



**THE WORLD BANK**

IBRD • IDA | WORLD BANK GROUP

**USING TRANSIT-ORIENTED  
DEVELOPMENT INTERVENTIONS TO  
SUPPORT SUSTAINABLE TERRITORIAL  
DEVELOPMENT IN THE BOGOTÁ -  
CUNDINAMARCA REGION**

Copyright © 2020 by the International Bank for Reconstruction and Development /  
World Bank Latin America and the Caribbean Region  
1818H Street, N.W. Washington D.C. 20433, U.S.A.  
[www.worldbank.org/co](http://www.worldbank.org/co)

All rights reserved  
First English Edition: April 2020

The World Bank does not guarantee the accuracy of the data included in this work and will accept no liability arising from its use or interpretation.

The boundaries, colors, denominations and other information shown on any map in this work do not imply any judgement on the part of the World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

The results, interpretations and conclusions expressed in this report are the authors' own and cannot and should not be attributed in any form or extent to the World Bank, its affiliate institutions, its Board of Directors or the Governments they represent.

Nothing herein shall constitute or be considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

The contents of this publication are protected by intellectual property laws.

Edition: First edition  
Banco Mundial/ Designed and Printed in Bogota, Colombia / 2020



# USING TRANSIT-ORIENTED DEVELOPMENT INTERVENTIONS TO SUPPORT SUSTAINABLE TERRITORIAL DEVELOPMENT IN THE BOGOTÁ - CUNDINAMARCA REGION

Prepared by: Vanessa Velasco-Bernal (WB Urban Specialist), Felipe Targa-Rodriguez (WB Senior Transport Specialist), Andrés Francisco Baquero-Ruiz (WB Consultant), Leonardo Cañón (WB Urban Transport Specialist). With the collaboration of: Mauricio Cuellar (WB Senior Transport Specialist), Alexandra Ortiz (WB Urban Leader for LAC), Taimur Samad (WB Leader for Colombia and Venezuela of the Sustainable Development and Infrastructure Program), Horacio Terraza (Urban Lead LAC region) Ming Zhang (Practice Manager LAC Region), Camila Rodríguez (WB Senior Infrastructure Specialist), Dr. Chang Gyu Choi (WB Consultant), Natalia Valencia (WB Consultant) and Andrés Achury (WB Consultant); Preparation based on input from consultancies carried out by JFP & Asociados – Derecho Urbano, Steer Group-Colombia, and Lizette Medina (WB Consultants). With additional support and input from: Empresa Metro de Bogotá, Gobernación de Cundinamarca, Secretaría de Planeación Distrital, Empresa Férrea Regional, Alcaldía de Madrid (Cundinamarca), and Financiera de Desarrollo Nacional. Design and Layout: INGENIA Estudio de Diseño.



# ACKNOWLEDGEMENTS

The authors of this technical note, along with the World Bank's Global practice for Social, Urban, Rural and Resilience and the Global Practice for Transport, would like to thank the Korea Green Growth Trust Fund (KGGTF) for funding the studies that served as input for the preparation of this policy note, as well as for supporting and reviewing its draft versions.

They would also like to thank the officials of the Gobernación de Cundinamarca, Bogota's Secretaría Distrital de Planeación, the Alcaldía de Madrid (Cundinamarca), Empresa Metro de Bogotá S.A., Empresa Férrea Regional, Financiera de Desarrollo Nacional, ProBogotá - Región and the Inter-American Development Bank, all of whom actively participated in the technical groups to discuss TOD-based improvements to either of the analyzed transport corridors. Their participation and feedback were instrumental in the preparation of this technical note.



# GLOSSARY

## 3V Methodology

Methodology proposed by Salat and Ollivier (2017) that allows authorities or other interested parties to evaluate the TOD Characteristics of a given region from 3 value perspectives: node value, place value and market value

## BIC

Bienes de Interés Cultural: Buildings or constructions which, due to historical or cultural reasons, were conferred a protection or preservation status by the local authorities, preventing them from being demolished to make way for new developments

## BML1

Bogota First Metro Line

## EFR

Empresa Férrea Regional S.A.S – Agency created in compliance with the first element on the list of requirements set out within Article 2 of Law 310 of 1996 to implement the RegioTram de Occidente

## EMB

Empresa Metro de Bogotá S.A. – Agency created in compliance with the first element on the list of requirements set out within number 1 of Article 2 of Law 310 of 1996 to implement Bogotá's First Metro Line

## ERU

Empresa de Renovación Urbana: Agency of the government of Bogota in charge of leading and executing urban renewal efforts within Colombia's capital

## FAR

Floor – Area Ratio: ratio used on zoning laws to determine the maximum area that can be built in a given area, based on the size of the landplot

## GIS

Geographical Information Systems

## IDECA

Infraestructura de Datos Espaciales para el Distrito Capital – a Spatial Data Infrastructure Developed by Bogota's Cadastre Agency to help articulate and distribute spatial information

## ITDP

Institute for Transportation and Development Policy

## IGAC

Instituto Geográfico Agustín Codazzi: Colombia's National Agency in charge of geographical information and data

## KGGTF

Korea Green Growth Trust Fund

## LUP

Land Use Plan

## POT

Plan de Ordenamiento Territorial (Spanish language term for Land Use Plans)

## RTO

RegioTram de Occidente – The name of the Transport Project linking Bogota, Funza, Mosquera, Madrid and Facatativá

## SDDE

Bogota's Economic Development Agency

## SDP

Bogota's Planning Agency

## SMA

Seoul Metropolitan Area

## Social Housing

It is a type of dwellings that is designed, built and sold to key workers or lower income households.

## TOD

Transit-Oriented Development

## TOD Standard

Document developed by ITDP (2017) to facilitate the assessment of TOD-compliance in specific places and the identification and prioritization of TOD-Improving interventions

# TABLE OF CONTENTS

|   |           |  |           |
|---|-----------|--|-----------|
| <b>Introduction</b>   | <b>7</b>  |  |           |
| <b>Challenges for sustainable and inclusive regional development in the Bogota – Cundinamarca region</b>  | <b>9</b>  |  |           |
| •The challenge of sustainable and inclusive territorial development   | 10        |  |           |
| •The Bogota – Cundinamarca region from a TOD Perspective  | 12        |  |           |
| •Opportunities and challenges for DOT interventions in BML1 and RTO’s future corridors  | 15        |  |           |
| <b>Interventions and strategies to seize the opportunities that Bogota’s First Metro Line and the RegioTram de Occidente Mass transit systems create for regional sustainable development</b> | <b>21</b> |  |           |
| •BML1: Improving the institutional capacity and articulation as the basis for TOD strengthening or transformation   | 23        |  |           |
| ·Market, institutional and regulatory framework conditions for TOD strengthening or transformation of the BML1 corridor.  | 23        |  |           |
| ·Recommendations  | 26        |  |           |
|   |           | •Strengthening territorial insertion and urban-regional management capabilities to achieve the RTO’s potential through complementary TOD interventions | 30        |
|   |           | ·Physical, socioeconomic, institutional and regulatory conditions of the RTO corridor  | 30        |
|   |           | ·Recommendations   | 36        |
|   |           | <b>Conclusions and next steps for TOD-based regional sustainable development for the Bogota – Cundinamarca region</b>                                  | <b>39</b> |
|   |           | <b>References</b>  | <b>43</b> |

## LIST OF TABLES

|  |    |
|--|----|
| <b>Table 1</b> - General information of the BML1 and RTO projects  | 15 |
| <b>Table 2</b> - Summary of findings from TOD-based analysis of the BML1 and RTO corridors   | 22 |
| <b>Table 3</b> - Aspects to consider when defining, scoping and validating urban renewal efforts   | 24 |
| <b>Table 4</b> - Approach, scope and instruments to be used by the EMB in three areas around the stations  | 27 |
| <b>Table 5</b> - Recommended public sector institutions' participation in the Comisión Intersectorial para la Renovación Urbana en el Área de Influencia de la Primera Línea del Metro de Bogotá | 28 |
| <b>Table 6</b> - Summary of results of the use of the 3V Methodology in five RTO station locations   | 32 |
| <b>Table 7</b> - Interventions proposed by Steer for Stations 6 (Bogotá) and 15 (Madrid)   | 33 |
| <b>Table 8</b> - Summary of recommendations, pointing to entities linked to their implementation   | 42 |

## LIST OF FIGURES

|  |    |
|--|----|
| <b>Figure 1</b> - Types and priorities of TOD intervention based on the results of 3V Methodology analysis for each of its value dimensions                                      | 11 |
| <b>Figure 2</b> - Evolution of the Urban Footprint of Bogota and other Neighboring Municipalities, 1997-2016   | 12 |
| <b>Figure 3</b> - The three patterns of relationships between GDP per cápita and modal share of private transport  | 13 |
| <b>Figure 4</b> - m <sup>2</sup> per inhabitant of different types of social infrastructures in Bogotá and its surrounding municipalities  | 14 |
| <b>Figure 5</b> - Administrative boundaries, social groups and BML1 and RTO Layouts  | 16 |
| <b>Figure 6</b> - Urbanistic treatments along BML1 and RTO corridors and in Station catchment Areas  | 16 |
| <b>Figure 7</b> - Features of BML1 and RTO corridors   | 17 |
| <b>Figure 8</b> - Travel time reductions without and with BML1 and RTO for morning peak period having the commercial area of San Victorino as the destination                    | 18 |
| <b>Figure 9</b> - Employment density by urban sector or rural section across the Bogota – Cundinamarca region  | 19 |
| <b>Figure 10</b> - BML1's Calle 72 Station environment analysis  | 25 |
| <b>Figure 11</b> - BML1's NQS Station environment analysis   | 25 |
| <b>Figure 12</b> - Reference P1, P2 and P3 areas to be considered for BML1 station surroundings interventions, based on the analysis performed for the Calle 72 and NQS stations | 27 |
| <b>Figure 13</b> - Travel time savings enabled by RTO (and BML1) to multiple destinations within Bogotá during the morning peak period   | 30 |
| <b>Figure 14</b> - Images of the RTO corridor within urban areas   | 31 |
| <b>Figure 15</b> - Location of the interventions proposed for RTO's stations 6 and 15  | 34 |

## LIST OF BOXES

|   |    |
|---|----|
| <b>Box 1</b> - Without commitment and drive from Local Government, regional growth may fall onto the default type of growth which is based on low density, space intensive and automobile based developments                | 13 |
| <b>Box 2</b> - Advances in the development of an UrbanSIM agent-based land use model for the Bogota – Cundinamarca region   | 20 |
| <b>Box 3</b> - Long term TOD and LVC efforts may overcome lack of short-term commitment of autonomous local governments to consensus and coordination on sustainable regional development - Lessons from Seoul, South Korea | 35 |



# INTRODUCTION

This Technical Note seeks to inform and contribute to policymaking efforts aimed at improving the ability of mass transit or transport infrastructure projects to deliver regional sustainable development benefits. This document analyzes the region created by Bogotá and its immediately surrounding municipalities within the Cundinamarca Department from a Transit Oriented Development perspective and considers the challenges and opportunities for sustainable territorial development arising from the implementation of Bogotá's First Metro First Line (BML1) and the RegioTram de Occidente (RTO). Major transport projects are set to be implemented in Bogotá and some of its neighboring municipalities in the coming years. If complemented properly by economic, social and regional development policies they may become catalyzers and drivers for sustainable territorial development. This note acknowledges the benefits that the BML1 and the RTO will bring to their users with the reduction of travel times, but also argues that the socioeconomical and physical conditions of the region and the corridors themselves need also to be addressed to shift the development patterns towards compact, inclusive and sustainable development.

Using Transit-Oriented Development (TOD) methodologies and standards to assess specific locations in this city-region context can help to identify gaps across social, economic, physical, institutional and regulatory dimensions and to better coordinate policies and interventions. TOD methodologies and standards facilitate

that discussion and coordination by (i) providing blueprints or references of what compact, inclusive and sustainable development looks like from different perspectives, (ii) facilitating the preparation of assessments and gap-analyses that help identify where a place's weaknesses lie with respect to those blueprints or reference values and (iii) helping identify and prioritize interventions. TOD methodologies and standards also help reconcile regional and local needs and interventions. This Technical Note makes use of the World Bank's 3V Methodology and ITDP's TOD Standard to have a first look into the actions and efforts that should complement BML1 and RTO to drive and achieve sustainable territorial and community development.

The shift towards sustainable territorial development must be backed by solid and capable institutional and regulatory frameworks. The Public sector must guide, monitor and control the development or transformation efforts, and provide certain social infrastructures services, but the private sector also needs to be engaged and on board. This means establishing and maintaining monitoring and coordination schemes between public sector agencies, companies, residents and real estate developers. It also entails developing the public sector's ability to lead and steer these private sector partners into the desired developmental path. The increasing complexity of city-region systems makes it difficult for any one regional stakeholder to understand how the multiple and diverging interests of local (and foreign) stakeholders

mesh into local development trends and patterns. The New Urban Agenda has stated why compact, inclusive and sustainable territorial development is needed. The TOD approach helps identify what that development is. But it falls upon the regional stakeholders to figure out how to achieve that goal and who does what within that local environment. Public-private partnerships backed by monitoring and coordination schemes are the basis for suitable institutional and regulatory frameworks.

This Technical Note has three sections. Section one presents a brief introduction to the general conditions and challenges of sustainable territorial development for the Bogota – Cundinamarca region<sup>1</sup> from the elements and perspectives considered in TOD methodologies or standards. Section two discusses the findings from a more in-depth analysis of the surroundings of two (2) BML1 and two (2) RTO stations, and provides recommendations, actions and strategies for intervention to make these areas more compliant of TOD elements and principles. The last section summarizes the conclusions for this Technical Note and suggests some analytical and

policy paths that could be followed in search of a shared TOD-supported sustainable territorial and community development for the Bogota – Cundinamarca region.

---

<sup>1</sup>Across this document we will use the Bogota – Cundinamarca region when making reference to Bogotá and those neighboring Municipalities with which a City-Region System functionally exists. The use of this term only seeks to address the functional relationships among Bogota and these municipalities and does not seek to justify or endorse any of the regulatory work being advanced to create a formal “Bogota Metropolitan Region”.

CHALLENGES FOR  
SUSTAINABLE AND INCLUSIVE  
REGIONAL DEVELOPMENT IN  
THE BOGOTA –  
CUNDINAMARCA REGION



# THE CHALLENGE OF SUSTAINABLE AND INCLUSIVE TERRITORIAL DEVELOPMENT

Positive and negative externalities associated with the spatial distribution of social and economic activities mean that the best financial use of the territory may not coincide with its best social use. Within the positive externalities it is possible to include the agglomeration economies that contribute to the creation of (i) specialized job markets, (ii) specialized services and (iii) knowledge spillovers that benefit all the residents of the area. Among the negative externalities are congestion, pollution, high land prices, disease transmission and crime. Urban regulation or, more generally, managing the spatial distribution of social and economic activities within a city-region, should create conditions that allow positive externalities to prevail over the negative ones, thereby maintaining the economic and social viability of the urban area. Some problems that arise when financial goals prevail over social considerations in territorial development include (i) the pricing-out of some lower-income social groups or less "financially profitable" activities from major urban centers into suburbia or nearby towns,

leading to longer trips and travel times and social segregation and (ii) areas of very low-density and single-use activities that encourage the use of automobiles and other individual means of transport. Both of these conditions create many side effects that go against the sustainability or inclusiveness of a territory.

Traditionally, the approach used to manage territorial development has been one of zoning and Land Use Planning (LUP). The spatial distribution of socioeconomic activity sought through the zoning regulations is subsequently used as the basis for issuing construction licenses or for preparing and executing utility networks and social infrastructure master plans. The LUP approach to territorial development management is convenient as it is able to bring some order to accelerated urban-regional growth processes with all new constructions having to comply with the use and intensity conditions in the LUP. However some cons of the LUP approach have also been identified, including (i) without strong institutional arrangements the LUP allows but does not direct territorial development (Buitelaar, Galle, & Sorel, 2011) which means that the desired sustainable and inclusive territorial development outcome is not met, and; (ii) that its adoption through regulations allow LUPs to become tangled or lost in political discussions or administrative decisions that detract from the ideal of it being a tool to maximize the social and environmental benefits of using the land<sup>2</sup>.

Approaching territorial development through TOD methodologies or standards could facilitate identifying, prioritizing and coordinating interventions due to the holistic approach of TOD to the analysis of a given location. The World Bank published in 2017 the document "*Transforming*

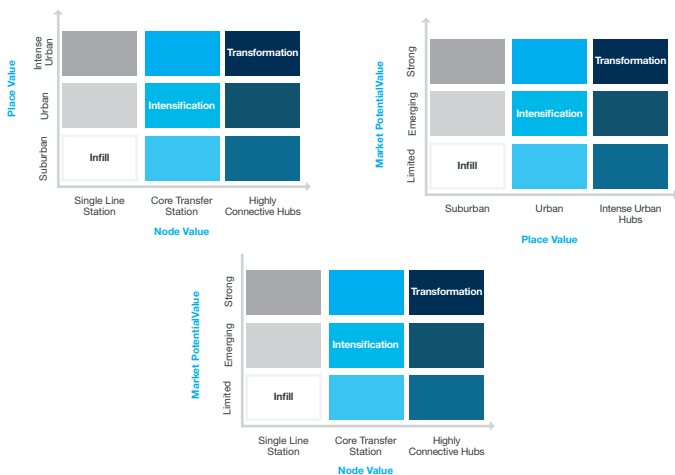
---

<sup>2</sup> Between 2017 and 2019, several inquiries and debates on "Volteo de Tierras" (land flipping) in municipalities close to Bogota and across Colombia were conducted. "Land Flipping" is the name given to a practice used by Mayors or other high-ranking local-level officials to assign more profitable uses or Floor-Area Ratios to particular land plots to benefit the owners and, according to the claims, the officials involved (Semana, 2017; Semana, 2018).

*Urban Space through Transit-Oriented Development – the 3V Approach*” (Salat & Ollivier, 2017) to guide the analysis and design of interventions for community development and sustainable territories. The 3V Methodology derives its name from the three perspectives of "value" from which the analysis should be conducted: node value, place value and market value. The node value is defined by the "centrality level" of the local node within the city-region’s transport network, transit ridership numbers, and its intermodal connectivity. Place value is defined by local permeability, mixed-use of the land and the density of social infrastructure to be considered within a radius of 800m of a reference transit station. Market value combines elements of demand such as population density in the area (regardless of activity), social conditions and transit accessibility to jobs, among others, with elements of supply related to real estate development opportunities and to the dynamics of the local real estate market as an indicator of market vitality. Data are added to obtain a score for each dimension of value and later combined through a weighted aggregate to obtain a score for the area. The values resulting from each of the three dimensions are to be subsequently classified and compared with the charts included in Figure 1 to determine which types of interventions should be pursued to make the location more TOD-compliant.

In Colombia, compact, diverse and sustainable territorial development is hampered by poor coordination between local governments (municipalities and districts) to address common issues including transport, solid waste, water and sewage systems, environment and natural resources or disaster mitigation. The Colombian legal framework allows for sustainable and coordinated territorial development through the provisions of Laws 388 / 1997 and 1454 / 2011. However, most municipalities have prioritized the “administrative autonomy” conferred to them by the Colombian Political Constitution, over the social and environmental benefits to be achieved through managed and coordinated regional development. It is not uncommon to find that municipalities within the same metropolitan area have different levels of adoption of territorial management and land value capture instruments. Adopting and developing these tools will be key towards funding the significant investments required by city-regions for housing, roads and transportation, water supply and sewage, waste management, energy, digital connectivity and urban services, and to create and maintain the institutional arrangements to plan, lead, execute and optimize these actions from a more comprehensive and holistic territorial development perspective.

Figure 1 – Types and priorities of TOD intervention based on the results of 3V Methodology analysis for each of its value dimensions

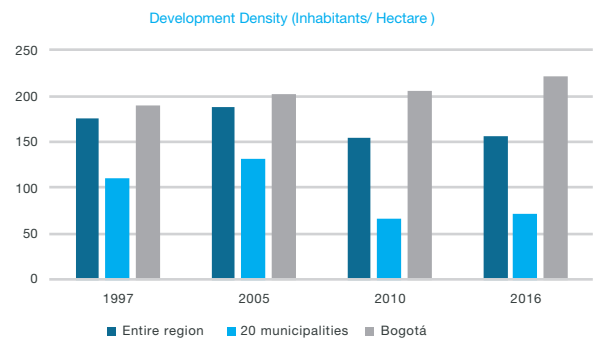
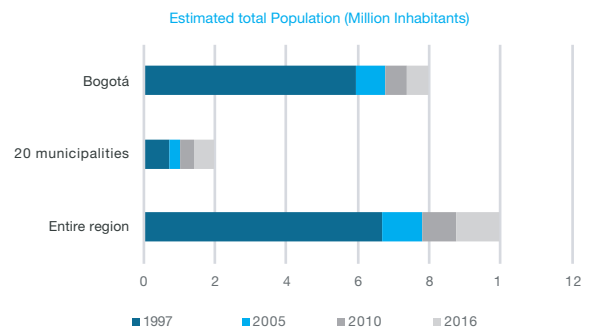
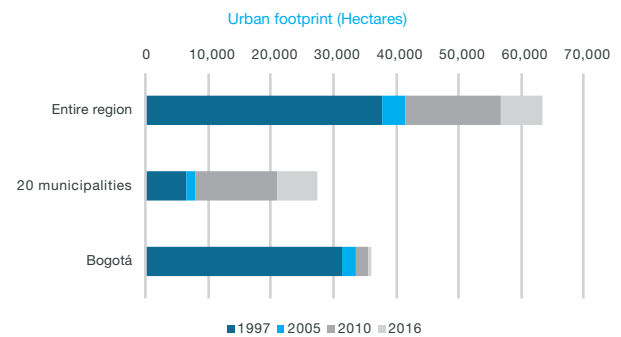
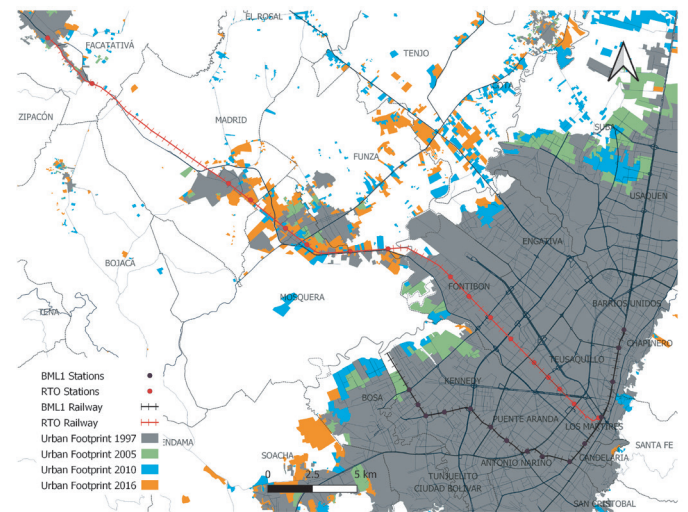


Source: Adapted from figure 2.5 in Salat and Ollivier (2017, pág. 52)

# THE BOGOTA – CUNDINAMARCA REGION FROM A TOD PERSPECTIVE

Over the last two decades, two important trends have played out in the “Sabana de Bogotá”: Bogotá has become denser, whereas suburban and rural areas have seen many low-density, gated and single-use developments cropping up, thus contributing to a drop in their average density. Between 1997 and 2016, the urban footprint of Bogotá and its 20 surrounding municipalities increased by 67.6%, leaping from 37,864 to 63,452 hectares. (IDOM, 2018a) This growth was not uniformly spread across the region: by 2016, Bogotá had circa 34% more population than in 1997, but managed to pack them in an area only 15.3% greater than the city’s urban footprint in 1997, achieving an impressive average development density of 220.8 inhabitants/hectare in 2016. In contrast, the other 20 municipalities analyzed in the study grew 318.2% in area between 1997 and 2016, but only grew in population an estimated 172.8% over that same period. Average development density in these municipalities dropped from 110.6 inhab/ha in 1997 to 72.1 inhab/ha in 2016 (Figure 2) due to many low-density developments (IDOM, 2018a) that make the region increasingly dependent on automobiles.

Figure 2 - Evolution of the Urban Footprint of Bogotá and other Neighboring Municipalities, 1997-2016



Source: Prepared and adapted by authors with input from IDOM (2018a).



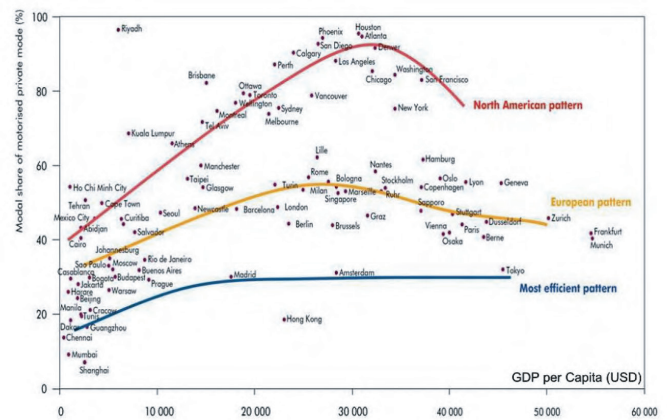
Box 1 - Without commitment and drive from Local Government, regional growth may fall onto the default type of growth which is based on low density, space intensive and automobile based developments

The Bogotá-Cundinamarca region has experienced rapid suburbanization over the last 20 years and may continue along that path if no deliberate effort is made by the local governments. A review of recent urban history confirms that without proper coordination between transit and development, and the commitment of public and private stakeholders, development may continue down the path of lower social and environmental benefit (See Figure 3). The planning and management of the region over the next few years will decide whether this area will be an automobile-oriented region like the suburbs of the United States, or be a sustainable region that has secured the use of public transportation.

It is difficult for suburban areas to become fully self-contained, as low densities are not able to support private businesses and public services as downtown areas do. The Bogotá-Cundinamarca region needs to grow more sustainably, and this necessarily involves the development of its public transportation network. Cervero (1995a) argued that constructing a new town that absorbs the rapid housing demand in the suburbs and connecting it to the existing downtown area could be an alternative approach in metropolitan areas experiencing rapid suburbanization, naming the Stockholm metropolis a ‘transit metropolis’ because commuters from the new towns have positively used railways. Stockholm, Copenhagen and Paris were able to develop new towns in metropolitan areas in the mid-20th century and link them through public transport (Hall, 2002). Self-containment in new communities in Europe is not as high as in the United States or United Kingdom, but the former’s public transportation commuting is higher than the latter’s (Cervero, 1995b).

The Seoul Metropolitan Area (SMA) can be seen assimilated to the European case above (Vongpraseuth, Seong, Shin, Kim, & Choi, 2020). The Korean government built large-scale new towns in the late 1980s in the SMA, when the region was suffering from growing housing-demand and rapid suburbanization. The Government found it difficult to achieve self-sufficiency in the new towns in suburbs and opted to connect the train network from these new towns to the center of Seoul. New towns are not likely to have jobs in the short term. This Transit and Housing (TAH) approach can be a short-term alternative to fully-self-sufficient new town idea, supplying housing in new towns and facilitating commuting into the city center. Of course, in the long term, public offices and private companies should be encouraged to move to new cities to increase self-containment.

Figure 3 - The three patterns of relationships between GDP per capita and modal share of private transport



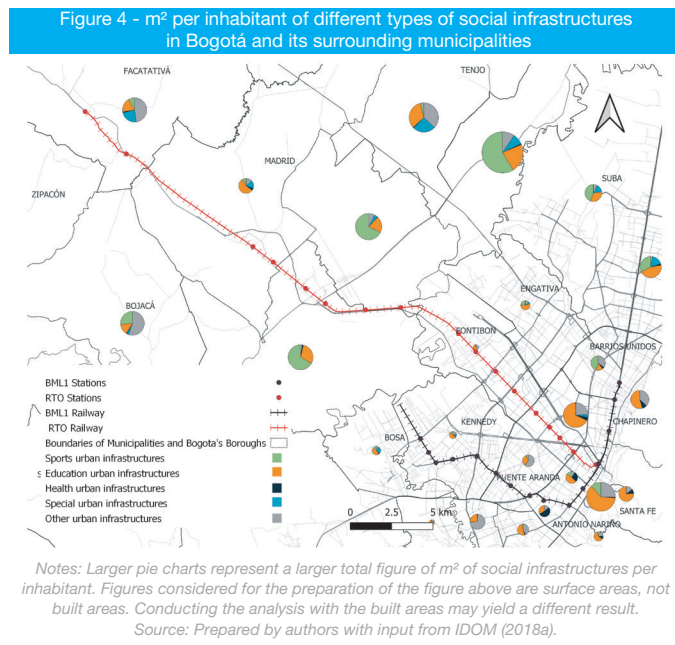
Source: Figure 3.6 from UNEP - Riso Centre on Energy, Climate and Sustainable Development (2011)

Economic activities and social groups in the Bogotá-Cundinamarca region are unevenly distributed. Higher-income groups are located to the north of Bogotá and in the municipalities to the north-east of Colombia’s capital. Middle-income groups cluster in the western areas of Bogotá and in the municipalities located to the west of Bogotá. Low-income groups concentrate in southern areas and in the municipalities to the south of Bogotá. Industrial activities that traditionally clustered in the Puente Aranda or Fontibon Boroughs, have found new homes in industrial parks and locations that emerged outside Bogotá after 2005, close to main national or regional roads in the Municipalities of Tenjo, Cota, Funza, Madrid and Mosquera to the west of Bogotá and in the northern municipality of Tocancipá.

The distribution of social infrastructures is also heterogeneous across the region. This imbalance becomes more apparent if social infrastructures offerings are considered using a normalized scale of area per inhabitant of the Borough (within Bogotá) or the Municipality (if outside of Bogotá). On that per head basis, Bogotá’s most populated Boroughs, such as Engativá, Fontibón, Kennedy, Ciudad Bolívar or Usme, have a reduced supply of social infrastructures when compared to other Boroughs or Municipalities in the same region with smaller populations. The analysis also highlights an uneven distribution

in the provision of social infrastructures across the region: Boroughs within Bogotá have proportionally larger shares of educational infrastructures than the other municipalities in the region. Health infrastructures are also clustered in just a few areas of the regions, mostly within Bogotá. Municipalities surrounding the capital with comparatively larger green areas concentrate most of the area available for sports activities (Figure 4).

Business District and the Municipalities' urban cores in terms of formal job demand and social infrastructures, resulting from their unavailability in the region's secondary urban centers or due to accessibility restrictions. BML1, RTO and other upcoming regional transit projects that should start serving the region in the next few years constitute a unique opportunity to introduce and roll out new, sustainable territorial management arrangements.



If the Bogota – Cundinamarca region were to seek to improve compliance of TOD recommendations, extensive efforts of mixing uses, mixing social groups and providing social infrastructures would be required across the region. The proposed layouts for Bogotá’s First Metro Line (BML1) and the RegioTram de Occidente (RTO) could be leveraged as means to “virtually” reduce these territorial disparities by improving regional accessibility and connectivity for uses, social groups and social infrastructures. The Bogota – Cundinamarca region has shortcomings in mixed-use or mixed-income group developments and in the distribution of social infrastructures. But perhaps the aspect in which the region is still lagging vis-à-vis sustainable territorial development lies in the significant differences between Bogotá’s Central

# OPPORTUNITIES AND CHALLENGES FOR DOT INTERVENTIONS IN BML1 AND RTO'S FUTURE CORRIDORS

The BML1 corridor is wholly contained within the urban perimeter of Bogotá, making the BML1 more urban than regional. The RTO combines a regional operation connecting the municipalities of Funza, Mosquera, Madrid and Facatativá with Bogota, with an urban service connecting the periphery of Bogotá with the central area<sup>3</sup>. Some general information about BML1 and RTO's characteristics and delivery scheme are presented

in [Table 1](#). Considering a catchment area of 800m, the BML1 can be said to serve communities in 10 out of the 20 Bogota Boroughs<sup>4</sup> and in most income groups. The RTO serves four Bogota Boroughs before crossing the Bogota River into the Cundinamarca department and the Municipality of Funza, continuing on towards Mosquera, Madrid and Facatativá, along a corridor that is populated mostly by low- and middle-income groups.

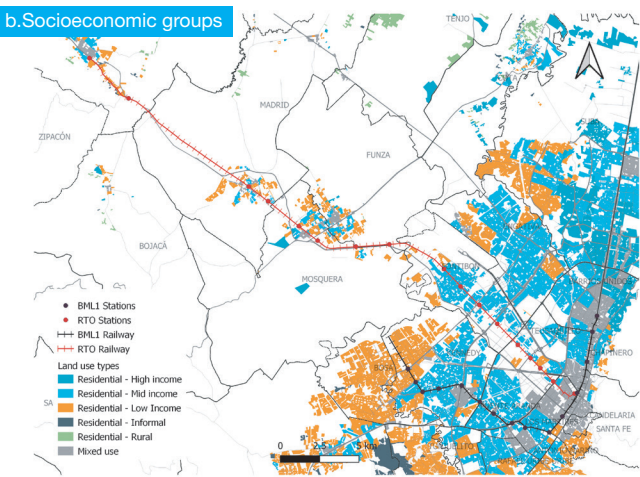
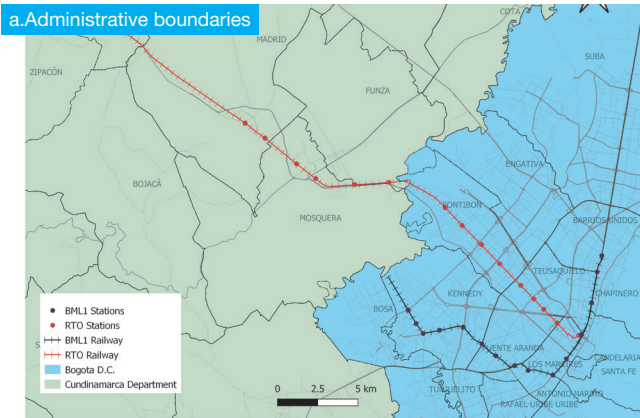
| Table 1 – General information of the BML1 and RTO projects |  |   |
|--|--|---|
| Aspect   | Bogota's First Metro Line              | RegioTram de Occidente                      |
| Length   | 19 km                                  | 39.6 km                                     |
| No. of Stations  | 16                                     | 17  |
| Daily Ridership  | 990,000                                | 126,000                                     |
| Operational Speed  | 41 km/h                                | 70 km/h                                     |
| Cities Served  | Bogota                                 | Bogota, Funza, Mosquera, Madrid, Facatativa |
| Delivery Mechanism   | DFBOMT PPP                             | DFBOMT PPP                                  |
| Status at moment of preparation of this TN                 | PPP contract signed - in design phase- | PPP contract signed - in design phase-      |

Source: Prepared by the Authors using publicly available information from Empresa Metro de Bogotá and the Empresa Férrea Regional.

<sup>3</sup> RTO benefits for other municipalities or urban centers will depend on its integration with local and regional transit services.

<sup>4</sup>The RTO crosses or runs along the boundaries of Bogotá's Martires, Teusaquillo, Puente Aranda and Fontibón Boroughs. Considering its wider catchment area, the RTO would also serve the Boroughs of Santa Fe and la Candelaria.

Figure 5 – Administrative boundaries, social groups and BML1 and RTO Layouts .

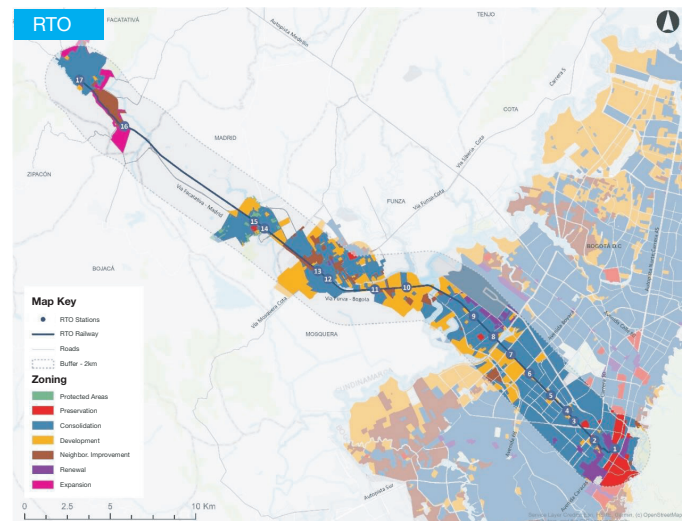
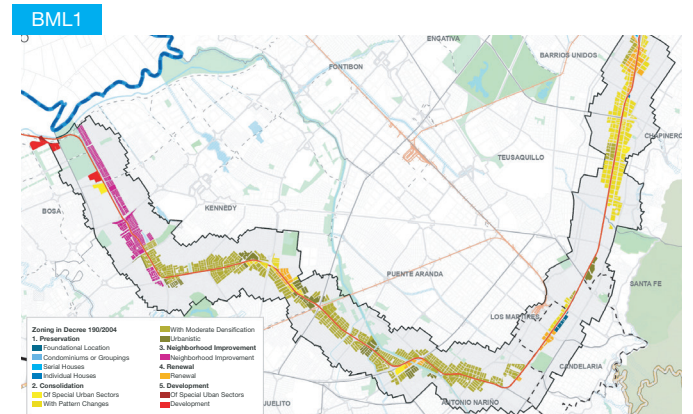


Source: Prepared by authors with input from Empresa Metro de Bogotá, Empresa Férrea Regional, IDECA and IGAC Open Data and IDOM (2018a)

As of March 2020, the BML1's corridor is zoned for renewal, whereas the RTO corridor is predominantly zoned for consolidation treatment, with a few areas zoned for new development in suburban areas and neighborhood improvement around urban cores. In 2019, zoning considerations for both the BML1 and RTO corridors were predominantly for consolidation, with the plot-by-plot densification process supported by this zoning being considered as undesirable for the two mass transit systems, as they tend to restrict larger scale, more holistic regeneration efforts. In December 2019, Bogotá's Mayor issued Bogotá's Decree 823 of 2019, effectively changing the zoning policies for the areas surrounding the corridors and stations of BML1, but leaving the RTO corridor untouched. The convenience of urban renewal

zoning stems from the increased ability to approach urban renewal in a more integrated manner through larger scale and more territorially managed redevelopments. (Figure 6).

Figure 6 – Urbanistic treatments along BML1 and RTO corridors and in Station catchment Areas.



Note: BML1 chart corresponds to treatments prior to Decree 823 of 2019. In that decree, yellow areas corresponding to consolidation treatment were changed to Renewal treatment.

Source: Adapted from JFP & Associates - Urban Law (2019a) and Steer (2019a)

The BML1 corridor is more compact and permeable than that of the RTO, as it has a larger number of blocks and a smaller total area of direct influence, when adding the areas of all blocks that have at least some part of them within a 220 meter buffer around the stations of these two mass transit systems. Combining the total area of the blocks that have some or all of their area within a 220m buffer of the BML1 and RTO stations, the area

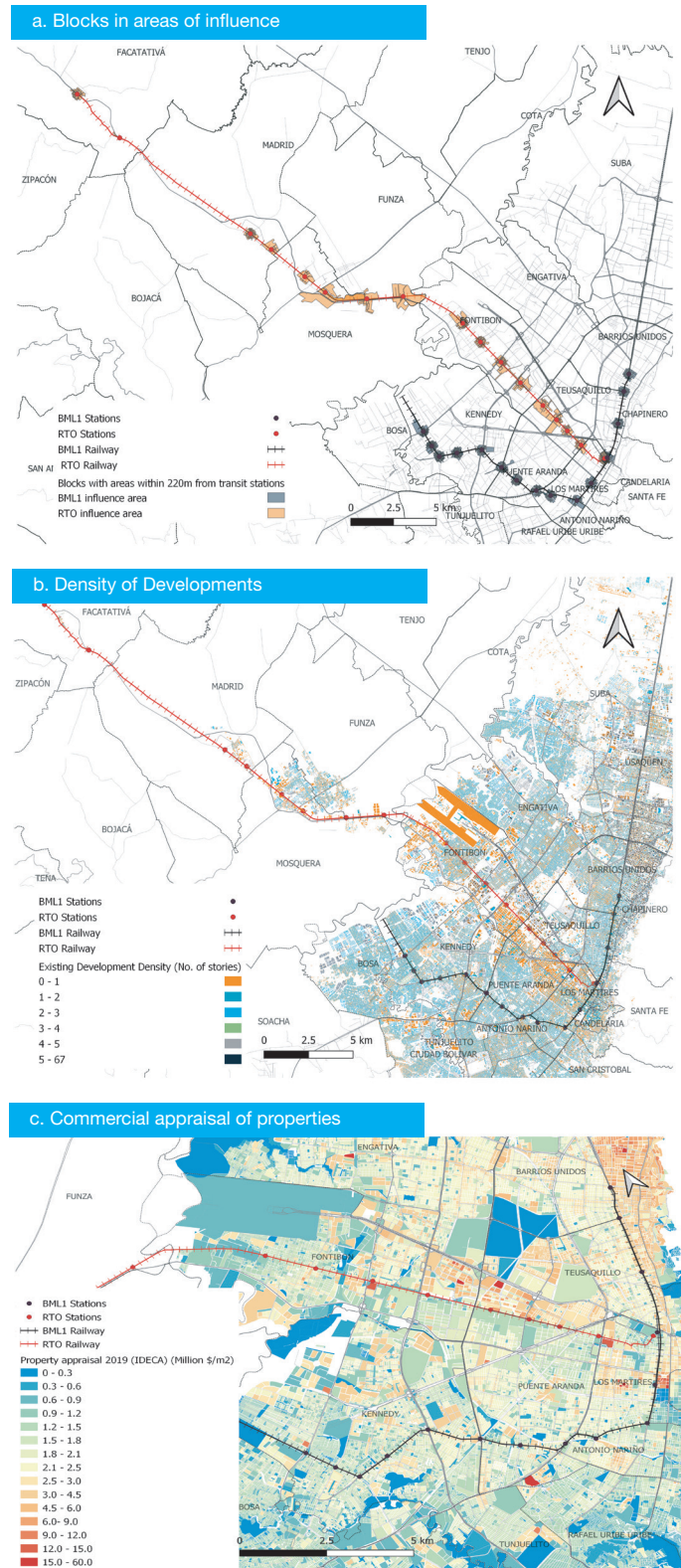


of influence of these two mass transit projects expands to ca. 1,500 hectares divided into circa 1,500 blocks. Of these, the BML1 corridor contributes ca. 478 hectares and 1,124 blocks and the RTO would participate with an area of ca 1,000 ha but only 336 blocks, highlighting an urban morphology with larger blocks along the corridor (Figure 7a).

Larger land plot areas, a lower development density, fewer owners with whom to negotiate plots or urban development plans, lower property values and a larger reduction of travel times due to the mass transit system make the RTO's corridor an interesting location for urban redevelopment and renewal. Real estate projects that require large land assembly efforts or that involve many stakeholders or communities with whom to discuss the project have more significant transaction costs or risks, discouraging developers from taking them forward. Projects that have a larger developmental potential are more likely to attract investors, as the payoff is likely to be greater<sup>5</sup>. A third option for developers is to seek higher prices based on design decisions or by selecting locations that stand to benefit from other public or private interventions. The maps in Figure 7 show the existing conditions of BML1 and RTO corridors and some of the physical features of their surroundings. Figure 8 presents a comparison between travel times to the San Victorino Commercial Zone during the morning peak period with and without BML1 and RTO. Areas that benefit from reduced travel times to key destinations within the region (marked with matching colored circles in Figure 8) could also experience an increase in property prices that could make these corridors more attractive for redevelopment or renewal.

<sup>5</sup> There are multiple ways in which real estate projects may attain a larger developmental potential. One way is by pursuing projects in those locations in which the zoning regulations allow for larger developments to be made. Another alternative is finding land plots whose existing development is less dense or intense than other plots restricted by the same caps set in development regulations.

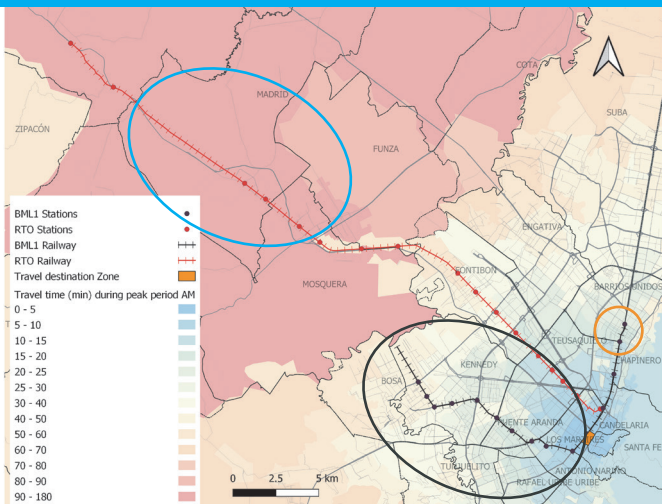
Figure 7 – Features of BML1 and RTO corridors



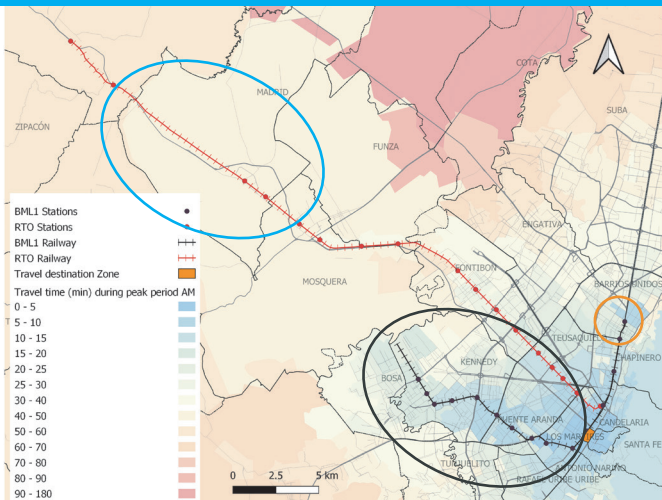
Note: Commercial value information only available for Bogotá. Source: Prepared by authors with input from Empresa Metro de Bogotá, Empresa Férrea Regional, Information and Open Geographical Data for the Region from IDECA and IGAC Open Data

Figure 8 – Travel time reductions without and with BML1 and RTO for morning peak period having the commercial area of San Victorino as the destination

Travel times during morning peak period without BML1 or RTO



Travel times during morning peak period with BML1 or RTO



Source: Prepared by authors with input from Regional Transport Modeling performed by the Empresa Metro de Bogotá, and information from Empresa Metro de Bogotá, Empresa Férrea Regional, Information and Open Geographical Data for the Region from IDECA and IGAC Open Data, and Transport Analysis Zone Data made available by Bogota's Secretaría Distrital de Movilidad

The areas with the largest land value capture potential for public sector financing could match those in which the private sector is willing to lead urban renewal efforts. Value capture instruments are tied to real estate transactions, and areas that attract developers are also the most likely to generate value capture. Instruments that capture land value for public sector financing are mostly tied to administrative decisions by local governments (i.e. by changing the land use or allowing higher Floor-Area-Ratios). However, the public sector's value capture revenues will only materialize

when a transaction that realizes the development potential has been completed. Therefore, value capture is most likely to provide a significant and constant cash flow for the public sector in those areas in which the private investors, by themselves, are interested in pursuing development.

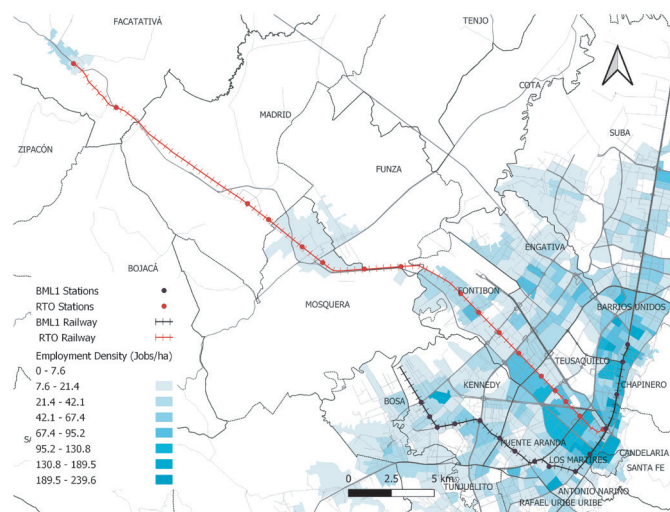
The local permeability and social and economic dynamics are stronger along the BML1 corridor and its stations than around the RTO's. Within the place value dimension, the 3V Methodology considers local pedestrian permeability, mixed-use developments, and density of social infrastructures within an 800m radius from the station. The implementation of the BML1 along the key transport and socioeconomic corridors of Avenida Villavicencio, Avenida Primero de Mayo and Avenida Caracas, will make for a relatively straightforward insertion of the BML1 into Bogotá's urban fabric and dynamics. The decision to implement the RTO on railway corridors that have been abandoned or barely used over the last two decades confront the Empresa Férrea Regional (EFR) with the challenge of integrating the RTO physically and operationally into the urban and regional fabric and dynamics. The sustainable territorial development potential of the RTO will only be achieved through operational integration between the RTO and other local and regional transit services, and also by leading and promoting the redevelopment of the areas surrounding its stations with increased permeability and also by locating trip origin or destination activities such as housing, jobs and key social infrastructures. Reducing the need for long distance trips, and facilitating the use of mass transit for those that cannot be reduced, should help to optimize flows within the regional area, reducing energy consumption, infrastructure congestion and travel times.

Both corridors connect residential and mixed-use areas of the region with regional employment centers, with job location being more homogeneous along BML1's corridor. The location of employment plays an important role in the evolution of the regional structure and in the



patterns of urban and regional mobility. The inelastic nature of travel-to-work trips<sup>6</sup> and the agglomeration economies that influence the decisions of related or complementary activities make employment centers the cores of the urban and regional structure. The BML1 and RTO show different job location characteristics along the corridors (Figure 9). The RTO corridor is marked by an uneven distribution of employment along its corridors, due to its commuter-train-like operations. However, the RTO provides connectivity to major regional employment centers in Bogota's Martires, Puente Aranda and Fontibon Boroughs, which could spark development interest in other locations along the corridor. Complementing the implementation of BML1 and RTO with TOD-focused interventions, such as mixed use and mixed income group developments, can be instrumental in ensuring that those redevelopment or renewal efforts are indeed designed and implemented to achieve compact, diverse and sustainable territorial development.

Figure 9 – Employment density by urban sector or rural section across the Bogota – Cundinamarca region.



Source: Prepared by authors with input from IDECA and IGAC mapping information and also some preliminary information from the Economic Establishment Survey conducted by SDP and SDDE in 2017 and 2018.

The BML1 and RTO corridors have different existing conditions and will require different interventions to improve TOD-compliance: BML1 efforts should focus on engaging and encouraging private developers to lead regeneration efforts along the corridor, while seeking to increase mixed-use and mixed-social group developments and the provision of social infrastructures; the RTO's efforts should focus on improving its physical and operational integration with its surroundings and on developing and using regional territorial development tools and arrangements. The BML1's denser corridor, smaller land plots and higher number of property owners, could make redevelopment efforts around its stations riskier or more expensive than similar objective and scope projects along the RTO corridor. In contrast, the RTO has poor physical and mobility integration with its surroundings and may only realize its full regional sustainable territorial development potential after significant efforts by local and regional authorities. One cross-cutting challenge for the two corridors, and for the region as a whole, is the need to maintain an adequate balance between supply and demand of different real estate typologies to avoid supply surges that affect prices across the region. Stalling or dropping property prices will discourage private developers to lead or support redevelopment efforts, and through this, limit the ability of the public sector to obtain the land value capture revenue that it expected or required to fund additional interventions.

Unfortunately, the complexity of urban contexts and real estate markets, and the actions and interactions of the stakeholders within them, makes it difficult to forecast what the outcome of the renewal or development actions will be. Traditional zoning schemes and urban/regional management practices have mostly failed to deliver the desired territorial development outcomes. The problem

<sup>6</sup>The inelastic nature of travel-to-work trips results from the inflexibility of these trips in terms of destination, time and cost. Unlike other leisure trips, in which the travelers can decide the destination or timing of their trips, travel-to-work ends at unique locations and need to end before the time at which the worker is required to be at work.

in their traditional approach of breaking down urban or regional problems or challenges into “sectoral” problems or challenges that fit into traditional sectoral (and siloed) policy- and decision making structures. The high level of interaction between stakeholders, activities and sectors in a given region requires multiple coordinated cross-sectoral efforts to drive and consolidate the change, with isolated sectoral efforts being seldom effective. Advances in IT and computing have allowed for computer-based analysis and simulations to model these interactions and interdependencies to gain insight on how they combine into the observed outcome. These tools can be also helpful in testing how individual or multiple (coordinated) actions contribute (or not) towards solving a particular problem or challenge and even test if the interventions can produce some unexpected or undesirable side-effects. Acknowledging the potential of these new computational tools, the World Bank, within the framework of the *Technical assistance for the preparation a TOD agenda for the Bogota – Cundinamarca region*, commissioned UrbanSIM to take the first steps in the development of an agent-based land-use model for the Bogota – Cundinamarca region. UrbanSIM’s model uses information and data on land use, transport infrastructure, socio-economic activities and real estate market dynamics to model urban development processes and support both analysts and decision-makers in identifying, prioritizing and coordinating interventions to achieve sustainable territorial development (see [Box 2](#)).

Box 2 - Advances in the development of an UrbanSIM agent-based land use model for the Bogota – Cundinamarca region.

Within the framework of the *Technical assistance for the preparation a TOD agenda for the Bogota – Cundinamarca region* the World Bank commissioned UrbanSIM Inc. to undertake the first steps in the preparation of an agent-based land use model for the Bogota – Cundinamarca region.

The preparation of an agent-based land use model requires 1-2 years of development and calibration efforts before the model is ready to be used as a formal support tool for regional planning and decision-making. Both the duration of the development effort and the quality and validity of the model obtained through it depend on the staffing assignment and the quality of the data used as input for the model.

The limited time and resources available for this initial effort for the development of an UrbanSIM model for the Bogota – Cundinamarca region means that activities focused on producing a codebase for the model, processing some regional data obtained from Bogota and the region for the model, preparing mock datasets and inserting placeholders for missing input data, putting everything together in a model that executed it, and connecting that model codebase with the UrbanCanvas Modeler to enable the use of the improved user interface of the latter.

This effort has produced a model that is operational, but is only suitable for demonstration purposes, as it is using mock information for its operation.

Developing a useful model will require two further development phases. The next phase after this initial effort should focus on collecting and processing all the missing input data for the model and advancing on adjusting and calibrating the parameters and submodels that support the tool’s operation. Once the calibration process is completed, the model could be gradually rolled out to support urban and regional analysis or decision-making processes.

Subsequent phases of development of the model would focus on refining its parameters, input or submodels, or on pursuing enhancements that could enable the model to produce higher resolution results that would allow for more detailed or insightful analysis or more effective decision-making.

INTERVENTIONS AND  
STRATEGIES TO SEIZE THE  
OPPORTUNITIES THAT  
BOGOTA'S FIRST METRO LINE  
AND THE REGIOTRAM DE  
OCCIDENTE MASS TRANSIT  
SYSTEMS CREATE FOR  
REGIONAL SUSTAINABLE  
DEVELOPMENT

The analysis of the Bogotá – Cundinamarca region from a TOD perspective identified significant differences in the physical, social, economic, transit operations and political-administrative conditions of the corridors for the two mass transit systems to be developed, which will for sure require different types of interventions and approaches to management. Table 2 presents a summary of some of these key differences. Opportunities and challenges for sustainable regional and urban development will vary in accordance to the context of the individual stations: locations with low permeability around the station or with accessibility issues will require different interventions to

those that have good permeability or accessibility; having mixed, dense existing uses will pose different challenges than those areas that have single use low density station surroundings. Even the potential for barrier effect during the operation will pose different challenges and requirements to the transit operations and the local governments. These differences need to be properly considered when proposing interventions to improve “sustainability” in the region’s development and, as will be discussed at greater length below, institutional and regulatory aspects will also be key to enable the appropriate actions and interventions being made.

Table 2 – Summary of findings from TOD-based analysis of the BML1 and RTO corridors.

| Aspect                                       | Bogota’s First Metro Line | RegioTram de Occidente                               |
|--|---------------------------|--|
| Regional and local Integration               | Mid-to-high               | Low  |
| Station accessibility and local permeability | Mid-to-high               | Low  |
| Development density around stations          | High                      | Low-to-high  |
| Mixed uses around stations                   | Mid-to-high               | Low (rural and Bogota) and high in municipal centers |
| Mixed social groups around stations          | Low                       | Low  |
| Supply (per capita) of urban infrastructures | Low                       | Mid-to-high  |
| Mix of urban infrastructures around stations | Low                       | Low  |
| Presence of condominiums around stations     | Mid-to-high               | High in areas, low in large tracts of the corridor   |
| Property/land price                          | Mid-to-high               | Low-to-mid   |
| Barrier effect                               | During construction       | During operation                                     |

Source: Prepared by authors

The following subsections will focus on how these findings from the regional context can be approached by the local and regional governments to seize the opportunities that both mass transit systems provide. Due to the better regional and local integration of the BML1, and the higher accessibility and permeability of the surroundings of its stations, discussions will focus on the institutional and regulatory challenges and actions to drive TOD-focused

focused change and transformation around its stations. The need for integration of the RTO with the station’s surroundings and transit services, along with the need for consistent and capable regulatory and institutional arrangements to guide and coordinate development along the corridor, set the stage for the alternatives and approaches that will be proposed below.

# BML1: IMPROVING THE INSTITUTIONAL CAPACITY AND ARTICULATION AS THE BASIS FOR TOD STRENGTHENING OR TRANSFORMATION

## MARKET, INSTITUTIONAL AND REGULATORY FRAMEWORK CONDITIONS FOR TOD STRENGTHENING OR TRANSFORMATION OF THE BML1 CORRIDOR

Bogotá's institutional and regulatory frameworks for managing and financing urban development are amongst the most robust in Colombia, adopting and using all of the tools provided by Law 388 of 1997. As Colombia's main administrative and economic center, Bogotá has significant resources and a direct link with law- and policymakers to create and adopt territorial management and financing tools. The city has also had close to 20 years of valuable experience in the use of those tools, gaining more experience and providing feedback concerning those lessons into its institutional arrangements and regulations. Acknowledging the urban transformation and the land value capture potential of BML1, Bogotá's City Council decided to grant urban operator powers in the agency's charter to the Empresa Metro de Bogotá (EMB), the implementation agency for BML1. In principle, assigning these powers to the EMB would provide better focus on and control over the renewal and transformation of the

BML1 catchment areas without affecting the broader territorial planning and management and urban renewal efforts carried out by the Secretaría Distrital de Planeación (SDP), the Empresa de Renovación Urbana (ERU) and other local agencies related to urban development.

The design and implementation of incentives that contribute to the renewal of the BML1 corridor must be backed by a robust institutional and regulatory framework, which clearly sets out the scope of the interventions of all the related institutions and the way in which they should interact among themselves. Urban renewal efforts must take into account multiple elements when defining the objective, scope and timing of the interventions or real estate developments. [Table 3](#) mentions some of these aspects to be taken into account vis-à-vis the real estate market, the institutional arrangements and the regulatory framework perspectives.

Table 3 - Aspects to consider when defining, scoping and validating urban renewal efforts.

| Analysis dimension        | Market   | Institutional   | Regulatory   |
|---------------------------|--|---|--|
| Renewal                   | <ul style="list-style-type: none"> <li>· Land prices.</li> <li>· Size of land plots and city blocks.</li> <li>· Location of Bienes de Interés Cultural (BIC) or of other prior location-specific activities within the block or areas to be renewed.</li> <li>· Current and potential FAR considering plot size or fronting lengths.</li> <li>· Current and projected conditions of the real estate market for the types of properties to be developed.</li> </ul> | <ul style="list-style-type: none"> <li>· Land ownership.</li> <li>· Institutional capacity to lead and manage urban renewal.</li> <li>· Social, financial and other challenges learned from prior renewal efforts.</li> <li>· Interdependence with other local agencies.</li> </ul> | <ul style="list-style-type: none"> <li>· Assignment and/or distribution of actions between institutions or agencies.</li> <li>· Zoning regulations that enable the desired type of intervention and facilitate its management.</li> <li>· Adoption of tools for territorial development or renewal.</li> </ul> |
| Value capture / financing | <ul style="list-style-type: none"> <li>· Additional FAR that the developers could obtain over and above current FAR allowances depending on the city's location and block conditions.</li> <li>· Higher land or property prices that could accrue in favor of current owners due to regulatory changes of land use or development intensity.</li> <li>· Estimation of possible revenues due to applicable instruments of value capture.</li> </ul>                 | <ul style="list-style-type: none"> <li>· Institutional capacity for value capture and resource use.</li> </ul>  | <ul style="list-style-type: none"> <li>· Adoption and relevance of regulatory frameworks to apply value capture instrument.</li> </ul>   |

Source: Own elaboration based on JFP & Asociados - Derecho Urbano (2019a; 2019b; 2019c) and Medina (2019)

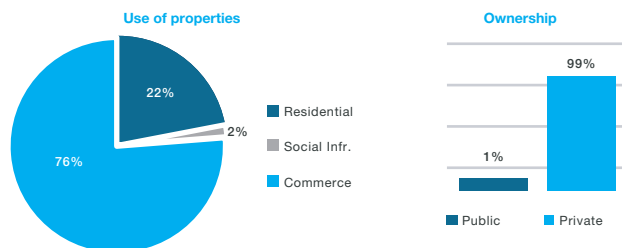
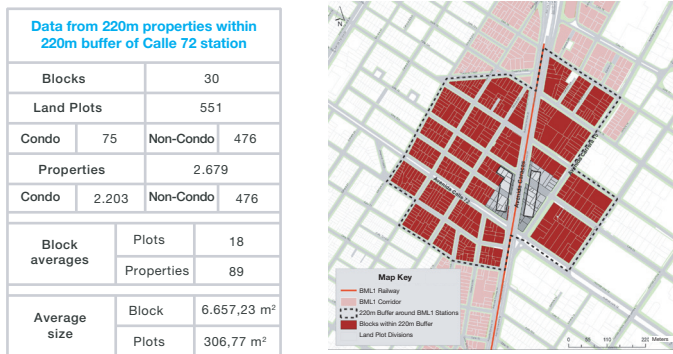
Although the TOD approach to sustainable territorial development around BML1 could help to focus urban renewal efforts along the mass transit systems' corridors, the area that would be considered for renewal, even considering a buffer of 220m around the stations, could be too large for the EMB to manage or finance it all on its own. For instance, the area within a 220m buffer of the Calle 72 station covers 30 blocks, 551 land plots and 2,679 individual properties (Figure 10) while the same influence area for the NQS station includes 41 blocks, 988 land plots and 1291 individual properties (Figure 11). Two of Bogotá's high-profile renovation efforts, Triangulo de Fenicia and Proscenio, span over 9 and 3 blocks, respectively, and have endured many years of analysis, discussions and negotiations. The area of intervention around just one BML1's station can be 6 to 12 times larger than the area of either of these two renewal initiatives, with proportionally larger land assembly and consensus-building efforts with residents, communities and the government.

Institutional and regulatory frameworks will need additional improvements and strengthening for EMB and Bogotá's Government to capitalize on the opportunities for TOD transformation and Land Value Capture. JFP & Asociados (2019c) reviewed both the EMB's organizational structure, processes and capabilities and also

Bogotá's institutional and regulatory frameworks related to TOD-focused interventions and Land Value Capture (LVC) efforts and concluded that improvements and strengthening were required within EMB and across Bogotá's institutions to successfully deliver transformation around BML1's stations and corridor. EMB's existing capabilities and processes may be adequate for the BML1 land assembly effort they have been prioritizing, but are likely to be insufficient to assume the transformation and LVC efforts. Bogotá's arrangements also need some revisions, particularly seeking to better articulate and leverage the attributions and capabilities of the different institutions. EMB would benefit from the experience of SDP and ERU in the preparation and negotiation of local redevelopment master plans, and of working with communities to get the projects accepted and executed, and also ERU and SDP could leverage EMB's capabilities and attributions for their own work. They would all benefit from joint developments, one of which would be pushing for new, alternative community engagement or land assembly schemes that could help to reduce both the risk or the resistance traditionally associated to urban renewal efforts, and for new tools that could help to understand and leverage behaviors such as gentrification, for the good of the local residents and cities as a whole.

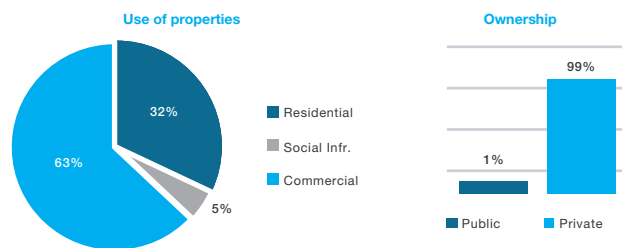
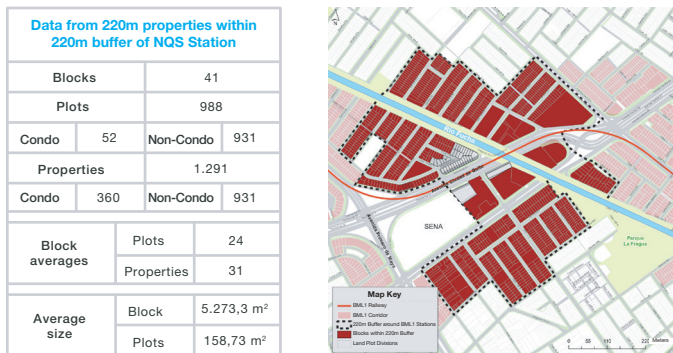


Figure 10 – BML1's Calle 72 Station environment analysis



Source: Adapted from JFP & Asociados - Derecho Urbano (2019b; 2019c)

Figure 11 - BML1 NQS Station environment analysis



Source: Adapted from JFP & Asociados - Derecho Urbano (2019b; 2019c)

Maintaining adequate regional and local real estate dynamics will be critical to encourage private developers to support or lead urban renewal efforts and to ensure that local authorities can maximize land value capture to finance other interventions. A surplus of properties

in one or more property types could lead to stagnation or a drop in property prices (when measured per m<sup>2</sup>) which may deter developers from participating in redevelopment efforts. The same real estate market conditions could undermine the efforts of local authorities to obtain funds from value capture mechanisms as the developers refrain from going ahead with the developments, or by shifting their focus to other places in which value capture potential for the government is lower.

The most likely option for value capture revenue along the BML1's corridor and its stations comes from the increased FAR allowances that developers can access if they pay for the rights and comply with some minima in the land plot to be redeveloped. Although the consultancies carried out during 2019 could not fully consider or estimate value capture potential arising from changes to zoning regulations introduced by Bogota's Decree 823 of 2019, it may be possible to obtain some revenue from that source. The main option for value capture is expected to come from the payments to obtain additional FAR for redevelopments along the BML1 corridor.

Value capture ex-ante estimates can be very unreliable. Increasing the accuracy of those estimates will require more detail about the redevelopment effort to be implemented and certain on-site conditions. Value capture revenues may be reduced if proposed redevelopments require renewal or upgrades to water supply or sewage networks (which renewal plans very often do) as these expenses would detract from the payment to the local government. Other aspects to consider for these estimations include the quantity and location of heritage buildings, other location-specific activities (e.g. higher education institutions or traditional stores), and tall buildings which sometimes contribute to the attractiveness of a redevelopment effort, but may also dissuade investors or developers from moving forward with a redevelopment if they imply additional costs, or if their location within the block to be redeveloped prevents the developer from obtaining the additional FAR development allowances that

make development financially viable and attractive within that block. The analyses of the two stations considered for pilot studies found that there is a larger presence of these types of properties around the Calle 72 station than around the NQS station.

Real estate absorption analyses estimate that the complete transformation of the areas around these two stations may take up to 20 years if redevelopments are conducted in a way that seeks to maintain the balance between real estate demand and supply. The real estate absorption capacity of a location should be considered when drafting any urban redevelopment plan. Real estate developments that create a local or regional surplus of property supply may create real estate surplus conditions that drag down prices and discourage real estate developers from supporting or leading the desired urban renewal processes. Property price stagnation or drops may also lead to lower revenues than expected from land value capture instruments. The use of the computer analysis or simulation software like UrbanSIM could provide a better understanding of these real estate market dynamics and prepare and execute transformation strategies for the stations that maximize private leadership and value capture revenue.

Considering the new zoning regulations and value capture conditions set by Bogota's Decree 823 of 2019, the total value capture potential for the area of influence of the two stations is of US\$36.38 million. The estimate for the entire corridor is of US\$446 million. These value capture revenues will become effective when the redevelopments are made, which means that they would be paid over a long period of time. This value capture estimation for the two stations took into account the existing urban conditions, the developmental potential based on prior zoning regulations or new conditions enabled by Bogota's Decree 823 of 2019, the restrictions to maximum development potential due to the location of restricted redevelopment properties, and the absorption capacity for different types of uses. The provided land value capture estimation for the whole BML1 corridor considered that the remaining

BML1 stations had similar conditions to those found around the Calle 72 and NQS stations. A more refined analysis should be conducted to estimate the total value capture potential (and timeframe) through (i) detailed studies of the actual conditions around BML1 stations, (ii) alternative scenarios of the growth of local and regional real estate demand and supply, and (iii) changes in the social and economic activities that are located around the stations. These analyses are also expected to benefit from analysis and simulation tools like UrbanSIM, due to their ability to determine how different interactions could impact the urban outcomes.

## RECOMMENDATIONS

**Recommendation 1: Prepare and execute a phased TOD intervention strategy for the redevelopment of the influence area of BML1 stations.**

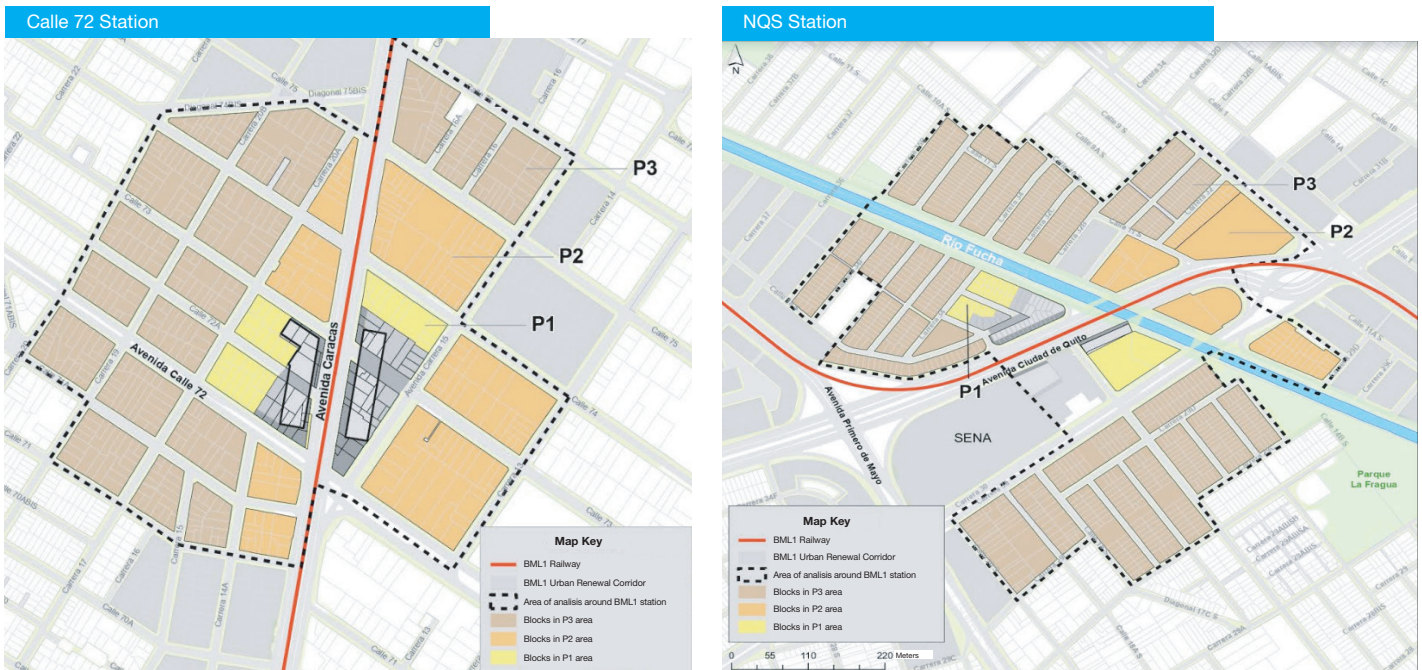
BML1 corridor or station TOD interventions should encompass many aspects to achieve the desired sustainable territorial development objective: (i) maintain a balance between real estate supply and demand for the different property types; (ii) conduct a proper distribution of roles and coordinated delivery across public sector institutions; (iii) strengthen institutional capabilities and arrangements to facilitate and speed up renewal efforts through enhanced interactions with developers and the local communities; and (iv) improve the insertion and interaction of the BML1 and its stations with their immediate surroundings. In order to address and manage these four aspects, EMB and Bogota's authorities should pursue a three-phase renewal strategy. Each of these three phases would intervene a different location within the station's area of influence and would require different levels of leadership and commitment from EMB. The details of these three phases / areas are presented in [Table 4](#) and the proposed land division for the areas around Calle 72 and NQS stations are presented in [Figure 12](#).

Table 4 - Approach, scope and instruments to be used by the EMB in three areas around the stations

| Area | Intervention Time Horizon | Criteria for block inclusion in phase   | Approach and scope   | Underlying legal or regulatory instruments   |
|------|---------------------------|---|--|--|
| P1   | Short term (2-4 years)    | <ul style="list-style-type: none"> <li>Functional relationship with buildings in same blocks as the BML1's stations.</li> </ul>   | <ul style="list-style-type: none"> <li>EMB leadership in the preparation and implementation of renewal or transformation efforts.</li> <li>Project promotion seeking to attract capital investors.</li> <li>Land assembly efforts led by the EMB, prioritizing schemes that allow voluntary participation of existing property owners.</li> <li>Use of public sector-owned land plots to support EMB renewal or transformation efforts.</li> </ul> | <ul style="list-style-type: none"> <li>Regulated procedure for the EMB to check and clear development proposals in the area.</li> <li>Schemes for selling or trading development rights as an incentive to attract investors.</li> <li>Use of trust funds to facilitate existing property owner participation and more transparent resource management.</li> </ul> |
| P2   | Medium term (4-8 years)   | <ul style="list-style-type: none"> <li>Proximity to blocks in which BML1 stations are located.</li> <li>Properties with fronting on main urban corridors within the area of influence.</li> </ul> | <ul style="list-style-type: none"> <li>Project promotion seeking to attract capital investors.</li> <li>Land assembly efforts led by the EMB, prioritizing schemes that allow voluntary participation of existing property owners.</li> </ul>  |  |
| P3   | Long term (8-12 years)    | <ul style="list-style-type: none"> <li>Other blocks within the 220m influence area.</li> </ul>  | <ul style="list-style-type: none"> <li>Support private developers and existing property owners to propose and mature renewal projects that balance the requirements and demands of the parties, and the greater social and environmental benefits to the region.</li> <li>Support and strengthen public and social initiatives that may lead to the emergence of community- based and -led urban improvement initiatives.</li> </ul>               | <ul style="list-style-type: none"> <li>Redevelopment based on renewal plans would be preferred for these areas as they can better lead and manage large scale urban regeneration efforts able to accommodate existing residents as needed and also to promote permeability and non-motorized means of transport around the BML1's stations.</li> </ul>             |

Source: Adapted from JFP & Asociados - Derecho Urbano (2019c)

Figure 12 - Reference P1, P2 and P3 areas to be considered for BML1 station surroundings interventions, based on the analysis performed for the Calle 72 and NQS stations



Source: Adapted by Authors from JFP & Asociados - Derecho Urbano (2019c)



The TOD strengthening or transformation strategy around the BML1 corridor and stations requires coordination tools and procedures among Bogota’s public sector agencies to undertake the renewal effort appropriately. As mentioned earlier, instead of deciding to undertake the BML1 corridor renewal on its own, EMB should seek to leverage the strengths and experience of other institutions with a track record of successfully tackling the many challenges that TOD strengthening or transformation efforts is likely to encounter.

**Recommendation 2: Strengthening of Bogota’s institutional arrangements to coordinate and manage TOD interventions along the BML1 corridor.**

This recommendation includes two actions. Firstly, EMB should join Bogota’s existing Comisión Intersectorial para la Gestión del Suelo en el Distrito Capital, as a participant. Second, a new Comisión Intersectorial para la Renovación Urbana en el Área de Influencia de la Primera Línea del Metro de Bogotá should be created to define and coordinate the renewal efforts to be made along the BML1 corridor according to TOD considerations. EMB should be designated as the technical coordinator for this Commission. [Table 5](#) suggests organizations that should be included within this new commission, and the topics with which they could contribute to TOD interventions along BML1’s corridors.

| Table 5 - Recommended public sector institutions' participation in the Comisión Intersectorial para la Renovación Urbana en el Área de Influencia de la Primera Línea del Metro de Bogotá  |  |
|--|--|
| Topics to contribute to the discussion   | Entity   |
| <ul style="list-style-type: none"> <li>· Design and operation of infrastructure and rolling stock of the First Line of Metro of Bogotá.</li> <li>· Urban operator for BML1 influence areas, according to the phased and zoned approach proposed in recommendation 1.</li> </ul>  | Empresa Metro de Bogotá S.A.– EMB  |
| <ul style="list-style-type: none"> <li>· Preparation and follow up of plans and programs for Bogota’s development</li> <li>· Land Use Plan Drafting and management of zoning regulations for Bogotá.</li> <li>· Collection and distribution of statistic and spatial data to support decision making by all public sector agencies of Bogotá.</li> </ul>   | Secretaría Distrital de Planeación – SDP                                 |
| <ul style="list-style-type: none"> <li>· Tools and vehicles for the collection or funding of urban interventions in the BML1’s area of influence.</li> <li>· Allocation and distribution of additional funding from Bogota’s Budget to BML1’s associated renewal or transformation efforts.</li> </ul>   | Secretaría Distrital de Hacienda – SDH                                   |
| <ul style="list-style-type: none"> <li>· Preparation and coordination of mobility plans for Bogota.</li> <li>· Formulation and adoption of regulations and policies to promote the use of BML1 and non-motorized transport alternatives.</li> <li>· Design and implementation of tactical urbanism interventions and signage in the influence area of BML1 stations.</li> </ul>  | Secretaría Distrital de Movilidad – SDM                                  |
| <ul style="list-style-type: none"> <li>· Route and service scheduling or rescheduling of BRT or zonal services to improve service integration with BML1’s operations, along with the procurement of infrastructures for integration.</li> </ul>  | TRANSMILENIO S.A.  |
| <ul style="list-style-type: none"> <li>· Support all of Bogota’s agencies in the drafting, passing and adoption of local regulations.</li> </ul>   | Secretaría Jurídica Distrital – SJD                                      |
| <ul style="list-style-type: none"> <li>· Design and implementation of policies, programs and projects related to public space use and preservation across Bogota and particularly, within the BML1s area of influence.</li> </ul>  | Departamento Administrativo de la Defensoría del Espacio Público – DADEP |
| <ul style="list-style-type: none"> <li>· Monitoring and analysis of BML1 corridor’s evolution and behavioral patterns from social and urban perspectives.</li> </ul>   | Unidad Administrativa Especial de Catastro Distrital - UAECD             |
| <ul style="list-style-type: none"> <li>· Provide information on water supply and wastewater treatment capacity for plots in the influence area of BML1.</li> <li>· Priority treatment in reviewing any urban renewal projects set to be built within the BML1’s influence area.</li> <li>· Prioritization within its plan and budgets for capacity or service quality investments that could benefit BML1’s influence area.</li> </ul> | Empresa de Acueducto y Alcantarillado de Bogotá - EAAB                   |

Source: Prepared and complemented by authors based on input from JFP & Associates - Urban Law (2019c).

**Recommendation 3: Strengthening the capacity of EMB and the tools available to other urban-related government institutions within Bogota to lead and deliver urban TOD transformation and LVC efforts..**

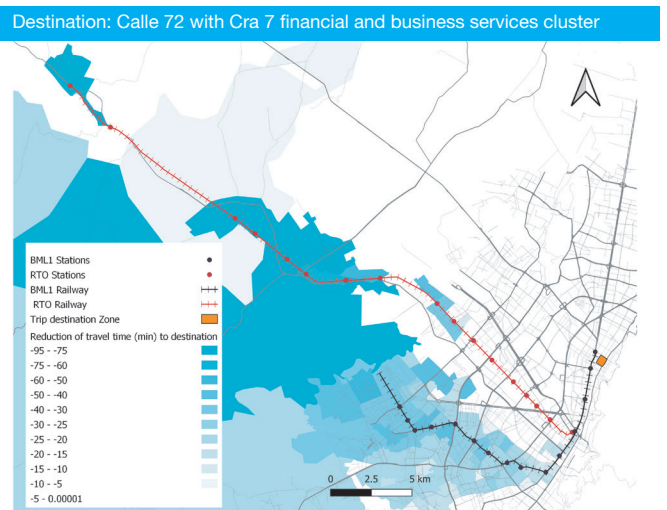
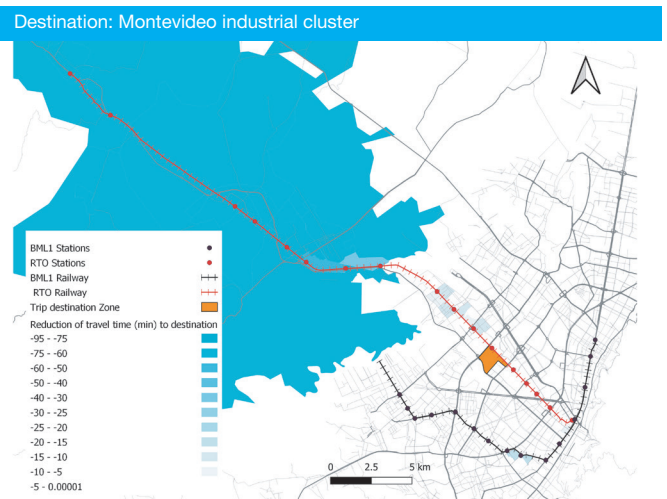
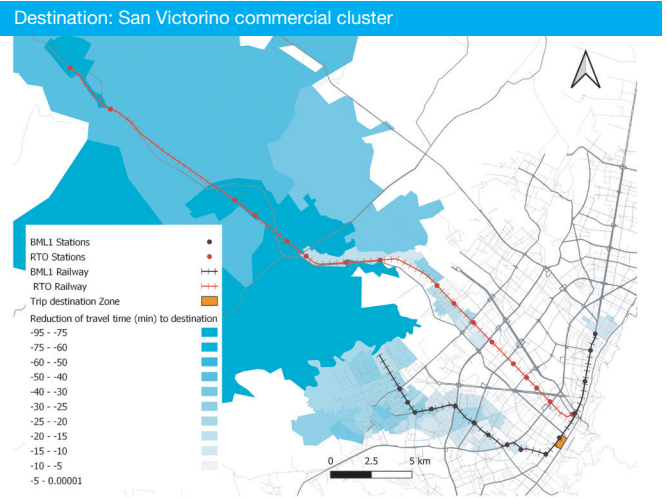
EMB urban and land operation's practices need strengthening to cope with the increased demands and challenges of urban renewal, reflecting the role or leadership that EMB is expected to assume. The current arrangements may be adequate for land assembly, but structuring or leading a real estate development involves either some new abilities that were not previously required (as architectural design or financial structuring of real estate projects), or that require a different approach as could be the case of community engagement, which may have so far been limited to ensuring compliance with social safeguards, but that may require new community-building or negotiation skills. These latter skills, together with strategies to reduce the adverse social impact of gentrification processes, make up two of the tools that should be jointly developed with other institutions as these would help to reduce the risk and resistance to large scale renewal efforts. Existing communities frequently resist these types of interventions as they consider them a threat to their way of life. However, if tools and practices were developed that help reduce this perception of threat and actually reposition these efforts as ways to improve and benefit local communities, the renewal efforts could be facilitated as these local communities become catalyzers for the transformation effort. These two lines of action could merge into voluntary participation schemes in which owners contribute their property to the redevelopment effort and are paid back in-kind with units in the redeveloped area, allowing the existing residents of the area to part-take in the benefits, while also reducing the perception of risk and upfront costs of traditional renewal developments for private investors.

# STRENGTHENING TERRITORIAL INSERTION AND URBAN-REGIONAL MANAGEMENT CAPABILITIES TO ACHIEVE THE RTO'S POTENTIAL THROUGH COMPLEMENTARY TOD INTERVENTIONS

## PHYSICAL, SOCIOECONOMIC, INSTITUTIONAL AND REGULATORY CONDITIONS OF THE RTO CORRIDOR

The commissioning of the RTO will improve accessibility between Bogotá, Funza, Mosquera, Madrid and Facativá for their residents by reducing travel times along the Calle 13 and the Bogota – Facativá corridors. The comparison of travel times with and without RTO for morning peak period trips show that the implementation could lead to time savings of 45 minutes between Bogotá and the municipalities (Figure 13). These savings come from users avoiding the usual high congestion and delays encountered on work days due to the high traffic along this western access to Bogotá. The congestion and delays have increased in recent years due to population (and urban development) growth in the municipalities along the RTO's corridor (Figure 2), and also to the designation of this corridor as the main access corridor into Bogotá for heavy trucks.

Figure 13 – Travel time savings enabled by RTO (and BML1) to multiple destinations within Bogotá during the morning peak period.



Source: Prepared by authors with input from Regional Transport Modeling performed by the Empresa Metro de Bogotá, and information from Empresa Metro de Bogotá, Empresa Férrea Regional, Information and Open Geographical Data for the Region from IDECA and IGAC Open Data, and Transport Analysis Zone Data made available by Bogotá's Secretaría Distrital de Movilidad



The railroad corridor along which the RTO will be implemented has a low physical and operational integration with its immediate surroundings. Figure 14 shows photographs taken at different points of the corridor. They all show low levels of integration between the railroad and its surroundings, with many areas of the corridor being blocked on one or both sides by walls from neighboring properties with no doors, or any type of access solutions to connect the rail corridor with its surrounding areas. The disuse of the rail corridor has meant that there were no transit services that integrated either operationally or that could be considered for farebox integration. Transit operational integration seems also like a very important challenge as it will require commitment from national and local governments and private transport companies to update existing routes and service schedules to complement the RTO. The 3V Methodology and the TOD standard consider such local integration and connectivity pivotal to achieve high-quality, TOD-compliant environments that achieve a more sustainable development and foster greater inclusion and better quality of life conditions for the region.

Figure 14 Images of the RTO corridor within urban areas.



Source: Steer (2019a)



Five RTO stations were analyzed under the 3V Methodology, concluding that stations 6 (Avenida Boyacá) and 15 (Madrid – Centro) had the highest compliance with the three value dimensions. The results of the assessment conducted within the World Bank’s Technical Assistance effort are presented in Table 6.

Table 6 - Summary of results of the use of the 3V Methodology in five RTO station locations.

| Value        | Weight   | Variable                            | Bogota Stations |             |             | Madrid Stations |             |
|--------------|----------|-------------------------------------|-----------------|-------------|-------------|-----------------|-------------|
|              |          |                                     | 6               | 7           | 8           | 14              | 15          |
| Node         | 33.33%   | Node Hierarchy                      | 0.25            | 0.24        | 0.20        | 0.25            | 0.25        |
|              |          | Diversity of Connectivity           | 0.25            | 0.20        | 0.20        | 0.25            | 0.25        |
|              |          | Node accessibility                  | 0.25            | 0.06        | 0.02        | 0.00            | 0.25        |
|              |          | Intensity of Activity               | 0.25            | 0.16        | 0.23        | 0.07            | 0.25        |
|              | Subtotal | 1.00                                | 0.67            | 0.65        | 0.57        | 1.00            |             |
| Place        | 33.33%   | Diversity of uses                   | 0.20            | 0.07        | 0.10        | 0.19            | 0.13        |
|              |          | Diversity of social infrastructures | 0.25            | 0.06        | 0.09        | 0.25            | 0.18        |
|              |          | Compactness                         | 0.14            | 0.19        | 0.25        | 0.05            | 0.25        |
|              |          | Cycling accessibility               | 0.25            | 0.23        | 0.17        | 0.21            | 0.25        |
|              | Subtotal | 0.84                                | 0.55            | 0.60        | 0.69        | 0.81            |             |
| Market       | 33.33%   | Human Density                       | 0.18            | 0.27        | 0.33        | 0.07            | 0.33        |
|              |          | Job/resident density                | 0.33            | 0.21        | 0.31        | 0.05            | 0.33        |
|              |          | Human density growth potential      | 0.33            | 0.11        | 0.22        | 0.17            | 0.33        |
|              | Subtotal | 0.85                                | 0.59            | 0.87        | 0.29        | 1.00            |             |
| <b>Total</b> |          |                                     | <b>0.90</b>     | <b>0.60</b> | <b>0.71</b> | <b>0.52</b>     | <b>0.94</b> |

Source: Prepared by authors based on Steer (2019a)

Stations 6 and 15 obtained high node value scores due to the presence of interchange or mode transfer nodes near RTO stations. It should be noted that this analysis only considered physical location and not service integration, which at the time of preparing of this Technical note is not guaranteed. Madrid's RTO station 15 benefits from its vicinity to a planned intermunicipal bus terminal that could foster and facilitate intermodal transfers between buses and the RTO. Station 6's high score was partly obtained from its proximity to Av. Boyacá, a main thoroughfare across Bogota, and also to the Intermunicipal Bus Terminal in the Salitre area. The connectivity and nodal hierarchy attained in these two cases justify the high score assigned to them.

The place *value assessment* identified local conditions that limit

the performance of Stations 6 and 15 in this value dimension: both have low incidence of mixed-use developments and limited local permeability and accessibility, features consistent with the large blocks discussed earlier for this corridor. Station 6's low score on compactness reflects the presence of the San Francisco River to the North of the station, blocking the access to the residential and commercial developments of significant importance located in that direction, and also the traditional industrial area to the south of the stations, whose large blocks hinder local access and discourage non-motorized modes. Station 15 performs similarly to Station 6 due to poor accessibility and connectivity between the RTO's station and the traditional urban center to the south, the presence of the Subachoque River to the west of the station, and finally, the fact that developments to the north are commercial or industrial, but with limited mix of uses.

The market value differences between Stations 6 and 15 lie in the better activity mix and human interaction potential of station 15 given its proximity to Madrid's traditional town center, conditions not available to station 6 as it is wedged between a river and the edge of Bogota's traditional industrial area. The population within walking distance to Station 6 is very limited due to the barrier made by the San Francisco River to the north of the station, and also to the presence of Bogota's traditional industrial area to the south. The amount or population with pedestrian access to the station could improve with the implementation of river crossings that reduced the distance to the residential and commercial developments that exist north of the river but that currently have no access to the station's location. Madrid's Station

15 gets full points in this assessment thanks to its proximity to Madrid's traditional urban core, which has significant commercial activity, and also the availability of land plots for residential or mixed-use developments nearby the RTO station's proposed location.

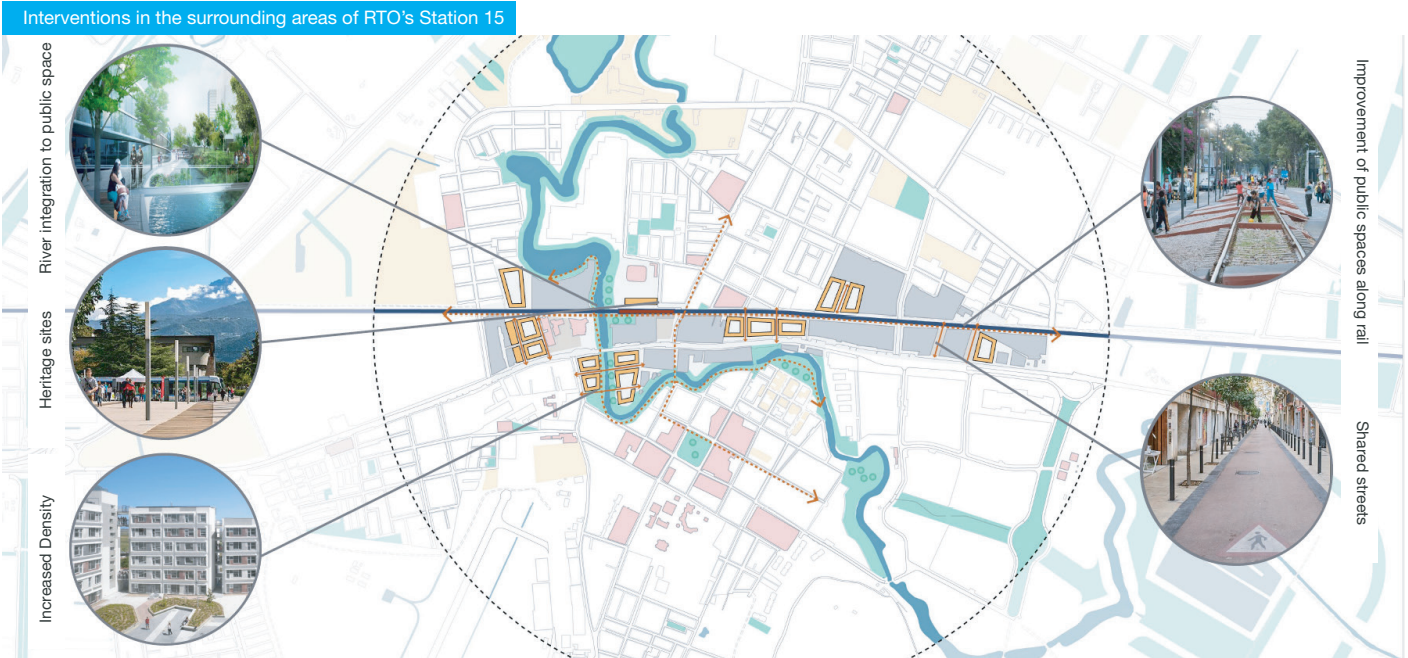
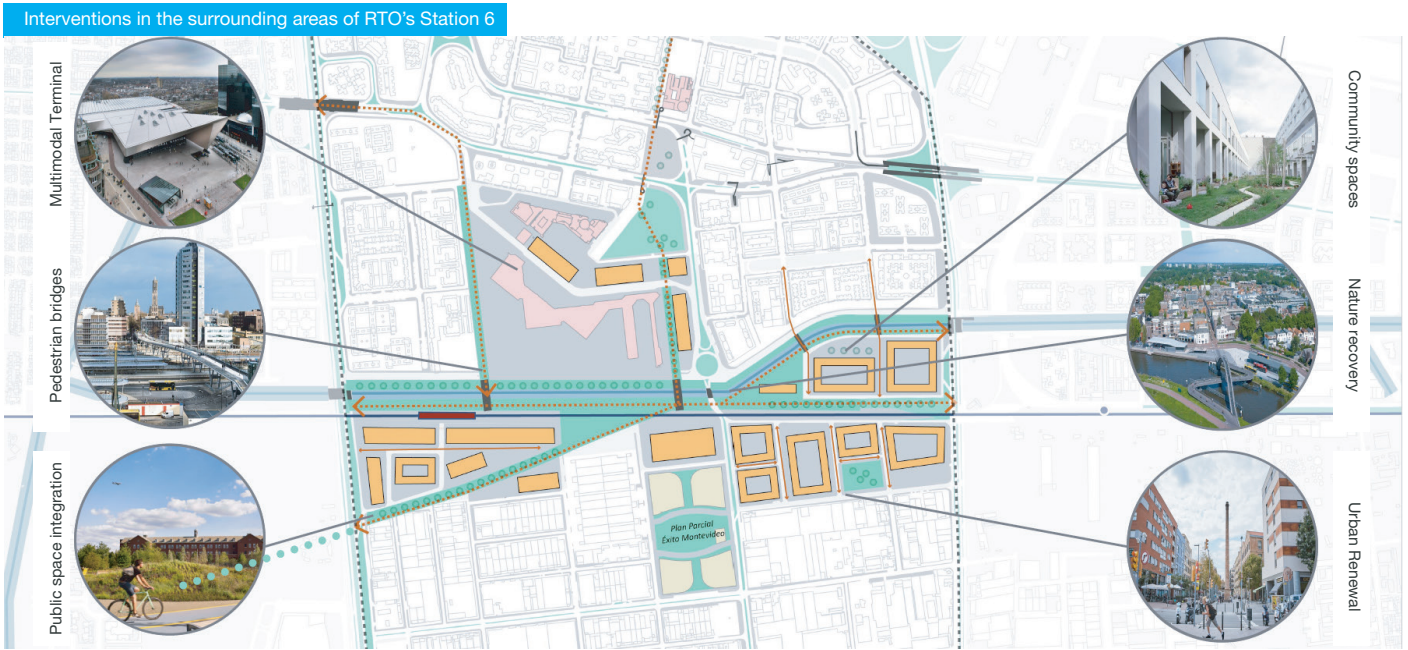
The interventions that seek to increase RTO's potential for sustainable territorial development should focus on the physical and operational integration and on placemaking efforts around the stations. Interventions proposed by the studies executed within the World Bank's Technical Assistance effort, based on a joint 3V Methodology /TOD standard assessment of the areas around the stations are presented in [Table 7](#) . The distribution of these interventions in the areas surrounding the two stations is presented in [Figure 15](#).

| Table 7 - Interventions proposed by Steer for Stations 6 (Bogotá) and 15 (Madrid) |   |  |   |
|---|---|--|---|
| Station 6 – Av. Boyacá  |   | Station 15 - Madrid Centro   |   |
| Intervention  | Expected impact   | Intervention   | Expected impact   |
| Multimodal Terminal / transfer station  | <ul style="list-style-type: none"> <li>· Increase demand for RTO and its influence on mobility conditions of the municipalities to the west of Bogota.</li> <li>· Provide intermodal travel options.</li> <li>· Facilitate user interchange between the RTO's station and the Intermunicipal Bus Terminal.</li> </ul> | Integration of the Subachoque River into public space                    | <ul style="list-style-type: none"> <li>· Turning the river into a driver of attraction and integration of public space, with options for passive recreation and pedestrian and cycling flows.</li> </ul>  |
| Urban integration through public space  | <ul style="list-style-type: none"> <li>· Increase the quantity and quality of public space around the RTO station.</li> <li>· Encourage the use of active modes.</li> <li>· Facilitate users' access to the Intermunicipal terminal and the RTO.</li> </ul>   | Reconfiguration of public space around proposed station                  | <ul style="list-style-type: none"> <li>· Increased use of active modes.</li> <li>· Recovery of municipal heritage.</li> <li>· Decreasing the barrier effect that the new station could generate in its immediate context.</li> </ul>  |
| Combined-use buildings that activate public space                                 | <ul style="list-style-type: none"> <li>· Creation of a diverse, active and safe urban environment.</li> <li>· Encourage use of active modes of transport.</li> <li>· Increase demand for RTO.</li> </ul>  | New housing typologies that incentivize diversity of uses and social mix | <ul style="list-style-type: none"> <li>· Efficient and sustainable use of infrastructure and urban lands.</li> <li>· Increased demand for the RTO.</li> <li>· Greater access to RTO by inhabitants of the Municipality.</li> <li>· Diversification of local housing supply.</li> </ul>  |
| San Francisco River Renaissance   | <ul style="list-style-type: none"> <li>· Integration and recovery of the river as main ecological structure element,</li> <li>· Increased use of active modes.</li> <li>· Revitalization of the Montevideo Sector that is crossed by the canal.</li> </ul>  | Rail corridor as a public space generator                                | <ul style="list-style-type: none"> <li>· Transform the railway corridor into an active mobility element in Madrid, generating and connecting quality public spaces.</li> <li>· Mitigation of the potential barrier effect to be caused by the RTO once in Operation.</li> </ul>         |
| Creating an innovation district   | <ul style="list-style-type: none"> <li>· Urban renewal through the creation of an innovation district.</li> <li>· Continuous use of the Montevideo sector throughout the day in order to enhance citizen security.</li> </ul>   | Shared streets   | <ul style="list-style-type: none"> <li>· Higher level of connection for pedestrians and cyclists.</li> <li>· Northern and southern integration of the city center through non-motorized transport modes.</li> <li>· Improved accessibility and road safety into RTO Station.</li> </ul> |
|   |   | Modal integration  | <ul style="list-style-type: none"> <li>· Lower dependence on private streets for local travel.</li> <li>· Diversification of transport options.</li> </ul>  |

Source: Prepared by authors based on Steer (2019b)



Figure 15 – Location of the interventions proposed for RTO's stations 6 and 15.



Source: Adapted by the authors from Steer (2019b)

The RTO faces significant challenges in developing the institutional capacity and also in creating and achieving agreement and coordination among the many local authorities whose population it serves, if it is to deliver its sustainable territorial development benefits. Unlike EMB, the Empresa Férrea Regional (EFR) has no statutory mandate to perform urban operator duties. The EFR is also located in an odd institutional position, as it reports to the Gobernacion de Cundinamarca, a regional government that has no institutions that can assist EFR in designing or implementing complementary TOD interventions. Without a regional agency to assume the regional development transformation role, the tasks of designing, financing and executing TOD interventions fall on the individual municipalities, which have been proven to have limited overall institutional capacity and incomplete regulatory frameworks. These shortcomings may compromise the RTO's potential for compact, inclusive and sustainable regional development.

Box 3 - Long term TOD and LVC efforts may overcome lack of short-term commitment of autonomous local governments to consensus and coordination on sustainable regional development - Lessons from Seoul, South Korea

It is quite difficult for multiple local governments and other entities with sufficient autonomy to reach consensus in a short period of time. However, it is not impossible to achieve this goal with long-term administration. In South Korea, Transit Oriented Development (TOD), pedestrian friendly streets, or public participation planning have been understood as goals that were considered unattainable 20 or more years ago. But now almost all local municipalities are oriented towards them, and most citizens consider this approach important and natural in some respects.

The Rosario Plan, the first TOD-related plan in Seoul, was proposed in 1980, and it was reflected in the official Comprehensive Plan in 1990 (Sung & Choi, 2017). During the 1980's Seoul did not develop around 50% of the Gangnam area (which became famous for the song called "Gangnam Style"), which now functions as one of the city's centers. By 1990, Seoul had almost reached its current urban districts' boundary as well as greenbelt lines, and had been developed under a less-dense development scheme until then, compared to current built environments. Around 1997, the

Rosario Plan recommendation of upzoning areas around mass transit stations was finally adopted. In this case, some of the recommendations of Rosario plan were finally adopted almost 20 years after they were initially proposed. However, even in the late 1990s, it cannot be said that TOD adoption progressed well in Seoul. Until the 21st century, most municipalities in Seoul had not taken up the idea that transit is important. A lot of the transformation to the current condition was based on Seoul Metropolitan Government's long-term commitment to opening and expanding subway line and bus networks, and seeking to serve most large-scale developments with transit services. Now everyone has public transport network in mind when choosing their jobs and homes, and politicians and government officials consider expanding the public transport network as their critical task.

For years, recommendations have been made to adopt "higher level" rules or to create a formal administrative institution to lead and steer regional development towards sustainability, compactness and equality goals. However, existing ad-hoc institutional arrangements could be as effective if they are strengthened. The inclusive and sustainable development of city-regions usually favor brownfield over greenfield developments. However, confining all new growth to already developed areas may not be feasible, as those municipalities with lower levels of prior development will oppose or resist these policies, since they force them to pass or miss out on inward investment or social and economic development opportunities that their more developed, and often wealthier neighbors, are able to seize. Sustainable territorial development is likely to require some residents to forgo opportunities to achieve the desired goal, and without redistribution or compensation schemes that evenly redistribute the social, economic and financial benefits of the effort across all participants, the commitment to the larger goal may be short lived. One interesting model to consider when designing and applying those redistribution or compensation schemes is the social cohesion model used by the European Union to compensate those countries or

regions that stand to gain less, or even lose, from the unification effort. Maintaining the commitment of the local governments within the Bogotá - Cundinamarca region to a regional sustainable development agenda may depend more on the effectiveness of these compensation schemes than on passing new regulations, creating new institutions or getting multiple local governments to sign an agreement.

The RTO Corridor within Bogota does not currently possess the same conditions or tools to pursue and manage TOD Transformation as BML1's corridor after Bogota's Decree 823 of 2019. This decree was issued in late 2019 to fill the voids left by Bogota's City Council's rejection of a proposed update of the city's 20-year-old Land Use plan. The Decree changed the zoning regulations and adopted additional tools for the BML1, but did not make any changes to the RTO corridor. Adopting similar tools to manage development and pursue value capture along the RTO is not only required to better manage redevelopments that follow the RTO's commissioning, but also to provide a better ground for territorial development across the city. Bogota should therefore make an effort to adopt similar management and value capture capabilities for the RTO's corridor to better guide redevelopment along the sustainable territorial development path, and to leverage value capture instruments to obtain more funds to support those TOD interventions that the public sector needs to make on its own.

## RECOMMENDATIONS

### Recommendation 1: Improving physical and operational integration between RTO stations and their surroundings.

The underutilization or abandonment for more than two decades of the railway corridor that will be used for the RTO has led to the disarticulation of the railway and its surroundings. Realizing the potential of the RTO as a catalyst and a backbone for sustainable regional development will require a deliberate and coordinated effort

from EFR, the Gobernacion and local governments to improve the insertion of the RTO into the local urban and regional fabrics through accessibility-improvement interventions and measures to improve intermodal transfers and operational integration between the RegioTram de Occidente and local and intermunicipal transit services. Accessibility improvements should also consider public space improvements and efforts to promote and facilitate non-motorized trips within the local station areas, but also across the wider region. These actions may have the additional benefit of increasing and securing ridership on the RTO, with the associated benefits in terms of revenue for the mass transit operator.

### Recommendation 2: Strengthening place value of the surroundings of RTO Stations.

The second set of recommendations focuses on raising place value by increasing the mixed-use nature of the station's surroundings, but also - and this is very important - by increasing the availability of social and economic activities that make station areas important trip origin or destination locations. Without these TOD interventions, most RTO users will need to resort to buses or other types of motorized transport to either get to the RTO station at the beginning of the trip, or to do the last leg from the station to the final destination, being these transfers even less desirable when no transit modes integration is considered. Increasing the number of origin and destination locations in proximity of the stations will help ridership projections for the RTO to be met, maintained and even surpassed, promote non-motorized forms of transport and realize the potential of the RTO to act as a new backbone for sustainable territorial development. One of the ways to increase place value around the RTO's (and also of BML1's) stations is by increasing the supply of housing, with particular attention of social housing which has tended to locate in the western and southern outskirts of Bogota, or in proximity of the Municipalities located in those areas (see [Figure 5](#)). The holistic territorial development approach provided by the combination between TOD assessment and interventions and land value



capture instruments could be used to increase the numbers of dwellings being located in proximity of mass transit stations. In particular, the higher value capture potential of the city's outskirts or of nearby municipalities could be leveraged by local and regional governments to increase the supply of social housing units in locations with good accessibility to jobs and social infrastructures.

**Recommendation 3: Institutional and regulatory framework strengthening to leverage the regional sustainable development and value capture potential of RTO.**

It is unlikely that the physical and operational improvements of recommendation 1 or the placemaking efforts of recommendation 2 can take place without solid institutional arrangements or regulatory frameworks for urban or regional development management across the region. Most of the regional connectivity or local accessibility interventions to improve RTO integration into the regional fabric need to be steered and bankrolled by public sector institutions. Weaknesses in both of these aspects may cause the urban footprint to continue expanding with the disperse pattern observed between 2005 and 2016, instead of evolving into a more convenient, compact, diverse and sustainable alternative recommended by the New Urban Agenda.

Promoting developments or redevelopments along the RTO corridor but failing to manage them may push RTO to miss the opportunity of becoming the catalyst and backbone for the sustainable development of Bogota and these western municipalities, if developers fail to use their designs to improve the node, place and market potential values of the RTO's stations, and local authorities are unable to channel land value capture instruments into providing the funds for the interventions corresponding to the public sector.

Institutional and regulatory strengthening will seek to work along three concurrent lines of work:

**1. Adoption of higher level rules by the National or regional**

Governments that force or nudge municipal governments into aligning their efforts. *Higher level rules* include decisions by organizations from the executive branch of power (Decrees, resoluciones) or by legislative branch decisions (laws, or ordenanzas from regional assemblies). It is important to consider the political, procedural or timing requirements associated to these different types of legal instruments before committing to an effort that may not yield the desired results.

**2. Strengthening of the Regional Institutional Arrangements and regulatory frameworks to adopt and monitor regional sustainable development objectives.** There is no need to wait for a Constitutional reform to be pushed through for the governments of Bogota's and the other regional institutions to agree and start pursuing regional sustainable development goals. Current ad-hoc schemes such as the Comité de Integración Territorial can become the forum where these agreements are reached, and also where their pursuit is coordinated and monitored, but they need to be given adequate resources and powers to perform this challenging role.

**3. Development of coordination, compensation and/or redistribution tools to maintain that commitment to regional sustainable development.** Regional sustainable development agreements (or mandates) cannot be expected to achieve their desired goals without explicit means for coordination and also for the redistribution of the benefits of sustainable regional development. Increasingly complex urban-regional contexts, such as that of the Bogota – Cundinamarca region being discussed, make it difficult for stakeholders to understand which types of behaviors and actions to pursue and which not to. Regional development analysis and intervention capabilities and tools (such as UrbanSIM's model discussed in [Box 2](#)) should be developed to increase the effectiveness of policies and interventions, and incentives schemes should be introduced to promote coordination among local stakeholders. These incentives schemes should be

be tied to redistribution or compensation schemes that seek to achieve and maintain the commitment of those locations that could gain less, or even lose out, from restrictions or limitations that come with the sustainable development effort. The European Union's Cohesion Policy and its implementation through structural or cohesion funds could serve as a model for those compensation schemes.

To promote inclusivity in the development and redevelopment efforts around the RTO's stations, the strengthening the institutional and regulatory frameworks should enable:

- (i) introducing a requirement to allocate 10%-30% of development or redevelopment areas for social housing,
- (ii) additional development rights of 20% FAR (or more) over the standard LUP, for developments that provide on-site social housing,
- (iii) regulatory and design flexibility for developments that provide on-site social housing,
- (iv) fast tracking of construction permits and licenses for developments that will provide on-site social housing,
- (v) tax breaks for property taxes or "participación en plusvalía" or reduced costs for licenses or other permits,
- (vi) ability to channel or benefit from social housing subsidies to leverage real estate projects with convenient disbursement conditions to improve the project cash-flows;
- (vii) Ability to rent social housing to reduce development costs and
- (viii) free contribution of public sector-owned land plots in exchange for on-site development of social housing.

**Recommendation 4: Adoption of territorial management and land value capture tools for the RTO that are similar in scope and breadth to those adopted for the BML1 corridor in Bogota's Decree 823 of 2019.**

Throughout this document it has been argued that the RTO corridor could be attractive to private developers for renewal or to the public sector for land value capture. However, in the absence of a toolkit similar to that of the BML1's corridor for territorial management and financing through Bogota's Decree 823 of 2019, it may not be possible to seize its sustainable territorial development or

value capture potential. This weakness may make it particularly difficult for local authorities to drive the node, place and market potential interventions that are needed to make the RTO a catalyst and a backbone for compact, diverse and sustainable development. The adoption of this toolkit is not limited to Bogota, as other Municipalities need to develop similar capabilities to leverage the benefits of the RTO for their territory.

CONCLUSIONS AND NEXT STEPS  
FOR TOD-BASED REGIONAL  
SUSTAINABLE DEVELOPMENT  
FOR THE BOGOTA –  
CUNDINAMARCA REGION

Bogotá and its surrounding municipalities make up an urban-regional system marked by high densities in Bogota, decreasing densities in the surrounding municipalities, clustering of land uses and social groups and uneven distribution of social infrastructure, conditions that could make it more difficult or costly to pursue a TOD-compliant regional sustainable development. The key challenge for the sustainable territorial development of the Bogota – Cundinamarca region based on TOD-identified and prioritized interventions lies in reducing the clustering of land uses and income groups, and also improving the distribution of social infrastructures across the region. The current spatial distribution of socioeconomic activities concentrates most formal jobs and social services in Bogota's expanded downtown area, with other smaller regional subcenters getting a minor share of employment and having social service limitations derived from the complete absence of those services or from accessibility problems. Major mass transit projects scheduled for implementation over the coming years in the Bogota – Cundinamarca region may help achieve a more sustainable development with even more opportunities and social services across the region and better access by mass and non- motorized transport.

Considering that the corridors of BML1 and RTO are part of the same urban-regional system, interventions to improve their TOD-compliance should be coordinated for planning and management. The increasing complexity of city-region environments have led many traditional tools and methodologies, which relied on sectoral analysis or linear-causality relationships, to become obsolete for approaching and tackling current urban problems. Today's high level of interaction between social and urban activities makes it likely that any given intervention may have a knock-on effect on activities and sectors beyond those deliberately targeted, which may facilitate or resist the change desired. As Norman (2011) discusses, complexity is a condition of the world we live in, and the problem lies not in the complexity

itself, but in lacking the tools and capabilities to grasp and manage it. Urban planning and management methodologies and tools should be updated and upgraded to acknowledge this increasing complexity, and to use it to its advantage by identifying high-leverage actions. Continuing with the development of the UrbanSIM agent-based land use model or other similar tools could help understand how regional development patterns emerge from the interaction of the multiple and diverse regional stakeholders, allowing the region's analysts and decision makers to test and coordinate policies and interventions before rolling them out. These models can also help develop and fine-tune strategies to encourage private sector developers to lead urban renovation efforts and maximize value capture efforts through revenue generation and local and regional impacts.

Notwithstanding the benefits and advantages that TOD methodologies and standards bring to focus interventions into more specific areas within a region, the sheer scope of the transformation challenge is likely to overwhelm the EMB or EFR's ability to lead and manage the transformation. Successful transformation will require a phased approach to the intervention around these mass transit systems' stations. This document makes the point for EMB to adopt a phased intervention strategy in the areas around the stations. This strategy consists of dividing the areas around the stations into three zones (P1, P2 and P3), each with a given priority or timeframe for intervention and with a different role for the institution in charge of the implementation and operation of the Transit System. For BML1, EMB should assume a leadership and hands-on promotion role for the redevelopment of the P1 zone. The importance of tackling this area first comes from the need to improve the interface between the transit system and the urban fabric around the station. Only after having made significant advances in transforming the P1 area EMB's efforts should focus on the P2 area, with similar significant advances being achieved before shifting focus to the P3 area. For BML1, EMB's role in P2 and P3 should be one of

facilitation and support for developer or community-led redevelopment initiatives. The TOD-interventions near the RTO's stations could follow a similar phased intervention strategy, which in their particular case becomes more relevant as one of the RTO's main challenges is improving its insertion into the city-region's fabric through connectivity and accessibility improvements and increasing origin and destination uses in their immediate context.

Stronger territorial management and land value capture institutional arrangements and regulatory frameworks need to be put in place to harness the potential of the RTO corridor as a catalyst and backbone for sustainable regional development. The physical and operational integration of the RTO with its surroundings is not likely to be achieved without stronger institutional arrangements and regulatory frameworks that allow for regional territorial development to be pursued jointly by public and private stakeholders. Without strong and capable institutions, and instruments that strengthen the public sector's position to guide or steer development or redevelopment, the future growth of the region's urban footprint may continue along the rural, low density, and heterogeneous development path observed during the 2005-2016 period, instead of the recommended compact, inclusive and sustainable alternative. Agreements and new formal administrative institutions need to be pursued, but increasing attention needs to be paid to how the regional stakeholders will be incentivized to commit in the long term to these objectives. Compensation or redistribution schemes similar to those adopted by the European Union under its Cohesion policy could be a viable alternative to achieve and maintain the commitment of those that could gain less, or even lose out, from the compromises that will be required for that sustainable regional development goal.



Table 8 - Summary of recommendations, pointing to entities linked to their implementation

| Emphasis Recommendation | Recommendation   | Linked actors  |
|-------------------------|--|--|
| <b>BML1</b>             | <b>Recommendation 1:</b> Prepare and execute a phased TOD intervention strategy for the redevelopment of the influence area of BML1 stations.  | EMB, SDP, ERU, Secretaria Distrital del Habitat, DADEP and Secretaria Distrital de Movilidad   |
|                         | <b>Recommendation 2:</b> Recommendation 2: Strengthening of Bogota's institutional arrangements to coordinate and manage the renewal of TOD interventions along the BML1 corridor.   | EMB, SDP, ERU, Secretaria Distrital del Habitat, DADEP and Secretaria Distrital de Movilidad   |
|                         | <b>Recommendation 3:</b> Strengthening the capacity of EMB and the tools available to other urban-related government institutions within Bogota to lead and deliver urban TOD transformation and LVC efforts.  | EMB, SDP, ERU, Secretaria Distrital del Habitat  |
| <b>RTO</b>              | <b>Recommendation 1:</b> Improving physical and operational integration between RTO stations and their surroundings.   | Ministry of Transport<br>Gobernación de Cundinamarca Alcaldía Mayor de Bogotá and its planning, urban renewal, public space and mobility institutions.<br>Municipal administrations along the RTO corridor with their planning, urban renewal, public space and mobility institutions<br>Empresa Férrea Regional |
|                         | <b>Recommendation 2:</b> Strengthening place value of the surroundings of RTO Stations.  | Ministry of Transport<br>Gobernación de Cundinamarca Alcaldía Mayor de Bogotá and its planning, urban renewal, public space and mobility institutions.<br>Municipal administrations along the RTO corridor with their planning, urban renewal, public space and mobility institutions<br>Empresa Férrea Regional |
|                         | <b>Recommendation 3:</b> Institutional and regulatory framework strengthening to leverage the regional sustainable development and value capture potential of RTO.   | Gobernación de Cundinamarca Alcaldía Mayor de Bogotá and its planning, urban renewal, public space and mobility institutions.<br>Municipal administrations along the RTO corridor with their planning, urban renewal, public space and mobility institutions<br>Empresa Férrea Regional                          |
|                         | <b>Recommendation 4:</b> Adoption of territorial management and land value capture tools for the RTO that are similar in scope and breadth to those adopted for the BML1 corridor in Bogota's Decree 823 of 2019.  | Alcaldía Mayor de Bogotá and its planning, urban renewal, public space and mobility institutions.  |
| <b>General</b>          | Move towards a holistic model of territorial analysis and of coordinated and coherent inter sectoral interventions that provide insights on the required interventions and on the high leverage policies and points that can lead to maximum contribution by BML1, RTO or other regional macro-projects to regional sustainable development. | Gobernación de Cundinamarca Alcaldía Mayor de Bogotá and its planning, urban renewal, public space and mobility institutions.<br>Municipal administrations along the RTO corridor with their planning, urban renewal, public space and mobility institutions<br>Empresa Férrea Regional                          |

## REFERENCES

# REFERENCES

- Alonso, W.** (1964). *Location and Land Use*. Cambridge, MA: Harvard University Press.
- Borrero Ochoa, O. A., & Montaña Murillo, M. C.** (2015). *Los Planes Parciales en Colombia*. Bogotá: Bhandar Editores.
- Buitelaar, E., Galle, M., & Sorel, N.** (1 de Abril de 2011). *Plan-led planning systems in development-led practices. Environment and Planning A 2011, volume 43*, págs. 928-941.
- Carlton, I.** (2007). *Histories of Transit-Oriented Development: Perspectives on the Development of the TOD Concept*. Berkeley, CA: Institute for Urban and Regional Development - University of California, Berkeley.
- Cervero, R.** (1995a). *Sustainable new towns: Stockholm's rail served satellites. Cities - 12* (1), 41-51.
- Cervero, R.** (1995b). *Planned communities, self-containment and commuting: A cross-national perspective. Urban Studies Vol 32* (7), 1135-1161.
- Crooks, A., Malleson, N., Manley, E., & Heppenstall, A.** (2019). *Agent-Based Modelling & Geographical Information Systems: A Practical Primer*. Londres: Sage Publications Ltd.
- DADEP.** (2016). *Reporte Técnico de Indicadores de Espacio Público*. Bogotá D.C.: DADEP.
- DANE.** (15 de Enero de 2020). *Población ajustada por Cobertura*. Obtenido de Censo Nacional de Población y Vivienda 2018: <https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivienda-2018>
- DNP.** (Junio de 2016). *Presentaciones*. Obtenido de Lanzamiento Programa Territorios Modernos: <https://colaboracion.dnp.gov.co/CDT/Prensa/Presentaciones/Lanzamiento%20Territorios%20Modernos.pdf>
- Hall, P.** (2002). *Cities of Tomorrow*, 3rd Ed. Oxford, UK: Basil Blackwell.
- IDECA.** (15 de Diciembre de 2019). *Mapas - Ideca*. Obtenido de Infreestructura de Datos Espaciales para el Distrito Capital: [https://www.ideca.gov.co/buscador?topic=All&metadata=All&nest=All&entity=All&resource=All&content\\_type=map&res=true](https://www.ideca.gov.co/buscador?topic=All&metadata=All&nest=All&entity=All&resource=All&content_type=map&res=true)
- IDOM.** (2018a). *Capítulo 2 Análisis Histórico y Evolución de la Huella Urbana*. Bogotá: IDOM.
- ITDP.** (2017). *TOD Standard Version 3.0*. Nueva York: ITDP.
- JFP & Asociados - Derecho Urbano.** (2019a). *Documento Ejecutivo 1: Análisis de alternativas de instrumentos normativos para ejecutar la estrategia DOT*. Bogotá: JFP & Asociados - Derecho Urbano.
- JFP & Asociados - Derecho Urbano.** (2019b). *Entregable 3: Recomendaciones para la estrategia DOT*. Bogotá: JFP & Asociados - Derecho Urbano.
- JFP & Asociados - Derecho Urbano.** (2019c). *Entregable 4: Conclusiones del Análisis Institucional y Normativo*. Bogotá: JFP & Asociados - Derecho Urbano.

**Marshall, A.** (1920). *Principles of Economics*. Londres: MacMillan.

**Medina, L.** (2019). *Apoyo en el cálculo de captura de valor de suelo y absorción del mercado inmobiliario para la implementación de estrategia DOT en la PLMB*. Bogotá.

**Norman, D. A.** (2011). *Living with Complexity*. Cambridge, MA: The MIT Press.

**Salat, S., & Ollivier, G.** (2017). *Transforming the Urban Space through Transit-Oriented Development: The 3V Approach*. Washington: World Bank.

**Schelling, T. C.** (1971). *Dynamic Models of Segregation*. Journal of Mathematical Sociology Vol. 1, 143-186.

**Semana.** (22 de Julio de 2017). *El escándalo de los POT 'mágicos'*. Obtenido de Semana.com: <https://www.semana.com/nacion/articulo/corrupcion-en-los-planes-de-ordenamiento-territorial/533383>

**Semana.** (22 de Septiembre de 2018). *¿Otro 'volteo'?* Obtenido de Semana.com: <https://www.semana.com/enfoque/articulo/municipio-de-cundinamarca-sufre-rationamiento-de-agua-y-volteo-de-tierras/584206>

**Steer.** (2019a). *Entregable 2: Análisis Urbano y Recomendaciones para el desarrollo sostenible de Bogotá - Cundinamarca*. Bogotá: Steer.

**Steer.** (2019b). *Entregable 3: Recomendaciones para implementar estrategias de desarrollo sostenible en Bogotá y la Sabana Occidente*. Bogotá D.C.: Steer.

**Sterman, J. D.** (2000). *Business Dynamics: Systems Thinking And Modelling For a Complex World*. Boston, MA: Irwin McGraw-Hill.

**Sung, H., & Choi, C. G.** (2017). *The link between metropolitan planning and transit-oriented development: An examination of the Rosario Plan in 1980 for Seoul, South Korea*. Land Use Policy 63, 514-522.

**UNEP - Risø Centre on Energy, Climate and Sustainable Development.** (2011). *Technologies for Climate Change Mitigation - Transport Sector*. Roskilde, Denmark: UNEP.

**UN-Habitat.** (17-20 de Octubre de 2016). *The New Urban Agenda*. Obtenido de Habitat III: <http://habitat3.org/the-new-urban-agenda/>

**Veeduría Distrital.** (15 de Enero de 2020). *Fichas Locales 2019*. Obtenido de Otros Documentos: <https://www.veedurriadistrital.gov.co/content/Fichas-locales-2019>

**von Thünen, J. H.** (1826). *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*. Hamburg.

**Vongpraseuth, T., Seong, E. Y., Shin, S., Kim, S. H., & Choi, C. G.** (2020). *Hope and reality of new towns under greenbelt regulation: The case of self-containment or transit-oriented metropolises of the first-generation new towns in the Seoul Metropolitan Area, South Korea*. Cities, DOI: 10.1016/j.cities.2020.102699.



