieve the Central Business District (CBD) and provide for an efficient organisation of urban areas.

We have followed the pattern shown in figure 9 for the envisioned Greater Bogotá. It is based on proposals from the “Plan de Ordenamiento Territorial” (POT) and “Modelo de Ocupación Territorial” (MOT). Shanghai also follows such a pattern, as does Moscow and, much earlier, London. Some smaller cities, such as Brasilia also follow this polycentric pattern. Ho Chi Minh City also applied this pattern in the latest Construction Master Plan 2025, and Jakarta tries to do so in cooperation with its surrounding four municipalities and five regencies.

figure 8

TRANSIT-ORIENTED DEVELOPMENT COMPACT NODES LINKED BY MASS TRANSIT

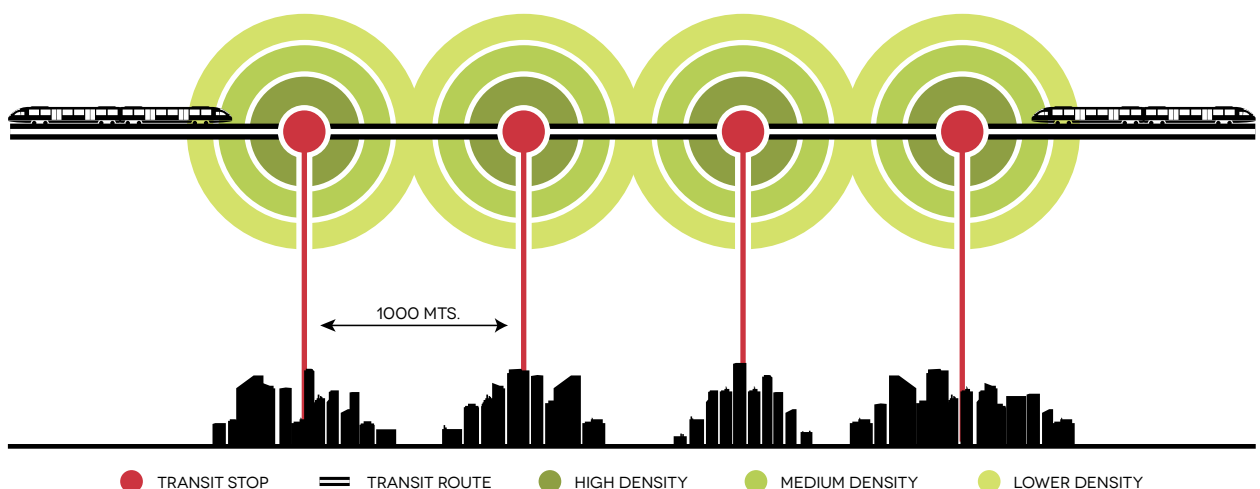
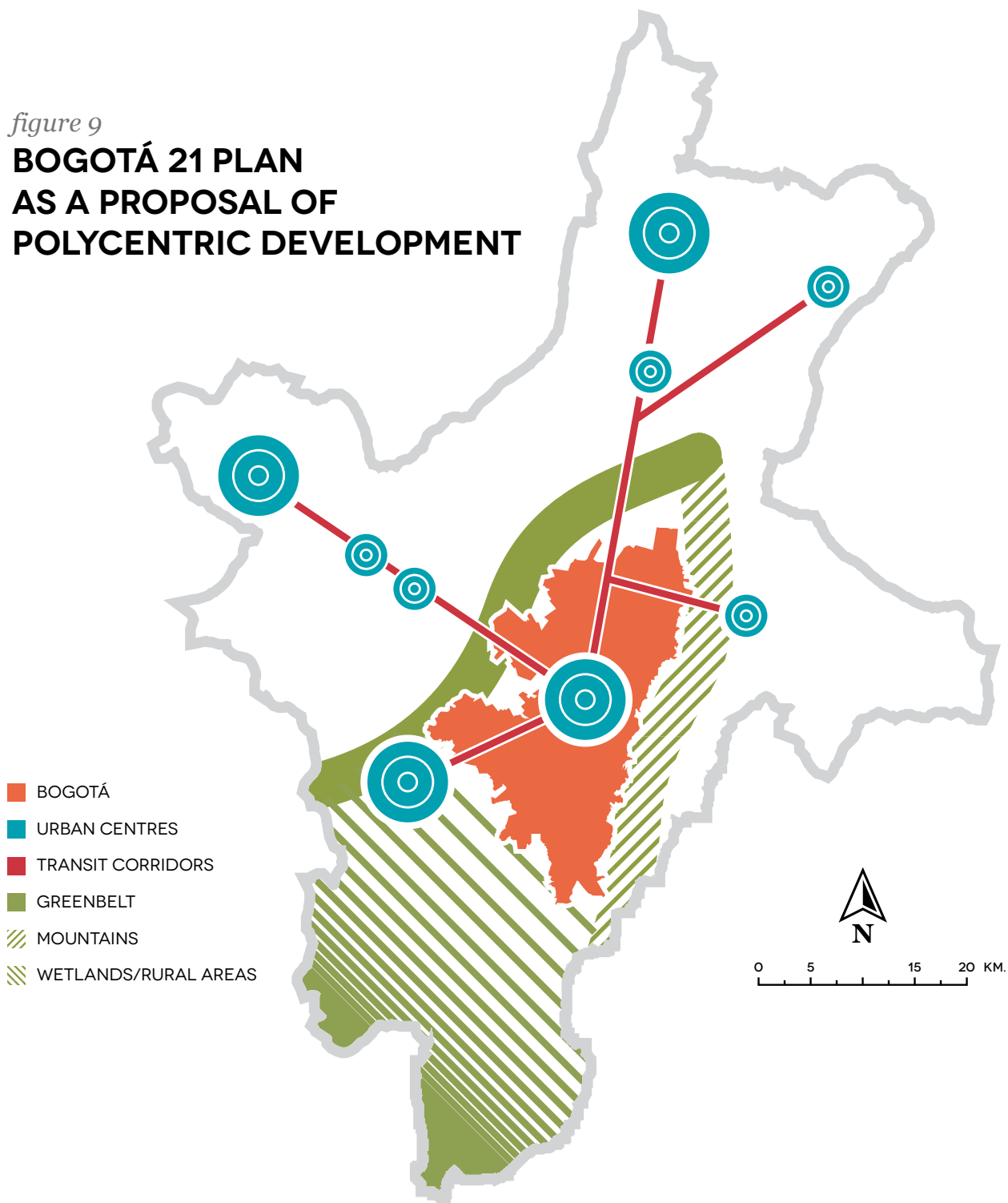


figure 9

BOGOTÁ 21 PLAN AS A PROPOSAL OF POLYCENTRIC DEVELOPMENT



The proposed POT for Bogotá 2020 also provides guidelines for the polycentric structure and land use development of the city. However, links with the development planning for the metropolitan region are largely missing as no integrated planning framework exists to coordinate the land use and transportation planning of the city with its hinterlands (Figure 9).

One major objective of the plan that should be supported is to create a polycentric city structure. It should be even enhanced by developing the metropolitan sub-centres as Transit-Oriented Developments (TOD). The idea is to disperse CBD functions and, by so doing, to develop a new metropolitan centrality. Bogotá has started to do this with its “centralidades” (centralities).

Such sub-centres would typically include high-density developments with mixed business, public and residential use, each with a distinct character of its own. They would spread economic activities across a larger area of the city and would de-concentrate the still largely mono-centric situation of today.

2.2 LONG-TERM IMPACT OF MEGA-TRENDS AND BOGOTÁ'S 2050 CITY RANKING

The long-term performance projection of Bogotá's performance has to take into account existing development master plans of the cities, prevailing mega-trends, and the long-term vision for the city for Bogotá.

The most significant of these mega-trends cover demographic change, urbanisation, globalisation, climate change and global warming, growing individual prosperity, growing uniformity of cities, and the ever-increasing motorisation. Figure 10 summarises the mega-trends as applied to Bogotá.

By nature, mega-trends are either imposing risks (and therefore to be taken as threats) or can create new opportunities (or a mixture of both). Some examples:

figure 10

MEGA-TRENDS AND IMPACTS FOR GREATER BOGOTÁ

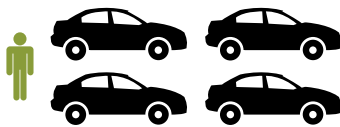
1.



DEMOGRAPHIC CHANGE

In 2050, up to 22% of the population in Bogota will be above 65 years of age (6% today). Today's low dependency ratio starts to increase by around 2021

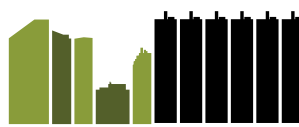
2.



INCREASING MOTORISATION

Car ownership in Bogota is still low (at 18%) but growing. A significant increase of road congestion is to be expected. NMT, MRT, BRT, and TDM (1) become increasingly necessary

3.



GROWING UNIFORMITY OF CITIES

A "modernisation drive" may cause demolition of cultural heritage and loss of community life, thus undermining cultural uniqueness

4.



GROWING INDIVIDUAL PROSPERITY

By 2050, the world will be populated by more than 9 Billion people, with everybody in average more wealthy than today. The effect on the world's resource consumption is frightening.

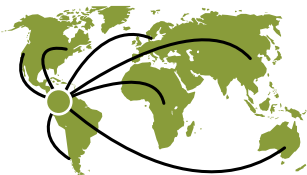
5.



URBANISATION - BOGOTA IS GOING TO GROW FURTHER

Colombia's urbanization is high (78%) and is growing further (85% by 2050). Metropolitan Bogota will become a mega city in the first half of the next decade

6.



GLOBALISATION

Exports / imports are growing 6.7 / 6.4 times faster than GDP (average 2004 to 2010), indicating Colombia's growing participation in the global economy

7.



CLIMATE CHANGE

Increasing vulnerability to river-borne flooding: Bogota is expected to see an increase in the asymmetry of runoff (frequency of max and min flows), with higher peak flows

1) MRT: Mass Rapid Transit; BRT: Bus Rapid Transit; TDM: travel Demand Management; NMT: Non-Motorised Transport

- **Growing individual prosperity: a threat if lifestyle role models are not adjusted**

World population growth, combined with growing individual prosperity, imposes a frightening threat. The resource consumption of the world today already affects climate change. If all of the world population of about 9.2 billion in 2050 is wealthy enough to afford the "American way of life" as prevailing today, and if they follow this lifestyle and consumption pattern, they will consume as much as eleven times the meat, fish, energy, commodities (and others) as today. This would be tantamount to the consumption of a world population of above 100 billion at the average consumption pattern of today.¹⁵

If this were to happen, the world would definitely not be a better place. Hence, the consumption pattern of the "American way of life" is quite the opposite of a role model. While the people of North America, Western Europe, Japan and Australia will have to adjust their lifestyles, the people living in the rapidly developing world are well advised not to copy lifestyles that nature is not able to afford.

- **Demographic change: a mid-term opportunity, a long-term threat**

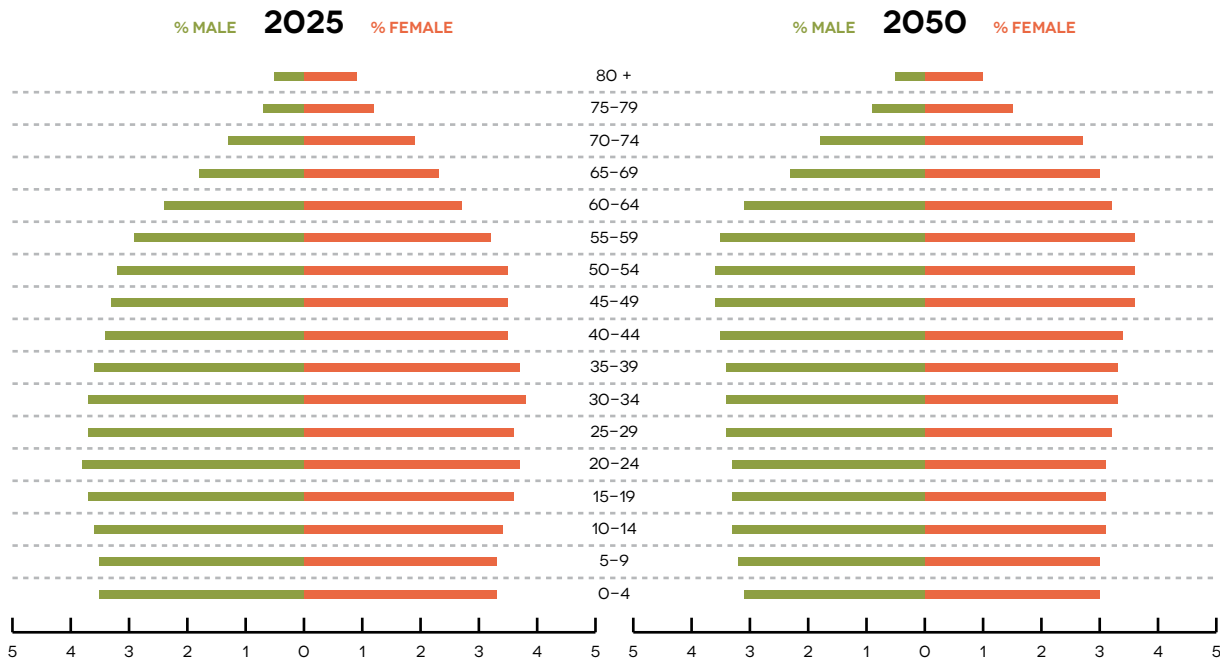
Colombia enjoys the benefit of a young population (median age 27.6 years). Even by 2050, close to 80%

15 For the mega-trend "growing individual prosperity", see Laurence C. Smith, *The World in 2050 – Four Forces Shaping Civilization's Northern Future*, New York 2011, p. 17.

figure 11

POPULATION PYRAMID OF BOGOTÁ (2025 AND 2050 FORECAST)

Source: Universidad de los Andes.



of the population in Bogotá will be aged 64 or less. In terms of the dependency ratio, longer life expectancy will be balanced by a reduced female fertility rate, leading to smaller families and an increasing share of household members of working age (Figure 11).¹⁶

This phenomenon, called “demographic dividend,” enables rising living standards and faster mid-term economic growth, if employment generation and human resources development keep pace with the growing work force. This window of opportunity is

BOX 5

MAINTAINING A COMPETITIVE EDGE

Is the mega trend of globalisation irrevocable? It is, to the extent that the driving forces of globalisation remain intact. However, the resulting benefits for fast developing countries cannot be taken for granted. Decreasing GDP growth rates in the industrialised world, and high GDP growth rates in the developing world, are narrowing the comparative labour cost advantage.

The more fast developing countries achieve their growth targets, the more their labour costs will go up, and the less attractive they will become vis-à-vis the industrialised world if compared to slower developing countries that still maintain a huge labour cost differential. In this scenario, fast developing countries will be forced to transform their economies. Singapore and Hong Kong can be taken as examples. These cities already had to reinvent their business model from manufacturing to service industries, and they did it very successfully.

These could serve as a role model for Bogotá as well, making the city the dominating national service centre

of Colombia, providing advanced producer services such as accounting, banking, financing, stock exchange, administrative and law services to keep Colombian industries flourishing and growing.

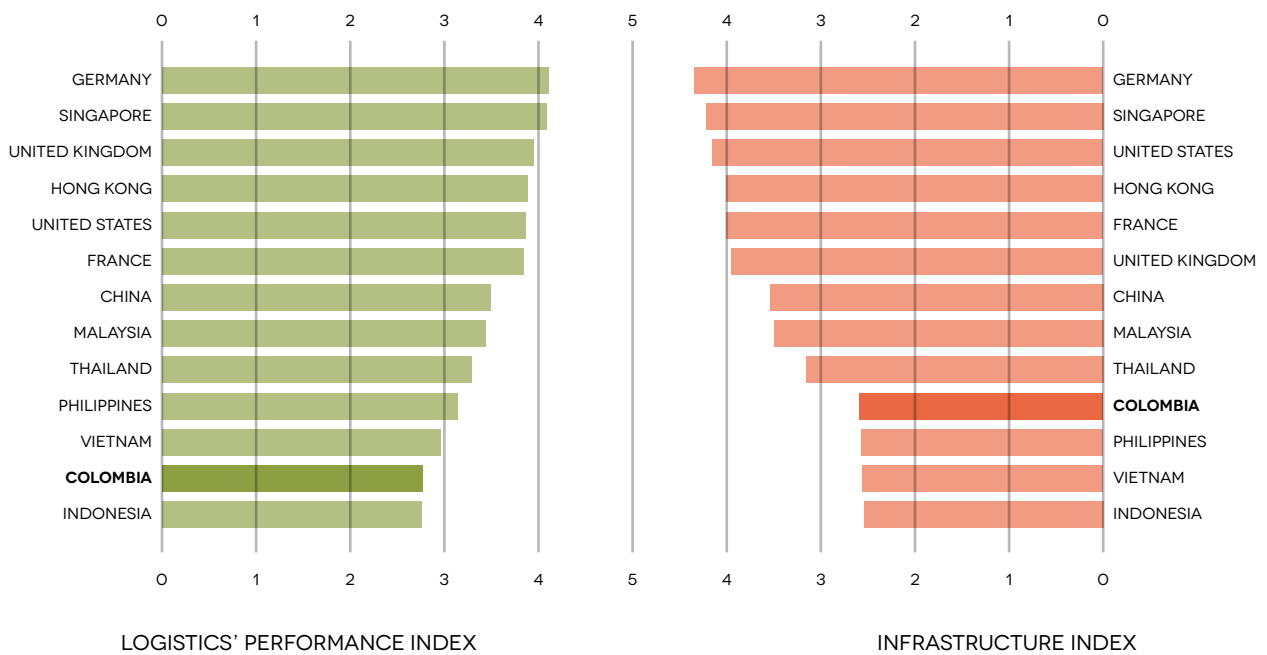
But it should be noted that following the strategies of Hong Kong and Singapore in shifting from manufacturing to service industries must not be the only answer. Service industries often don't make up for the job losses in manufacturing, which has a devastating impact in countries with growing populations and work forces.

A complementary strategy, focussed on investments that help to maintain the competitive advantage to the extent possible, is needed. One possibility is to lower logistics costs. Increasing labour cost, combined with an inappropriate reduction of domestic logistics costs, results in a decrease of the competitive edge and of foreign direct investment.

¹⁶ This opportunity, and the related challenges alike, is also addressed in the National Development Plan. National Development Plan 2010–2014 – “Prosperity for all”, Bogotá 2011, Executive Summary, Chapter 10, Page 54–55.

figure 12

LOGISTICS' PERFORMANCE INDEX AND INFRASTRUCTURE INDEX



especially large within the next ten years (with inverse long-term impacts, starting around 2020).

- **Globalisation: a mid-term opportunity and a long-term threat to be mitigated**

Both Bogotá and Colombia currently enjoy stable, medium sized economic growth and solid foreign direct investment (FDI).

Globalisation is largely driven by the desire of footloose industries from developed countries to re-locate production to destinations where lower labour costs promise higher returns. Hence, the labour cost differential is the most relevant driving force (Box 5).

As there is entropy of the labour cost differential between developed and emerging economies, there is always a risk of footloose industries relocating to even cheaper places again (e.g. the relocation of footwear industries from Indonesia to Vietnam in the late 1990s).

This mechanism will come into place the earlier, and the more successfully, Bogotá and Colombia develop. Risk mitigation has to go beyond the common counter-strategy of promoting service industries. It has to concentrate on the reduction of the cost of logistics. And the “monumental backwardness of

Colombia’s transport network is perhaps the biggest obstacle to economic growth.”¹⁷

Figure 12 shows the currently low performance of Colombia in this regard and indicates how pressing the action needs are for Bogotá and the nation as a whole.

- **Increasing motorisation: a threat**

At present, Bogotá’s motorisation rate is still quite low, also in comparison with other major cities in Latin America. However, the rate has had an alarming increase since 2006, mainly due to the increase of GDP and the improvement of the exchange rate between Pesos and USD. The results are vehicle sales rising to a level of 324.570 vehicles in 2011, with an expected increase for the following years¹⁹ (see figure 13 for the trend of vehicle registration, where Bogotá’s rate of motorisation is slower than Colombia’s).

The trend indicates that vehicle purchasing and operating costs will reduce further in relation to the GDP per capita while the GDP will continue to increase, thus accelerating the trend of private motorisation. According to projections from Universidad de los Andes, motorisation will reach much higher levels in the near future.²⁰ This will be further exacerbated by the Free Trade Agreements between Colombia and Mexico, South Korea and the

17 As The Economist writes in its September 17th edition (2011; page 39), citing Juan Martín Caicedo (President of Colombian Infrastructure Chamber).

18 World Bank, Logistics Performance Index 2010, Washington, 2010. Figure 12 compares the performances of the host countries of the metropolises included in the Bogotá 21 benchmark, taking “overall performance” and “transportation infrastructure” as indicators. In total, 155 countries are included in the World Bank survey, with Germany achieving the first rank (overall ranking, 4.11 points), Colombia the 72nd rank (2.77 points, slightly above the arithmetic mean), and Somalia ranking 155th (1.34 points).

The most pronounced weaknesses of Colombia are in the fields of customs, international shipment, and infrastructure. Improving Colombia’s performance is imperative to maintain the country’s attractiveness as a destination for the resettlement of manufacturing and FDI.

19 Data from <http://www.portafolio.co/economia/colombia-los-paises-que-menos-tienen-carros>.

20 Jorge Acevedo, Juan Pablo Bocarejo, Germán C. Lleras, Juan Carlos Echeverry, Germán Ospina y Álvaro Rodríguez Valencia (2009) El Transporte como Soporte al Desarrollo de Colombia: Una visión al 2040. Universidad de los Andes.

United States – due to a 35% reduction of import duties, these agreements will reduce final prices of automobiles and motorcycles.

This is a definite threat to the city (and also to the country though to a lesser extent). Measures must be taken to reduce its impact on the liveability and efficiency in the Colombian capital.

Based on the impacts of the mega-trends on Bogotá and the available data of the thirteen metropolises in the benchmark, we assessed the 2050 performance of the cities, using trend-based projections. Due to the long forecasting horizon, we applied conservative assumptions for all cities (gliding trends if less conservative performance values were obtained than with linear trend projections, and vice versa).

Bogotá’s trend-based development potential is summarised in figure 14, showing the overall 2050 performance of the metropolises.

It is evident at first sight that the developing and emerging cities are rapidly improving their performance, and they are doing so much faster than the metropolises of the industrialised world. The latter cities are also improving but at a significantly slower pace. While Berlin’s overall performance is still the best and will improve by 5% until 2050, Bogotá’s performance will take a steep jump, improving by 50%.

London, New York, and Paris will capture the second, third, and fourth ranks. However, we do not expect Berlin and these three cities to maintain any clear distinction from second-best performers. We expect Singapore and Hong Kong to become part of the best practices group. They have almost closed the gap with the “old cities”.

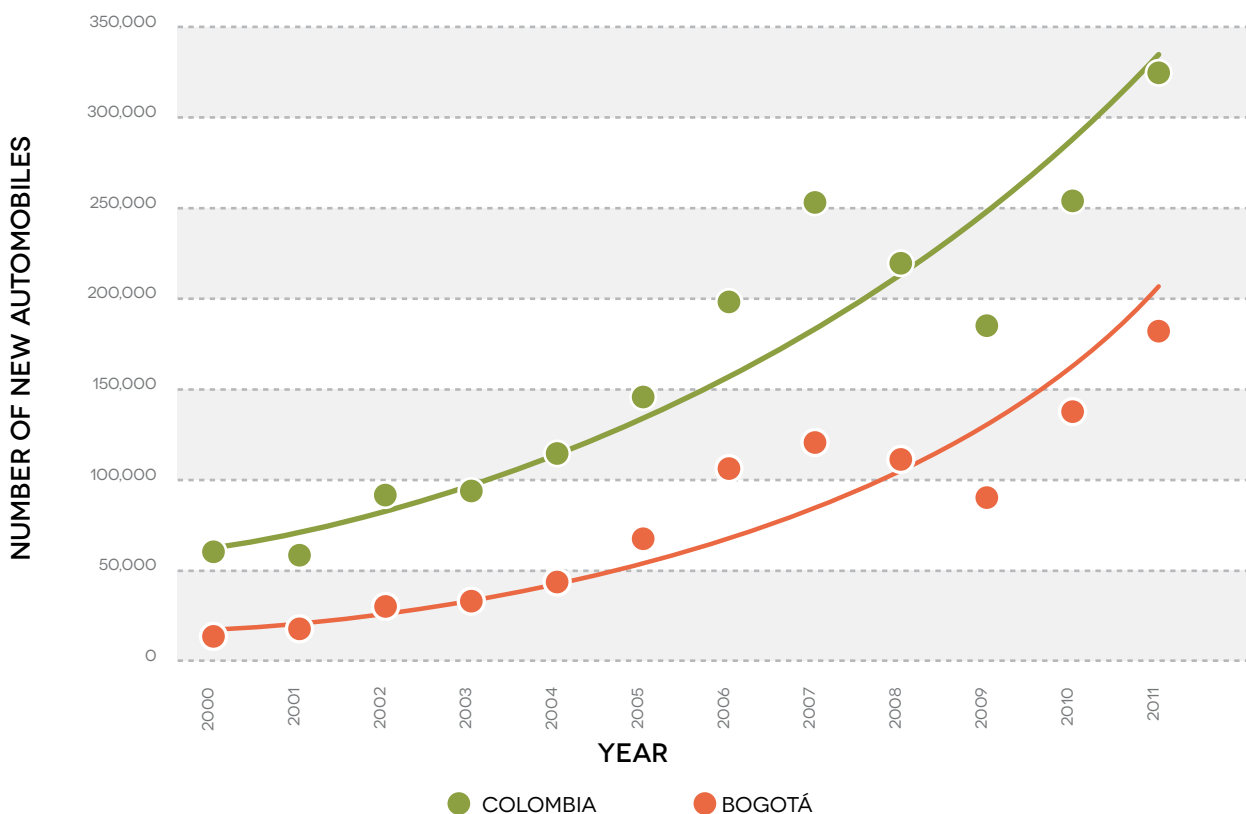
The second group of cities is made up of Kuala Lumpur, Shanghai, Bogotá and Bangkok and, slightly behind, a third group by Ho Chi Minh City (HCMC), Jakarta, and Manila. HCMC is expected to develop faster than other cities and to overtake Jakarta and Manila prior to the middle of the century.

The overall level of performance of the second and the third group still falls behind the first tier but to a much lesser extent than today. In total, Bogotá will achieve 78% of the points Berlin earns (compared to 52% in 2010).

Though an improvement of 50% is already impressive, it is still not sufficient to become world-class by the middle of the century. In light of this target, the performance of Bogotá will not be satisfactory. The main reason for this stems from its comparatively weak performances in *accessibility and hub function* and *safety and security*.

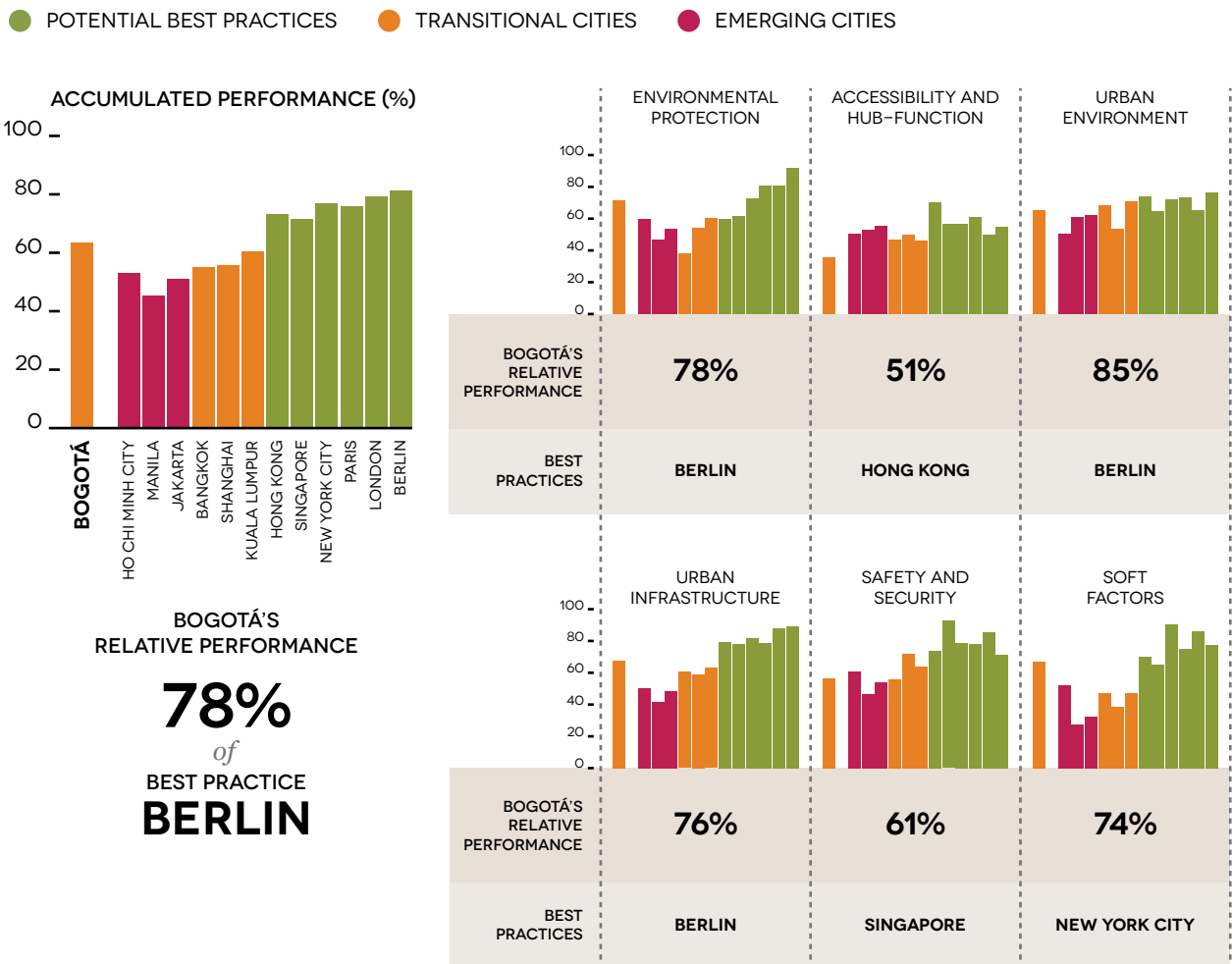
In 2010, Bogotá’s second-worst performance was in the field of *accessibility and hub-function*. With regard to this criterion, Bogotá is improving the least, and other metropolises are improving faster, some even much faster.

figure 13
**NEWLY REGISTERED AUTOMOBILES
 IN COLOMBIA AND BOGOTÁ**



Source: Ministerio de Transporte de Colombia (Ministry of Transport) and Secretaría de Movilidad de Bogotá (Secretary of Mobility)

figure 14
**2050 PERFORMANCE OF BOGOTÁ
 IN THE CITY BENCHMARK
 (TREND-PROJECTED FORECAST)**



For example, we expect Hong Kong to continue its rapid progress, based on the assumption that the joint efforts of Hong Kong and Shenzhen to enlarge Hong Kong's Special Administrative Region and to "merge" both metropolises into one megalopolis will be successful.

Bogotá shows a strong performance improvement in *safety and security*, by around 95% (the single most pronounced improvement) but still falls behind Singapore, the best-in-class city. In short: the improvement is huge as the point of departure is low. A change in the mindset of acceptance of loose law enforcement is needed to improve further.

With regard to the *soft factors*, Bogotá improves its relative performance significantly but is expected to still lag behind in some aspects of cultural facilities and world-class education to prepare young elites to play a proactive, innovative and entrepreneurial role in the

globalised economy. In these areas, Hong Kong and Singapore are "investing" heavily, because they have recognised the importance of these factors for attracting high-potential, urban elites to their cities.²¹

In *urban infrastructure*, Bogotá is expected to achieve a medium improvement. This category was one of the main reasons for the comparatively good performance of Bogotá in 2010, and we expect that this also will be the case in 2050, though to a lesser extent. Deficits are expected to continue, especially due to still insufficient urban and suburban transportation infrastructure.

In *environmental protection*, the presently high level of GHG emissions (CO₂) is expected to show clear improvement, indicating that the development towards a sustainable transit system will reduce the reliance on private means of mobility, resulting in huge positive impacts on the environment.

21 To mention just one example from Hong Kong: the West Kowloon Cultural District. It will cover an area of 42 hectares. The overall grand design of Lord Norman Foster is currently in the third and last round of public consultation. With this master plan, Foster follows in Karl Friederich Schinkel's footsteps: Schinkel created the master plan for the Museum Island in Berlin in 1822, on an area approximately half the size of the new project in Kowloon. Foster's plan avoids high-rises and adds an element of horizontality to the skyline of the most vertical city in the world. It will feature many museums, theatres, outdoor arenas, pedestrianised areas, and open greens. It includes a new green harbour-front promenade for West Kowloon, reflecting and complementing the planned green waterfront of Hong Kong Island in the Wanchai and Causeway Bay area. The overall investment is huge, amounting to 21.6 billion HKD (around 2.8 billion USD) for the first phase alone (approximately the same amount of money which will be needed to complete the renovation of the Museum Island in Berlin, with the cost for the re-building of the old Hohenzollern City Castle included). Phase I shall be completed by 2020. With this mega-investment, Hong Kong expects to become one of Asia's main cultural centres.

In *urban environment*, Bogotá's has equally gained points, showing that the emphasis that the master plan puts on the greening of the city pays off. We expect that Bogotá will reach 85% of the points of Berlin, its strongest relative performance. However, this improvement is based on the assumption that effective measures will be taken to prevent urban sprawl.

2.3 SWOT ANALYSIS AND BEST PRACTICES

The “Strengths” and “Weaknesses” of Bogotá today, taken together with the “Opportunities” and “Threats” of the future, provide the basis for developing strategic long-term planning (“SWOT Analysis”). The focus of such planning should be on balanced, sustainable development and on identifying the areas where priority measures are to be taken first. Figure 15 summarises the findings of the SWOT-Analysis.

figure 15
SWOT ANALYSIS OF BOGOTÁ

S	W	O	T
STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
ENVIRONMENTAL PROTECTION			
Share of renewable energy in power generation	High level of CO2 emissions, high emission allowances	Better standards to protect the environment, better transit systems	Motorisation growth, decrease of renewable energy
ACCESSIBILITY AND HUB-FUNCTION			
Important airport within Latin America especially for air cargo	National rail, road and inland waterways grid, cost of logistics	Growth potential for tourism and service industry on a Latin America scale	No potential as international hub (Air and sea traffic)
URBAN ENVIRONMENT			
Density of inner-city parks, fair quality sidewalks, adequate amount of open green space	Plan harmonisation (city and provinces), high concentration of employment	Decentralized concentration of employment and housing	Urban sprawl leads to a loss of open green space and increased private motorisation
URBAN INFRASTRUCTURE			
Very efficient BRT, coverage of piped water supply (incl. water quality) and sewage system	Density of road network, no rail-based MRT, high frequency of flooding, poor waste recycling and waste water treatment	TOD, hierarchical transit system, TDM, improvement of waste handling (both, water and solid waste)	Uncontrolled urban development undermines TOD and results in urban sprawl
SAFETY AND SECURITY			
High awareness of need for improvement	Level of violent crime and hostilities still high	Turning safety & security in a national USP	Failure to improve S&S undermines growth potential
SOFT FACTORS			
Facilities for culture, sports, enrolment for higher education	Procedures for doing business, level of transparency	Develop cultural USP as magnet for tourism and business alike	Average education remains too low, including language skills

TOD: Transit Oriented Development - S&S: Safety and Security - USP: Unique Selling Proposition - TDM: Travel Demand Management



figure 16: BUS RAPID TRANSIT SYSTEM IN BOGOTÁ AT UNIVERSIDAD NACIONAL STATION.

Photo by Claudio Olivares Medina.

Summarising the strengths and weaknesses of Bogotá, it is obvious that most of the weaknesses are related to insufficient infrastructure, most importantly transit and transportation infrastructure (contributing in turn to the high cost of logistics), flood protection and waste handling (waste water and solid waste recycling), and to a level of crime still too high.

Particular strengths are the prevailing high share of power generation from renewable energy, the importance of the international airport on a regional scale, the comparatively green urban environment, the excellent Bus Rapid Transit system (Figure 16), the dense urban networks for high-quality water supply (drinking water) and sewage, and the number of facilities for culture and sports, combined with a rather good enrolment ratio for higher education.

When summarising the opportunities, it turns out that many of them are indeed related to better planning, better laws, better enforcement of plans and laws (related not only to crime prevention but also to the violation of planning frameworks), and better “selling” of the cultural USP through a better city marketing.

In the infrastructure field, the three largest opportunities are related to implementing Transit-Oriented Development combined with the implementation of travel demand management (TDM), the implementation of a hierarchical transit system combining Bus Rapid

Transit (BRT), urban, suburban and regional high and medium capacity transit systems, and a systematic approach towards an improvement of flood protection and waste recycling.

The threats are related to mega-trends such as the increase of private motorisation, but also to a decrease of the status quo, e.g. power generation from renewable sources if power demand increases. Also, the possible failure to enforce plans and laws due to a lack of good governance constitutes a threat, as does the risk that present deficiencies simply remain.

In the area of infrastructure, these are especially the transit-related deficiencies that reduce efficiency of the road network. Deficiencies related to the hinterland connectivity undermine efforts to reduce the cost of logistics. In the field of safety and security, the threat is that measures that will be implemented might not be sufficiently effective, putting the opportunities at risk to develop the tourism industry and to attract foreign investment in service industries to create quality employment.

In summary: significant changes in mindset are urgently needed: from “laissez faire” handling of planning frameworks towards consistent enforcement, from incremental improvements and debottlenecking of infrastructure towards a much needed step jump, from slow towards fast, efficient, and systematic ad-

BOX 6

SYMBOLS OF ACHIEVEMENT

Bangkok, Ho Chi Minh City, Jakarta, Manila, and Bogotá – regardless of the extent to which criticism of certain developments might be justified – are seen by inhabitants as symbols of achievements. And expatriate observers should view them in a similar light. Their speed and scale of development is extraordinary.

This development is not to be compared to the slow and careful progress of the developed metropolises. The latter have the privilege of contemplating a final touch to their city centres, for example, by rebuilding the Hohenzollern castle on the Museum Island in Berlin, constructing a new philharmonic hall in Hamburg’s Harbour City, or a new World Trade Centre in New York.

It is true that cities like Berlin, London, New York and Paris remain the best practices in terms of the quality of urban life. As such, they are providing benchmarks for urban infrastructure across a wide range of social, environmental, technical, and land-shaping aspects. But they are no longer the role models for the cityscape.

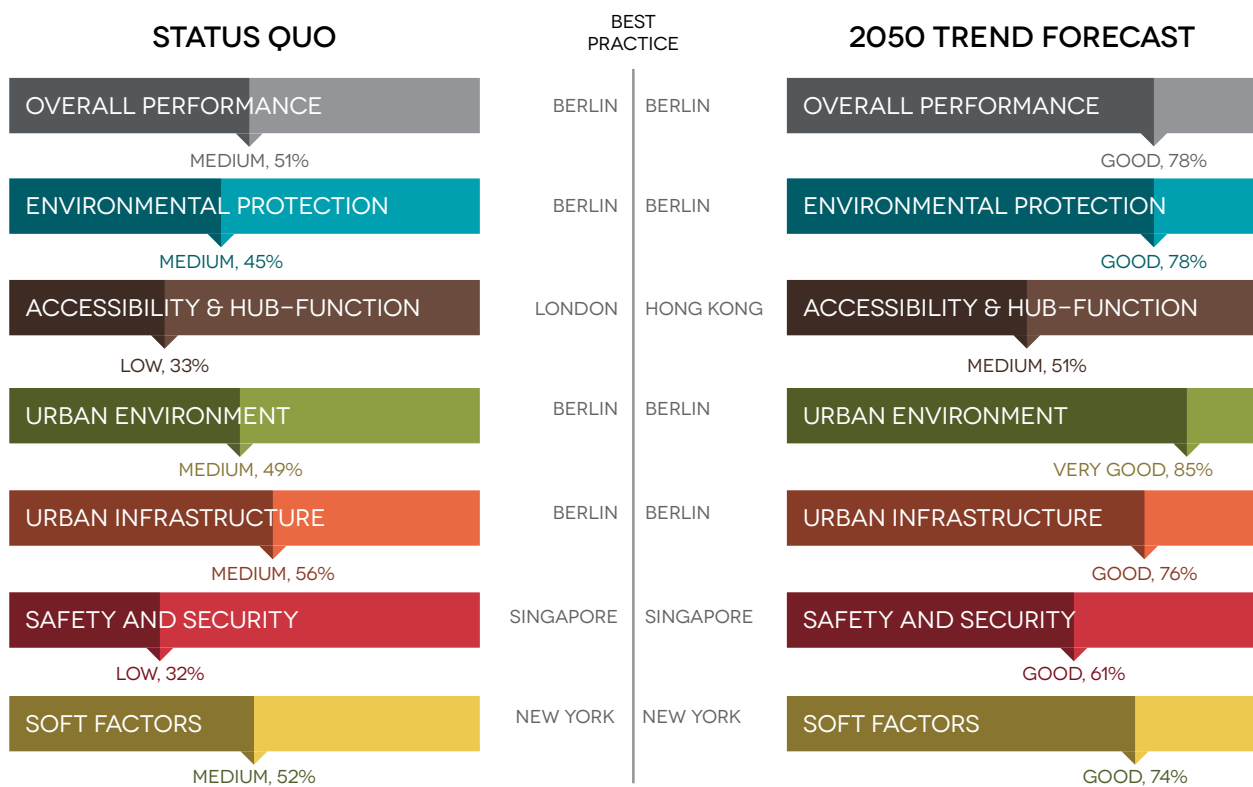
The new urban form of the 21st century is being invented elsewhere, in cities like Hong Kong and Singapore first, and places like Bogotá, Bangkok, Ho Chi Minh City, Jakarta, Kuala Lumpur, Manila, and Shanghai thereafter. To study the future of urbanisation, one has to focus on cities outside of Europe, North America, and Australia.

ministration of project implementation (Box 6). The best practices from the two benchmarks are summarised in figure 17. It demonstrates that the predominant role which was held by the metropolises of the industrialised countries is eroding, with developed South and East Asian cities beginning to lead and to become the representatives of best practices. Based on master plan related trend projections, Bogotá is going to improve its performance from medium to good.

Singapore emerged as the first city breaking into the lines of the best practice metropolises of the industrialised countries in the field of *safety and security*. In the future, Hong Kong will also be among the best practices. This projection is based on the assumption that Hong Kong will be able to maintain its present position as the major commercial and trade hub within the South China region due to its merger with Macau and Shenzhen.²²

figure 17

BEST PRACTICES AND BOGOTÁ’S RELATIVE PERFORMANCE

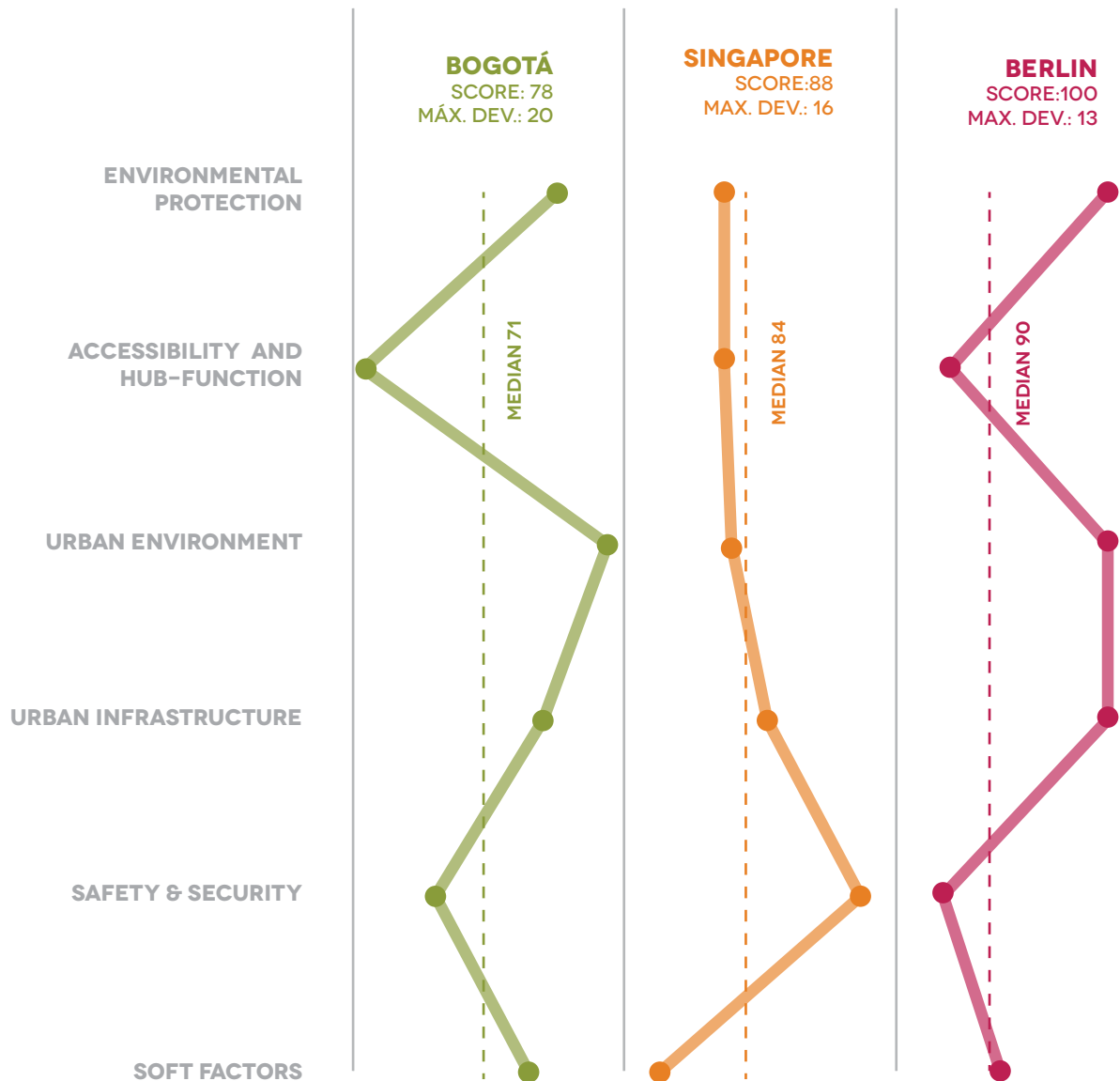


GOOD: BOGOTÁ PERFORMANCE LEVEL > 60% OF BEST PRACTICE; MEDIUM 40% - 60%; LOW < 40%

22 However, the outcome of this process is difficult to assess as seemingly contradictory signals are sent out. Some point towards an increasing “mainlandisation” of Hong Kong by e.g. limiting press freedom (see guest column of Ching Cheong of the Straits Times of Singapore in The Nation (Bangkok), September 20th, 2011, page 13A) or by rapid integration of Hong Kong into the mainland’s High Speed Rail (HSR) network (ongoing construction of a new passenger terminal on Kowloon side next to the Elements TOD). This is e.g. contrasted by the roadmap for a gradual increase of regional democracy in Hong Kong by the a stepwise enlargement of the number of seats in Hong Kong’s Legislative Council directly elected by universal suffrage (currently 50%) and by the fast development of new transportation links within the region of the later new mega-metropolis (e.g. the new 50 km long Hong Kong – Zhuhai – Macau bridge).

figure 18

PERFORMANCE VARIATION INDEX (2050) OF BERLIN, BOGOTÁ AND SINGAPORE



Bogotá is expected to improve in all fields, but it doesn't do so in a really well balanced manner. If trend-based forecasting methods are applied and no major policy changes are assumed, it will still produce a good or better performance in five criteria, with a performance variation ranging from 51% to 85% of the best-in-class cities in the respective categories (Figure 18).

The conclusion from this comparison is that the overall performance improvement of Bogotá is significant, proving that the city is principally on the right track. But even so, Bogotá will not be able to challenge the top performers. A lot more will be needed to transform it into a top-performing city.

We analyse below how much more will be needed. But before that analysis takes shape, we need to outline the fields of priority actions more clearly. Only then can we indicate the proposed short-term measures and immediate actions that are needed to kick-off the development towards a world-class, transit-oriented metropolis.

2.4 FIELDS OF PRIORITY ACTIONS AND MEASURES

The strengths and weaknesses of Bogotá today, the opportunities and threats of the future, along with lessons that can be learned from best practices, can guide us to develop the foresight for strategic long-term planning. It can also help us to identify and recommend the required priority measures.

Based on the SWOT analysis, we summarise the fields in which priority actions and measures are proposed. It illustrates why improvements in the transit system are of such relevance. Figure 19 provides an overview.

Because of the outstanding relevance of the transportation sector, infrastructure is split into two groups, transportation and non-transportation. Besides infrastructure improvement, there is also a need to update or amend national laws to promote the policies associated with the priority measures.

1. Transportation infrastructure:

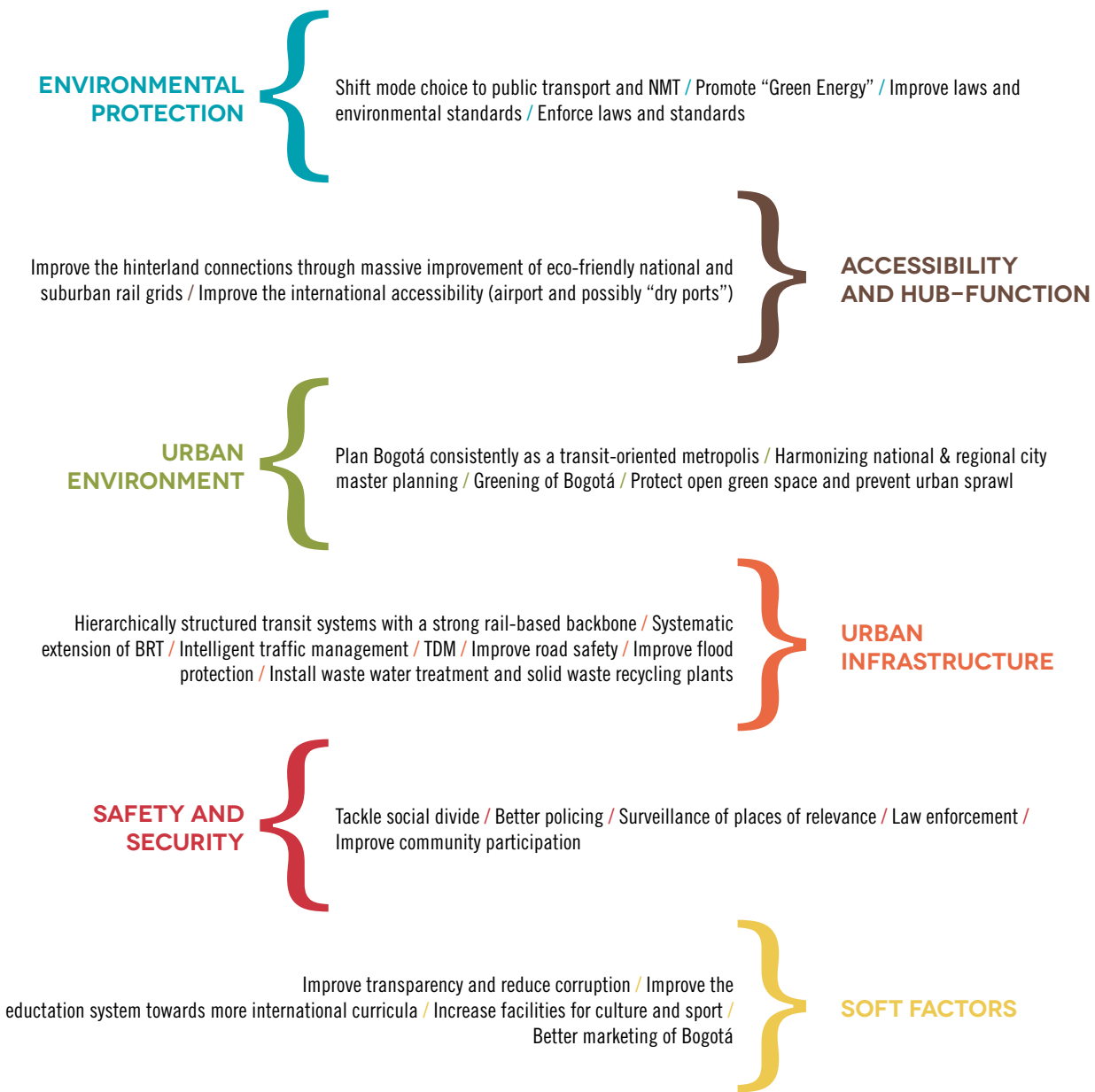
As *The Economist* writes in its September 17th edition (2011), the cost for exporting a standard shipping container amounts to USD 1,770 in Colombia, compared to USD 1,480 in Argentina.²³ The Government of Colombia recognises the competitive disadvantage of high cost of logistics in Colombia, and in its Development Plan for the years from 2010 to 2014 it has set ambitious targets to upgrade the country’s national transportation infrastructure (roads, rail, and inland waterways)²⁴. The need for big investments in the transportation sector is also strongly supported by the outcome of the Bogotá benchmark. No significant progress in *environmental*

protection, accessibility and hub-function, urban environment, and urban infrastructure will be possible without a prime allocation of attention to the development of transportation systems.

This concerns both public and private transportation, but transit has to come first. There is no question that an improvement of the road network, its maintenance, and of road safety is needed, including its adequate clustering in primary, secondary and tertiary roads. Travel demand management (TDM) by de-congestion pricing, along with better traffic management, is highly recommended. But the dependency of the citizens on private means of transport is to be addressed first.

figure 19

PROPOSED FIELDS OF PRIORITY ACTIONS



23 The Economist, September 17th edition 2011, pages 39-40.

24 The length of Colombia’s dual carriageway roads shall be almost doubled by 2014 (from 1,050 km to 2,000 km), railways shall be revived and even new ones built with 2,000 km of railways in operation compared with 906 km at present, and the Magdalena River shall be made navigable on 800 km by dredging 600 km of new canals in the riverbed. National Development Plan 2010–2014 – “Prosperity for all”, Bogotá 2011, Executive Summary, Chapter 11, Page 63/64

figure 20

TRANSMILENIO NETWORK



Authors elaboration, data from TransMilenio S.A.

Faster and better transit systems, based on adequate, top-quality master plans and Transit-Oriented Development (TOD) are required, especially on very high demand corridors like the North-South axes passing through the CBD (the Transmilenio Line A - Troncal Caracas), running from Calle 76 to Tercer Milenio, (see Blue Line in figure 20) for which a replacement by a metro line becomes increasingly urgent.

Depending on average travel distances, adequate transportation means are to be implemented, with a clear hierarchy (regional, suburban, urban) and a clear relation to expected long-term demands (rail, Bus Rapid Transit, conventional buses, with lower-capacity systems acting as feeders to the higher-capacity systems).

Besides the mentioned first metro line, the upgrading of existing railways to modern suburban systems should be a medium term priority as well (Figure 21 shows an example for an existing plan) to promote the planned decentralised concentration in suburban areas. As right-of-ways exist already, the upgrading could be achieved at a relatively low investment cost.

Transforming existing railway lines into state-of-the-art suburban services – an action that is in line with the Development Plan for the years from 2010 to 2014 of the Government of Colombia – would be a suitable priority project; existing and induced travel demand justifies the investment required to connect newly planned primary centres in the neighbouring provinces to Central Bogotá.

Further, the accessibility of areas in the vicinity of stations would trigger land value increments and facilitate transit-oriented development, generating returns that can be used to recover parts of the investment needed for revitalising railway lines (see Box 13).

Finally, the entire transit system must be properly integrated to facilitate public transport trips by various modes with one common ticket. This entails the integration of non-motorised transport (bicycle lanes, walkways, pedestrianisation), high-quality transfer facilities, and unified fare structures and ticketing systems.

Also, beyond Bogotá, the transportation infrastructure needs to be developed so that the capital can truly living up to its role as the primate city of Colombia, to the benefit of the entire nation (as also recognised by the National Development Plan; see footnote 24 for reference). This concerns the national road, rail, and inland waterway grids, which also deserve top priority among future infrastructure investments. Figure 22 highlights needs related to the transportation sector.

2. Non-transportation infrastructure:

Similar to the transportation sector, other types of infrastructure also have multiple impacts on the quality of urban life. For example, there will be no significant improvement to environmental protection if there is no adequate recycling of solid waste and handling of toxic waste, and if the waste water from Bogotá and upriver towns is not purified prior to discharge into the water bodies.

Non-transportation infrastructure development must prioritise flood protection in terms of storm water and river-born flooding. Urgent action is needed to

improve drainage detection and prediction. Flood protection measures to fence off the city’s urbanised area from water penetration are needed, and the protection of open green space to serve as “polder and flood retention area” is to be improved. To prevent stormwater flooding and the spread of water-borne pollutants, sewage canals and pipes need to be better maintained and cleaned.

3. Legal framework:

A number of legal steps need to be taken in the interest of the city’s transportation and non-transportation infrastructure.

In *environmental protection*, fuel and vehicle tax adjustments and emission fees are ways to promote the use of less polluting fuels and the purchase of less polluting vehicles. Colombia has a fuel surcharge, but has regressive vehicle taxes and subsidises its fuel.

In addition, energy efficient construction technologies can be promoted through adjustments in building laws. The use of “green energy” can be encouraged

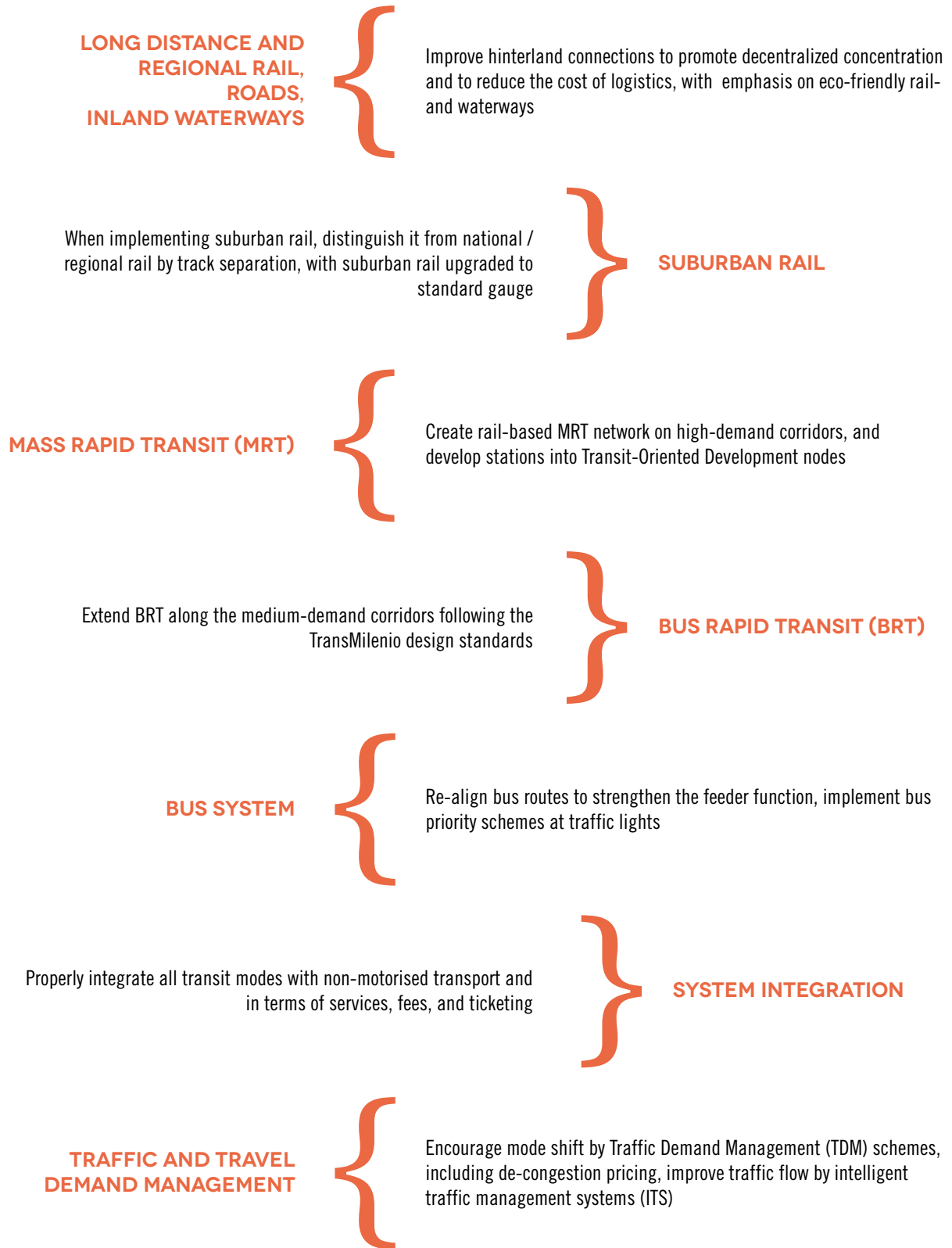
figure 21
**PLANNED SUBURBAN RAIL
 IN BOGOTÁ AND ITS
 SURROUNDING MUNICIPALITIES**



(Source: Gobernación de Cundinamarca)

figure 22

TRANSPORTATION RELATED PRIORITY ACTIONS AND MEASURES FOR GREATER BOGOTÁ



through laws obliging power-distribution companies to buy electricity that is generated from renewable sources, for example, from wind power or waste-burning power plants.

In the field of *urban environment*, laws should be enacted or amended to generate higher penalties for the violation of approved plans. In *safety and security*, the adjustment of laws should be considered to allow for more community participation, along with efforts to improve the policing of crime (Box 7).

And in the area of soft factors, laws need to be adjusted to create even more business and investor-friendly procedures for registration and closure of businesses

and for the taxation of revenues, along with an improvement of transparency in doing business. With regard to higher education, more international curricula and language training would be desirable.

Suitable measures within the contexts mentioned above are highly recommended because large impacts can be achieved at low cost, provided that adjusted laws are properly enforced.

The two groups of infrastructure addressed above have something in common: Development is expensive, and it must be largely borne by the public sector. Global experience shows that available budgets never correspond to the wishes and rarely to the needs; creative fund-raising measures will be essential.

BOX 7

GATING

Nowadays, gated communities are a dominating feature of upper- and middle-class settlements in many cities, in low-density residential areas as well as in housing areas dominated by high-rise condominiums. Usually, they are guarded by private security troops and technically sophisticated surveillance systems that make up for the lack of public security, either real or imagined, as a kind of social discomfort. The trend towards living in gated communities is in full swing, including cities in South America (Caldeira, 2001).

The root cause for this trend is social segregation: the wide gap between opulence and poverty. The worry for security makes this development a market-driven phenomenon: gated communities, protected malls, and safe offices are in demand. Ironically, it is the benevolence of the rich for themselves that turns office and residential towers into modern fortresses (Blakely and Snyder, 1997).

The exclusion of the poor has turned into a consequential element of city development. The result is a separation of spheres of life. For the wealthier, there are the gated and comfortable facilities for housing and living, for shopping and working, with private cars maintaining comfort, safety and privacy for travels in between. For the less privileged, the gaps are left (compare Rimmer, Dick, 2009, p. 148-149).

Bogotá hasn't yet suffered immensely from this international trend towards gated communities,²⁵ however, the trend is increasing in Greater Bogotá (in Chía, La Calera, and other nearby towns this has now become a common development), where large gated communities are being developed with single-use patterns and distant from general goods and services (schools, markets, and the like). This issue must be addressed as soon as possible to reduce the negative impact of such developments.

25 The period of 1998-2000 saw the reduction of gated public spaces due to a specific campaign to take back such parks from private buildings that had appropriated the land as their own. There are no studies relating these actions to a change in personal safety or level of theft in the buildings or the area, though it would be an interesting topic to review.

CHAPTER 3

THE POTENTIAL: VISION AND ACTION NEEDS

3.1 OPTIMISATION OF THE INVESTMENT PORTFOLIO

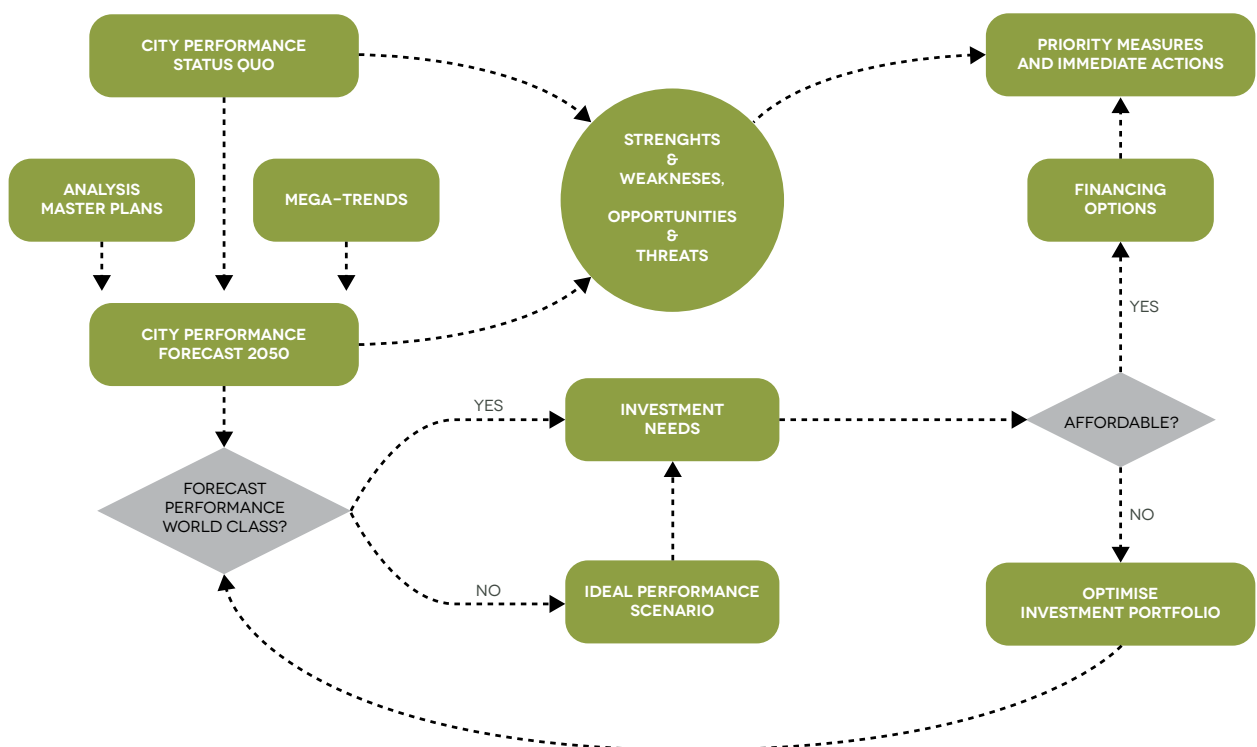
The trend-based, long-term forecast reveals that Bogotá is projected to achieve 78% of Berlin’s performance in 2050. Compared with the status-quo performance of 52%, this is a relative improvement of 50% - impressive, but still not good enough to catch up with the top-performers and to allow Bogotá to become a candidate for the title “capital of the 21st century”. To do so, the city would have to be among the first group of cities in this benchmark (currently comprised by Berlin, London,

New York, Paris) by the middle of this century. Bogotá would have to attain an average performance level similar to that of Berlin to achieve this goal.

To determine how best to reach this objective, we developed a two-step test to see which improvements would be required to lift Bogotá to this level. The first step is to create an ideal investment scenario that meets this target. In the second step, we optimise this scenario by minimising the investment required. The methodology from the two initial benchmarks to the optimisation is summarised in figure 23.

figure 23

CITIES 21 METHODOLOGY FOR THE OPTIMISATION OF THE INVESTMENT PORTFOLIO



Step 1: Ideal Investment Scenario

In the first step, we based our approach on the assumption that Bogotá and Colombia are prepared to pursue this objective by achieving the best possible balance across all criteria. The investments allocated to the various infrastructure items were increased until the city’s performance met that target.

In other words: we generated a new and ideal 2050 benchmark, which is no longer based on trend-projected master plans but on the hypothesis that much more would be done and much more would be invested than planned today. We also assumed that this increased investment would be followed through until 2050, to allow the city to reach the most harmonious world-class performance by the middle of the century.

With this hypothesis applied, Bogotá would equal Berlin by 2050, and it would be unrivalled in terms of a balanced quality of urban life across all of the six main criteria. We labelled this scenario the “Ideal Investment Scenario”. The results are presented in figure 24.

The results show the enormous hypothetical improvements of Bogotá in comparison to the other cities (which show the same performance values as in the case of the

trend-projected forecast). In this ideal scenario, we expect Bogotá to perform best in two of the main criteria (*accessibility and hub function; urban environment*), with a perfectly balanced overall performance and no major weaknesses remaining.

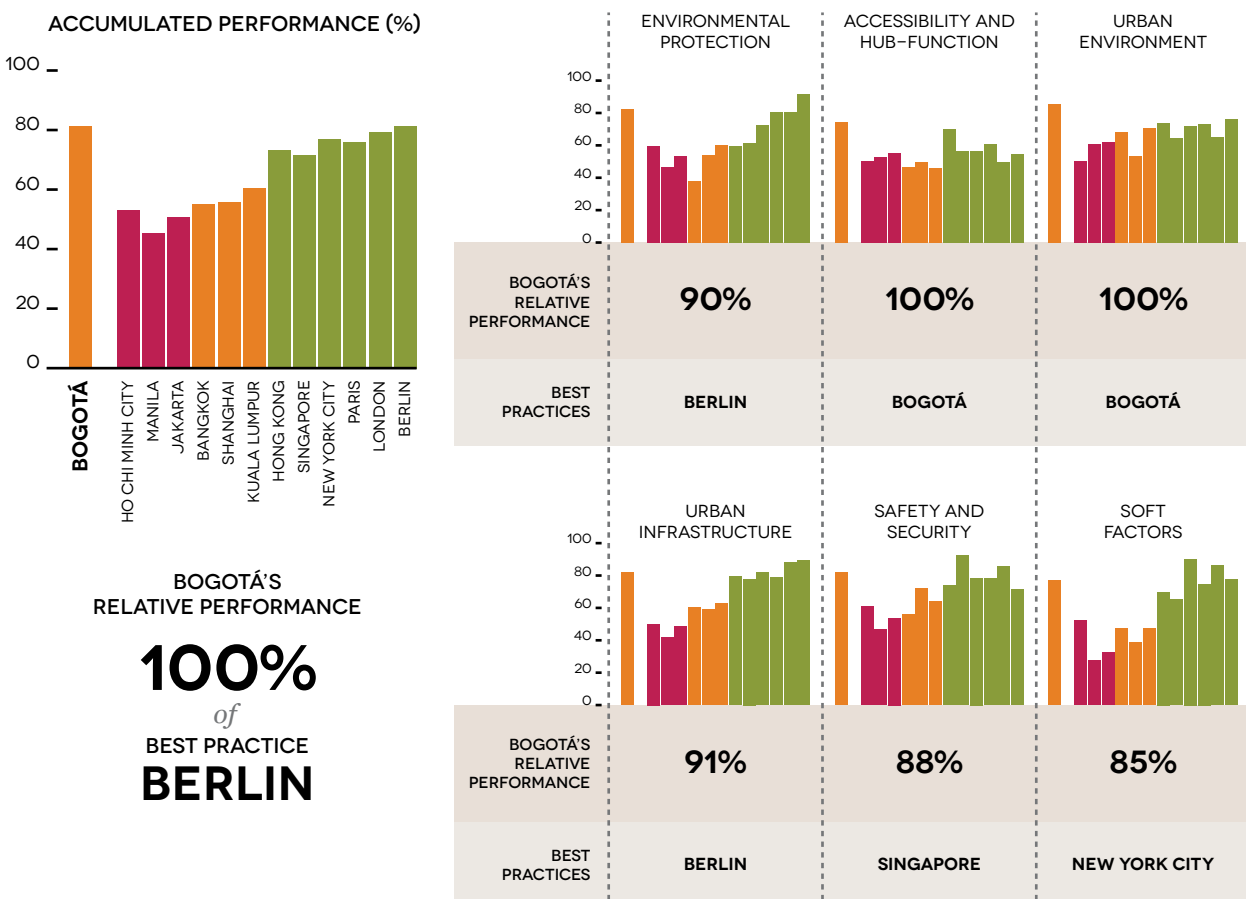
About 400 billion USD of investment (including maintenance and repair) are needed until 2050 (in current prices) to achieve the performance of the trend-projected forecast (the first forecast, based on planned investments), tantamount to an average investment of 10.6 billion USD annually from now onwards (starting in 2013, hence for the next 38 years). This figure corresponds to about 3.7% of the present national Gross Domestic Product (GDP).

More than one quarter (29%) of the investment would be spent on national infrastructure, for example, to develop the national rail and road grid. This part of the investment would benefit the nation as a whole. The investment that is spent within Bogotá and to the sole benefit of the city amounts to 7.5 billion USD annually (2.7% of the national GDP), out of which 5.3 billion USD are to be financed by the public sector, with parts of these investments (about 40%) financed by the national government.

figure 24

PERFORMANCE OF BOGOTÁ IN THE IDEAL INVESTMENT SCENARIO

● POTENTIAL BEST PRACTICES ● TRANSITIONAL CITIES ● EMERGING CITIES



However, to achieve the ideal performance, the corresponding figures are dramatically higher: The total investment needs would increase drastically to 1.4 trillion (1,400 billion) USD, the annual average to 36 billion USD, with the share of the national GDP climbing to 12.7%. This increase is largely due to the needed additional investments for the improvement of the national transportation infrastructure and the hinterland accessibility.

Investments of the order of magnitude needed for the Ideal Investment Scenario don't appear feasible at all. Therefore, we defined more reasonable investment scenarios for the second step of our test by setting an investment cap on the annual share of the national GDP. This cap was set at 5.0%.

Step 2: Optimised Investment Scenario

With this investment cap applied, we developed the fourth scenario: the so-called "Optimised Investment Scenario." The objective was to identify the investment portfolio that achieves the highest overall performance across all indicators at an investment of 5.0% of the GDP or less. In other words: a Pareto-Optimisation was applied to identify the best possible distribution of funds in the investment portfolio.

Three main considerations guided the optimisation. First, we focussed on investments that would achieve a comparatively significant performance improvement at comparatively low cost. Second, we emphasised investments with a widespread overall impact on the benchmark. Third, investments that mitigate risks related to mega-trends remained unreduced from the Ideal Investment Scenario.

With these principles applied, it is obvious that expensive investments into areas that have a comparatively limited impact on the overall performance of Bogotá would be reduced. This applies especially to the investments dedicated to the improvement of the hinterland accessibility as all projects in this field are huge and involve very high costs.

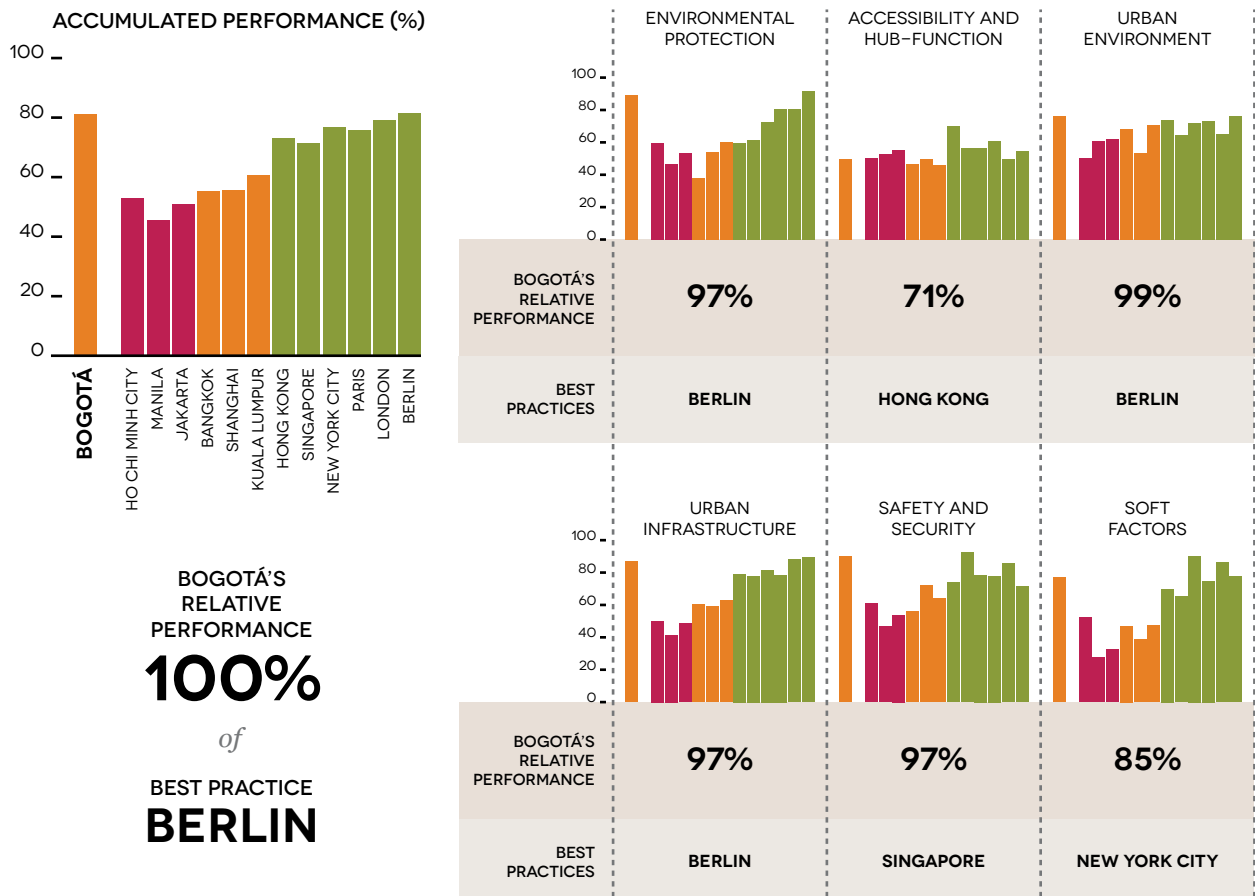
Correspondingly, mainly investments into the performance improvement of the main criterion *accessibility and hub-function*, which were significantly increased in the Ideal Investment Scenario to harmonize the overall performance of Bogotá, were partly taken back in the optimised scenario.

We were able to perform the optimisation of the investment portfolio successfully. We calculated that a performance level equal to that of Berlin can be

figure 25

PERFORMANCE OF BOGOTÁ IN THE OPTIMISED INVESTMENT SCENARIO

● POTENTIAL BEST PRACTICES ● TRANSITIONAL CITIES ● EMERGING CITIES



achieved at an overall investment of 11.9 billion USD annually, tantamount to 4.2% of the national GDP.

A share of 28% of this amount can be borne by the private sector or can be recovered by fees paid by the beneficiaries. Hence, the overall public investment would amount to 3.0% of the annual national GDP.

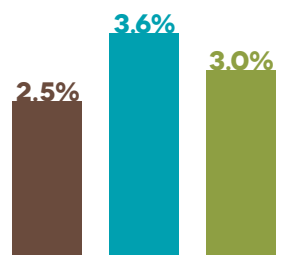
In total, an investment of about 452 billion USD would be required until 2050. About 31% of it would contribute directly to the development of the nation. The share of the investment that would be spent within Bogotá, and to the sole benefit of the city, would amount to 8.2 billion USD annually out of which about

72% or 5.9 billion USD annually are to be financed by the public sector. If the present contribution of the national government to Bogotá's investment budget were maintained, the amount to be invested by Bogotá's own financial sources would total 3.6 billion USD, tantamount to about 120% of Bogotá's 2012 investment budget (from its own funds).

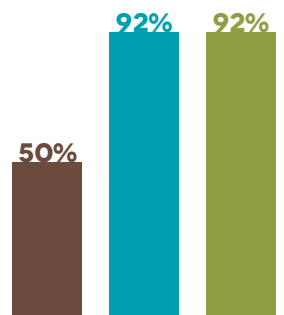
The results of the optimisation are shown in figure 25. It is evident that Bogotá would equalise Berlin. It would not lead in any of the six main criteria, but would be among the best in each except *accessibility and hub function*, and still be among the best balanced cities in the benchmark.

figure 26

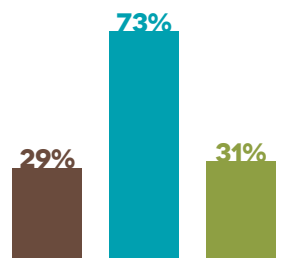
COMPARISON OF INVESTMENT SCENARIOS



PUBLIC INVESTMENT NEEDS (% OF GDP)



PERFORMANCE IMPROVEMENT



SHARE OF BENEFITS TO THE NATION

- TREND PORTFOLIO
- IDEAL PORTFOLIO
- OPTIMISED PORTFOLIO

Conclusions for Bogotá

The simple conclusion is that 10.6 billion USD of total annual investment would not be enough to transform Bogotá into a true world-class metropolis. Instead, around 11.9 billion USD would be needed as annual average over the next 38 years to achieve this target by the middle of this century.

The optimised investment scenario provides a fair balance of benefits between Bogotá and the nation. 31% of the investment, almost one third, would benefit the nation; better than the trend-projected scenario, but not as good as the unaffordable ideal scenario).

In terms of investments flowing directly into Bogotá, it requires about 83% of the investments needed for the ideal scenario, meaning that the optimised scenario is about 26% more efficient than the ideal in the performance improvement per investment unit (per % of GDP per year). If compared with the trend-projected scenario, it achieves a 53% higher efficiency and an 84% better performance improvement at 20% higher investments.

The comparison of the three investment scenarios in terms of their efficiency is shown in figure 26.

Even though 11.9 billion USD appears high, it is not beyond reach. As the development of Bogotá into a world-class city progresses, funding mechanisms can be installed that can contribute to narrowing the gap between planned investments incorporated in the trend-projected investment scenario and the proposed optimised investment portfolio.

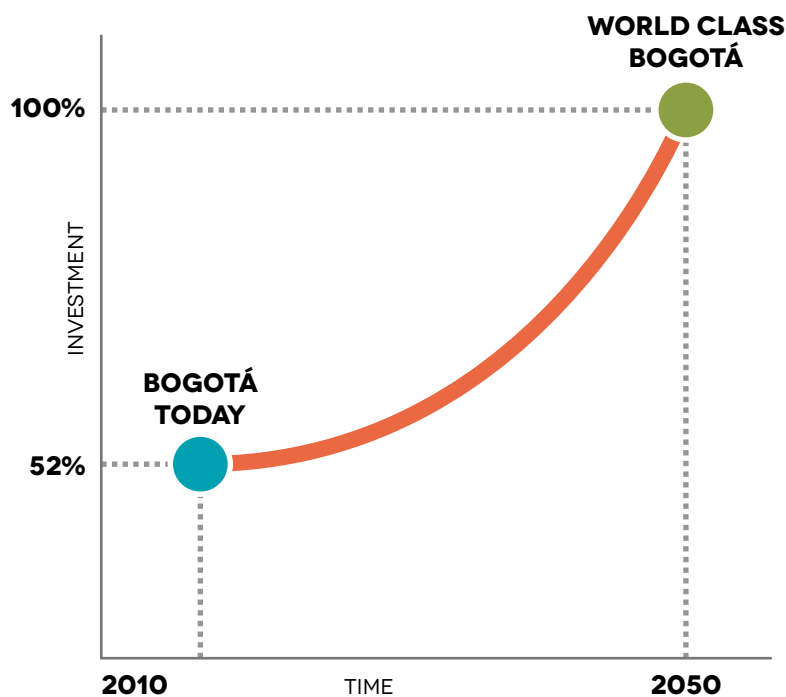
Furthermore, the annual public financing burden of Bogotá is not increasing significantly from the trend to the optimised portfolio: from USD 5.3 billion to USD 5.9 billion only. The conclusion is: the most recent budget planning of Bogotá's new administration is already very well anticipating the investment needs for transforming the city into a world-class metropolis by the middle of the century. In terms of budgeting, it falls short by 11% only. However, in terms of budget allocation, quite substantial room for a portfolio optimisation is left.

Finally, it should be stated that annual average investment does not mean that the same amount needs to be spent every year. In the beginning, a lower bud-

figure 27

SEQUENCED INCREASE OF THE BOGOTÁ 21 INVESTMENT BUDGET

**THINK BIG
START SMALL
SCALE FAST**



get could be allocated, which would be gradually increased later; investments could follow the increase of tax returns and revenues from the measures proposed in Chapter 8 (Figure 27).

3.2 SELECTED ACHIEVEMENTS OF THE OPTIMISED INVESTMENT SCENARIO

Three indicators were selected to represent the order of magnitude of improvements that would be achieved by 2050, if the optimised investment scenario were implemented. They are related to the network density of high-capacity transit systems in the urbanised area:

- Network density of urban railways in Bogotá by 2050: 0.58 km/km² (Today: 0.00; Berlin today: 0.70 km/km²)
- Network density of suburban railways in Bogotá by 2050: 0.25 km/km² (Today: 0.05; Berlin today: 0.36 km/km²)
- Accumulated network densities in Bogotá by 2050: 0.83 km/km² (Today: 0.05; Berlin today: 1.06 km/km²)

Even if the optimised scenario were implemented, the network density of high-capacity transit systems in Bogotá in 2050 would still be clearly lower than in Berlin, New York and other cities today. However, this should not be understood as a deficiency: Berlin's networks, for example, are actually too dense. They were designed to a large extent at a time when private motorisation was much less common.

Bogotá's network density would be adjusted to the facts of a still growing population, the high population density, the expected growth of individual mobility,

the future implementation of travel demand management that will shift the modal split towards a higher share of public modes, and to a level of service and comfort that avoids heavily crowded busses and trains.

With a well developed system of urban and suburban railways in place, Bogotá could follow Hong Kong's role model and develop settlements and new-town developments in tandem with the modern high capacity transit systems obtaining their patronage from the induced demand of the new settlements.

Once this level is achieved, the ultimate objective of transit-oriented development is met. Instead of modelling transit networks after existing demand patterns (reactive TOD), demand patterns are created best suited to efficient transit systems (pro-active TOD).

This stepwise approach towards transit-oriented development would place Bogotá in a position to achieve financially successful urban and suburban railway networks. We express the financial success of public transport services by the so-called "fare box ratio". It compares revenue generated by the services (revenues from ticket sales only, no other kind of revenues) to operating and maintenance costs.

A service is considered financially successful if surplus revenue is generated (fare box ratio > 1). Medium dense networks in cities with a high population density tend to produce the best financial returns. Figure 28 shows the matrix of the current fare box ratios of the cities in the benchmark and the projection for Bogotá (2050) in relation to the population and network densities of urban plus suburban railways.

figure 28

FARE BOX RATIO OF RAIL-BASED MRT RELATED TO POPULATION AND NETWORK DENSITY

FARE BOX RATIO

- HIGH (> 1.2)
- MEDIUM
- LOW (< 0.8)
- NO MRT SYSTEM YET



As mentioned before, Berlin's network density would still be higher than Bogotá's. But Berlin has to pay a high price in annual subsidies for its excellent infrastructure. It has the most unfavourable ratio of network density to population density of all the mentioned cities. Correspondingly, the top performance in terms of networks and services is plagued with poor financial performance.

Hong Kong has the most successful mass rapid transit system in the world in terms of an excellent fare box ratio, generating huge operational profits of over 8 billion HKD (more than 1 billion USD) in the year 2010. After the opening of the airport express and other lines connecting new remote locations outside the urbanised core area of Hong Kong to the city centre, the profits from the railway operation temporarily turned into losses. But once the new Transit-Oriented Development (TOD) centres along the new lines approached completion, the financial performance started to improve again. The Airport Express stations on Hong Kong Island, in Kowloon (Elements), and in Tsing Yi as well as LOHAS²⁷ Park in Tseung Kwan O are good examples (see Box 13 also).

This is the lesson to be learned from Hong Kong: If Bogotá follows this development principle of transforming the city into a transit-oriented metropolis and builds urban and suburban railway lines along important high-demand corridors and areas with high population and employment density, it will also be able to achieve a good level of financial performance in its mass rapid transit operations.

With the proper application of these lessons from Hong Kong, combined with the introduction of an efficient travel demand management system, the assumed "medium fare box ratio" in the figure above might easily turn out to be a conservative assumption, with a high potential to develop from medium to good.

However, Bogotá should not be expected to completely equalise Hong Kong. If the outstanding high population density of the latter is avoided (Chapter 4) for good environmental reasons, the target will be to find the right balance between urban densification, efficient transit, and a quality environment.²⁸

26 All figures of 2010 except Bogotá (2050, optimised investment scenario).

27 LOHAS: Life of Health and Sustainability

28 This is a real opportunity for Bogotá: learning from Hong Kong as the "TOD best practice" and avoiding the environmental problems of Hong Kong at the same time: This is an opportunity Hong Kong simply doesn't have: with a present population of 7.12 Million (still growing, plus around 1 Million daily commuters) and a habitable land mass of about 225 sqkm, de-densification even of parts of the urban land is impossible (daytime population density above 36,000 inhabitants per km²).

3.3 BREAKDOWN OF THE OPTIMISED INVESTMENT SCENARIO

We calculated the breakdown of the optimised investment portfolio by splitting it into three main sectors: transportation, energy, and “others” (such as flood control, sewage, education, culture, etc). The high share of the investment portfolio dedicated to transportation reflects the importance of this sector for the improvement of Bogotá’s performance, and especially its hinterland connectivity, through a massive investment in the national transportation networks. The results are shown in figure 29.²⁹

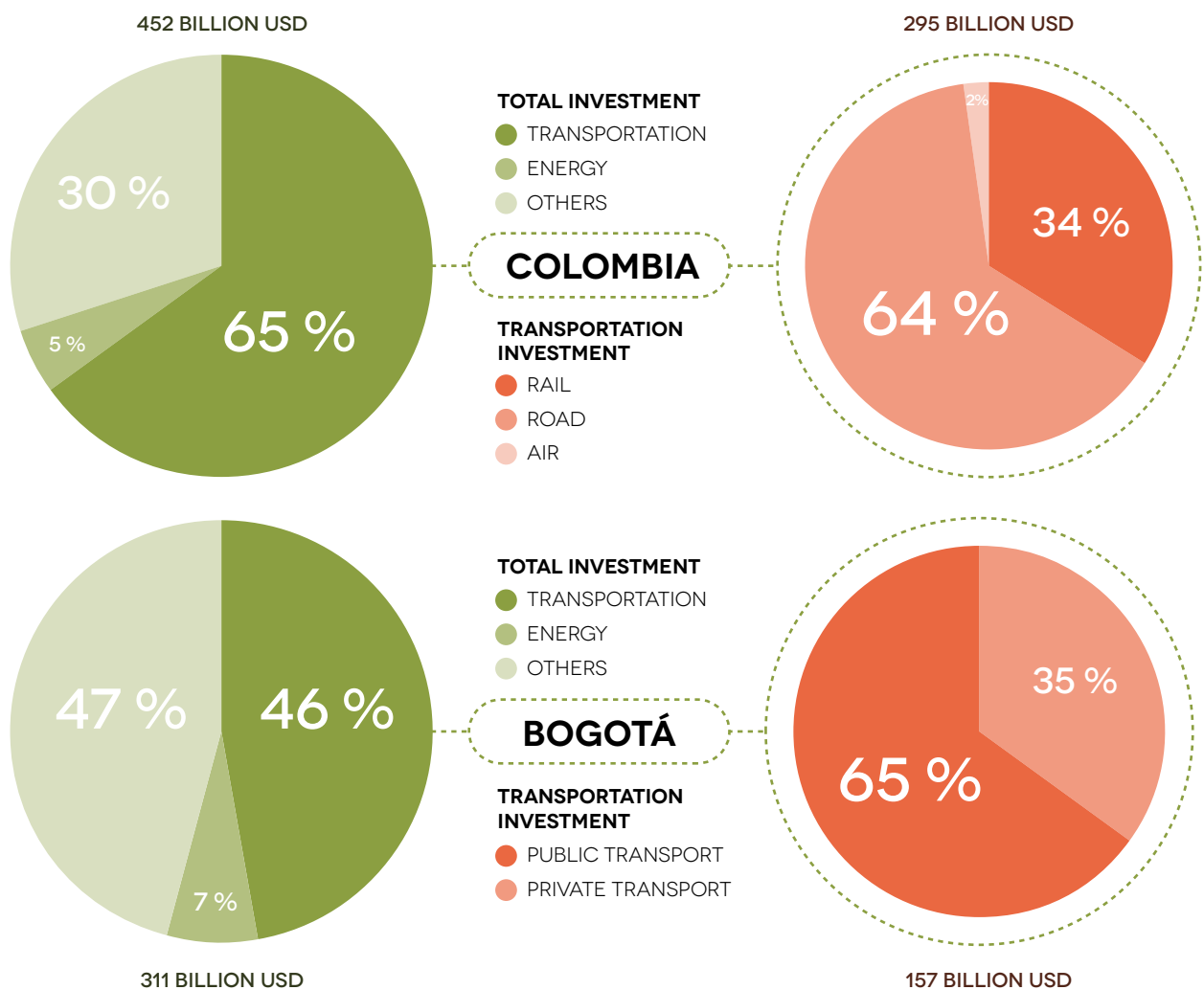
Figure 29 shows the breakdown of the optimised investment portfolio among the mentioned sectors for the total Bogotá 21 portfolio and for the portfolio of the capital city of Bogotá. It further shows the breakdown of the national transportation related investments among rail, road, and air transport and among public and private transport in Bogotá.

The overall share of the transportation related investment is high (65%; about 295 billion USD) because the share of the investment dedicated to the development of the nation (31%) is related to the accessibility of the Bogotá metropolitan region, that is, to transportation systems.

We calculated that roughly one third of the transportation-related investments (34%) should be spent for a significant improvement of the national and metropolitan railway systems to promote the most sustainable, energy-efficient, and environmental-friendly mode of land transportation (passengers and freight alike), which has been neglected for so long in Colombia.

The investment split between public and private transport in Bogotá is in favour of public transport (65%), hence in favour of a cleaner environment and a more liveable city. The total investment into the public transport industry (urban and suburban railways, bus rapid transit, busses) equals 22.5% of the optimised investment portfolio, and amounts to approximately USD 102 billion (in current prices).

figure 29
SECTOR-SPLIT OF THE PROPOSED INVESTMENT SCENARIO



29 “Nation” in this figure is to be understood as the core landmass of Colombia. This is the part of the Colombian landmass that uses Bogotá as its main hub for imports and exports, services, etc., and that is, as such, dominated by the metropolis. This area is assumed to cover around 20% of Colombia’s landmass. “Bogotá” in this figure means the administrative region of the city.

CHAPTER 4

TRANSFORMING BOGOTÁ INTO A WORLD-CLASS, TRANSIT- ORIENTED METROPOLIS

Bogotá 21 aims to support urban sustainability and decentralisation as stated in the POT and, on a broader scale, the MOT regarding a larger region than Greater Bogotá. Inside the city, this vision seeks to strengthen urban centralities. Regarding Greater Bogotá, it focuses on creating a network of self-sufficient and compact towns.

4.1 UNDERLYING URBAN DEVELOPMENT PRINCIPLES

The aforementioned vision requires strong strategies based on integrated land-use and transport planning in order to move from a mono-centric urban structure to a polycentric one.

Transit-Oriented Development to Prevent Peri-urban Growth

Bogotá's continued and even increasing trend towards suburbanisation converts formerly rural areas into peri-urban zones. These areas are difficult to service and to access by transit, tending to increase the dependency on private means of road traffic instead.

The present trends towards horizontal sprawl, which will result in problematic suburbanisation, must be stemmed by a strong growth-management policy, based on decentralised concentration. Such a policy can effectively direct urban growth toward a sustainable pattern.

This implies effective land-use control. There will always be a demand for low-density residential areas, which may be designated off the transit corridors. But the focus of metropolitan urbanisation should be directed towards a pattern conducive to effective mass transit. Therefore, Transit-Oriented Development, which aims to maximise the use of transit access and non-motorised transport by increasing residential and commercial activities around public transport stations, is also the most effective tool to prevent peri-urban growth.

Network infrastructure is the prime driver shaping the physical form of metropolises like Bogotá (Bocarejo et al. 2012). It largely determines the pattern of urban development, both quantitatively and qualitatively. Particularly,

the Transmilenio Network has contributed to shaping the city (see figure 30).

In an infrastructure-led pattern of development, basic infrastructure facilities and services should be put in place before, not after, urban land is developed. Fast-growing cities need to plan and effectively safeguard infrastructure corridors by setting aside appropriate right-of-ways for roadways, public transit lines and trunk utility services. This ensures that future mobility and basic service requirements of cities can be met. In this way, costly infrastructure need not be built far ahead of demand but closely phased in with it.

Decentralisation

In decentralising Greater Bogotá, we support the policies pursued by the POT, the MOT and the Transportation Master Plan. This involves promoting a strong polycentric pattern around the city, by spreading metropolitan growth further upstate. We envision regional growth centres at a distance of 40 km and more from Bogotá as part of the decentralisation process. This would prevent regional growth centres from being swallowed up by the congested core as the city grows.

Major components in a decentralised metropolis include transit corridors, a substantial greenbelt, and sub-centres. In this arrangement, the outer sub-centres are satellite towns, conceived as growth centres in their own right and not as part of metropolitan spill over. These satellite towns need to develop their own overlapping networks for living, working, retail and recreation, including functioning infrastructure grids, ideally with a distinct pattern of juxtaposition and internally structured by transit-oriented development as well.

4.2 URBAN ENVIRONMENT

In conceiving an urban vision for Bogotá, Singapore may serve as a role model. It features islands of intense development at major transport nodes, surrounded by green open space and water bodies throughout the urban areas. The water bodies provide amenity and rain water retention, while also acting as a potential future source of drinking water.

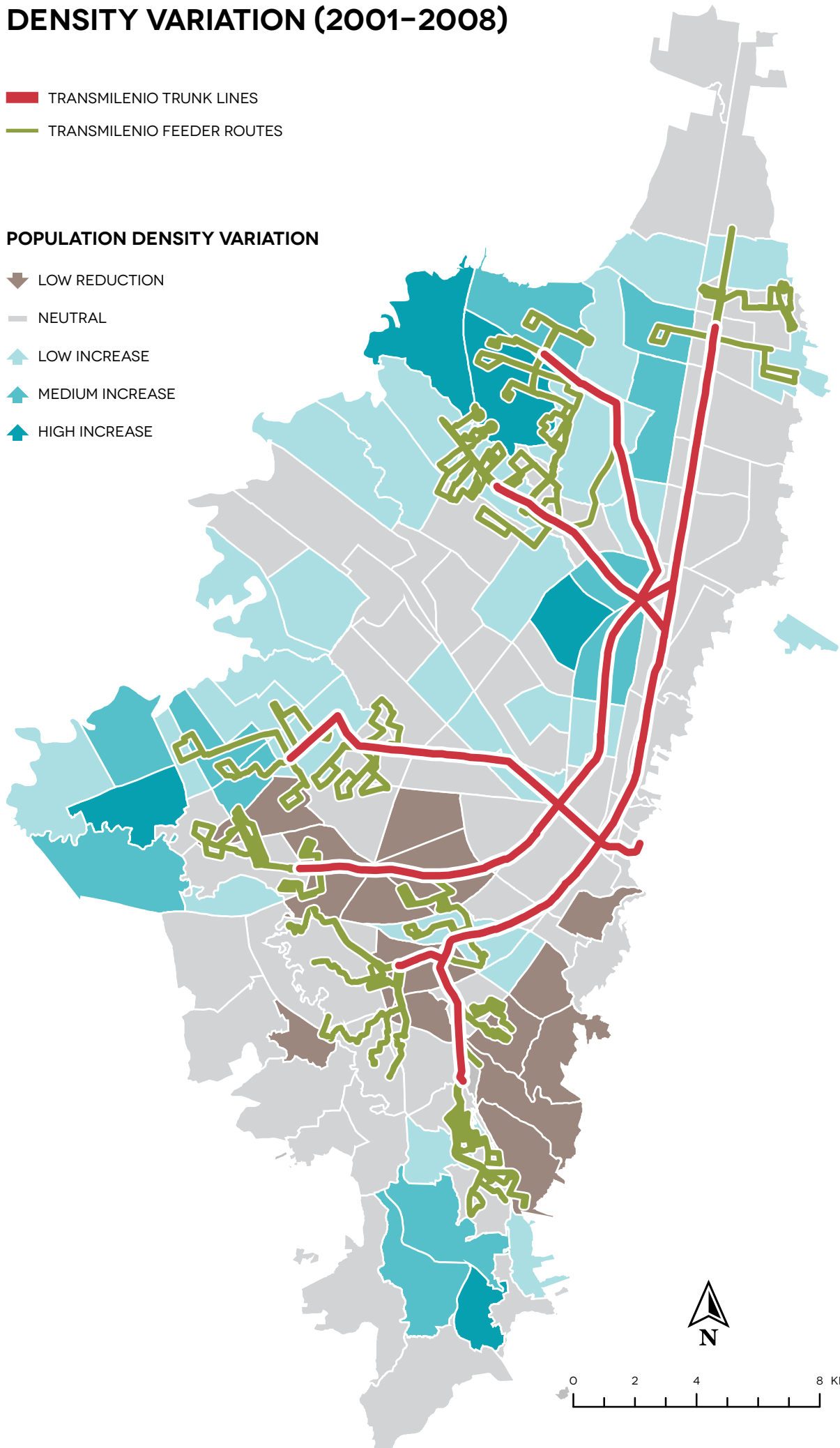
figure 30

TRANSMILENIO CORRIDORS AND POPULATION DENSITY VARIATION (2001-2008)

- TRANSMILENIO TRUNK LINES
- TRANSMILENIO FEEDER ROUTES

POPULATION DENSITY VARIATION

- LOW REDUCTION
- NEUTRAL
- LOW INCREASE
- MEDIUM INCREASE
- HIGH INCREASE



BOX 8

LE CORBUSIER'S LEGACY FOR BOGOTÁ

One of the most famous urbanists of the twentieth century was hired during the period of 1949 to 1952 by Bogotá Municipality to develop the first complete Urban Master Plan for the city. His work has guided many of the planning efforts of the city from that time and until today, and is a mandatory reference to anyone trying to understand the city's urban evolution.

When arriving, Le Corbusier saw Bogotá as a city out of balance when compared to its original urban form, and his main goal was to restore the harmony that had been there before. Le Corbusier visited Bogotá seven times in order to produce what would later be called the “*Plan Regulador*” (Regulating Plan) for the city, in which he defined road typologies and produced maps and guidelines for the development of urban spaces according to their function and integration. As is typical of Le Corbusier's town plans, this plan defined overarching principles of order, clear establishment of

city functions and prioritised the automobile and its roads for the development of Bogotá.

The reaction to Le Corbusier's plans and proposals has been mixed, though there is general agreement that the production of the *Plan Regulador* was a first step towards thinking about Bogotá and its long-term planning, although some of Le Corbusier's proposals were not received well by the city and its citizens.

A more comprehensive review of Le Corbusier's plans and his visits to Bogotá can be found in the following sources:

- El Proyecto «Le Corbusier en Bogotá, 1947-1951: Libro—exposición—seminario» - <http://www.lecorbusierenbogota.com/>
- Arias-Lemos, F (2008). Le Corbusier en Bogotá: El proyecto del “grand immeuble”, 1950-1951. Universidad Nacional de Colombia



Le Corbusier, project for the Plan Director (1950): Analysis of occupied and to-be-occupied territory in Bogotá, 1950. © Archivo Cartográfico/colección Museo de Bogotá .

From a larger perspective, the beauty of the concept lies in its matching urban development to the goals of ecology and the laws of nature - the ultimate meaning of sustainability in an urban context. Also inherent in this pattern is a balance between optimum population densities in urban areas and maximising the economic value of the land.

Lower densities of population and employment, combined with more green space and inner-city parks, can be realised only if densities are concentrated at Transit-Oriented Development (TOD) nodes. Such a shift might take decades to materialise. It demands very careful land-use planning on the district- and micro-level, and especially rigid plan enforcement.

But if this principle is followed, open space may eventually constitute a major organising element for Bogotá, as in the case of Singapore, particularly if comprised of a continuous network of green areas and water bodies. Such space may be used to help provide unity to the urban structure of Bogotá, offer recreational amenities, and lend the city its own unique character: a dense city with a high quality urban environment (See figure 31).

Land Use and Transport

From the above discussion, it is obvious that land-use planning plays a key role in creating a sustainable transport network and vice versa. Planning can influence the need for travel, and even the travel mode. The importance of integrated land-use and transport planning cannot be overemphasised. Cities' environmental quality and economic efficiency are dependent on transport systems that are well-integrated with urban structure and form.

For instance, locating employment centres, such as offices and non-polluting industries, and commercial centres near residential areas can help reduce people's need to travel. Basically, higher-density, mixed-use communities adjacent to major transit corridors, will provide an environment in which residents and workers alike will be encouraged to walk or cycle to their local destinations, and use transit for inter-district travel.

More high-rise developments should be planned near MRT stations. Properly landscaped and integrated, these will help realize the vision of building a transit-oriented and sustainable city of excellence.

figure 31

ENVISIONED GREEN OPEN SPACE INCREASE AND HIGH-RISE DEVELOPMENTS PUENTE ARANDA

2008



■ TRANSMILENIO CORRIDOR

● GREEN AREAS

AVERAGE BUILDING HEIGHT

● 3 TO 15 MTS.

● 15 TO 27 MTS.

● 27 TO 40 MTS.

● 40 TO 52 MTS.



2050

As the example of Singapore illustrates, the winners in such an approach would be threefold: the city, by getting a less space-consuming transport grid and a more efficient land-use system; the citizens, by benefiting from a cleaner environment; and the transit system, by obtaining higher patronage and revenue. The result would be a “de-Los Angelesation”³⁰ of Bogotá.

This inter-dependence between land use and transport planning should be the guiding principle of the future development of Bogotá. First, transport master plans have to be adjusted to existing population and employment patterns. Second, land use patterns must be adjusted to the transport plans. This approach would clearly maximise the benefits of an integrated-planning approach.

Some studies maintain that in metropolitan cities, city-wide urban land-use plans, based on concepts, such as regulatory zoning, mean little. In fact, many rapidly developing cities thrive on, and benefit from, an intense mix of land uses. Their mega-urban landscapes should be understood “more as a process than a stable constellation”, as a “landscape in transition”.³¹ Therefore, the most effective and useful basic urban plan in Bogotá would be a simple one, setting growth boundaries with adjustments made over time.

The idea is a simple, two-zone plan, indicating where development is permitted or preferred, (and where it is not permitted), with detailed local plans delegated to the community or district level. Randstad in the Netherlands, the Ruhr Region of Germany, and the San Francisco Bay Area of California are already practicing such growth boundary planning with success.

30 The term “Los Angelesation” was used by Teaford to describe the city development of North America in the twentieth century. Teaford, Jon, 1993, p. 152

31 Ipsen, Detlev: From Urban Growth to Mega-Urban Landscape. In: Wolfram, Sophie and Nerdinger, 2008, p. 20.

BOX 9

AIR POLLUTION HOTSPOTS

One of the biggest environmental challenges in today's developing cities is achieving admissible levels of local pollutants and control greenhouse gas (GHG) emissions as they grow. Bogotá is no exception. According to Gaitán and Behrentz (2009), particulate matter concentrations of less than 10 microns in diameter (PM₁₀) recorded by the local Air Quality Network are particularly high, exceeding since 2001 local air quality annual standards on more than 40% of the days of the year. Their work also showed that PM₁₀ concentrations are especially problematic in the western industrial zone of the city where most of the fixed sources operate. Nevertheless, mobile sources play a fundamental role in Bogotá's air quality.

In 2010 Bogotá's municipal government, along with Transmilenio S.A. and the Universidad de los Andes, released the city's Air Quality Management Plan, which identified the main PM sources. Mobile sources account for 56% of the total emissions in the city and of these, public transport represents close to 40% of the PM₁₀ emissions. These high levels are mainly due to operation with old technologies and poor maintenance practices.

Hence, corridors with high volumes of public transport vehicles (i.e. Carrera Séptima, Avenida Boyacá and Avenida 68) present higher emissions, which in turn represent higher concentrations of local pollutants associated with health effects such as respiratory and cardiovascular diseases. In Bogotá, the Air Quality Management Plan estimated the economic costs of poor air quality in the next ten years (in a business as usual scenario) to be around 8 billion dollars for that period.

The relationship between transport emissions and public health is even more relevant when concepts such as particle size and personal exposure are considered. The smaller the particle diameter, the deeper it can penetrate in the pulmonary airways, and the more damage it can do to the lungs. Emissions from internal combustion engines are typically smaller than 2.5 microns (PM_{2.5}) and are more likely to reach the inner-most regions of the respiratory system. In addition, the typical proximity between citizens and mobile sources prevents high rates of dispersion of air pollutants, resulting in even higher concentrations.

Modelling exercises performed by Universidad de los Andes suggest that PM_{2.5} concentrations near public transport corridors could reach hourly averages of 85 µg/m³. Newer technologies (i.e. Euro IV buses) could reduce concentrations in as much as 45%. Concentrations inside the public transport vehicles could be reduced in even greater proportions resulting in drastic reductions (more than 75%) in typical personal exposure levels during daily trips to work. Evidently, public transport plays an important part in the city's air quality and its associated social costs.

In terms of CO₂ emissions, Bogotá's mobile sources account for 6 million tons every year (85% of the city's CO₂ emissions) and by 2020 this could grow to be 13 million. In terms of GHG, changes in technology (e.g. using electric vehicles), or in mode (e.g. promoting bicycle use) could have important impacts in preventing future emissions.

Distinct District Identities

Next to central place hierarchy, structuring Greater Bogotá into districts or sectors, each with a distinct character of its own, is another major tool used in organising a city.

In social terms, distinct district identities give residents and employees a sense of community and place in the ever-expanding metropolis. In functional terms, the idea is to promote higher density, mixed-use districts located adjacent to, or connected to, primary transit lines. Thus, district centres or sub-centres act as gateways and provide access to inter-modal transfer points for the secondary transit network.

The aim is to promote dynamic interaction between the various sub-centres and the core of Bogotá. In this regard, the Tokyo metropolitan sub-centres may serve as examples; they represent some of the highest-density city districts, sheltering the world's busiest urban transit hub (Shinjuku Station).

Bogotá Cityscape

Despite being one of the most densely populated cities in the world, Bogotá is characterised by low-rise developments in its south, western and peripheral zones. Most of the highest buildings are clustered in specific areas, mainly in the CBD and financial district, as well as along principal axes like Carrera Séptima and Carrera Décima.

Our recommendation is to concentrate future high-rise towers at nodal points of the transport network, and in this way strengthen activity clusters³². This would provide a more interesting, varied townscape with high-rise clusters contrasting with low-rise or green and open space.

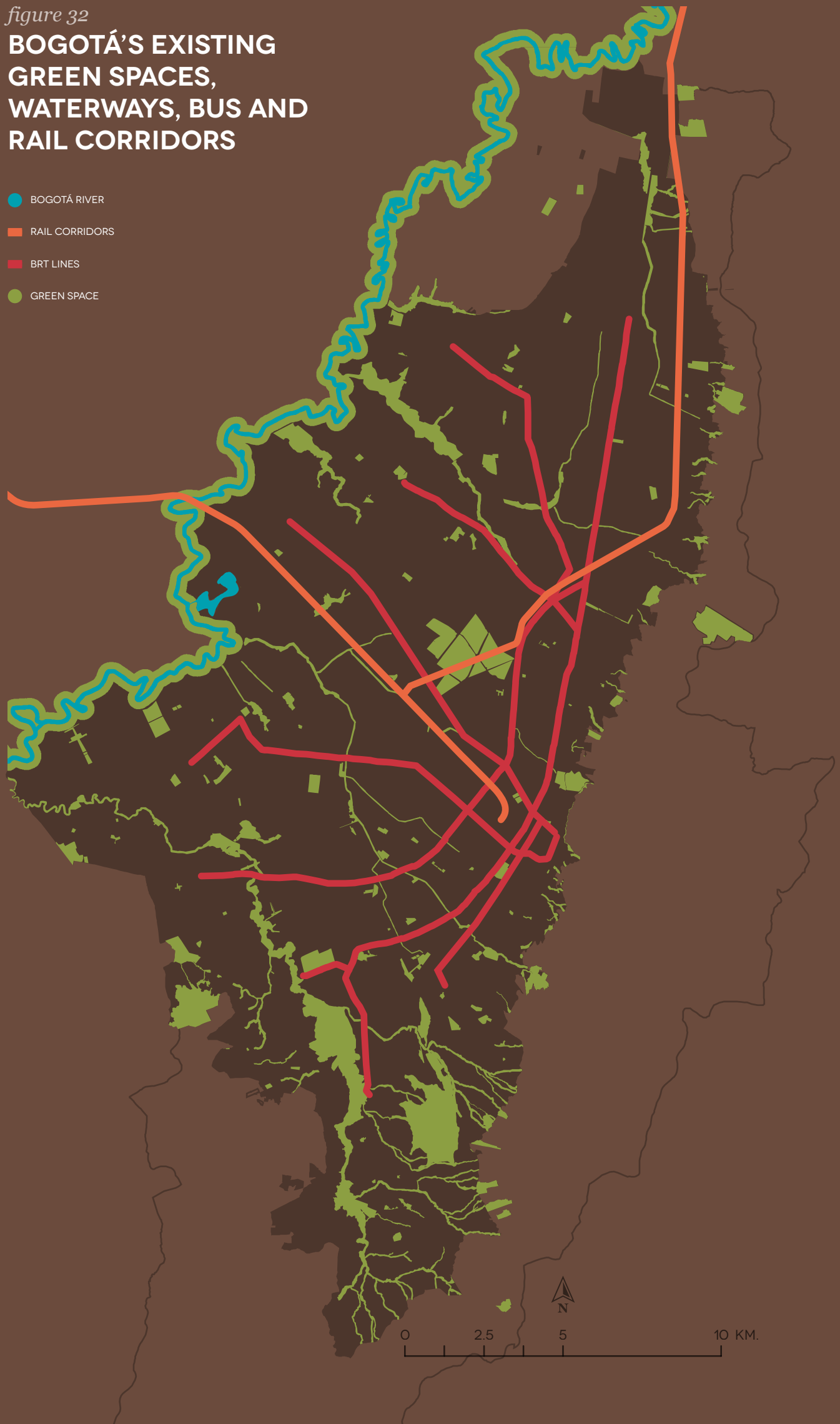
This kind of cityscape would even help to limit the occurrence of air pollution hotspots (Box 9). Though it will be difficult to avoid such hotspots altogether (because they are a lifestyle-caused phenomenon), the intensity can be reduced by facilitating good air venti-

32 It must be noted, however, that the soil properties of Bogotá are not the most adequate for high-rise buildings, and thus special care must be taken to address this issue (special investments in foundations and new techniques of construction).

figure 32

BOGOTÁ'S EXISTING GREEN SPACES, WATERWAYS, BUS AND RAIL CORRIDORS

- BOGOTÁ RIVER
- RAIL CORRIDORS
- BRT LINES
- GREEN SPACE



lation through the avoidance of ubiquitous towers and wall-like structures.

City Parks and Green Boulevards

Greater Bogotá offers large green areas and inner-city greens as recreational space. In its efforts to “green” the city, Bogotá’s Municipality plans to enhance the “lungs of Bogotá” by adding more green space and public parks.

The planned increase of green spaces (from 5.5 to 10 m² per inhabitant) should be seen as the first step. These efforts to allocate more green should be encouraged. This target also supports the objective in the new land use plan of decreasing GHG emissions by 30%, in addition to increasing natural drainage of rain water.

The city administration has set up the following plans to maintain the existing green space and to develop additional ones:

- Setup and maintain existing and new parks;
- Maintain cemetery land and existing sports fields;
- Encourage developers to participate in the creation of new green spaces on the roofs of the buildings (roof gardens), green walls, fences, and plants in residential and commercial areas;
- Setup and maintain green lines at the roadside and highway medians, arterial and collector roads, on the border of railway lines, under high-voltage electricity transmission lines, and adjacent to rivers, canals and reservoirs.

If these plans are followed, Bogotá will have already taken a first step towards a greener city. Figure 32 depicts the existing green areas, waterways, bus ways, and railway lines in Bogotá.

Green lines along bus ways, rail tracks and main waterways could spin a net of shady and comfortable walkways and bicycle trails, and would thereby enhance the city environment and the urban ecology.

4.3 STRUCTURAL PLANS FOR BOGOTÁ D.C. AND ITS METROPOLITAN REGION (GREATER BOGOTÁ)

The particular situation of Bogotá and its region shows a mono-centric configuration, where Bogotá acts as an attractor of both population and employment, with high density and little open green space. To revert this situation, Bogotá 21 aims to transform Bogotá and its region with a new spatial configuration, pursuing policies of the city’s current spatial plan (POT), the regional plan (MOT), and other measures. The following principles will guide this transformation:

- A polycentric structure in Greater Bogotá with a balanced distribution of population and employment
- High-density developments to enhance TOD and stop urban sprawl.

- Recovering and extending urban green space to improve the urban quality of life.³³

Population distribution

Currently, Bogotá concentrates around 85% of the metropolitan area’s population, and trend projections show that this situation may not vary in the future. The attractiveness of Bogotá as a major industrial, commercial, political, educational and service centre has drawn new inhabitants from the surrounding regions and the whole country. To accommodate the population influx, the city broadened its urban boundary. Consequently, conurbation phenomena occurred at some surrounding municipalities.

Hence, a large, unplanned urban structure developed. However, there is a general consensus to limit the expansion of Bogotá and to control the conurbation by a natural border, the Bogotá River, which defines the city’s western and northern borders. This situation bounds Bogotá to a limited area.

Inevitably Bogotá D.C. will maintain its attractiveness as the region’s main activity and population centre. However, its territory has a limited capacity to support the expected population growth. Thus, in order to assure a high quality of life, just a limited number of new inhabitants will be able to live inside Bogotá’s urban area. Bogotá 21’s vision to address this challenge is to foster compact growth by means of high-density developments; these will produce the desired urban growth, while ensuring a good urban environment. Such a vision is defined based on the following parameters:

- Increase gross density in Bogotá D.C. to accommodate future population.
- Guarantee the quality of urban life by increasing the per capita green space quota from around 5.3 m² today to 10 m² in the future³⁴.

Implementing these principles means trading-off between built area and floor space. Therefore, some built areas must be recovered and transformed into open green space, and some others should host high-rise developments. It will result in an increase in city’s gross density and in built density³⁵. In order to enhance these trade-offs, a more attractive urban regulation should be created. This should present suitable incentives for private investors to carry out urban renewal projects.

Based on these principles, Bogotá’s “population capacity” depends on the level of densification that the city will pursue in the future and the maximum available urban land for further developments. Bogotá’s urban expansion area is presently restricted to around 3,000 hectares, accounting for 7.2% of its urban area. Some undeveloped border zones of almost 4,000 hectares have been set aside as natural reserve areas for shaping a greenbelt around the city proper.

33 This would include designing a city-parks network system, where parks would be connected using bikepaths and pedestrian boulevards, in order to generate greater usefulness of a system.

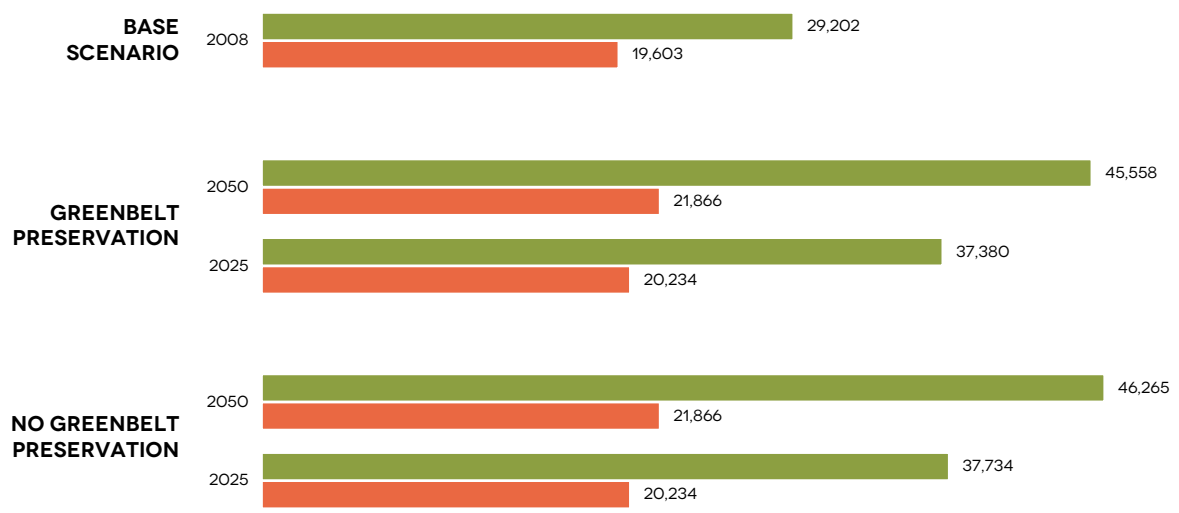
34 10m²/inhab is a measure defined by the WHO (World Health Organization) to ensure an adequate supply of green open space in urban areas.

35 The useful or built density is a measure of inhabitants per unit of land without open green space and road network space.

figure 33
TWO URBAN GROWTH SCENARIOS

URBAN DENSITIES (INHAB / KM2)

● BUILT DENSITY ● GROSS DENSITY



POPULATION DISTRIBUTION (MILLIONS)

● 17 MUNICIPALITIES ● BOGOTÁ

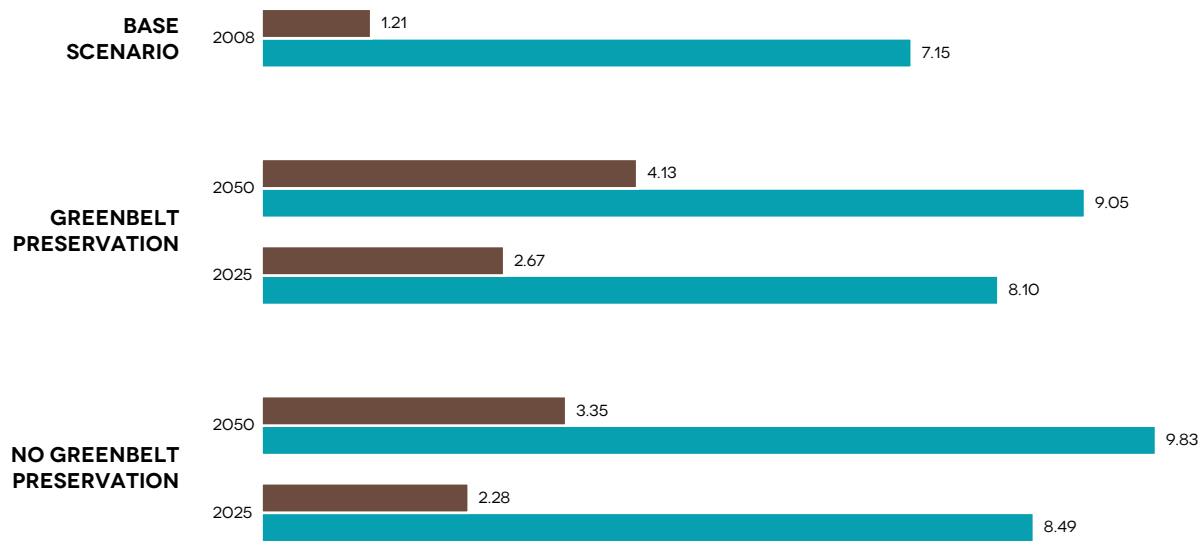
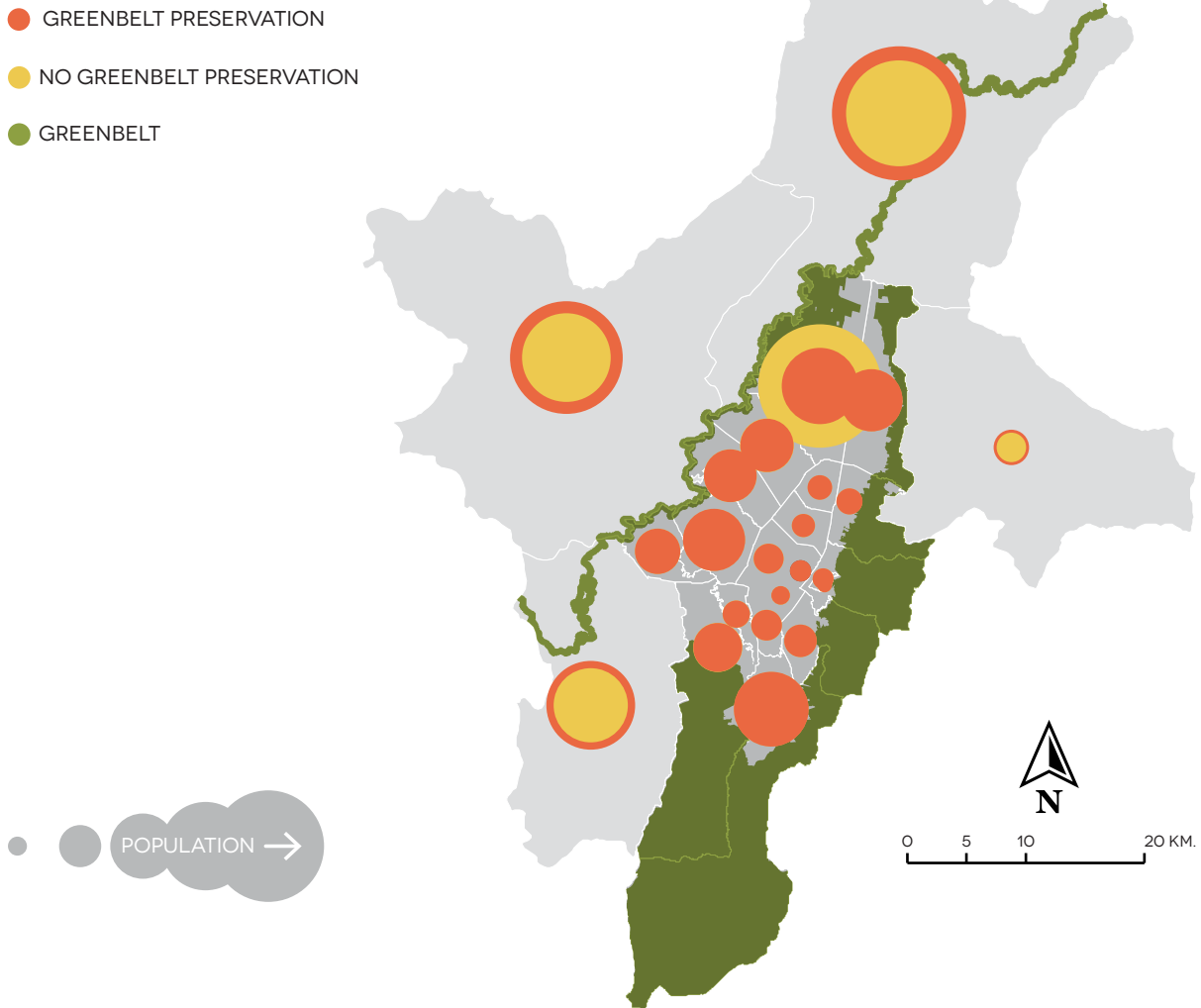


figure 34

BOGOTÁ 21'S URBAN GROWTH SCENARIOS (2050)



The preservation or not of these greenbelt defines two future scenarios and, consequently, its maximum future population (See figure 34). As previously stated, significant decentralisation of population towards Greater Bogotá is expected in the “greenbelt preservation scenario”; a total of 31% of Greater Bogotá’s population would live in municipalities around the present city by 2050, while in the other scenario this amount would be reduced to 25%. As it can be seen in figure 33 and figure 34, the “no greenbelt preservation scenario” provides extra space for almost 800,000 new inhabitants and therefore reduces regional growth. This scenario would not coincide with the Bogotá 21’s vision:

- Without greenbelt preservation, there will be no physical barrier preventing the surrounding municipalities from becoming part of the conurbation of Bogotá through urban sprawl.
- Urbanising natural reserve areas to provide more space within Bogotá reduces the growth potential of the region, contrary to the target of a more balanced city – region development.
- This scenario consumes open green space needed to provide a better urban environment.

Therefore, according to our Bogotá 21 principles previously mentioned, we propose to transform Bogotá into a world-class, transit-oriented metropolis, encircled by a substantial greenbelt. Figure 34 illustrates our Bogotá D.C. and regional greenbelt vision.

Employment Distribution

The most decisive factor for developing the region of Greater Bogotá is the employment distribution. With a significantly larger population in the surrounding municipalities, the amount of jobs in those municipalities must increase proportionally to avoid an immense growth of commuter traffic.³⁶

At the same time, the centralisation of employment within Bogotá is a challenging issue; Bogotá’s employment clusters are mainly located in and around the CBD. This highly dense concentration of jobs in one single area configures a mono-centric destination of work-related journeys, creating high levels of congestion.

36 At present, Bogotá concentrates about 87% of the Greater Bogotá region’s employment and is home to a similar percentage of the region’s population (85%).

Bogotá 21's vision is to create a polycentric metropolis, with a decentralised concentration of population and employment. This will reduce the importance of, and decrease the dependence on, Bogotá's CBD, thus shifting commuting from a mono-centric pattern towards a spatially decentralised one.

These main ideas have also been included in the recent spatial plans for Bogotá and its region (POT and MOT). The POT defines a variety of new centralities within Bogotá that should concentrate employment. The regional vision also includes a decentralisation scenario in which some municipalities would turn into specialised economic centres. This would provide the jobs necessary to balance regional distribution (see figure 35).

Available land and the region's potential for connectivity create an advantageous scenario that can attract industries. The MOT envisions a metropolitan region hosting high level education and health services, centres for agriculture, industries and logistics, and high-tech facilities.

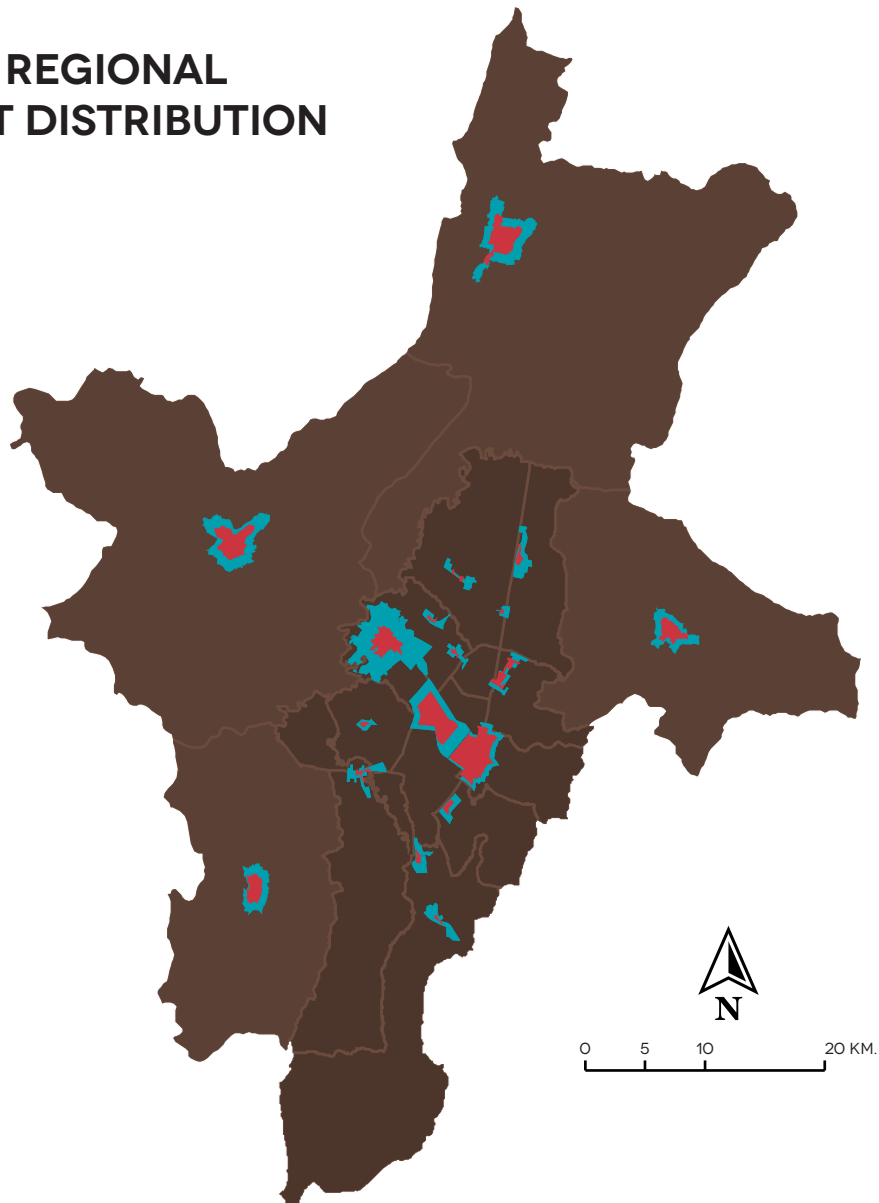
In order to achieve this new spatial configuration of Greater Bogotá, many policies must be implemented. Reshaping the urban and regional configuration needs integrated planning between land-use and transport features. Myriad economic, political and social interventions are necessary to achieve the "TOD vision" and the polycentric pattern.

Comment on housing policies

As was stated in the beginning of this document, we are focussing on the importance of transport-related infrastructure and projects, while outlining other issues of importance in Bogotá's planning. For instance, the integration of transport with housing policies is a very broad topic that needs a very detailed discussion, and as such escapes the scope of this document. We address this topic in greater detail in Chapter 6.4. of this book, but we would like to underline here that our approach, though not stating this explicitly, is aware of the importance of the topic and is confident that the measures proposed here will most definitely contribute to reduction of socio-spatial segregation and gentrification, to achieve an adequate regional balance.

figure 35
BOGOTÁ 21'S REGIONAL EMPLOYMENT DISTRIBUTION

● 2010 ● 2050



BOX 10

MAXIMUM URBAN GROSS DENSITY AND WORLD-WIDE COMPARISON

Bogotá is the densest non-Asian City in the world. According to the world ranking of gross urban density (Demographia, 2010), Bogotá ranks in 13th position, and is among the top ten densest cities over 1 million inhabitants. The only world-class city ranking among the top ten densest cities is Hong Kong.

Bocarejo et al (2012) have found strong evidence which indicates that Transmilenio has helped contain Bogotá urban expansion by increasing population

densities inside city boundaries. Thus, Bogotá's present population distribution represents an important opportunity to further drive urban growth through TOD.

Bogotá 21's proposal is to raise the gross density from 20,733 to 22,000 inhab/km². This will position the city as one of the top 10 densest cities world-wide. To achieve this transformation, adequate urban planning regulations should be created and adapted.

TABLE 1

DENSEST CITIES IN THE WORLD

Rank	Geography	Urban Area	Population (Thousands)	Area (Km ²)	Density (Inhab/Km ²)
1	Bangladesh	Dhaka	11,485	324	35,448
2	India	Mumbai	21,290	777	27,400
3	India	Surat	4,265	161	26,491
4	Bangladesh	Chittagong	2,910	111	26,216
5	China	Hong Kong	7,030	275	25,564
6	India	Jaipur	4,245	168	25,268
7	China	Yangzhou	1,040	49	21,224
8	India	Solapur	1,155	54	21,389
9	Colombia	Bogotá	8,600	414	20,773
10	Morocco	Fez	1,065	52	20,481

Source: Authors elaboration based on data from Demographia, 2010.

CHAPTER 5
PRINCIPLES
TO BUILD THE
TRANSIT-
ORIENTED
METROPOLIS

5.1 HIERARCHICALLY STRUCTURED MASS RAPID TRANSIT FOR BOGOTÁ

Bus Rapid Transit (BRT), urban, suburban, and regional railway systems are the backbone of the proposed future transit system of Bogotá. This system is essential to a successful transformation of the city into a transit-oriented metropolis, with the ultimate objective of achieving world-class status through consistent application of TOD principles.

Suitable overall design principles have to be in place to ensure that the transit system is tailored to ensure the maximum benefit for the travelling public. These

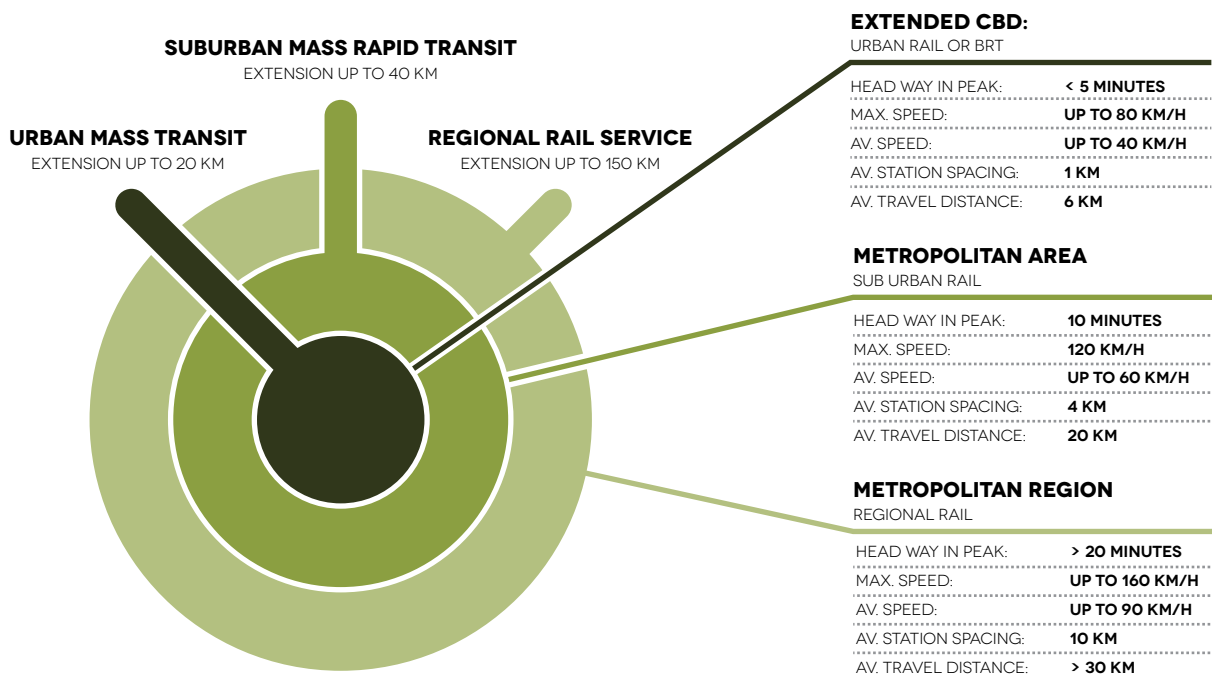
principles have to avoid an unlimited system variety that would lead to drastic increases of life-cycle costs. To avoid this, we propose a suitable structure for peak-demand related technology choices composed of three levels: urban, suburban, and regional.

For **urban transit systems**, the following structure is proposed:

- Low demand (< 15,000 pphpd³⁷): Buses
- Medium demand (15,000 to 40,000 pphpd): Bus Rapid Transit or Light Rail Transit³⁸
- High demand (> 40,000 pphpd): rail based urban Mass Rapid Transit

figure 36

HIERARCHICAL STRUCTURE FOR METROPOLITAN TRANSIT SYSTEMS



37 Pphpd: passengers per hour per direction.

38 Bus Rapid Transit (BRT) and Light Rail Transit (LRT) provide similar transport capacities. At the lower end of the medium demand range, BRT requires clearly lower investment cost; at the upper end, higher land acquisition cost for a dual carriageway per direction might result in an advantage for LRT (depending on the location and the cost of land). If life-cycle-cost instead of investment cost is the relevant financial basis for the systems' selection, LRT gets more attractive. With increasing labour costs, the advantage of LRT increases further (one driver can transport a larger number of passengers per LRT train than per BRT bus). On the other hand, it is difficult to provide capacity over 30,000 pphpd using LRT technology.

For suburban transit systems, an adjusted structure is needed as space-demanding BRT systems with double bus lanes per direction are considered inappropriate:

- Low demand (< 15,000 pphpd): Buses
- Medium demand (15,000 to 20,000 pphpd): Bus Rapid Transit
- High demand (> 20,000 pphpd): Suburban rail

For regional transit systems, the choice between buses and trains has to be made. In terms of demand, regional rail is proposed if the peak demand surpasses 20,000 pphpd. See figure 36 for a schematic presentation of these three levels.

However, trains can be operated already at lower demand as the railway tracks used by regional rail services are also used by long-distance and freight trains. Hence, the operation of regional trains is to be decided along with the revitalisation of existing tracks and the densification of the national rail grid; this action has been proposed to reduce the high logistics costs in an environmentally friendly manner.

Besides suitable design criteria, the integration of rail-transit and road-based transit is essential for an

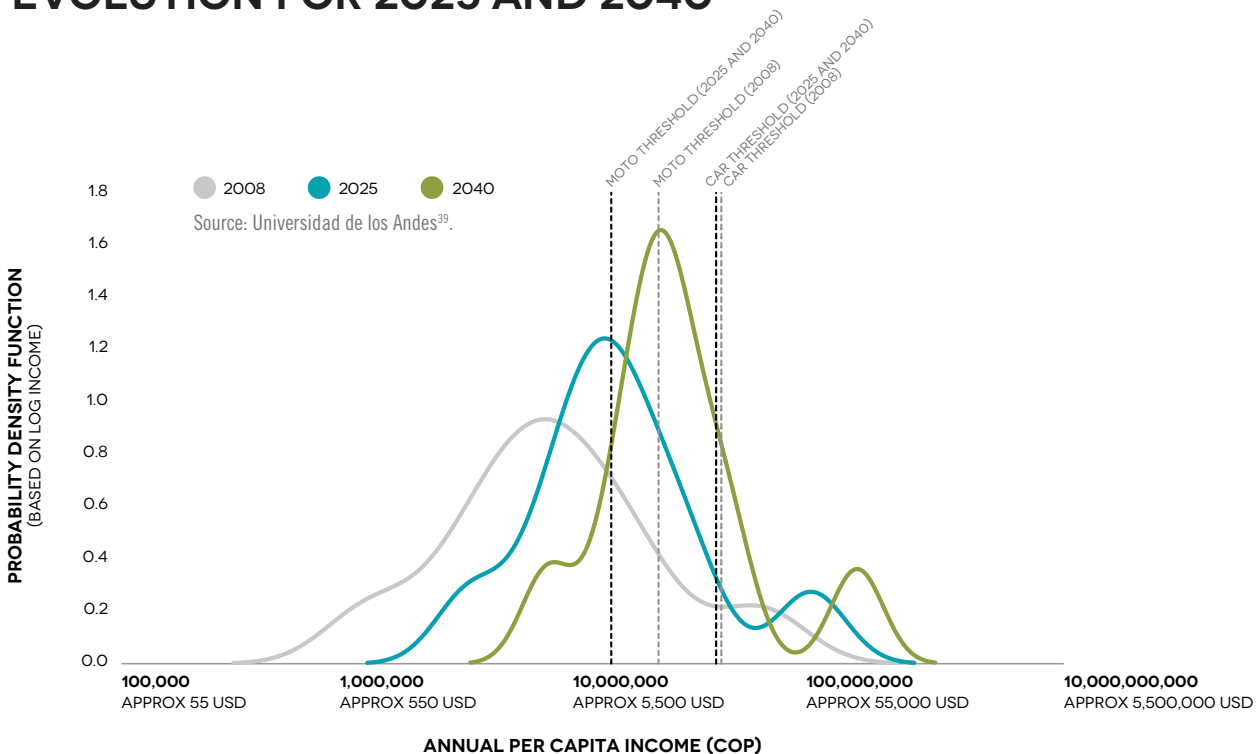
efficient public transport industry. In parallel with the step-wise development of a metropolitan rail system, bus lines and maybe also BRT lines need to be realigned to serve as feeder systems, and bus services need to be improved and adjusted to future demand.

However, key to a successfully functioning metropolitan transit infrastructure is the integration of urban, suburban, and regional systems. The entire architecture of the transit system is to be structured in a well-integrated, hierarchical manner; this will guarantee the comfort, performance, and affordability needed to attract and maintain a strong customer base.

A metropolitan transit system not structured in a suitable hierarchy will not be appreciated by the public as an attractive means of transport, inevitably resulting in jeopardised acceptance and a loss of patronage. With people getting richer, more of them will be able to afford private means of transport (see figure 37). An estimation based on per capita income shows that, by 2025, the city will have around 14.61 million motorcycles and 5.6 million cars. According to the current trend, in 2040 there will be a total of 27.6 million motorcycles and 10.39 million cars. Only an attractive

figure 37

CAR AND MOTORCYCLE MOTORISATION THRESHOLD EVOLUTION FOR 2025 AND 2040



39 The area enclosed by the 2025 curve and Moto Threshold represents the number of motorcycles in the city. The area enclosed by the 2025 curve and Car Threshold represents the number of cars.

transit system, complemented by suitable application of de-congestion pricing (travel demand management), will be able to avoid transit passengers of today becoming the motorcycle or car users of tomorrow.

For example: under the current conditions of 6 passengers per square metre in BRT, passengers will not enjoy long trips from the periphery of a metropolitan region to the city centre in crowded buses, possibly with a low ratio of seated to standing passengers at an average speed of 27 km/h or less (average speed of Transmilenio). As travel distances grow, so does the importance of speed and level of comfort. Hence, a BRT application to regional transit would have to take an adjusted vehicle interior design (higher ratio of seated to standing passengers, hence lower capacity per bus) into account, and it would have to be designed in such a manner that higher travel speeds can be achieved.

Suitable design criteria for each layer of the hierarchically-structured transportation networks need to be applied. They have to be focused on passenger requirements, performance and cost-efficiency (Figure 38). For modern railway systems, assuming they are justified by adequate demand, the following design criteria are proposed: Note should be taken that the conversion to standard gauge is strongly recommended, in particular, for new railway lines (urban and suburban); Colombia

currently uses standard gauge only in its Cerrejón – Puerto Bolivar line. Standard gauge facilitates higher speed, requires a lower investment due to stronger competition among suppliers (60% of the world’s railway system use standard gauge), and is more flexible in terms of rolling stock extension or replacement.

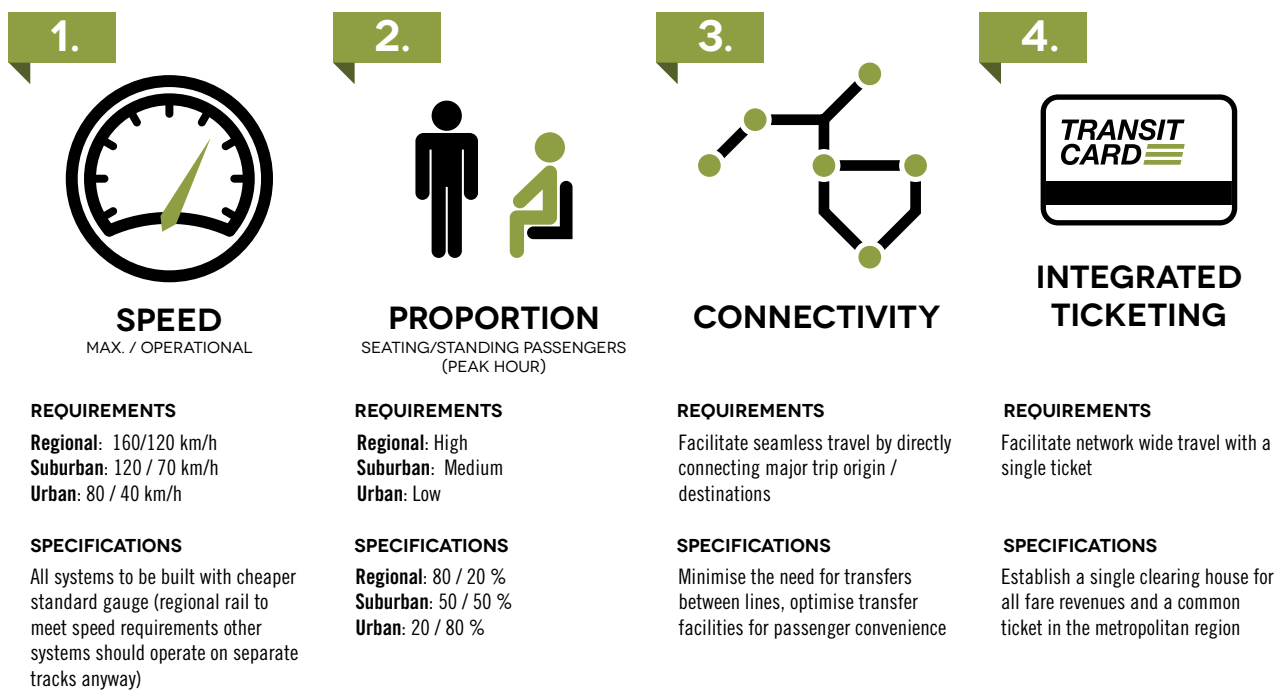
For Colombia’s long-term development, it is extremely important that the standards for Bogotá’s transit system be harmonised nationwide. These nationwide solutions would apply not just in Bogotá, but also in other cities such as Cali, Medellín, Barranquilla, and Cartagena.

Limiting the number and variety of system designs would not only secure savings in the life-cycle costs of the Bogotá transit system and maximise the benefits in terms of economies of scale, but would also facilitate the establishment of a local industry in the supply chain of metropolitan railway systems.

The result would be significantly lower life-cycle costs that would materialise over the entire lifetime of the system’s operation. This would not only be due to lower replacement costs of components and lower costs for fleet extensions and other issues, but also due to lower infrastructure investment costs (e.g. several lines could share one depot).

figure 38

OVERALL DESIGN CRITERIA FOR LAYERS OF GREATER BOGOTÁ’S TRANSIT SYSTEM



5.2 ORGANISATIONAL STRUCTURE FOR MASS RAPID TRANSIT IN BOGOTÁ

Finally, institutional frameworks must be strengthened to ensure these projects succeed. As stated in Acevedo et al (2009)⁴⁰, it is necessary to consolidate local transport and planning authorities. The responsibilities for planning, managing and coordinating the integration of the urban, suburban and regional transit systems need to be concentrated within a single planning unit comprising national, metropolitan and local institutions, without limiting operational diversity in the future. This planning unit would be responsible for the overall planning of the hierarchical transit networks, while a Public Transport Authority (PTA) is proposed for planning and supervising the operations (e.g. headways, time tables, etc.).

The improvement of the planning process seeks to align all plans towards one single guiding principle: the transformation of Greater Bogotá into a transit-oriented, world-class metropolis with well integrated transit networks and services.

Because a variety of bodies on national and regional levels are involved (Secretaría de Movilidad, Instituto de Desarrollo Urbano (IDU), Secretaría Distrital de Planeación (SDP), Ministerio de Transporte, Departamento Nacional de Planeación (DNP), among others), the professional steering of this process needs to be carried out by a sufficiently empowered, high-level steering committee. This committee must guide and oversee plan developments, in addition to controlling their enforcement and implementation (it could be modelled similar to the Steering Committee proposed for the implementation of the Bogotá 21 project; reference is made to Chapter 7.3). Current committees are either national-level or local-level specific, but there is no permanent national-local level committee in place.

Besides an improved planning process, a simple ownership structure for future regional, suburban, and urban railway systems is recommended, with clear implementation responsibilities. As such, MRT systems do not exist in the Colombian capital and its hinterlands today. A brief outline of the proposed structure, based on international best practices, shall be provided; this outline shall serve as input for a more detailed planning of an adequate institutional set-up for Greater Bogotá. The outline covers the three rail components of the proposed hierarchical transit system and includes the three dimensions of ownership, implementation responsibility, and operational responsibility:

- Regional railways serving surrounding provinces of Bogotá should preferably be built, owned and operated by one single entity. As the National Railways of Colombia were liquidated in the 1990s, no entity can be nominated as the preferred owner, thus a new one will have to be established. Regional trains will

share tracks with long-distance and freight trains; hence, appropriate track sharing mechanisms need to be established. Note should be taken that the proposed speed for regional rail (160 km/h) is difficult to achieve with a metre gauge system (current plans have been done for 80 km/h speeds).

- Suburban railways should not be mixed with regional railways, neither in terms of ownership nor in tracks, due to the significant difference in technology and the short headways of suburban railway services. Ownership and implementation responsibility could rest with the same entity that develops and operates the regional railways; operational responsibility could be within an independent corporate body (which could be a subsidiary of the owner and operator of the regional railways, as is the case on most of the suburban rail systems in France or Germany) or could be outsourced, e.g. on concessions basis.
- Urban railways are recommended to be owned exclusively by one single body, for example, a corporation owned by Bogotá D.C. This would ensure system harmonisation and limit the variety of technologies, which would undermine the possibility of benefiting from an economy of scale in supplies.

If the Hong Kong model would be followed, this corporation could be established in the legal form of a private company, but with the Bogotá government being the only initial share holder. At a later stage, the corporation could be registered and publicly traded at the stock exchange.

The corporation would build and own the urban railways and could also operate them (like in Hong Kong) but it might choose to focus on associated businesses, e.g. property development of plots in the vicinity of stations to implement the TOD principle, and might, therefore, decide to outsource operation and maintenance to concessionaires.⁴¹

- If operation and maintenance are outsourced, all concessionaires (for urban and suburban rail systems alike) should operate and maintain the systems using fair, gross-cost based operation licenses. This means they will cover their costs and facilitate a fair profit margin, so that a harmonised fare regime and ticketing system can be applied.

The authority for defining fare structures and levels should rest with a new Public Transport Authority (PTA), which should also refine the technical and operational standards for a unified automatic fare collection (AFC) system, and plan and supervise its operation and maintenance.

Bogotá is planning on transforming Transmilenio S.A. into that authority, which would control and manage all mass transit. It would also include the control of operations – adherence to service schedules, frequen-

40 See also CONPES 3677, specifically discussing “integrated mobility for the capital región of Bogotá”.

41 One example: the Mass Rapid Transit Authority of Thailand (MRTA) has outsourced the operation and maintenance for the Blue Line to BMCL (Bangkok Metro Public Company Limited), a private company owned by a construction firm that participated in the construction of the Blue Line. BMCL, in turn, has outsourced the maintenance of the system to the supplier of the electrical and mechanical (E+M) system components. MRTA will also follow this model also with new lines, which are currently under construction. MRTA's responsibility for urban railway lines is not limited to Bangkok, but covers all of Thailand.

cies, headways, among others – through penalties or bonuses for compliance and non-compliance. If the PTA is gradually created by extending the functions of Transmilenio, neighbouring municipalities need to be included into this process as the Authority would ultimately serve a regional function.

The PTA could also operate the automatic fare collection system, but it might decide to outsource it to a private sector company, like in Hong Kong. The public transport stored value ticket of Hong Kong (called “Octopus Card”) can be used for all modes of transit,

but also as an electronic purse for the everyday shopping at practically all groceries, convenience stores, and countless other shops in the city. This greatly enhances the convenience of shopping in an increasingly coinless city.

With this policy in place, the government would extend its control over traffic and transport policies and instruments, allowing it to influence the mode-choice behaviour of the travelling public and, hence, the modal split.

CHAPTER 6
PROPOSED
PRIORITY
MEASURES AND
ACTIONS

6.1 PRIORITY INVESTMENT PROJECTS

Priority projects are, by nature, projects that are most desired to improve the quality of the urban life in Bogotá, and they are related to sectors in where the pressure to act is most pronounced.

Seventeen physical priority projects were identified, based on the analysis of strengths and weaknesses, opportunities and threats (SWOT analysis). They were also partly based on investment decisions made by the Bogotá Municipality, or the Colombian Government, or a combination of both. A subset of these is included in the immediate action programme (Chapter 6.3).

Eight of these priority projects are related to the transportation sector, mainly because the action needs in this sector are most pronounced. The priority projects are:

- **Agreements towards a regional metropolitan authority/agency**
Bogotá is functionally dependent on several other municipalities for its daily activities. Despite having various options, there has not yet been any agreement on the nature, structure, or jurisdiction of an authority that will coordinate the interaction and development of these municipalities with Bogotá. It is therefore a priority to define, fund, and implement such an authority, agency or whatever structure is suitable, in order to have better and more organised development in the region. The definition has to include also the interactions between this new entity and Transmilenio (converted into a Public Transport Authority; see Chapter 5).
- **Implementation of Travel Demand Management (TDM) by de-congestion pricing, complemented by Intelligent Traffic Management Systems (ITS)**
These two related measures are extremely relevant to the improvement of traffic flow and the generation of greater revenues from urban transport. Bogotá's travel demand management has not evolved to meet the increase in private car ownership. A de-congestion pricing scheme is proposed to improve traffic flow, increase travel speed, and reduce accidents and pollutants emissions, while also generat-

ing revenue for the city. This will internalise the negative externalities and persuade motorists to modify their travel behaviours by choosing other transport modes, like public transport, or by using private cars more efficiently. Along with the decongestion pricing, the city needs to update its traffic signals by implementing a traffic-actuated signal control system and embarking towards an Intelligent Traffic Management Systems (ITMS). See Chapter 6.3.

- **Road maintenance**
All levels of Bogotá's road network – primary, secondary, tertiary – have suffered from neglect of maintenance (only 37.1% of road surfaces is in good condition, 22.9% is in regular condition, while 40% is in bad condition (Bogotá Cómo Vamos, 2011)), causing massive disturbances to the traffic flow. Urgent repair is needed, combined with guidelines for implementing early maintenance measures on a regular basis.
- **Extension of the medium-capacity public transport network**
Currently, the medium-capacity network of the city is composed mainly of the BRT Network (Transmilenio). It is the backbone transit of Bogotá with a length of 120 km at present. In the longer term, high demand corridors will be served by a rail based Metro system, with the low to medium-capacity systems becoming feeders serving medium to high demand corridors as part of the Integrated Public Transport System (Sistema Integrado de Transporte Público - SITP). See Chapter 6.3.
- **Construction of Metro Line 1**
Bogotá has had various metro proposals over the past 50 years, but the one being discussed in Bogotá, which this document takes as a basis, has moved forward in the government agenda. A potential metro line could be implemented along the Eastern Corridor, where Avenida Caracas has projections of metro-like demand in the near future. See Chapter 6.3.
- **Integrated bicycle policy**
Bogotá is well-known for its bikeway network, which is now 354 km in length and the largest in Latin America. It still requires the development of a proper

policy of integration with public transport (i.e. Transmilenio, metro and other modes) and a proper institutional framework that will generate a long-term policy. See Chapter 6.3.

- **Densification of the national dual carriageway road network**

The National Development Plan of the country has established the goal of doubling the length of its dual carriageway road network from 1,050 km to 2,000 km within the current government 2010-2014, mainly to take first steps to reduce the very high costs of logistics in Colombia which is limiting the economic growth potential of Bogotá and the nation alike, however bearing in mind the importance of other non-road-based solutions. See Chapter 6.3.

- **Comprehensive logistics plan: cross docking, freight corridors**

Bogotá has a coherent freight policy as part of its mobility master plan (*Plan Maestro de Movilidad - PMM*), but efforts to implement specific projects such as cross-docking and freight corridors should be improved, and moved forward more quickly, to complement other measures currently being taken in other transport subsectors. Freight corridors must be implemented in order to ease connections between main supply centres and national roads. Also, it is important to develop logistics centres located at the North, West and South of the city as freight gateways, as well as to improve El Dorado Airport and Corabastos⁴² infrastructure and connectivity.

- **Improvement of Airport traffic management**

Though the El Dorado International Airport of Bogotá underwent a large reconstruction, it is expected that further improvements will be needed soon including new terminal buildings, new cargo facilities, and better air traffic management to cope with increasing air traffic demand. Also, earmarking of land for a third runway is recommended. The option of redistributing commercial, military and non-commercial air-traffic between the different airports of the city - i.e. CATAM *Comando Aéreo de Transporte Militar* (Military transport air Command), Madrid, Guaymaral - should be properly evaluated, alongside a review of the current zoning plan called "MURA" (*Macroproyecto Urbano Regional del Área de Influencia del Aeropuerto El Dorado* -Regional urban macro-project of the airport influence area) to ensure that long-term capacity demands can be met without relocating the airport. Otherwise, the land owned by the airport authority would need to be enlarged.

- **Waste water treatment**

Waste water is currently very poorly managed, with less than one quarter treated prior to discharge into the Bogotá River. The situation is largely addressed by the Rio Bogotá Project. However, at least one major new waste water treatment plant should be built soonest to arrive at a more sustainable waste water treatment solution. See Chapter 6.3.

- **Toxic and solid waste treatment**

Collection and disposal of solid waste, mainly at Doña Juana landfill, is already quite well organised and managed but there is still some room for policy improvement towards: recycling, extending the landfill's useful lifetime, discharge of toxic waste, and the handling of construction rubble. See Chapter 6.3.

- **Flood prevention**

Frequent flooding became one of the most pronounced weaknesses of Bogotá, most especially during 2011. To treat river borne floods, widening and revitalisation of the riparian zones by increasing the distances between the dikes along the Bogotá River is needed; this is part of the comprehensive programme of the ongoing Rio Bogotá Project. However, additional measures are needed to protect from storm water flooding in the city. A systematic master plan for flood prevention that covers flood defence, as well as flood retention, is needed. Also, a high quality emergency response plan needs to be drafted and enacted to mitigate flood risks in an efficient manner. See Chapter 6.3.

- **Health care**

While the health care system of private hospitals is quite satisfactory, this is not so the case with public hospitals. Both services and facilities need to be improved. The insurance coverage for clinical treatment needs to be increased.

- **Promotion of energy efficient construction methods and construction supervision**

Bogotá, and Colombia in general, do not have regulations related to energy efficient construction methods. These should be developed since there is great potential in this specific measure. Some local organisations can enhance their implementation. One of these is the Green Building Council's Colombian Chapter, which has promoted the development of such regulations and has extensive experience in their implementation. A second, government-based, organisation would be the local planning department (Secretaría Distrital de Planeación), which is in charge of overseeing construction plans in the city. The third would be the Curadurías, which provide construction permits to developers.

- **Strengthening of Municipal Institutions**

Bogotá's municipal institutions are in need of strengthening due to recent structural changes, their nature and various political changes in the past years (as well as the underperformance of previous administrations). The current municipal administration has a more appropriate focus than previous ones, but any new structure needs support in its initial development. Improving governmental bodies' communication between each other and with the citizenry would improve institutional efficiency and increase transparency, while reducing the risk of incidents of corruption.

42 Corabastos self-defines itself as "the main supply platform of the country, CORABASTOS offers specialised services, adequate infrastructure and national coverage to participants in the agro-food industry, with national coverage in the commercialization of food in the traditional channel." (from Corabastos, 2012).

- **Crime prevention**
Crime in the city, and especially violent crime, is one of the major concerns of citizens and potential foreign investors alike, and some actions have been taken to solve this problem. Campaigning, policing, and in general, systematic actions to reduce social divide by increasing salaries and lowering unemployment can improve this situation substantially.
- **Re-launching citizen culture initiatives**
Bogotá was well known during the decade of the 1990's for its comprehensive agenda of "citizen culture" that was led by the municipality. Actions developed during that time increased citizens' appropriation of the capital. The re-development of a policy in citizen culture in Bogotá is greatly needed to create a stronger identity of citizens with their city, improve liveability, and improve residents' sense of caring and ownership towards urban infrastructure. Previous initiatives could be taken up again and adapted for current needs. See Chapter 6.5

6.2 PRIORITY STUDY NEEDS

Priority study needs are either related to certain aspects of the priority measures considered essential for their successful implementation, or to aspects that were not adequately taken into consideration in the past and need to be studied now to overcome these deficiencies.

Five priority study needs were identified, based either on the Bogotá 21 SWOT analysis or on direct connections with the above-listed priority projects. A subset of these is included in the proposed immediate action programme (Chapter 6.3). The priority study needs are:

- **Transit Oriented Development (TOD)**
TOD is considered a proven strategy for integrating the planning of land uses and transportation, to the benefit of efficient transit and transport solutions, of the environment, and of the development of urban spaces. Therefore, a pilot study to verify the benefits of a TOD application to Bogotá is proposed. See Chapter 6.4.
- **Hierarchical transit system**
In light of the huge size of Greater Bogotá, the transit systems have to be hierarchically structured to be user-friendly, attract the patronage required to be financially feasible, and obtain the best economic benefits for the cities and its inhabitants. Reference is made to Chapter 5 of this book. This could be considered when the next update of the transportation master plan is carried out, and as a complement to the ongoing process of the SITP (Integrated Public Transport System).
- **Securing land for the right of way of the suburban mass transit**
Despite not currently having a very high demand according to recent studies, the future needs of

suburban rail can be planned in advance. The early purchase of land needed for the additional right of ways of such projects is recommended (in accordance with plans for regional integration). Current plans for rail projects do not include medium-speed rail capacities (120 to 160 km/h) in their designs, and this could be improved. Increasing the operational speed to a more reasonable level might result in land acquisition needs along existing right-of-ways due to wider radii (horizontally and vertically).

- **Structuring the legal and institutional framework for mass transit operation**
The implementation of an MRT line along the eastern corridor of the city (most probably along the Caracas Avenue which has the highest and most increasing demand in the near future), as well as the improvement of bus services via SITP (*Sistema Integrado de Transporte Público* – Integrated Public Transport System – to be implemented from 2012 onwards), leads to the need for establishing an act for railway operation and maintenance (Railway Act), along with the establishment of a related safety code to be enacted by a decree. The immediate development of the bill and the draft safety code is recommended because the enactment will be time consuming due to the large number of stakeholders involved. See Chapter 6.3.
- **Regional Public Transport Authority (PTA)**
Though Bogotá as a city has an adequate mass transit authority (Transmilenio), a regional public transport authority is proposed to establish a harmonised fare structure and ticketing system for all public transport in the entire area. This could be in the form of a Special Purpose Vehicle (SPV) that would eventually leverage the development of a regional authority for all sectors. The PTA could also run the ticketing system and take over responsibility for public transport planning in terms of interconnected services and feeder bus networks. It would be integrated to the SITP management structure (currently Transmilenio).

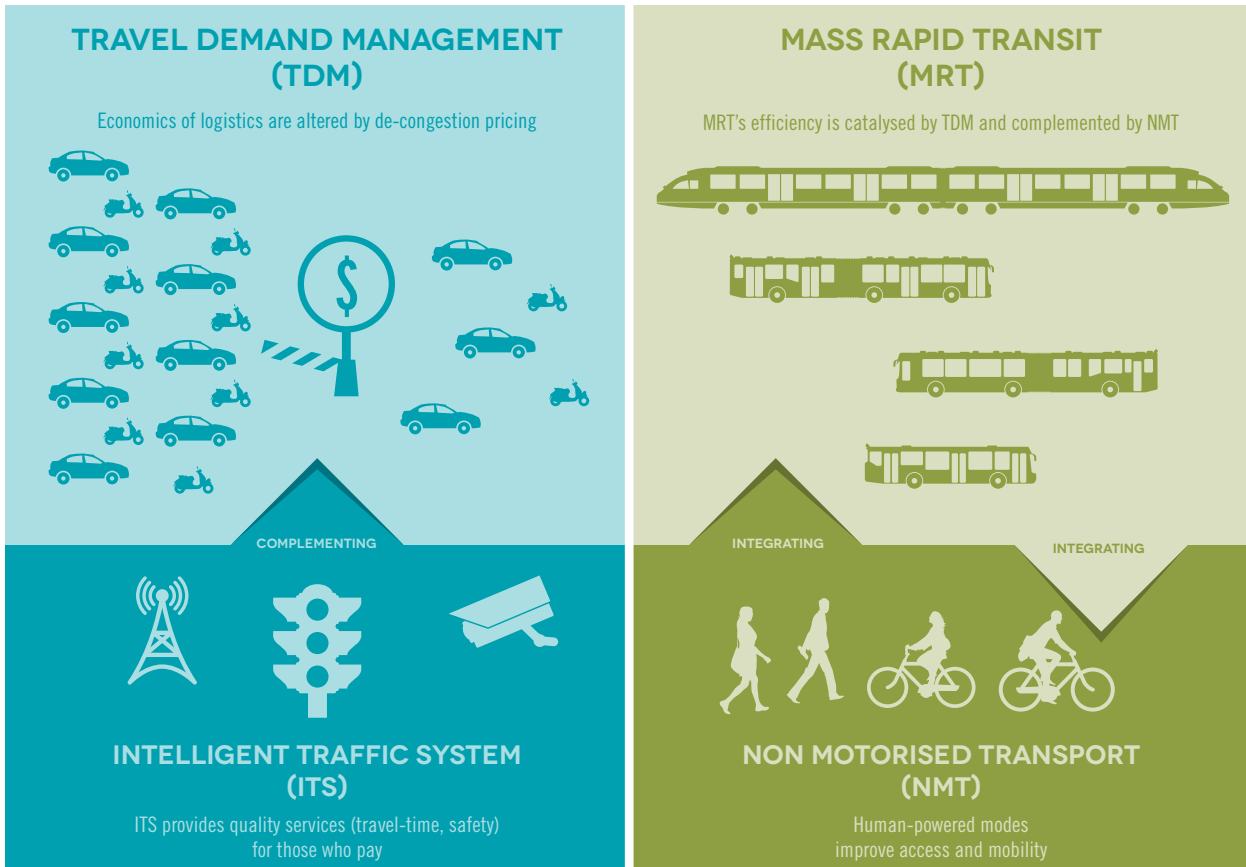
6.3 IMMEDIATE ACTION PROGRAMME

The proposed immediate actions form a subset of the priority projects and study needs and are those which have to be implemented by latest 2025. It is mainly focussed on transit infrastructure. A nine-point action programme has been drafted:

- Implementation of travel demand management (TDM) and Intelligent Traffic Systems (ITS)
- Extension of the medium-capacity transit network
- Construction of the first Metro (Line 1)
- Structuring the legal and institutional framework for mass transit operation
- Bicycle Integrated System (BISY)
- Densification of the national dual carriageway road network
- Toxic and solid waste treatment
- Construction of new waste water treatment plants

figure 39

RELATIONSHIP BETWEEN NMT, MRT, TDM AND ITS



- Complement the flood prevention and emergency response plan by DPAAE (Dirección de Prevención y Atención de Emergencias - Department of prevention and emergency response)

In addition, the development of a road map for the application of the Transit-Oriented Development (TOD) planning principle (Chapter 6.4) and the revitalisation of programmes for community participation (Chapter 6.5) are highly recommended.

Implementation of TDM and ITS

Bogotá is undergoing a very steep increase in private motorisation since 2006 (for instance, 2011 has seen Colombian car sales in excess of 300,000 vehicles – for Bogotá approximately 130 thousand), and this trend will continue to increase. The higher motorisation has consequently increased the Vehicle Kilometres Travelled (VKT). Congestion has become a huge, if not the largest, problem for its citizens, the city's productivity, and its attractiveness. Counter-measures are needed to stop the growth of VKT, and the most adequate means to achieve this is travel demand management (TDM).

The implementation of TDM and intelligent traffic management systems (ITS applications) are considered essential to safeguard high patronage of pub-

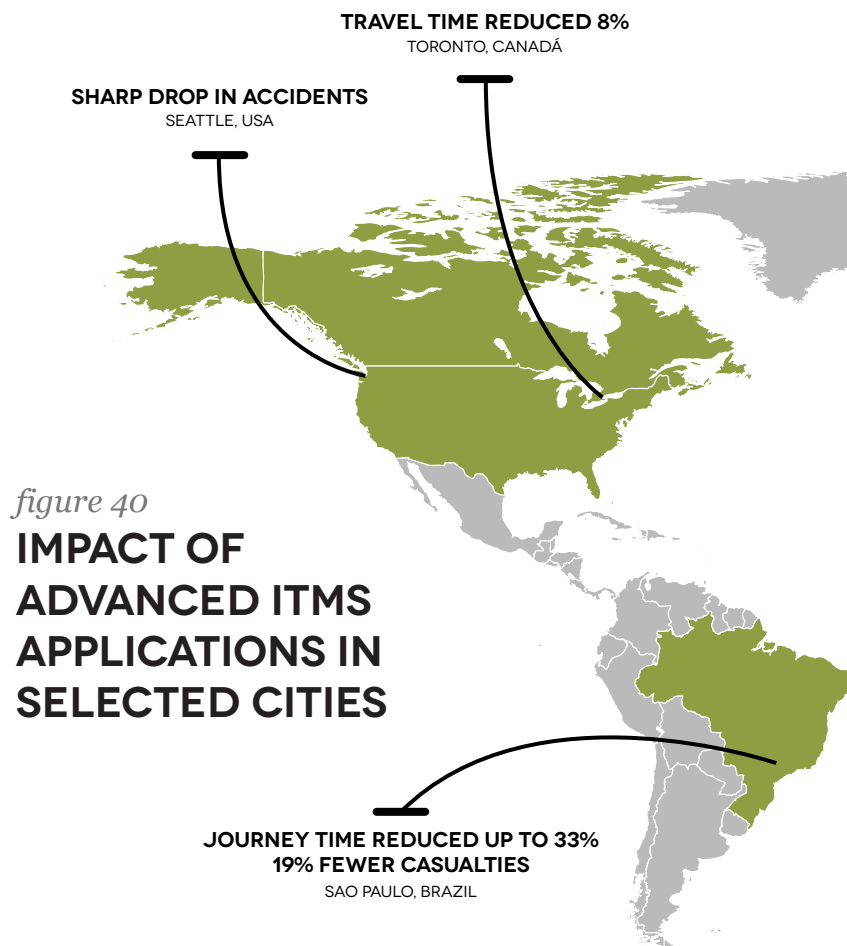


figure 40

IMPACT OF ADVANCED ITMS APPLICATIONS IN SELECTED CITIES

lic transport and high efficiency of the use of road space. Figure 39 illustrates the interaction between NMT, MRT, TDM and ITS.

TDM has been shown to effectively reduce congestion by means of specific measures that range from parking policies (pricing and supply management) to de-congestion pricing, the latter being a proposal from the current mayor and supported from the National Ministry of Transportation.

De-congestion pricing is applied in many major cities worldwide, with London and Singapore being the best-known examples (the terms used there are Congestion Charging and Electronic Road Pricing, respectively). Though it is not popular with citizens, it will help generate revenue for the city, reduce congestion and increase the patronage for public transport and the use of non-motorised transport.

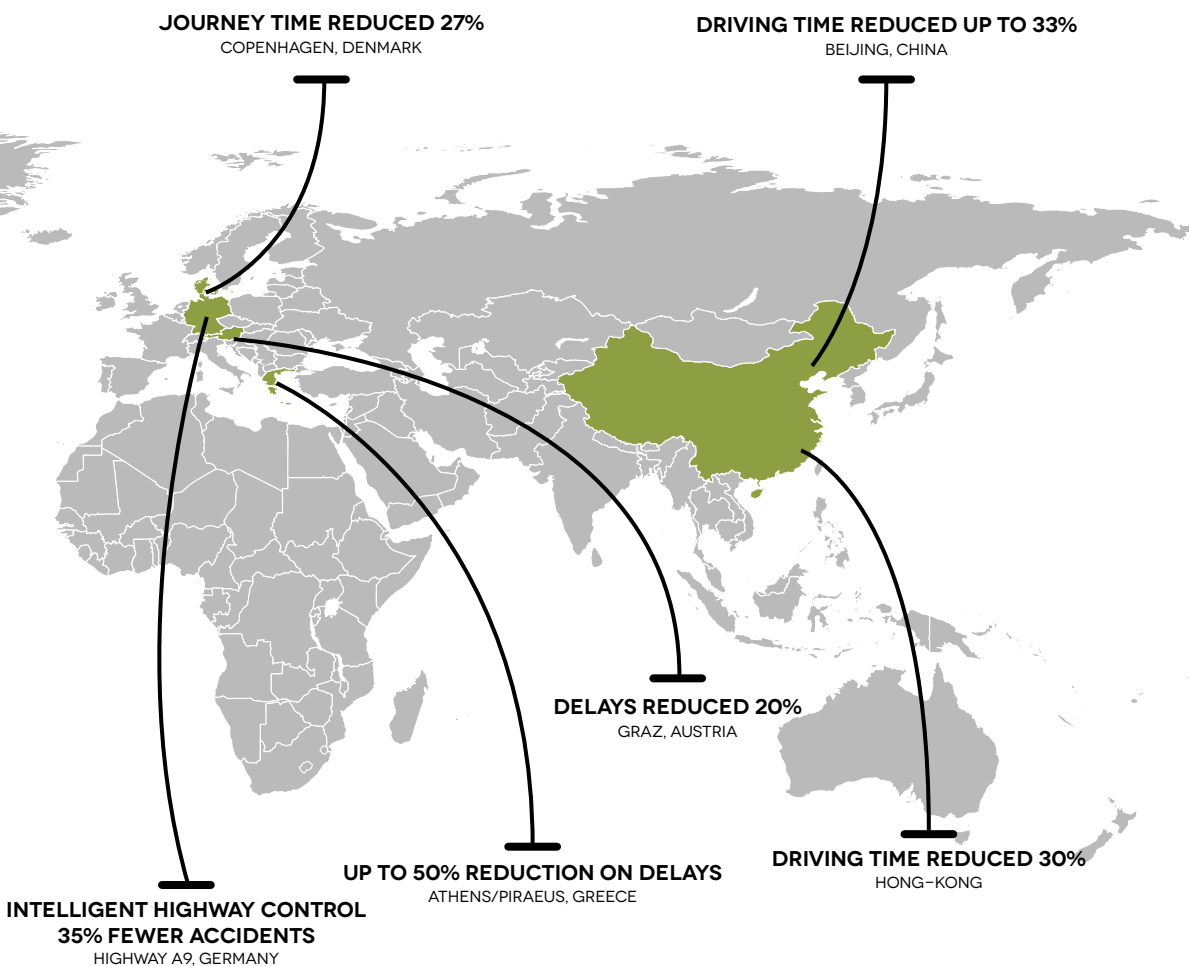
TDM should be complemented by ITS. The objective of ITS-systems is to optimise the use of road space, thus reducing traffic congestion, accidents and fatalities. Figure 40 illustrates to what extent good management of road traffic can reduce the economic losses caused by such incidents.

• **Extension of medium-capacity network**

According to *Programa Integral de Movilidad de la Región Capital*⁴³ of 2010, the Capital Region should have a hierarchical and integrated transit system. It aims to improve accessibility and connectivity between peripheral and rural areas, regional centralities and Bogotá. This system must be fully coordinated and harmonised with the SITP.

In order to get National Government funding, mobility projects must be developed in accordance to the objectives mentioned above and supported by technical studies that demonstrate their relevance, financial sustainability, and present their economical appraisal. In the short term, Transmilenio enhancement appears as a priority (see figure 41 and figure 42), as does the infrastructure adjustment required for SITP.

Although Bogotá’s BRT system is known all over the world for its successful implementation and performance, it is currently facing capacity problems, particularly in Avenida Caracas, its main trunk corridor. Such problems result from significant demand growth and because Transmilenio’s network has not been expanded as initially planned. Currently, the BRT network is 120 Km long, carries approxi-



43 See CONPES document: Departamento Nacional de Planeación. CONPES 3677. Conpes de Movilidad Integral para la Región Capital Bogotá – Cundinamarca, Bogotá (2010).



Photo by Carlos Felipe Pardo.

figure 41: TRANSMILENIO IN BOGOTÁ'S CITY CENTRE.

mately 1.7 million passengers daily, with a reported maximum capacity of 48,000 passengers per hour per direction on Caracas Avenue Trunk corridor (Figure 42).

It is essential to develop a full transit system comprising low, middle and high-capacity transit corridors. This would help balancing the current excessive load on high demand trunk lines, and would also improve the overall performance and passenger convenience of mass transit for Bogotá. Moreover, the implementation of a high quality and efficient regional transit system is crucial to support the envisioned development of Greater Bogotá, and to maintain the high public transport modal-share.

In this respect, based on the steadily increasing passenger demand, the future transit network requires higher capacity systems, including suburban corridors connecting western and northern municipalities. By 2025, the medium capacity network should be around 200 Km long while the high capacity network should be around 29 Km. In addition to present Transmilenio trunk lines, the 2025 network must include Avenida Boyacá, Avenida 68, and Avenida Ciudad de Cali corridors, which cross the city from north to south. Be-

sides, in order to assure good coverage, it is necessary to implement radial axes joining main residential areas to the CBD, therefore Avenida Primero de Mayo and Avenida Calle 13 should be integrated. As for suburban transit, main corridors will be served mainly by low-capacity transport technologies, with about 110 km of medium capacity network established.

- **Construction of Metro Line 1**

Bogotá has had various metro proposals since 1967. We propose one that has a phased approach as presented in figure 43. It shows one metro line that is replacing the Transmilenio Line A (Troncal Caracas) which should be operational latest by 2025, but sooner would be better (2020). It further shows an outlook until 2050, with three more lines in place.⁴⁴ It must be noted that these are the expected demands that grow from the existent networks and public transport usage, but that an enhanced development aiming towards a World Class City (such as that envisioned for Bogotá in 2050) would imply a greater network of high capacity mass transit (see also Chapter 3.3).

The metro's vertical alignment should be mostly underground in the inner-city sections. Hence,

44 According to this proposal, and in order to evolve according to the city growth, Bogotá should have 3 more high-capacity transit corridors by 2050 connecting the highly dense northern to southern areas and crossing employment centres. Also the Avenida Primero de Mayo corridor should be transformed into a high capacity transit corridor to assure metro network linkage to the city centre. The proposed length of the high-capacity transit network would then extend to approximately 82 Km.



figure 42: TRANSMILENIO AT ITS MAXIMUM CAPACITY.

Photo by Carlos Felipe Parido.

negative BRT impacts such as noise and air pollution, visual contamination and barrier effects will be avoided. Extensions might be underground or elevated (viaduct) depending on the area and the availability of land.

In line with the arguments outlined above, utmost attention needs to be paid to the optimal integration of metropolitan and urban transit systems, MRT, BRT, conventional buses, and the modes of non-motorised transportation. This concerns the design of interchange stations, service integration, fare structure, and ticketing system.

- **Structuring the legal and institutional framework for mass transit operation**

If the metro project is confirmed and has begun, it is necessary to establish proper legal and institutional frameworks. Such a process involves various ministries and authorities of the government of Colombia, of the local governments, police, fire fighting departments, etc. Due to the complexity of the task, the large number of stakeholders, and due to the risk of delays, it is proposed to initiate this activity at the earliest possible time.

Note should be taken that some (limited) elements of a consistent framework are in place already, such as a Metro financing law and CONPES for BRT, standards from ICONTEC, etc. The experience of Medel-

lín and its metro system is also useful here. Such elements would have to be integrated into the new framework, which, however, would be much more elaborate in nature.

A consistent legal framework for the project life cycle from system design to construction to operation should be established to ensure the legal certainty for all participants, and efficiency of project implementation. It is proposed to depart from proven legal frameworks and to develop an applied solution for Colombia.

Such a consistent legal framework should consist of the following elements:

- A general law on public transport determining rights, privileges, and obligations of all parties concerned (legal environment)
- Fundamental decrees issuing ordinances or statutory regulations that define and establish the safety criteria for functional concepts and elements, and their compatibility (technical framework conditions)
- National and international standards for (industrial) products, also extended to service quality (technical specifications)
- (Technical) Guidelines aiming at a unified design and the application of common rules and practices (assistance in planning and design)

Besides the establishment of an adequate structure of the legal framework for the design, construction, and operation, good international practice also recommends the establishment of a National Safety Code for railway. In the case of Colombia, the Ministerio de Transporte (Ministry of Transport) would most likely be in charge of issuing this code, by a decree.

Finally, good international practice recommends establishing a Technical Supervisory Authority (TSA) at the Ministry of Transport. The purpose of the TSA is central supervision of the overall designs and safety requirements, entrusted to one single body under the responsible Ministry. To avoid redundancy, and because safety standards should be defined nationally, it is recommended to create one national body for this purpose, instead of local decentralisation.

The proposed legal framework is summarised in figure 44.

For creating the consistent legal framework, the following steps are proposed to be taken:

- Development of a draft bill for the National Railway Law of Colombia
- Timely enactment of the National Railway Law
- Establish a comprehensive “Safety Code”
- Establish the required national standards or certification of international standards
- Issuing Guidelines on various fields, to be applied in design and construction
- Preparation for the establishment of a Technical Supervisory Authority.

- **Bicycle Integrated System (BISY)**

Bogotá is also well-known for the development of a large-scale (350+ kms) bikeway network that increased ridership from 0.5% to 4% in less than

5 years. It has some integration with public transport (for now, 7 Transmilenio stations) but could be greatly improved by means of bicycle parking facilities in various stations of the entire mass transit system and comprehensive network integration with medium and high-capacity systems (Transmilenio and in future metro lines).

The system would also benefit from the improvement of infrastructure and regulations at crossings, though the history of improvements around the decade of 1990-2000 and the existence of a clear policy for the period 2012-2015 are good indications that this issue can move forward and become a solid policy for the city and a crucial transport mode/system. This should be complemented with a public bicycle system that should gradually achieve a dense network of pick-up and drop-off points.

- **Densification of the national dual carriageway road network**

Colombia’s freight is transported mostly (95%) by its road network. Thus, there is a short term need to improve its capacity and quality. This is seen as a priority measure by the National Government of Colombia and by this project alike to reduce the country’s high cost of logistics.

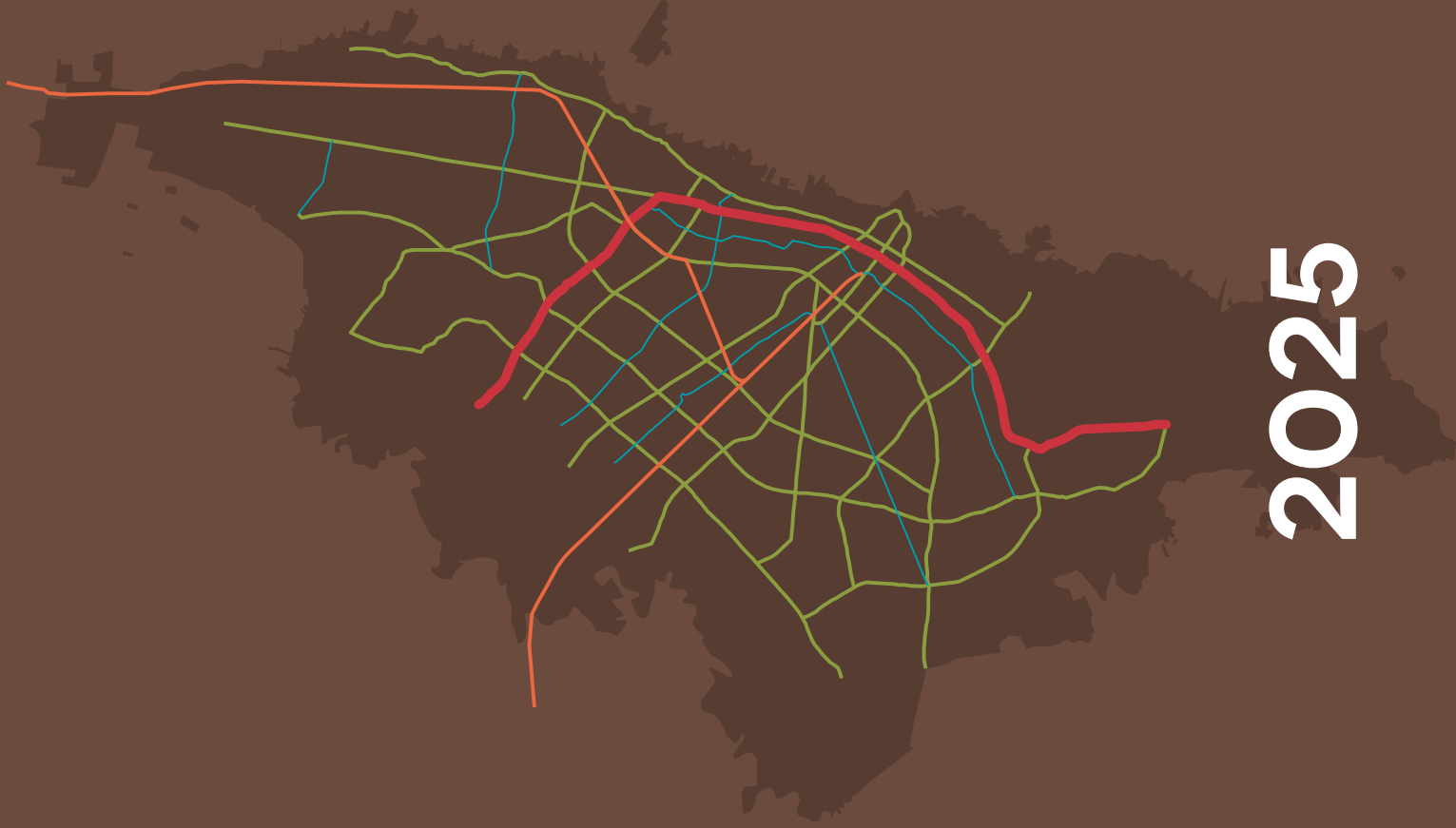
The National Development Plan has established a goal of almost doubling the length of its dual carriageway road network from 1,050 km to 2,000 km within the current government 2010-2014, increasing efficiency of the road network by 91%. A prerequisite for this kind of efficiency improvement, however, is a consequent strengthening of the efficiency of freight carriers and logistics’ services providers in the country (Figure 45).

figure 43

PROPOSAL FOR A TRANSIT NETWORK IN GREATER BOGOTÁ

CAPACITY IN PPHPD

- HIGH CAPACITY > 40,000
- MEDIUM CAPACITY 15,000 - 40,000
- LOW CAPACITY 10,000 - 15,000
- SUBURBAN MEDIUM CAPACITY 15,000 - 20,000
- SUBURBAN LOW CAPACITY < 15,000



2025



2050

figure 44

PROPOSED LEGAL FRAMEWORK FOR METRO LIFE CYCLE (DESIGN TO OPERATION)

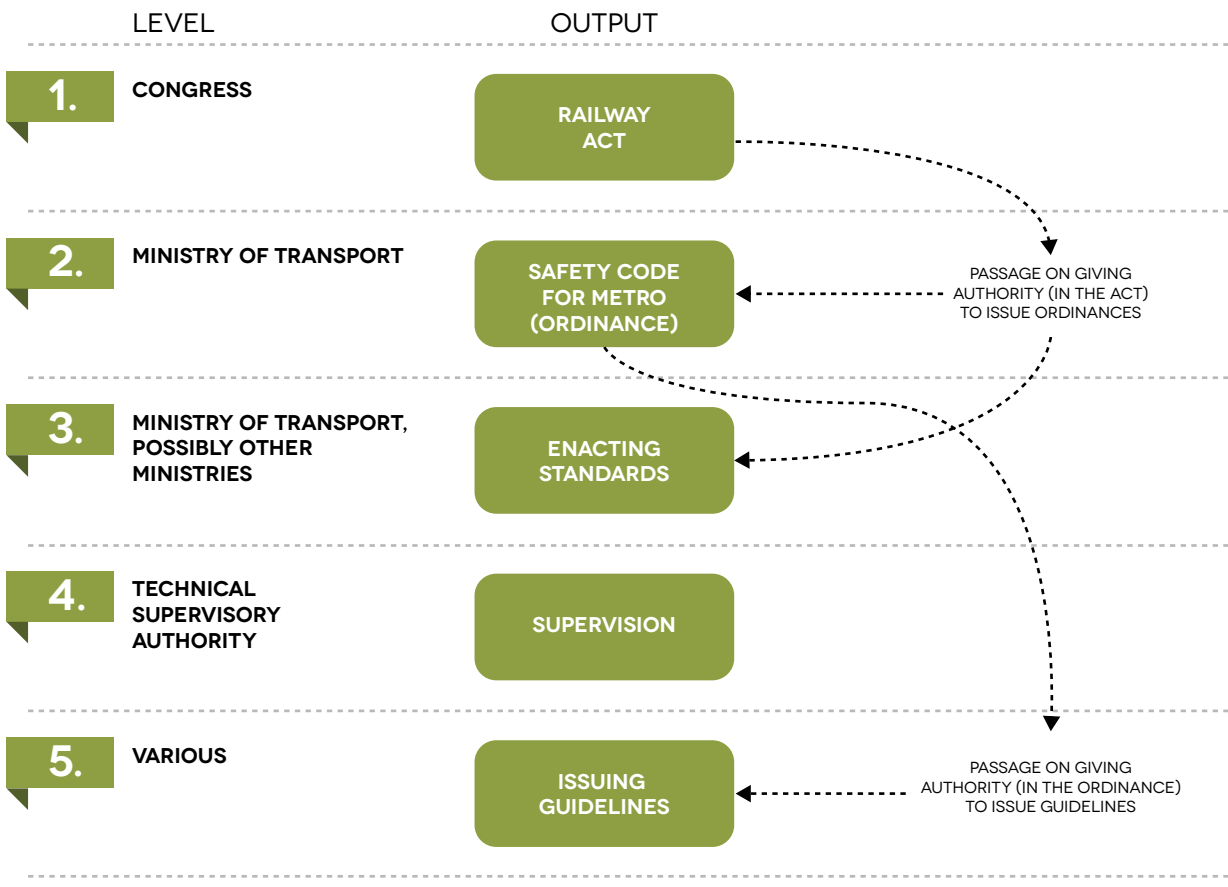
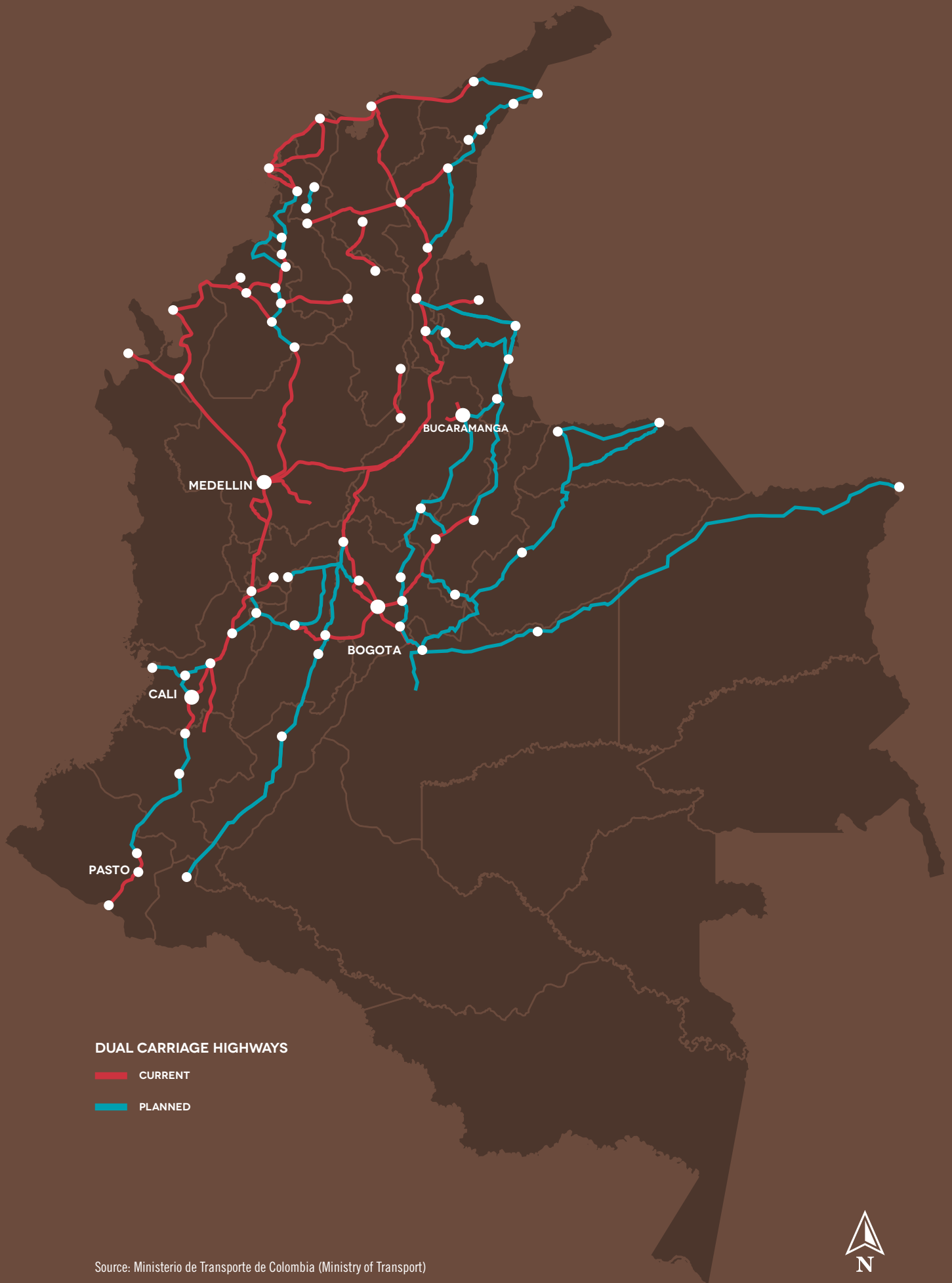


figure 45

PLANNED IMPROVEMENTS OF THE NATIONAL DUAL CARRIAGEWAY NETWORK



Source: Ministerio de Transporte de Colombia (Ministry of Transport)



figure 46: CURRENT DOÑA JUANA FACILITIES.

- **Toxic and solid waste treatment**

Since 1994, a PPP scheme is in charge of collecting and disposing the solid and biological waste. Currently a bidding process to award the fully integrated solid waste management of the city to new concessionaires is on course, but some legal and procedural issues have delayed the process.

Bogotá has issued a Solid Waste Integral Management Plan (*Plan de Manejo Integral de Residuos Sólidos* - PMIRS - acronym in Spanish) in 2006⁴⁵. While addressing the procedures for the handling of the city's solid waste, it falls short to adequately respond to others stages of solid waste management: enhancing the rate of recycling and recovery, curbing the growth of waste production, and adequately disposing toxic and dangerous materials, and construction rubble.

Also improvements for the management and treatment processes should be included in the PMIRS that would allow the city to have an effective and optimal response to prevailing solid waste problems. An example is the current scheme of levying the charge for the collection of solid waste: it rewards the operator in terms of the amount of waste disposed in the landfill but does not reward the efforts carried out by the citizens to reduce their production. This is a sub-optimal solution that creates a disincentive for the separation at the source and the recycling of solid waste. Hence, an improved scheme should be promoted by the PMIRS in which the separation and recycling processes are the ma-

ior objective of the solid waste management. This implies a change in the fee structure and, furthermore, of the overall vision of how the city is going to dispose its discarded materials.

Although Doña Juana landfill (see figure 46) has enough capacity for the medium-term, it requires some investments in order to optimise its lifetime. The increase in the landfill lifetime must be jointly accomplished by the arrangement of new disposal zones, and the improvement in separation at the source and recycling processes, thereby reducing the need for new landfills.

There are currently some mechanisms for waste conversion by "waste to energy" power generation, but these are mostly limited to Doña Juana landfill (including their biogas project). It is highly recommended to expand these waste treatment plans and projects to improve the situation.

Finally, alternative measures must be taken in terms of construction rubble disposal. The current structure of the solid waste management does not include an effective and full-scale solution for this kind of waste. This absence has turned into an acute problem⁴⁶, given that there is no regulated service and not enough discarding grounds. The service is being offered informally, and materials are discarded in public areas like parks, roads and wetlands. An appropriate scheme must be implemented, both for the collection and disposal of rubble, whether at Doña Juana or at a different disposal site.

45 Through the Decreto 312 of 2006.

46 As published by El Tiempo on 13th April 2012: (...) Construction rubble occupies sidewalks. District acknowledges it cannot control all the material (...) Bogotá produces 12 million metric tons a year of this material. Just 330.000 metric tons are gathered by UAESP [local department responsible to provide the service]. The rest is considered illegal'



figure 47: FLOOD IN BOGOTÁ AFTER HEAVY RAINS IN LATE 2011.

Source: El Tiempo.

- **Construction of a new waste water treatment plant**

In the last three decades, several sanitation alternatives have been proposed for Bogotá. By 1994, the local administration decided to adopt a strategy based on a series of treatment plants. In 2000, the first stage of one of the proposed treatment plants, the El Salitre Waste Water Treatment Plant (SW-WTP) entered into operation with little improvement to the Bogotá River water quality, as the plant has a treatment capacity of roughly 25% of the total amount of wastewater generated in Bogotá only. Hence, the Bogotá River is still among the most polluted rivers in the world. Consequently, Bogotá ranks third-worst in the city benchmark in terms of wastewater treatment.

However, the deficiency has been recognised by the municipality of Bogotá and the Colombian government. Supported by the World Bank and others, they jointly established the Rio Bogotá Project and embarked on a massive investment programme of USD 1.5 billion to improve water management and the environmental situation of the Bogotá River basin.

This plan addresses not only the river water's quality, but also flood control. Various measures shall be implemented, including the restoration of meanders, revitalisation and widening of the riparian zones by increasing the distance between the dikes, hence enlarging the floodplains, and building hydraulic connections with adjoining wetland areas.

In short: "The project aims to create a dynamic multifunctional river with ecological and recreational value, as well as reduce the risks of flooding."⁴⁷

Once this programme is completed, the water quality of the Bogotá River would be improved to Level IV (suitable for agricultural use). The risk of river borne flooding will practically be eliminated to a level of less than once in 100 years.

One of the first steps of this programme is to double the capacity of the Salitre waste water treatment plant and to upgrade the purification processes. In phase 1, the project targets the middle level of the river basin, which forms the western border of the city's landmass. To improve the water quality there, the water management upstream will be improved, the Salitre plant capacity enlarged, but the majority of Bogotá's waste water will still be rerouted by interceptors to the lower river basin.

This interim solution – a treatment of the lower river basin shall follow mid-term – might be dictated by budget constraints but clearly has to be called sub-optimal. A more forward approach towards a sustainable solution for the waste water treatment of Bogotá would be to build (at least) a second treatment plant with a capacity equal to the enlarged plant in El Salitre.

Long-term sustainability of waste water treatment, however, can only be achieved within a broader vision. A series of small measures will help extend the life of the solutions: larger green areas to improve rainwater infiltration, green rooftops that absorb water, tax incentives and land use regulation requiring the use of grey water, smaller local waste water plants and better maintenance of the current drainage network would go a long way towards increasing the system's resilience and capacity.

In addition to this, there is a need for stronger inter-institutional coordination. Many different authorities and entities from national, regional and city levels are involved in making decisions regarding investments in the Bogotá river. It is important that appropriate mechanisms are put in place such that the different stakeholders can agree on policies more easily.

47 Browder, Greg; Yee, Carmen: A Regional Strategy for the Rio Bogotá Project. Washington D.C., 2010, http://water.worldbank.org/water/sites/worldbank.org/water/files/WPPBN1_final.pdf

- **Complement the flood prevention and emergency response plan by DPAE (*Dirección de Prevención y Atención de Emergencias* - Department of prevention and emergency response)**

As a by-product of climate change, intensified by “La Niña phenomenon,” Bogotá has been experiencing extreme weather events, mostly torrential rains. As a result, storm water induced flooding has become a very frequent event within the city in the last years (Figure 47), with the intensity and frequency increasing.

The lack of a proper flood and storm water management system within the city itself is increasingly felt, and draws our attention to this area which was previously not seen as very urgent or necessarily relevant. Lack of maintenance and cleaning that re-

duces the capacity of the sewage network is one of the main contributors to this problem.

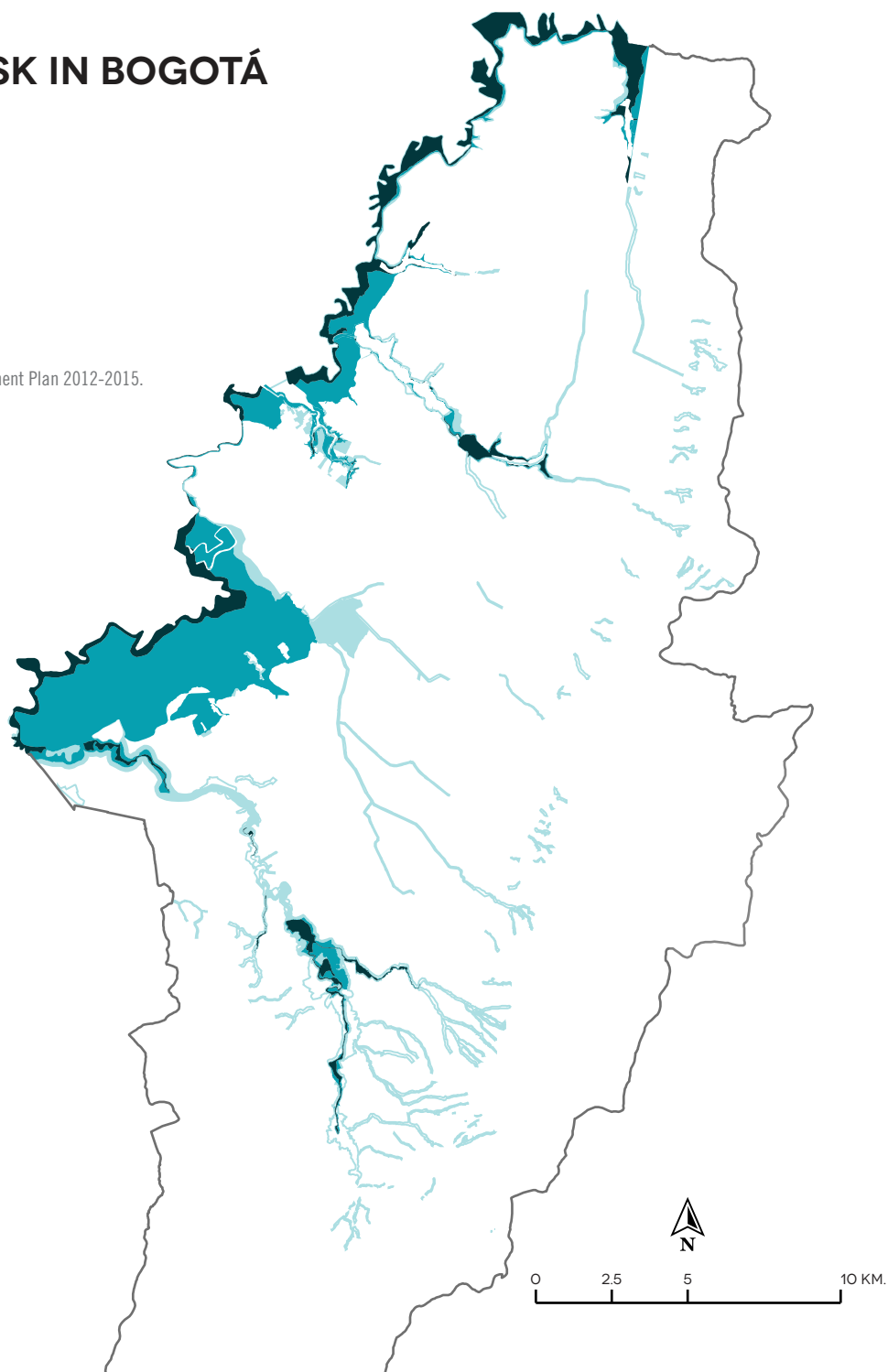
The vulnerability of the city to storm water-induced flooding is certainly increased by the phenomenon of climate change but is also due to human intervention in nature, such as the increase of impermeable surfaces in the urbanised areas preventing rain water infiltration.

As seen on the map (Figure 48), the borders of rivers are the zones that represent higher risks of floods. Since many of the houses located in these zones were informally built, much construction was never accounted for. They now represent a challenge for the municipality; it must mitigate the latent danger of these zones as much as possible.

figure 48
FLOOD RISK IN BOGOTÁ
2011

- HIGH
- MEDIUM
- LOW

Data source: Bogotá Development Plan 2012-2015.



A systematic master plan for the handling of floods that covers prevention and retention is needed. This must be complemented by a high quality emergency response plan, to be drafted and enacted for the sake of an efficient management of flood events.

Flood prevention requires the adequate maintenance of existing sewage systems, and the master plan would have to identify additional measures and investments needed to reduce flooding risks. Besides building more and larger sewers with higher storage capacity and de-coupling of waste and rain water drainage systems, increasing inner-city green space would provide for more unsealed soil and would also contribute to the liveability of the city in many other ways.

Flood retention in inner-city areas is limited to mainly two options: the construction of underground water tanks or cisterns that can take in huge quantities of water and, if possible, the development of inner-city polders at the deepest terrain sections in order to reincorporate them as natural retention areas into the discharge dynamic.

The emergency response would address the residual risks and would define the actions to be taken if floods cannot be prevented to contain their negative effects. This has to cover the responses before, during, and after a flood, and it has to provide the definitions for the related actions that are to be taken by the responsible parties such as local water authorities, rescue services, police, road administration, military forces, hydropower companies, and the like.

“Before flood” actions include regular training on flood preparedness for both rescue forces and the public, well defined responsibilities of the various parties for their cooperation and interaction, mechanisms for early flood warnings prepared to the public, and mechanisms for preparing the flood management measures themselves.

“During flood” actions include the rescue measures, such as: evacuation and rescue services, supply of food and drinking water, medical supplies, prevention of injuries and death, e.g. by electric shocks or similar issues, along with mechanisms for competent information distribution to the public through various media. A series of shelters should be available in certain risky areas for the quick and safe relocation of inhabitants of flooded areas.

“After flood” actions include the reconstruction of public buildings, support for the reconstruction of private buildings, repair of damaged flood protection facilities, and rules for the compensations for those in need (especially those who are unable to pay for flood insurance).

6.4 TRANSIT-ORIENTED DEVELOPMENT: APPLICATION TO BOGOTÁ

The main principle of transit-orientation is to concentrate metropolitan growth along public transport axes.

Stops and stations of transit systems, and their surroundings, rank among the most accessible areas of a metropolis. High density of population and jobs symbolise the centrality of these locations.

Highly dense urban areas guarantee strong and effective demand for high-capacity public transport modes. Therefore, TOD not only benefits urban development, but transit infrastructure as well (Box 11).

In addition to transport infrastructure planning, a land use strategy is crucial to achieve the TOD aim of incentivizing certain urban developments in strategic areas. It is strongly recommended that a detailed study on TOD application should be carried out for a major corridor planned for metro development or for a selected zone of Bogotá. The study should produce city-specific guidelines for TOD application.

TOD would have to be integrated with measures and suitable land management instruments that exist in Colombian law already. Bogotá has a legal framework that contains several land management instruments: a national law of 1997 (Ley 388 de 1997), and the incorporation of the instruments in the POT and other local regulations.

For new developments, there is an instrument called “partial plan”, which has to be applied to any development in urban expansion land, and to urban areas larger than 10 hectares. It guarantees articulated developments in areas that are larger than a single plot (using other strategies, such as land readjustment and associated management), and is aimed at achieving an equitable distribution of burdens and benefits from urban development (in the sense that the private developers have to finance and build themselves the needed infrastructure, green areas, public facilities and social housing units to support the building of profitable housing, commercial and industrial units). This instrument can be used to prevent the gentrification of newly revitalised areas.

For developments in consolidated areas, there is the priority development declaration from 2008, which identified empty plots in key locations that would have to be developed within 2 years. If they were not developed, they would be auctioned to build social housing units. This instrument can be used for other purposes as part of a TOD initiative: for instance, to guarantee that the land around transport infrastructure is developed in a reasonable timeframe and to avoid speculation of such land.

The land value capture (*Participación en Plusvalías*), adopted in Bogotá in 2003, is an instrument whereby every land owner who benefits from public investments or regulation changes that increase their land price (and in turn made more intensive land uses possible) has to return half of the price increase to the city in cash when a construction permit is obtained. The revenue that the city obtains from this levy should be invested in urban priorities like social housing and infrastructure.

There are other instruments that have not been widely applied in Bogotá but are included in national law and could be used for a TOD strategy: the transfer of development rights (TDR), a relatively complex instrument

BOX 11**TRANSIT-ORIENTED DEVELOPMENT**

Transit-Oriented Development (TOD) differentiates three levels of TOD centres: macro, meso, and micro. These levels shall be illustrated by examples taken from Hong Kong:

- The first level consists of new towns and satellite cities (LOHAS-Park is an excellent example),
- The second level includes major activity centres (e.g. Hong Kong Station or Kowloon Station),
- The third level consists of Mass Rapid Transit stations (e.g. Olympic on Kowloon side is one of the many possible examples).

An ideal application of the TOD principle to Greater Bogotá would cover all three levels: existing cities, e.g. Facatativá or Chía, and new towns would be macro-level TOD centres connected to Bogotá by efficient suburban railway systems. Activity centres, such as Fontibón, would represent the meso-level, and stations of the future regional, suburban, and urban railways would become micro-level TOD nodes. Each higher level TOD would be encircled by lower level TOD centres and nodes.

If these TOD principles are applied in Bogotá, the benefits would be manifold:

- Promotion of the mode shift towards public transport through optimum accessibility of the transit systems in walking distance by micro-level TOD nodes,
- Reduction of travel distances and the need for motorised trips through decentralised concentration by bundling activities in the meso-level TOD centres,
- Conversion of satellite cities and new towns into growth centres in their own right, with mixed land uses to reduce the travel needs between macro-level TOD centres and the core of the metropolitan region.

The result is less frequent and less distant travel. The beneficiaries are the people who spend less time in traffic, the economy because of reduced time losses and cost, and the environment that is less burdened by greenhouse gas emissions.

For each of the TOD centres and nodes, maximum land use densities (in terms of floor area ratios) should be defined, with highest ratios at the TOD core and ratios proportionally decreasing in concentric circles with increasing distances from the centre's core.

“to accomplish in one transaction two complementary goals: open space preservation and compact, centred development”.⁴⁸ Also, initiatives similar to Brazil's CEPACS (Certificate of additional potential of construction⁴⁹, in which the development rights in strategic locations can be commercialised in a stock exchange) could be taken into account for those areas that require important public investments and would cause significant land price increases in the surrounding areas, in order to distribute the benefits, and provide financial support for infrastructure development (Box 14).

6.5 COMMUNITY PARTICIPATION

During the decade of 1990, Bogotá's strong leadership focussed on educating its citizens along the lines of a philosophy termed “Citizen Culture”.⁵⁰ It meant that, by means of various pedagogical tools, citizens would learn to become part of their city, take care of it as their own, and have more pronounced civic behaviours to improve the liveability in the city as a whole.

A consequence of the citizen culture programme was the improvement of the participatory processes from citizens on the decisions being taken in their city, since they saw their city as something that they too should take care of.

However, a reduction in these efforts during the first decade of the new millennium led directly to a reduction in participation, citizen culture and appropriation. It reduced the sense of city ownership and civic attitudes in general, and in particular, participation in all decision making processes in the city suffered. It can be concluded that the efforts to establish a strong citizen culture were stopped too early and, hence, the programme failed to be sustainable.

Independent research has identified three different trends in citizen participation in Bogotá during 1990-2010 (Hernandez, 2010). The first is one where local and sub-local participation policies started to emerge, the second where accountability and social control became present, and the third was the presence of new social movements (mainly environmentalists but increasingly others). These three have improved processes of participation and, further, have catalysed the government's attention to citizens' role in planning the city. Civil society has started to become identified as such in a parallel process of top-down and bottom-up, one that could be nourished properly in the coming decades.

Since 2006, Bogotá has established a governmental department whose goal is to improve the participatory processes in the city: IDAPC (*Instituto Distrital de la Participación y Acción Comunal* (District Institute of

48 This definition comes from a more comprehensive description of this instrument, available from http://www.lincolninst.edu/pubs/424_Transfer-of-Development-Rights-for-Balanced-Development-

49 See http://sandroni.com.br/?page_id=310

50 A more common term would be “civic culture”, but we prefer to use “citizen culture”, the term used by Antanas Mockus.

participation and community action). Its focus is mainly on improving access to information and on equality in participation from specific groups of the population (women, afro-Colombian population, disadvantaged, sexually diverse, etc). It includes a District Information System that should serve as the main axis of information of the city.⁵¹

Because this governmental body is very new, it has yet to be consolidated and to improve its reach within the city. The need for integration of the activities of this body into all projects of the city is crucial, since citizens still lack ease of access to information and need to be better included in participatory processes.

The government policy for 2012-2015 has complemented this effort with participatory processes that have created an option of including comments in the production of the Development Plan for the city (via websites and meetings with citizens in strategic locations, plus expert meetings), and has started to establish a Participatory Budget process that is still in its early stages. The legitimacy and outcomes of these projects must be carefully evaluated, and these must be related to the efforts made between 1995 - 1998 and later during 2001 - 2003 and somewhat in the following years. Working on these issues will evidently increase Bogotá's liveability and enhance its direction towards a world-class city that strives for transparency and will achieve the Right to the City (see Fernandes and Maldonado Copello, 2009 and Maldonado Copello, 2007 for a discussion of this issue in Latin America).

In terms of the lessons that could be learned from the reduction in participatory processes in the later part of the 2000-2010 decade, the city should take them as an opportunity to reevaluate what was done during that 1990's and early 2000s and improve the system that was put in place, while adding a greater component of

participation per se in the processes of decision making in the city as has been done recently.

First of all, this sense of ownership could be improved by means of cultural activities and other programmes that specifically bolster the sense of civic duty and how citizens can contribute to the city's well-being. Further, participatory processes in general could be greatly improved. For instance, the development of informative workshops of projects that the city is developing could be transformed into workshops where citizens/participants could propose sensible modifications to what is being planned. With this modification of the participatory process, projects will be understood better by the public and will finally turn out to be "owned" by citizens.

Another possibility is to include criteria of clarity and access to information, for instance regarding municipal budgets and their disaggregation. Though some of the municipal management issues are difficult to understand, municipalities must strive to improve the clarity of that information and provide as easy access as possible, in order to improve government transparency.

Also, participatory processes could be included into the decision-making at an earlier stage, even during project development. This would significantly contribute to good governance in general. This issue is noted here since, at the time when this document is produced, the larger effort of participation has been focussed on the creation of the Development Plan for the city but not (yet) in the development of specific projects – these still only include an informative approach towards participation; actual early engagement of stakeholders from society in taking decisions of what should be done, and how it can be influenced by their views is still missing. Government could easily move forward in their participatory agenda if it would include this feature in upcoming projects.

51 IDPAC, 2012. Huellas de la participación en Bogotá 2008 – 2012. Bogotá.

CHAPTER 7
HOW TO
IMPLEMENT
THE BOGOTÁ 21
PROGRAMME

7.1 DEVELOPING THE BOGOTÁ 21 AGENDA

This report does not pretend to deliver a comprehensive master plan for the implementation of the Bogotá 21 Initiative, or to deliver an action plan or a detailed road map for a “Bogotá 21 Agenda”, especially because Bogotá has already developed enough territorial, social and economic development plans in the past few years. But these steps will need to be taken if the objective of transforming the city into a world-class metropolis shall be met, an ambition that is much larger than what is currently envisaged by the city.

The results of the Bogotá 21 Initiative should be understood as proposed general guidelines for various items, such as future land-use and transportation planning. This report outlines the principles only; the development of detailed plans and the agenda are a

task ahead that will need to be carried out by the entrusted organisations.

In the final chapters of this report, we shall address three aspects of the successful planning and implementation of the agenda:

- Key factors of success
- Steering of planning and implementation
- Options to finance the Bogotá 21 agenda

7.2 KEY FACTORS OF SUCCESS

There are four key factors of success that could either drive or jeopardize the implementation of a Bogotá 21 agenda, and equally any of the proposed actions and measures in this report. They are summarised in figure 49:

figure 49

KEY FACTORS OF SUCCESS FOR IMPLEMENTING THE BOGOTÁ 21 AGENDA

1.



STRONG POLITICAL COMMITMENT

It is indispensable and essential to achieve significant improvements in urban quality, e.g. for starting and regular updating of the detailed planning of the Bogotá 21 agenda, for the earmarking of funds, and for the enforcement of plans and laws, such as higher environmental standards.

2.



SUPPORTIVE LEGAL FRAMEWORK

It is self-explanatory. Higher environmental standards need to be enacted and enforcement measures defined. The promotion of travel demand management requires adequate laws, and also integrated planning for a hierarchical transit system, which needs to be supported by adequate legal provisions.

3.



COMMUNITY AND PRIVATE SECTOR PARTICIPATION

It is considered essential to ensure that both will support the measures proposed. This requires that they understand the necessities, that businesses contribute to the investments in the measures, and that all develop a positive attitude towards placing public welfare above individual benefits.

4.



STABLE FUNDING SOURCES

Such as taxes, fees, levies, and charges, have to be both productive in terms of revenue generation and reliable in terms of fund scheduling. They need to be transparent in terms of fund distribution to allow decision-makers to plan the budget availability with a high degree of certainty.

Actions are to be taken to achieve these key factors of success, with the most needed ones summarised below and addressed in the following items:

- 1. Strong political support and commitment:** Bogotá enjoyed strong political support from the national government in the past, and it is hoped that this will continue in the future as well. It will be needed also to establish the proposed regional metropolitan authority/agency.
- 2. Supportive legal framework:** Also in this regard, good cooperation of Bogotá with the national government is required, for example to achieve a good integration of TOD with the measures and land management instruments existing in Colombian law and to create a consistent legal framework for metro operation. The call on Bogotá is to take the pioneering role again, just as it did in banning 2-stroke motorcycles and promoting electric mobility.
- 3. Participation of the private sector and community:** Colombia has issued a law on public-private partnerships very recently (*Ley 1508 de 2012*). The tasks ahead are related to the promotion of this law and its strengthening on the local level, along with the revitalisation of community participation.
- 4. Stable funding sources:** During the two terms of Mayor Mockus (1995-1998 and 2001-2003), the revenues

from local taxes were improved substantially, even a voluntary tax of 10% was introduced and 65 thousand households paid it (Ruvalcaba, 2010). Further measures will be proposed in Chapter 8.

Some aspects, especially related to points 3 and 4, will be addressed in Chapters 7.3 and 8.

7.3 STEERING OF PLANNING AND IMPLEMENTATION

A suitable and efficient institutional framework is needed for the implementation of the agenda. In the case of a project of this order of magnitude, there is an obvious need for a cross-provincial implementing agency with central government participation that is guided by a high-level steering committee, to ensure plan implementation and timely completion. Some efforts have been seen in this respect in Bogotá, but firm agreements are needed to move forward.

The transport sector may serve as an example to illustrate the complexity of the prevailing planning process: Responsibility is shared between Bogotá on the municipal level and national government ministries on

the main components of a project and its investment.⁵² The coordination among municipalities is often not efficient, as there is no organisation that coordinates cross-municipal affairs.

We see the need to create a professional body at the regional level as implementing agency for the Bogotá 21 agenda. This organisation would be responsible for both planning developments, controlling the enforcement and implementation of plans. To guide this agency, a high-level Steering Committee that would kick-off and oversee the work should be established.

The responsibilities of the Steering Committee are as follows: overseeing planning and plan implementation, actively contributing to the development of the suitable legal framework and to securing the programme funding by proposing adequate legal amendments⁵³, and ensuring that the civil society is adequately involved. Hence, these responsibilities can be summarised in a single phrase: to ensure that the key factors of success are achieved.

Such a Steering Committee should be lean to be efficient, that is, consisting of not more than 20 to 30 executives, such as the Mayor of Bogotá D.C., the Governor of the state level (Cundinamarca), Mayors of the surrounding cities as well as key ministers of the central government. We believe that this committee will only

be successful if headed by one of the most empowered officials of the nation, i.e. the Mayor of Bogotá.

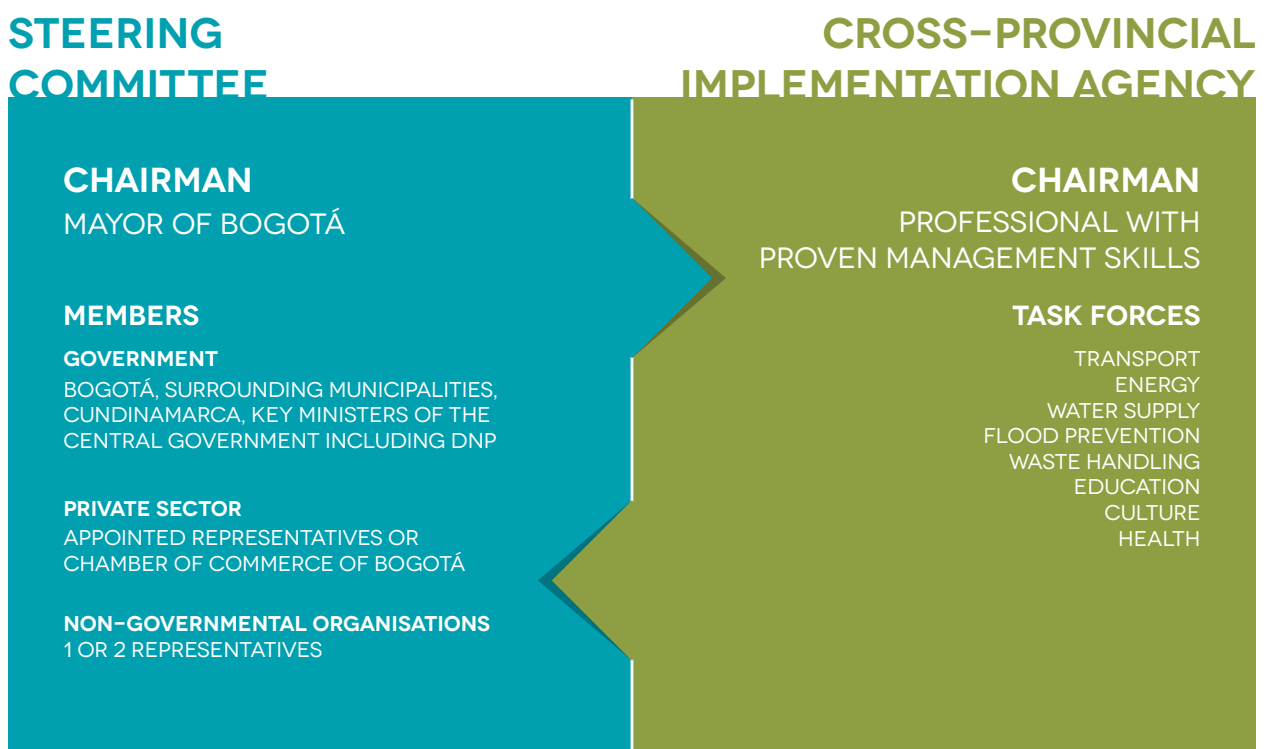
We recommend that the Chairman of the Committee appoints respected, high-profile leaders of private sector companies – alternatively the Chamber of Commerce of Bogotá - to participate on the committee, along with leaders from Non-Governmental Organisations or civic organisations. We consider this approach essential to facilitate private-sector participation in the financing, and public support in the implementation, of the Bogotá 21 agenda.

We also recommend that task forces for each sector be established at the Implementation Agency, reporting to the Steering Committee, with clear deliverables and timelines. The proposed institutional set-up, consisting of the two units mentioned, is summarised below in figure 50.

The Bogotá 21 Implementation Agency should be staffed by highly-qualified and motivated professionals in their respective fields, not only in the technical task forces, but also with regard to project management, administration, financing, accounting and the like. If this implementing agency were created, the lack of inter-municipal / regional coordination could be overcome, to the benefit of better integration of Bogotá with its hinterlands and surrounding municipalities.

figure 50

PROPOSED INSTITUTIONAL SET-UP FOR THE BOGOTÁ 21 IMPLEMENTATION



52 The executive agencies of the central government include, at least in the case of large-scale projects, the Ministry of Transport, the National Planning Department, the Ministry of Finance, and the Central Bank of Colombia.

53 e.g. starting with development of CONPES documents.

CHAPTER 8
OPTIONS TO
FINANCE THE
BOGOTÁ 21
AGENDA

This report would be incomplete without discussion of options to finance the Bogotá 21 agenda. After all, it involves a large-scale investment that must balance infrastructure supplies and the needs of the city and of Colombia. These needs might be beyond question, but the funding is not.

In the following section, we attempt to assess the productivity of selected funding sources. Note should be taken that many other options are not considered (to mention a few within the transport sector: vehicle registration taxes, vehicle ownership taxes, emissions fees, parking charges, fuel taxes, etc.).

Note should be taken also that the calculations below are to be considered assessments. All figures are in constant prices (2012), neither considering inflation nor economic growth.⁵⁴ It should be read as a brief summary of financing options, not at all as a financing plan.

We have clustered the investment needs for the Bogotá 21 optimised scenario to identify the share that the public sector needs to bear. We estimated that this share will be around 72% for the overall investment, with the remaining 28% being borne by the private sector or directly paid for by the citizens through levies or fees.

An overall amount of USD 452 billion will be needed until 2050, to finance the measures included in the optimised investment scenario. The burden covered by the public sector would be on the order of USD 326 billion, about USD 8.6 billion per annual average, equivalent to 3.0% of Colombia's present national GDP.

For Bogotá alone, 69% of this overall amount, or USD 311 billion, are needed to finance the measures within the boundaries of the city itself. This amount corresponds to a yearly average investment (including maintenance and repair) of USD 8.2 billion or to 2.9% of the present national GDP of Colombia (see Table 2, optimised investment scenario).

TABLE 2

INVESTMENT NEEDS FOR THE BOGOTÁ 21 IMPLEMENTATION PROGRAMME WITHIN BOGOTÁ D.C.

Funding Needs and Split by Source	Trend-projected investment scenario				Optimised investment scenario			
	Funding Needs (Bill. USD)	Annual Funding Needs (Bill. USD)	Annual Funding Needs (% GDP)	Assumption 80% of needs are funded	Funding Needs (Bill. USD)	Annual Funding Needs (Bill. USD)	Annual Funding Needs (% GDP)	Additional Annual Funding Needs
Total	285	7.5	2.6		311	8.2	2.9	
Public sector	200	5.3	1.8	4.2 Bill. USD, 1,5% of GDP	224	5.9	2.1	1.7 Bill. USD, 0,6% of GDP
Non-Public sector	85	2.2	0.8		87	2.3	0.8	

⁵⁴ The assessment of investment cost is based on current prices in 2012, which are kept constant until 2050. By the time when the investment will be carried out, prices might be higher due to inflation (e.g., an investment costing 100 in 2012 might cost 130 in 2020). At the same time, the investment might be a lesser burden to the budget of the city and the nation in 2020, due to the fast economic growth of Colombia, and the expected growth of tax revenues. These impacts of inflation and economic growth are not considered in the calculations below.

If the necessary public investments for Bogotá incorporated in the trend-based investment scenario were completely secured, this would equal some 1.8% of Colombia's national GDP to be sourced from public funds annually. A gap of further 0.3% of the national GDP would require additional public funding for financing the proposed measures of the optimised investment scenario for Bogotá (the difference between 2.1% and 1.8%).

However, we believe that the assumption of completely secured financing of the trend-based investment scenario is overly optimistic. Therefore, we have followed a more conservative approach, assuming that only 80% of the investment incorporated in the trend-based forecast is thoroughly secured (twice the difference between Bogotá's planned investments and disbursed investment budgets in the past).

In this case, the need for the additional public funding would rise from 0.3% of GDP to around 0.6% (the difference between 2.1% and 1.5%). This corresponds to a total need for additional public funds of 1.7 billion USD annually until 2050 (the difference between USD 5.9 and 4.2 billion), tantamount to around USD 65 billion in total.

To assess the amount of funding to be generated by Bogotá, we assumed further that the national government's contribution to the capital's investment funding will be maintained in the future as well. At present (2012 budget plan), the national government contributes about 43% to these investments.⁵⁵ If this support is continued, the remaining funds to be generated within Bogotá itself are reduced to 1.0 billion USD annually.

We believe that generation of these additional funds should be based on the principle that the beneficiaries of the proposed improvements should pay for them by passing on a share of their benefits to a fund that we have called the "Bogotá 21 Fund". And we believe that the generation of this fund should be shared between the city and the nation. Fund-raising should be shared in the same proportion as the benefits are shared as well. Bogotá should only be in charge of raising the funds for investment that directly flow into the city. Colombia should be responsible for the investment that is spread across the nation.

Hence, measures are needed to generate additional USD 1.0 billion annually within the city of Bogotá for the implementation of the Bogotá 21 agenda. Even though this amount appears to be high at first sight, it is by no means undoable. This is shown below.

Among beneficiaries in Bogotá, we propose to target two groups to generate the funds: first, the beneficiaries of the added value of land along the new transportation infrastructure (Box 12) and, second, the beneficiaries of the de-congested metropolitan road network, which is brought about by better mass transit in the city. We took Bangkok as an example to assess the first model. On average, land prices along the Bangkok Transit System (BTS) have more than doubled in the first 10 years following the opening of the BTS (width of corridor: 350 m to either side of the alignment). In comparison, land prices in Bangkok have generally increased by only 34% over the same period of time. The excess increase in land prices along the BTS Sukhumvit line, around two-thirds of the total increment, has been generated by the new transportation infrastructure, due to better accessibility of building plots.⁵⁶

BOX 12

INTERNALISING EXTERNALITIES

A limited number of players, mostly conglomerates, usually dominate the property development business in megacities like Bogotá. Their businesses are largely diversified to service their property developments by supply chains for building materials, construction companies, and financing, and the like, and also by facilitating a broad range of supplies within, such as health care, education, retailing, even telecommunications (Rimmer, Dick, 2009, p. 197). By these up- and back-wards diversifications, the conglomerates are able to internalise the externalities of the developments. This comes on top of capturing the betterment value of the land they develop; with the appreciation of this value increasing the most as the government invests in the accessibility of the development sites.

Up- and backwards diversification is part of the conglomerates' business model and, as such, they also take the related risks. However, the monopolised capture of betterment values is not only unfair to those who have to relocate for land clearance, but also to government, which spends for accessibility. Mechanisms for refunding government spending are needed, either through accessibility-related betterment levies (existing in Bogotá already), or through the taxation of land based on real values, or through an adjustment of the development model by buying the land first, improving the accessibility as investment, and then selling it to the developers thereafter at a higher price (the Hong Kong model, implemented by MTRC, the Mass Transit Railway Corporation).

55 In 2012, Bogotá's budget plan includes investments of around 5.3 billion USD, of which 3.0 billion USD are financed by the city and the remaining amount (2.3 billion or 43% of the total) by national transfers.

56 Rodriguez and Mojica tried to assess the land value impacts of Transmilenio lines in Bogotá, concluding that a clear functional dependency of land values from accessibility is impossible to verify. Nevertheless, significant value increase could be observed in Bogotá as well. Rodriguez, Daniel A.; Mojica, Carlos H.: Land Value Impacts of Bus – The Case of Bogotá's Transmilenio, Lincoln Institute of Land Policy, Cambridge MA (2008).

To assess the net effect on possible tax revenues if the added land value could be levied, we assumed that the same surplus growth of land prices would occur along mass rapid transit routes in Bogotá as well. Taking the high capacity transit network of metro and suburban rail systems as proposed in Chapter 6.3 as an example, we assumed that 101 stations of the urban and suburban systems (average station spacing urban mass transit network: 1.0 km, suburban transit network 2.5 km) would be built until 2050, with 94 of them located in the urbanised area of Bogotá D.C. and 7 in the metropolitan region.

We also assumed that 50% of the value increase of this land would be levied by the existing instrument called

Participación en Plusvalía (Land Value Capture; see Chapter 6.4). Given these assumptions, the resulting annual tax revenue would amount to 0.51 billion USD, which would be generated by the investment into the urban and suburban railway. Around 88% of it, or 0.45 billion USD, would be generated in Bogotá's urbanised area and the remaining part in the region. These tax revenues would even surpass the investments in the urban and suburban railway lines.

And the assessment above, based on the Bangkok experience, is only one way to capture the value increase of land and property. A second example draws on the experience from Hong Kong (Box 13), while a third can be taken from the Sao Paulo experience (Box 14).

BOX 13

CAPTURE OF LAND VALUE INCREASE IN HONG KONG

Hong Kong applies the most efficient method to capture land value increments generated by accessibility gains through mass transit. The method is called "Railway + Property" (R+P).

MTRC enjoys the privilege of a "right of first refusal" to buy state-owned land along a planned railway alignment. If MTRC buys land it does so at "Greenfield – No Railway" prices. While constructing the railway infrastructure, it auctions parts, or all, of the building site in the vicinity of stations to private developers, hence earning an early return.

The land prices achieved in these auctions are in general significantly higher than the ones which were paid by MTRC before, anticipating the expected high returns of the developers resulting from the future excellent accessibility of the plots.

The figure below shows one example which was developed by MTRC following this method: the area on top of the Hong Kong Station (terminus of the airport express and the Tung Chung Line, see framed part of the Hong Kong skyline).

The R+P method was applied to around 50% of the MTRC stations with impressive returns. Even as the financial results from railway operation dived in negative territory in the first half of the first decade of the 21st century (opening of the Tseung Kwan and Tung Chung Lines, connecting not yet developed TOD areas to the CBD), MTRC remained a highly profitable company due to property development and ownership.

Starting in 2006, the railway operation itself became profitable again, as did the new railway lines. These gained higher patronage once the new TOD areas were close to completion and people and businesses started to move in. Hence, TOD makes MTRC earn profits twice: from the property sales first, and from the railway operations later. In the past 3 years, the largest share of profit was generated by the operation of the mass transit railway system.

Between 2001 and 2010, average profit from the property line of business was 5 billion HKD (equals around 640 million USD) annually, with a peak in 2007 when



TOD at Central (Hong Kong Island): International Finance Centre II to the Four Seasons Hotel (see white frame).

BOX 13 CONT.

CAPTURE OF LAND VALUE INCREASE IN HONG KONG

8.3 billion HKD profit was earned. The profit generated from property ownership and management has been constantly impressive since 2001 (see figure below).

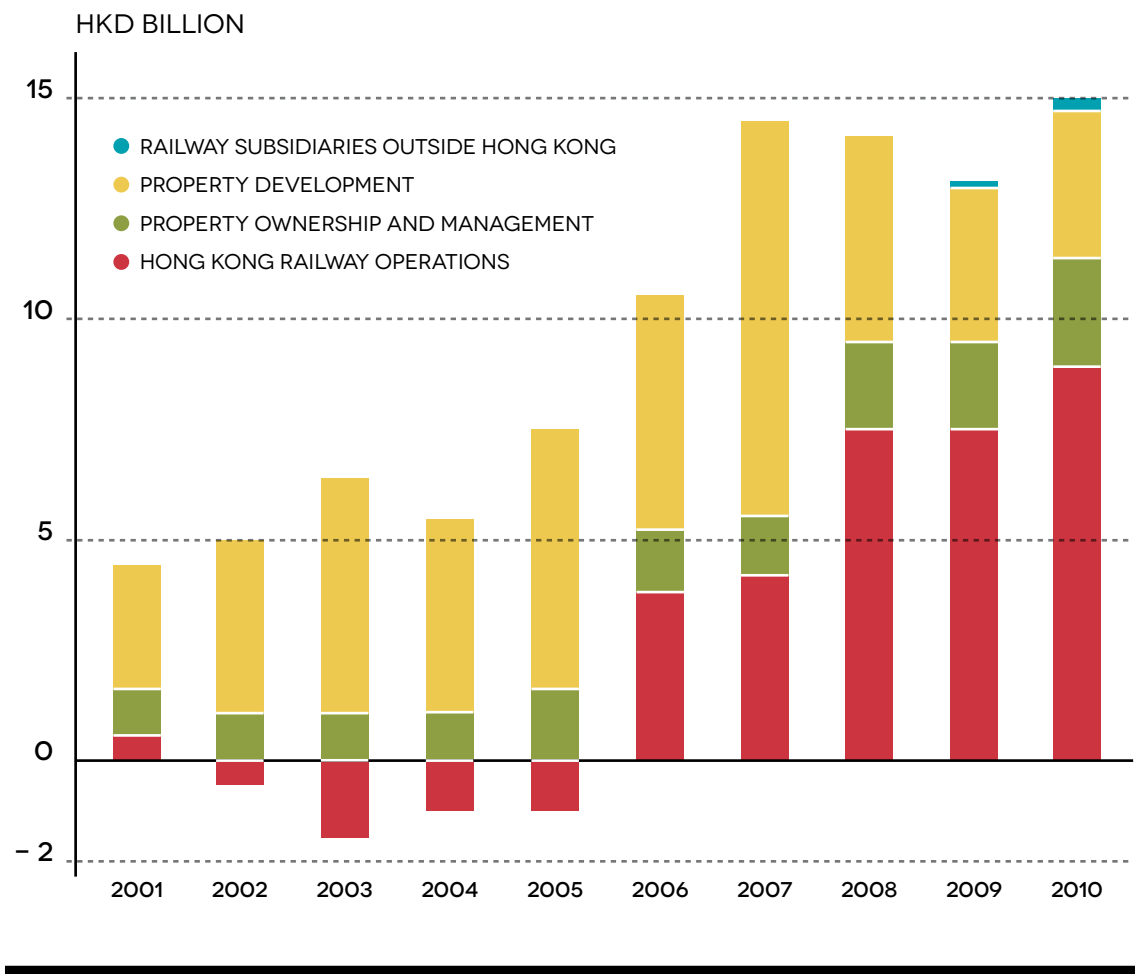
MTRC is financially self-sustained. It neither needs capital investment nor loan backing from government nor operational subsidies. All railway development in Hong Kong (except the far distance high speed railway line connecting to mainland China built entirely underground) is carried out without any government funding.

MTRC's financial soundness allows the company to even globalise its railway operating business. By today, MTRC is operating railway lines in London through its subsidiary company LOROL (London Overground Rail Operation Limited), a joint venture with Deutsche Bahn (German Railways), Newcastle

upon Tyne (1 Metro Line), Stockholm (the entire Metro network), Melbourne (the entire metropolitan rail network), Shenzhen, and Beijing. Since 2010, the international business started to generate profit as well.

The lessons to be learned are: Hong Kong and MTRC are excellent examples for a successful application of transit-oriented development through the R+P scheme. If a similar scheme had been applied with the Bangkok Transit System (BTS), the two existing lines would have earned enough money for BTS to build two more lines within 10 years of the start of revenue operation of the first lines.

In conclusion, with the right mechanisms in place, the problem to be solved is the financing of the first and maybe the second line. The later lines can be financed from the property development profits of the first and the second.



BOX 14**LAND MARKET INSTRUMENTS IN SAO PAULO**

During the last three decades, Sao Paulo, the largest South American metropolis, has experienced a meaningful economic growth derived from its efforts to create appropriate conditions to attract international investment and host corporate headquarters of multinational corporations. Such transformations have been driven by its ambition to become an important node in the world economic system.

Particularly, Sao Paulo has witnessed important land market competition and physical modification of its real-estate stock, focusing on the office market. To support this transformation, the city has adjusted its land-use regulation framework and has implemented innovative land value capture mechanisms (Bernardes da Silva & Castillo, 2007). Most of these mechanisms aim to recover capital gains produced by improvements of transport infrastructure and changes on building intensity. For instance, the mechanism of “Charges for Additional Building Rights” (*Outorga Onerosa do Direito de Construir*) was introduced establishing minimum, basic and maximum land use coefficients (Sandroni, 2011).

This mechanism has been positively perceived by real estate promoters, and they have put pressure on local urban planning authorities to increase building limits in certain areas of the city. All of the revenues from this charge are used to fund infrastructure. Between 2002 and 2008, around 325 million USD were collected resulting in an annual average revenue of USD 54 million. These revenues were invested in roads, parks, sidewalks and urban facilities (Sandroni, 2011).

Urban regulation has defined some areas where Urban Interventions can be developed in public private partnership (PPP). In order to capture capital gains from these interventions, the Prefeitura de Sao Paulo issues Certificates of Additional Construction Potential. (CEPAC by its acronym in Portuguese). These new building rights are priced through auctioning the CEPACs. It is updated monthly by the *Secretaria Municipal de Finanças de Sao Paulo* and can be traded in while they are associated to a lot located in the urban intervention zone. Revenues obtained in such a way are re-invested in the same area. From 2004 to 2009, revenues of USD 400 million were obtained in several auctions, resulting in an average annual revenue of USD 80 million (Sandroni, 2011).

We believe that the beneficiaries of the de-congestion of the metropolitan road network should also contribute to the Bogotá 21 Fund. A reasonable method would be to levy a road user charge⁵⁷ for private cars and motorcycles travelling within the extended city centre. This charge would be paid when entering the so-called restricted zone. London, Oslo, Singapore, and many other cities worldwide have successfully introduced similar schemes.

The revenue largely depends on the size of the restricted zone, the road charge levied⁵⁸, and the technology-dependent cost of operation and maintenance.⁵⁹

The scheme that is proposed here is composed of two stages: first in the “classic” extended city centre, and then in the current proposal of the extended city centre as per Bogotá’s Development Plan 2012-2016. These are shown in figure 51 with their respective borders.⁶⁰

57 We call it “de-congestion pricing system” (instead of “congestion” pricing) because the levy is charged to reduce congestion and to pay for the investments needed for the betterment of the urban environment of Bogotá and of the urban life within the city.

58 London charges a daily fee for the entry to the restricted zone which amounts to 10 pounds, around USD 15 per day. As the GDP/capita in London is six-times higher than in Bogotá, an initial fee of 1 USD, progressively increasing to 2.50 USD could be considered adequate. Correspondingly, these fees were applied in the revenue calculation.

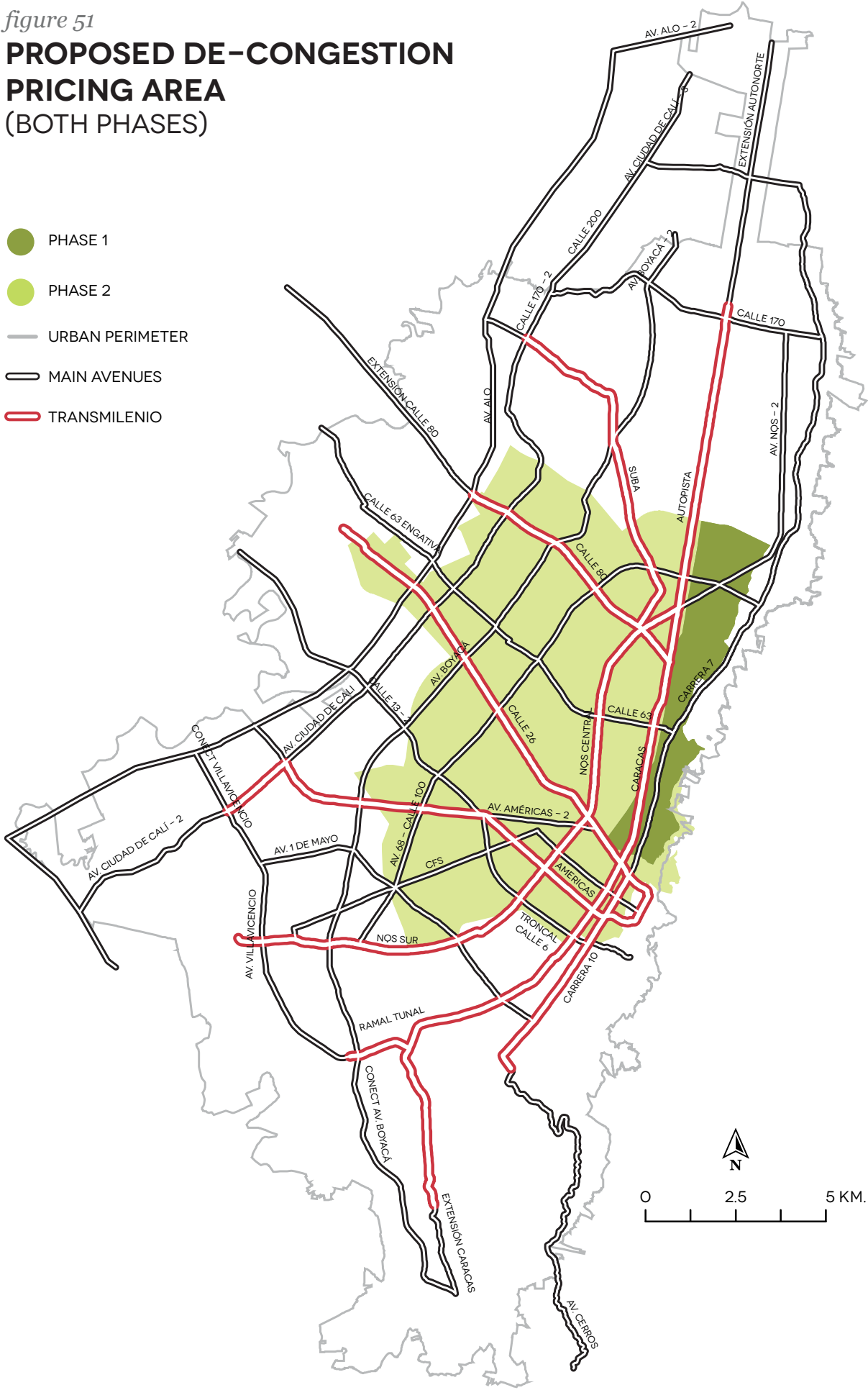
59 Details about the revenues and the cost of operation and maintenance (O+M) of existing applications are difficult to obtain. The very modern GPS-based system installed on German motorways (toll system for trucks only) generated revenues of 5.4 Bill USD in 2011. The system is operated and maintained by Toll Collect, a private company. Toll Collect operates at a profit. It withholds one-third of the revenues collected (in accordance with the concession contract). Hence, 33% of the revenues were deducted for system O+M.

60 In the case of Bogotá, the first stage (“classic extended centre”) has an area of 14 km². The second stage (extended centre as defined in the new development plan) has a size of 114 km².

figure 51

PROPOSED DE-CONGESTION PRICING AREA (BOTH PHASES)

- PHASE 1
- PHASE 2
- URBAN PERIMETER
- MAIN AVENUES
- TRANSMILENIO



The first stage (within the “classic” extended city centre), would work as follows: approximately a total of 180,000 cars per day enter this area. If, as supposed, the de-congestion charge reduces this daily demand by 15%, the annual revenues would reach 44.4 million USD when considering a 1.0 USD fare.

The transition to the second stage (within the newly proposed extended city centre) follows the implementation of adequate mass transit coverage in the area. It is characterised by a larger zone of operation, a higher fee (2.50 USD), and a stronger impact on demand reduction due to the higher charge. At an assumed daily amount of private trips into this area of 1,000,000 today (assumed to be reduced by 20% due to the expensive de-congestion pricing), an annual surplus revenue of 0.44 billion USD appears realistic.

About 0.9 billion USD could be generated by Bogotá annually through these two measures alone, once the de-congestion pricing system is fully established. Correspondingly, the remaining amount needed for financing the required additional funds is reduced to USD 0.1 billion. This amount should be generated by a tax that flows into the coffers of the national tax revenue to cover also the additional funding needs on the side of the national government of Colombia.

To meet this objective, a more general approach has to be followed as no specific benefit can be attributed to certain groups of Colombian citizens or individuals. This is consistent with the nature of the task ahead. The development of Colombia’s infrastructure has to be considered a national project that brings about a huge economic benefit to each and every citizen.

For example, everyone would benefit if logistics costs would decrease due to better infrastructure, resulting in lower prices for all kinds of commodities. A share of these savings should be captured by a tax to finance the required infrastructure improvements. The tax amount should be balanced to generate the required amount, but still leave a fair share of the benefits with logistics companies and the people.

One way to achieve such a capture is to increase the value-added tax (VAT). The VAT is a general sales tax, easy to assign and collect. This VAT increase could be compared to the so-called “solidarity tax”, introduced in Germany in 1990, after the unification of the nation.⁶¹ In case this is pursued, a strong commitment from the National Government should be sought and achieved.

With a VAT increase by 1.0%, additional national tax revenue of USD 1.0 billion would be generated. It is estimated that the citizens and businesses of Bogotá would contribute around 29% or USD 0.29 billion to the additional VAT revenue as most of the nation’s large corporations are headquartered in the capital. The national government would have to refund at least a part of the Bogotá-share of this additional VAT revenue to the revenue department of Bogotá, from where it would flow into the Bogotá 21 Fund to cover the 0.1 billion USD that would remain even after introduction of land value increment taxation and de-congestion pricing.

Table 3 provides an overview of the three discussed funding sources.

In total, almost 2.0 billion USD would be generated per year, well above the overall increase of financing needs (from 10.6 to 11.9 billion USD).

Fund Contributor	Potential Funding Sources	Annual Revenues (Bill. USD)	Bogota’s Share of Fund Generation (%)	Bogota’s Contribution to the Fund
Bogotá	Tax on added land value	0.51	88	0.45
	De-congestion pricing	0.44	100	0.44
Colombia	Increase of VAT by 1%	1.0	29	0.29
Total		1.95		1.18

61 This special tax was levied as a surplus tax on individual and corporate income taxes. The return of the income taxes is increased by the tax rate, which was initially fixed at 7.5% in 1991 and gradually decreased to 5.5% today. The purpose for the introduction of the tax was to upgrade the insufficient infrastructure in the eastern part of Germany.

CHAPTER 9
CONCLUSIONS

Bogotá has planning tools that have contributed to a significant improvement of the quality of life of its inhabitants and to promote economic growth. The Land Use Plan (POT) and its different master plans that complement it in mobility, solid waste, public space, water and sewage have contributed to a sustainable urban development. Projects and strategies presented in this book take this as a basis and propose a vision that is complementary to the aspiration of Bogotá to be a world-class city.

In order to materialize such an ambition, the vision stated here promotes a model of a city that is dense and of good quality, in line with what is stated in its POT, providing citizens with sufficient and adequate green and public spaces. Additionally, it proposes the development of a competitive region that integrates surrounding urban centres into a polycentric model. Thus, one of the main challenges of the inevitable reduction of space within the Capital District is the creation of a metropolitan institutionality that plans regional development, coordinates and regulates it.

The desired growth model was formulated taking as a basis the concept of transit oriented development, which in essence aims at developing dense urban areas along mass transit corridors. To support this future scenario a hierarchical transport network is needed, which must be expanded according to the evolution of demand, in such a way that public transport becomes an efficient, safe and comfortable alternative to the use of the automobile. By the year 2050, the urban mass transit network must have 82 kilometres of high capacity, 162 kilometres of medium capacity, and at

the metropolitan level 47 kilometres of medium capacity corridors.

Along the same lines, a concrete vision of a transit oriented city demands a series of measures of traffic and travel demand management, supported by intelligent traffic technologies. In other sectors, it is necessary to develop projects such as the recovery of the Bogotá River, the management of solid waste and the prevention of flooding among others that will contribute to improve environmental quality and reduce vulnerability.

Finally, the ambitious transformations proposed here require significant investment efforts. In comparison to the trend scenario, based on current plans of the city, an increase of about 10% of the budget is needed, that is 26 billion US dollars until 2050. New sources of financing are to be explored, such as internalisation of externalities through congestion charging schemes and capturing land value increments resulting from public investment in infrastructure. This will contribute importantly to the generation of necessary resources to achieve the ambitious goal proposed here.

In light of the new funding sources, a 10% increase of the annual investment shouldn't be beyond reach. Hence, the new focus of the future investment budget planning of Bogotá is proposed to be shifted towards portfolio optimisation instead of budget increase. With an optimised portfolio in place, it is indeed possible for Bogotá to be a promising candidate for the honourable title of "Capital of the 21st Century." It is not a dream. It is an *option*.

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ABBREVIATIONS

AFC	Automatic Fare Collection	MRT	Mass Rapid Transit (Metro)
BISY	Bicycle Integrated System	MRTA	Mass Rapid Transit Authority of Thailand
BMZ	German Federal Ministry for Economic Cooperation and Development	MTRC	Mass Transit Railway Corporation (of Hong Kong)
BRT	Bus Rapid Transit	MURA	Macroproyecto Urbano Regional del Área de Influencia del Aeropuerto El Dorado (Regional urban macro-project of the airport influence area)
BMCL	Bangkok Metro Public Company Limited	NMT	Non-Motorised Transport
BTS	Bangkok Transit System	OECD	Organisation for Economic Co-operation and Development
CBD	Central Business District	PM	Particulate material
CATAM	Comando Aéreo de Transporte Militar (Military transport air Command)	PMM	Plan Maestro de Movilidad (Mobility Master Plan)
CEPACS	Certificate of additional potential of construction	PMIRS	Plan de Manejo Integral de Residuos Sólidos (Solid waste integral management plan)
CEPAL	Comisión Económica para América Latina y el Caribe (Economic Commission for Latin America –ECLA-)	POT	Plan de Ordenamiento Territorial (Land Use Plan)
CO₂	Carbon Dioxide	PPHPD	Passengers per hour per direction
COP	Colombian Pesos	PPP	Public-Private Partnership
CONPES	Consejo Nacional de Política Económica y Social (National Council on Economic and Social Policy)	PTA	Public Transport Authority
CORABASTOS	Corporación de Abastos de Bogotá S.A (Supplies Corporation of Bogotá)	R+P	Regulation and Planning
D.C.	Distrito Capital (Capital District)	SA	Sociedad Anónima
DANE	Departamento Administrativo Nacional de Estadísticas (National Administrative Department of Statistics)	SDP	Secretaría Distrital de Planeación (District Department of Planning)
DOT	Development-Oriented Transit	SITP	Sistema Integrado de Transporte Público (Integrated Public Transport System)
DNP	Departamento Nacional de Planeación (National Planning Department)	SPV	Special Purpose Vehicle
DPAE	Dirección de Prevención y Atención de Emergencias (Department of prevention and emergency response)	SWOT	Strengths, Weaknesses, Opportunities, Threats
FDI	Foreign Direct Investment	SWWTP	Salitre Waste Water Treatment Plant (Planta de Tratamiento de Aguas Residuales - PTAR El Salitre)
GaWC	Globalization and World Cities	S&S	Safety and Security
GDP	Gross Domestic Product	TSA	Technical Supervisory Authority
GHG	Greenhouse gases	TDM	Travel Demand Management
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German International Cooperation / Cooperación Alemana)	TDR	Transfer of Development Rights (Transferencia de Derechos de Construcción)
HCMC	Ho Chi Minh City	TIS	Trend-projected Investment Scenario
HKD	Hong Kong Dollar	TKO	Tseung Kwan O
HSR	High Speed Railways	TOD	Transit-Oriented Development
ICONTEC	Instituto Colombiano de Normas Técnicas y Certificación (Colombian Institute for Technical Standards and Certification)	UAESP	Unidad Administrativa de Especial de Servicios Públicos (Special Administrative Unit of services)
IDPAC	Instituto Distrital de la Participación y Acción Comunal (District Institute of participation and community action)	UITP	Union International de Transporte Público (International Association of Public Transport)
IDU	Instituto de Desarrollo Urbano (Institute of Urban Development)	UN	United Nations
IT	Information Technology	USD	US Dollar
ITMS	Intelligent Traffic Management System	USP	Unique Selling Proposition
LOHAS	Life of Health and Sustainability	VAT	Value Added Tax
LOROL	London Overground Rail Operation Limited	VKT	Vehicle Kilometres Travelled
LRT	Light Rail Transit	WCED	World Commission on Environment and Development
MECE-principle	Mutually Exclusive, Collectively Exhaustive	WHO	World Health Organization
MOT	Modelo de Ocupación Territorial (Model of land occupation)	WWWTP	Waste Water Treatment Plan

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