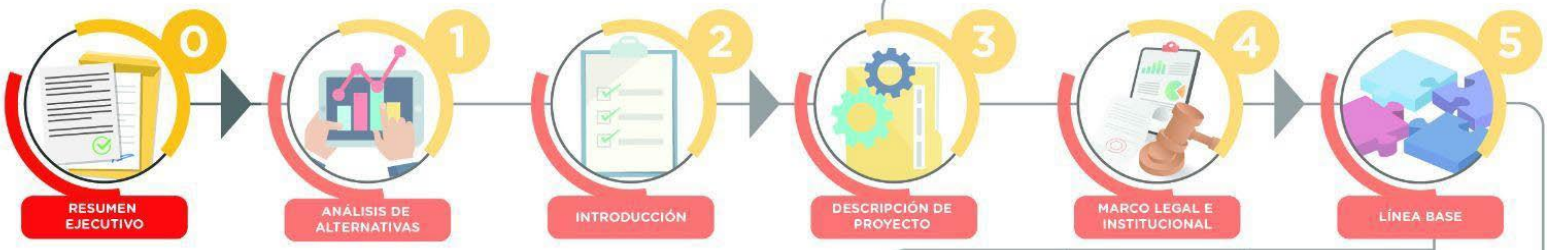
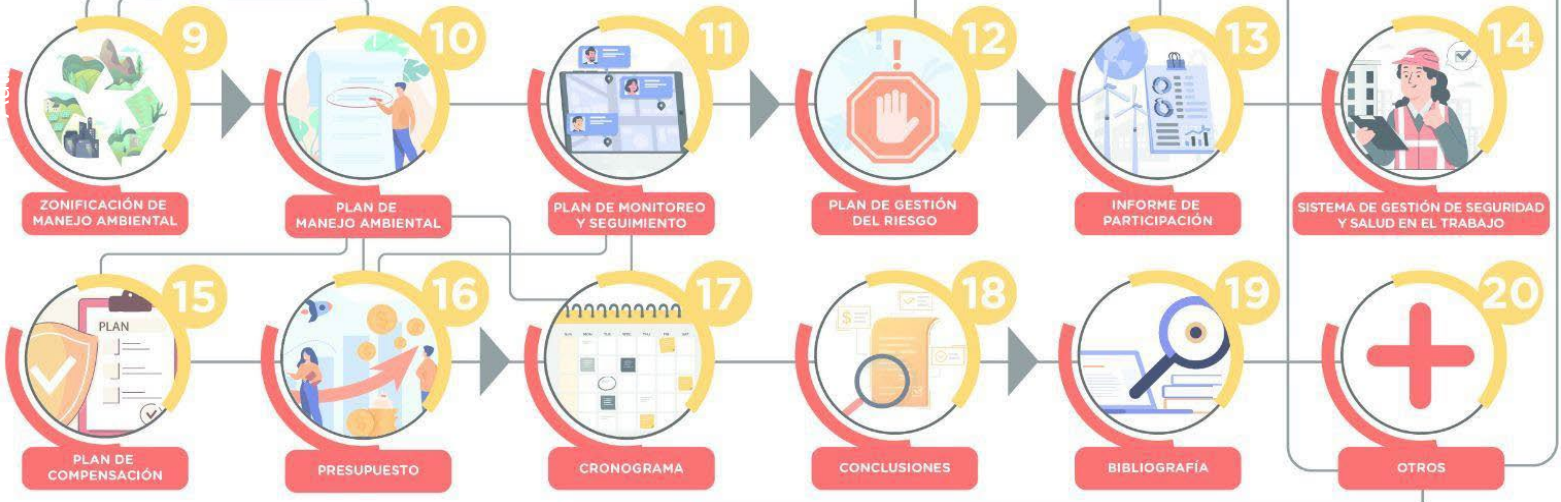
METRO BOGOTÁ

¡EL METRO HACE PARTE DE NUESTRA VIDA!

0. RESUMEN EJECUTIVO





FDN Financiera de Desarrollo Nacional

La BOGOTÁ que estamos construyendo

ALCALDÍA MAYOR DE BOGOTÁ D.C.

METRO BOGOTÁ

BOGOTÁ

Inter-administrative contract 136 of 2021
Carry out the integral structuring of the Line 2 project of the Bogotá Metro, including the legal, risk, technical and financial components

Chapter 0
Executive Summary

Document No.: L2MB-0000-000-MOV-DP-AMB-IN-001-VE

Prepared by:

CHANGE CONTROL

INDEX OF MODIFICATIONS

Revision	Date	Amended section	Remarks
To	26-11-2022	_	Original version
B	08-11-2022	Throughout the document	The observations generated by: World Banking. Product of the work tables held during October 3, 4 and 5, 2022. Audit presented in email of October 6, 2022
C	04-11-2022	Throughout document	Attention to observations generated by the Audit associated with completeness, presented through communication INTL2MB-EGIS-MOV-CE-TEC-270 of October 28, 2022 and those related by mail of November 2, 2022.
D	10-02-2023	Throughout document	Attention to observations generated during the Bank's missions carried out in November and December 2022. Attention to observations of Empresa Metro de Bogotá presented in communication EXTS22-0006106 of November 4, 2022. Attention to comments to the European Bank. Attention to audit observations submitted on January 19, 2023.
And	27-07-2023	Throughout document	Attention to observations generated by the Audit Office on 22-02-2023. Attention observations generated by the EMB through mail of 03-17-2023. Attention observations generated by the Bank through mail of 12-04-2023. Attention observations generated by the World Bank Banking through mail of 07-19-2023.

FDN REVIEW AND APPROVAL

Name. Surname 27-07-2023
Structuring Director

REVIEW AND APPROVAL MOVIUS ADVISORS

ENVIRONMENTAL DIVISION	Prepared: Mr. Duarte 27-07-2023	Revised: D. Martinez 27-07-2023	Revised: I. Silva 27-07-2023
	VoBo. Abiotic Medium Executing Engineer	VoBo. Abiotic Media Coordinator	VoBo. Department Director
	Prepared: Mr. Peña 27-07-2023	Revised: G. Pedraza 27-07-2023	Revised: R. Martin 27-07-2023
	VoBo. Biotic Executor Engineer	VoBo. Biotic Media Coordinator	VoBo. Department Director
	Prepared: J. Otero 27-07-2023	Prepared: J. Samaniego 27-07-2023	Revised: Y. Ruiz 27-07-2023
	VoBo. Socioeconomic Engineer	VoBo.Medium Socioeconomic Coordinator	VoBo. Department Director

Prepared:	Revised:

A. Saenz 27-07-2023	A. Amaya 27-07-2023
VoBo. Environmental Study Coordinator	VoBo. Environmental Study Director

Prepared: F. Sanchez 27-07-2023	Revised: O. Veliz 27-07-2023	Approved: J.M. Martinez 27-07-2023
VoBo. Technical Coordinator	VoBo. Technical Director	VoBo. General Manager of Structuring

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0. EXECUTIVE SUMMARY

0.1. INTRODUCTION.

Taking into account the background described in Chapter 2 - Introduction, and in accordance with the need to advance the integral structuring of the Line 2 Metro de Bogotá project in its legal, risk, technical, and financial components, LA EMB and LA FDN signed Interadministrative Contract 136 of April 12, 2021 (hereinafter the "Interadministrative Contract").

On the occasion of the Inter-Administrative Contract, the FDN signed with La Unión Temporal MOVIUS a contract which aims to "CARRY OUT THE INTEGRAL STRUCTURING OF THE BOGOTÁ METRO LINE 2 PROJECT, INCLUDING THE LEGAL, RISK, TECHNICAL AND FINANCIAL COMPONENTS", which includes the Environmental and Social Impact Study.

For the execution of the studies and designs of the technical component, the following products were developed in a transversal way, according to the technical specifications:

- ET-01. Demand study
- ET-02. POP
- ET-03. Mobility
- ET-04. Land
- ET-05. Environmental and Social Impact Assessment (ESIA)
- ET-06. Topographic Studies
- ET-07. Road geometric design
- ET-08. Urbanism and landscaping
- ET-09. Service networks
- ET-10. Geotechnics and pavements
- ET-11. Structures
- ET-12. Train signalling and control
- ET-13. Telecommunications
- ET-14. RAMS
- ET-15. PMP
- ET-16. Platform doors
- ET-17. Rolling stock
- ET-18. Power supply and traction
- ET-19. Patios and Workshops
- ET-20. Railway geometric design
- ET-21. BIM
- ET-22. Track superstructure
- ET-23. BCC
- ET-24. Tunnel project
- ET-25. Stations and buildings
- ET-26. CapEx
- ET-27. Work program and investment flow
- ET-28. OpEx
- ET-29 Cost Benefit

This Environmental and Social Impact Study (ESIA) - ET-05 of the Bogotá Metro Line 2 - L2MB project, is an environmental and social management tool that allows identifying the characteristics and environment of the areas where it is developed, inputs that will provide the tools to evaluate the possible negative and positive effects that the project will generate on the environment during the pre-operational stage and operation and maintenance stage, In addition to proposing, according to the theory of the hierarchy of mitigation, management measures that allow preventing, correcting and compensating the identified impacts. On the other hand, the approach in all the chapters of this Study is carried out based on the environmental and social regulations applicable at the national level, as well as the different Environmental and Social Standards established by the Multilateral Bank, in each chapter the annotations of their compliance and the corresponding context of applicability are made.

The environmental and social evaluation of the L2MB project has required an extraordinary and atypical effort, which has required multidisciplinary activities, involving specialists and professionals from various disciplines.

The study collects and analyzes primary and secondary information that in some cases exceeds the decade in terms of historical collection of information from the city. In addition, the same evaluation poses challenges of great importance for the project and the analyses required to support the understanding of the territory. In this sense, studies with a high degree of specialization were carried out focused mainly on topics related to geology, geotechnics, hydrogeology, soils, air quality, noise, vibrations, landscape, water quality, biotic issues, social and cultural issues, most of which are part of this document and are incorporated as annexes to the study.

It should be noted that the environmental and social evaluation of the L2MB project required the identification of areas of direct and indirect influence, on which broad and sufficient models were built to understand hydrogeological dynamics, air quality behavior, noise and vibrations in the localities under the scenario without project and with project and understanding of social and cultural dynamics. In this way, the scope of the impacts caused by the project activities was identified.

As a final note, the Detailed Executive Summary is presented as annex 0-6, which is structured to comply with Technical Specification 05 Environmental and Social of the National Development Finance - FDN

0.2. STANDARDS SAFEGUARDS AND PRELIMINARY GAP ANALYSIS

The project was developed following the Environmental and Social Standards of multilateral banks that are considered applicable to the project, according to the following list.[1]

- IFC Performance Standards. International Finance Corporation (Corporación Financiera Internacional)
- Guide on environment, health and safety IFC Railways
- IFC EHS Guidelines
- Environmental and social framework World Bank
- Environmental and Social Performance Standards of the Inter-American Development Bank - IDB
- Environmental and social standards European Investment Bank - EIB
- CAF Environmental and Social Standards

During the ESIA process, a preliminary gap analysis was conducted with the following standards, frameworks and performance norms of the Multilateral Bank: i) World Bank Environmental and Social Framework (2016), ii) IDB

[1] The description of international standards or policies for environmental and social protection is broken down in paragraph 4.5. INTERNATIONAL REGULATIONS of Chapter 4 Legal Framework.

Environmental and Social Policy Framework (2020), iii) EIB Environmental and Social Standards (2022) and iv) IFC Performance Standards (2012).

Table 1. Preliminary Gap Analysis

STANDARD	MULTILATERAL BANKING				To the	PRELIMINARY GAPS IDENTIFIED
	BM	IDB	EIB	IFC		
Assessment and management of environmental and social risks and impacts	1	1	1	1		Reconciliation with multilateral banks of social and environmental action plans for the next stages of the project Definition of reporting mechanisms to multilateral banks. Need to strengthen EMB's Environmental, Social and OSH management system
Labor and Working Conditions	2	2	8	2		Need to identify and establish a differential mechanism of Petitions, Complaints and Claims for project workers Need to consolidate all labor documents and instruments of national regulations into a labor management plan Joint definition of categorization of occupational accidents for reports to multilateral banks
Resource efficiency and pollution prevention and management	3	3	3	3		In the L2MB project, no gaps are identified against this Multilateral Banking standard
Community Health and Safety	4	4	9	4		In the L2MB project, no gaps are identified against this Multilateral Banking standard
Land acquisition, restrictions on land use and involuntary resettlement	5	5	6	5		Gap analysis and alignment with this performance standard will be addressed through the project's Resettlement Framework and Plan (PR)

Biodiversity conservation and sustainable management of natural resources	6	6	4	6		Need for a biodiversity action plan for the Juan Amarillo and La Conejera wetlands Difference between the environmental compensation mechanism of district regulations and multilateral banking standards
Indigenous Peoples	7	7	7	7	N/A	According to the characteristics of the project and based on the conclusions of the different missions with the Multilateral Bank, it was determined that the standard of ethnic communities is not applicable.
Cultural heritage	8	8	10	8		In the L2MB project, no gaps are identified against this Multilateral Banking standard
Stakeholders	10	10	2	N/A		Need for NO OBJECTION to the Stakeholder Engagement Plan - PPPI
Climate change	N/A	N/A	5	N/A		In the L2MB project, no gaps are identified against this Multilateral Banking standard
Conventions						
To the Alignment						
Total alignment						
Partial Alignment						
No Alignment						
Not Applicable N/A						

Source: FDN 2022

The above is the result of the conclusions generated in the different missions carried out to date with representatives of the different multilateral banks and the exercise prepared by the consultant to review specific issues associated with the requirements of the applicable rules of Multilateral Banking and their status of compliance in the EIAS (ANNEX OF THE TABLE PREPARED BY MOVIUS).

Based on this preliminary gap analysis, these will be validated with environmental, social and OSH professionals from the different Banks and the instruments established by each entity for gap management will be developed, among which we can highlight the IDB's Environmental and Social Action Plan (ESAP) and the World Bank's Environmental and Social Commitment Plan (ESAP).

In order to ensure that the Project complies with applicable Multilateral Bank policies specifically associated with IFC's environmental and social and rail guidelines, Annex 0-7 summarizes detailed preliminary gaps with the main environmental and social aspects and their alignment with policies. The preliminary gap analysis allowed us to identify which aspects merit greater detail or definition, thereby incorporating them into the ESIA.

In Annex 0-2. Checklist safeguards, presents the comparison of the standard or chapter of the ESIA where it is developed, including the annotations of its compliance and the corresponding context of applicability, taking into account the different standards established by some Banks, within the EIA.

0.3. PERMITS AND/OR AUTHORIZATIONS REQUIRED IN THE PROJECT

Below are the environmental permits that the L2MB project will demand during the pre-operational and operational stages, which must be processed by the Concessionaire in the pre-operational stage - preliminary phase. In the event that in the construction stage, the Concessionaire modifies some designs, it must verify the need or not to process additional permits.

Table 2. Required permissions

Permission to be processed	Entity	Project Stage / Phase	Responsible
Forest harvesting permit	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire
Request for compensation for affectation of permeable areas	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire
Presentation of the landscape designs proposed for implementation in the construction project	District Secretary of Environment, Botanical Garden of Bogotá	Pre-operational stage / construction phase	Concessionaire
Single National Safe Conduct for the mobilization of specimens of Biological Diversity – Flora and Urban Trees	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire
Permit for temporary lifting of flora in closed season	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire
Visual Outdoor Advertising Registration	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire
Permission to develop work at night	Local Mayor's Office	Pre-operational stage / construction phase	Concessionaire
PIN for construction and demolition waste procedures	District Secretary of Environment	Pre-operational stage / construction phase	Concessionaire

Source: UT MOVIUS 2022

Consultations were made before the environmental authorities related to the RAMSAR areas, and with respect to the Juan Amarillo and La Conejera wetlands, UT Movius through communication L2MB-MOV-ANLA-CE-TEC-003 of October 18, 2022 to the ANLA, I request concept on the NO affectation of the Juan Amarillo and Conejera wetlands, considering that there will be no intervention on these by the layout and the crossing of the arm of the Juan Amarillo wetland occurs at the level of subsoil, and for the Conejera, the Patio Taller is outside the delimitation area of the wetland. The ANLA through official letter of October 28, 2022 and with File: 2022242123-2-000 indicated that it is not the competence of the ANLA to rule on the communication of the matter, considering that the delimitation of wetlands and the protection made to them is outside the environmental scope of the entity. Additionally, he mentioned that it is up to the Ministry of Environment of Bogotá as the highest regional environmental authority, to respond to the concerns and through file 2022240480-2-000 of October 26, 2022, the ANLA transferred to said entity so that within the framework of its competences it could respond to the request. To date, the SDA has not pronounced, so UT Movius sent communication to the SDA requesting the concept on the subject of wetlands and the AICA Wetlands of the Sabana de Bogotá.

On the other hand, through communication 2023EE8380 of 04-17-2023, the District Secretary of Environment responds to communication 2023ER38786 _ Request for information File 2022242123-2-000 of October 28, 2022. and in it indicates with respect to requesting the certificate of non-affectation to the wetlands of Juan Amarillo and La Conejera that according to the information sent it is indicated that the project will be built at subsoil level, and it is pointed out that, according to the cartographic crossing carried out, it has overlaps with several elements of the EEP, and especially with the Juan Amarillo or Tibabuyes District Wetland Reserve. Therefore, within the framework of the specific evaluation of the environmental permits and procedures subject to the project, reference and describe in detail the designs and activities of the project, as well as its environmental management measures, and at that time, the respective environmental pronouncement will be made. The details of the communication are presented in Annex 0-1. Environmental Authority Releases. Given the above, the Concessionaire must evaluate it once it has the information of the construction engineering of work.

With respect to the permits for occupation of the channel, it is understood that, due to the characteristics of the project, the permit for the occupation of channels does not apply, taking into account that there is no physical impact on the channels of the surface water bodies near the project. However, it is important to bear in mind that the project is in the Feasibility phase, if required by the environmental authority in the future, the concessionaire awarded the construction of the L2MB, will have to process any permit before the SDA based on the final designs that will have to be developed in the previous stage of the project. The above does not ignore that with the technical information presented in the integral structuring of L2MB, it would have the support of any permit to be processed according to the need.

0.4. PROJECT LOCATION

The L2MB project will connect the city from Northeast to Northwest from the town of Chapinero to the town of Suba, the line will have an approximate length of 15.8 km running through the corridors of Calle 72, Avenida Ciudad de Cali, ALO road reserve and the extension of Avenida Transversal de Suba.

The K0+000 is located on Calle 72 with Carrera 11 approximately and continues until heading north along the axis of Avenida Ciudad de Cali or Carrera 86, until Calle 75 where it takes the eastern side of the corridor to reach station No. 6. Later, on the Avenue. City of Cali at the height of Carrera 103 crosses the Nueva Colombia neighborhood to find the reserve of the ALO. From there it continues crossing stations 9, 10 and 11 until it reaches Fontanar del Río where the Patio Taller is located. (See Figure 1).

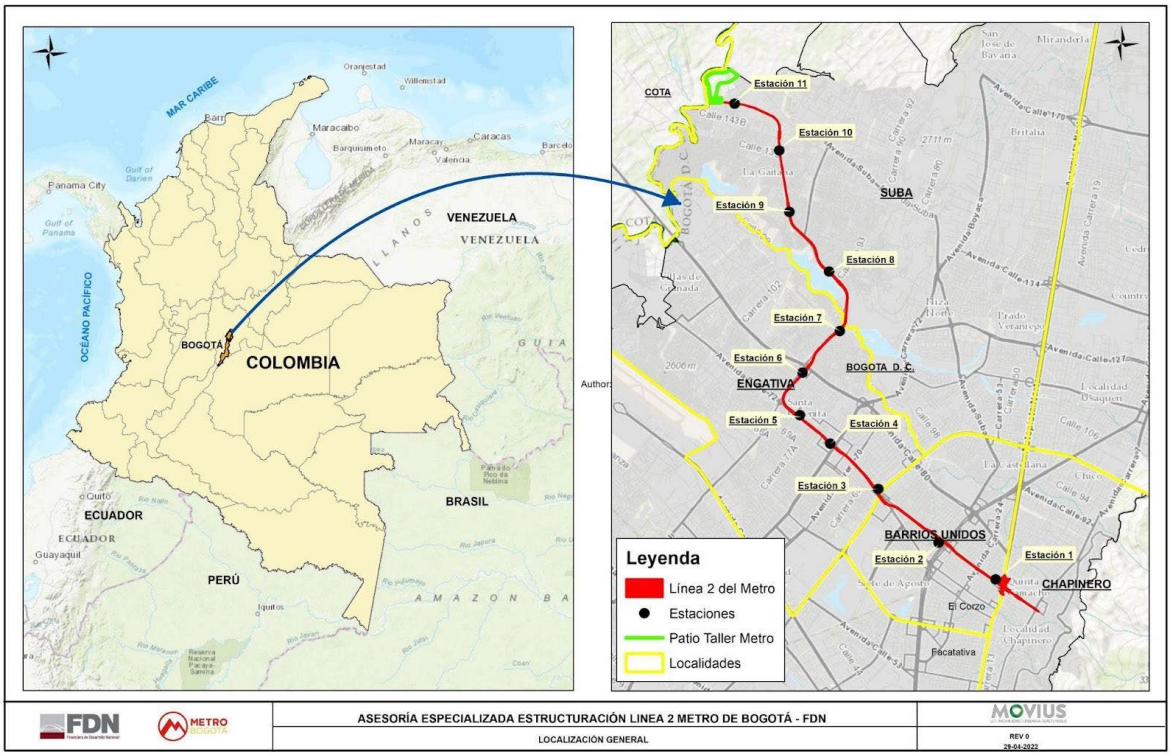


Figure 1. L2MB project localization
Source: UT MOVIUS 2022

0.5. GENERAL ENVIRONMENTAL AND SOCIAL IMPACT STUDY (EIAS)

In the case of the abiotic environment and as an example, to understand the results of the hydrogeological model that support the area of abiotic influence, it is necessary to understand and know the conceptual basis (conceptual hydrogeological model), which is based on the geology, hydraulics, hydrology and hydrogeochemistry of the territory. The same hydrogeological model confirms that in relation to the modification in the exchange dynamics, the valuations developed along the underground line including stations and wells, allowed to establish that neither during construction nor once the works come into operation, there will be any affectation in reference to the current condition of the system; Exchange rates between geological units and surface water sources do not fluctuate once the infrastructure is operational
.
With regard to the modification in the water table, together with the results of the exchange dynamics of the system, the results of the modeling do not reflect fluctuation in the water table either during construction or once the project comes into operation, except with respect to the changes associated with the construction of underground stations and wells, which involve soil removal. In the latter case, the impact is limited to the perimeter of the aforementioned works and is associated with the replacement of existing soils by stations and wells.

For the biotic environment, according to the MADS report, the L2MB project does not intersect areas of National or Regional Forest Reserves, nor forest reserves of Law 2 of 1959, Complementary Conservation Strategies, Strategic Ecosystems, or Biosphere Reserves. However, it reports the intersection of the L2MB project with the Ramsar site, corresponding to the Urban Wetlands Complex of the Capital District of Bogotá, a situation that overlaps underground. Similarly, the consultation with National Natural Parks did not report overlap of the project with areas of National Natural Parks, nor National Conservation Priorities CONPES 3680, nor overlap with RUNAP areas.

Therefore, there are no areas at the national or regional level that belong to the National System of Protected Areas - SINAP or CONPES 3680 areas, or moors, or reserves that are part of the upper basin of the Bogotá River; and the areas with international distinctions that are found, without being categories of management of protected areas but complementary strategies for the conservation of biological diversity, correspond to the Juan Amarillo or Tibabuyes Wetland Ramsar Site that is part of the Urban Wetlands Complex of the Capital District of Bogotá, and the AICA Humedales de la Sabana de Bogotá, as an Important Area for the Conservation of the birds of Colombia and the World - AICAS.

At the local level and in accordance with the categorization of the EEP established in the POT of the city of Bogotá D.C. of 2021, adopted by Decree 555 of December 29, 2021 of the Mayor of Bogotá, D.C., the area of intervention of the project crosses underground on five elements of three categories of the EEP, corresponding to the components of the Conservation Areas, the Areas of Special Ecosystem Importance and the Complementary Areas for Conservation.

In the component of the Conservation Zones, it is within the District System of Protected Areas, the District Reserve of the Juan Amarillo Wetland or Tibabuyes.

Among the areas of special ecosystem importance, there are as part of the city's water system, four bodies of natural water and two artificial bodies of water that are crossed underground by the route of the project and that correspond within the natural ones to the Cafam and Salitre channels, the Salitre river and the Juan Amarillo or Tibabuyes wetland. and among the artificial water bodies, the water bodies of Lago Club Los Lagartos 3 and Lago Club Los Lagartos 4. With respect to the Juan Amarillo or Tibabuyes wetland, the route of the project crosses the northeastern arm of the wetland under the subsoil and at depth, so the projected underground tunnel of the L2MB is outside the legal limit established by the SDA for the surface of the wetland and the zoning of the Environmental Management Plan. Similarly, all bodies of water in the Water System are crossed underground by the project, without affecting their channels, water rounds, parallel strips, or the afferent protection or conservation area.

In the component of the Complementary Areas for conservation, the projected route of the L2MB does not cross areas of the category of contemplative parks and the Structuring Network that are part of the Main Ecological Structure and Edge Parks, however, it crosses areas of the category Subzone of environmental importance of the POMCA Río Bogotá, that correspond to the ecological restoration area ARE-Humedal-Humedal de Juan Amarillo or Tibabuyes, which is crossed underground by the projected tunnel, so that the constructive works of the project will not intervene on the surface of the ARE-Humedal-Wetland areas of Juan Amarillo or Tibabuyes.

In accordance with the above, the L2MB project does not involve elements of the EEP of the city of Bogotá and its crossing is carried out underground without intervening the legal limits established by the SDA, without interfering with the environmental zoning of the Juan Amarillo or Tibabuyes wetland, and without affecting its components and ecological functionality.

It is important to note that in accordance with the mitigation hierarchy and the guidelines of the multilateral bank, adjustments were made early in the designs of superficial works of the L2MB project, based on the application of social and environmental criteria, allowing the non-affectation of EEP such as the Cafam, Salitres channels and the Juan Amarillo Tibabuyes wetland.

On the other hand, for the socio-economic environment, it is essential to understand the cultural, political-organizational dimensions, economic activities, the physical environment and the population to be resettled; under the latter it is indicated that the process of property acquisition in the L2MB project and consequently the impact of involuntary transfer of population and the Resettlement Plan are directly related to the planning and execution of the surface works and in particular with the planned stations.

Taking into account the above, the impact of the Involuntary Transfer of Population will be presented in the specific areas of neighborhoods of seven UPZ and three localities (Barrios Unidos, Engativá and Suba) of the city of Bogotá (See Document of the Resettlement Plan).

The design criteria of the surface works of the L2MB project and the property selection and acquisition processes took into account the main concepts, approaches and guidelines of the Multilateral Bank, in particular the Environmental and Social Standards of the World Bank, WB and the Environmental and Social Performance Standards of the Inter-American Development Bank. IDB, referring to the avoidance of the impact of involuntary transfer of population.

In correspondence with the guidelines of the multilateral bank described, the optimization of the designs of superficial works of the L2MB project, from the application of social and environmental criteria, allowed to disaffect some properties that had initially been considered which mostly corresponded to residential uses, thus avoiding the affectation of Units Social located mainly in the UPZ of Minuto de Dios, in the town of Engativá.

The ESIA document presented below is interesting, with a high level of research and science, complete, multidisciplinary, interdisciplinary, which reflects the reality of the territory and raises and supports the development of a mass transport project necessary for the city of Bogotá that will transform its transport system, the public space along the route, It will improve the quality of life of users of the system and citizens living or working in its vicinity. .

The following Executive Summary of the Environmental Impact Study contains the necessary information to understand the main elements of the project (location, characteristics of works and construction activities, design criteria, among others), its development phases, the particularities of each medium, the process and result of the environmental and social assessment (including the determination of the area of influence and zoning), the proposal of the environmental management plan and other important elements to understand the territory and the results of the study. The Executive Summary is presented following the structure of the ESIA document itself, following each of the chapters that make up the document (Help mind map - COVER)

0.6. ANALYSIS OF ALTERNATIVES

The selection of the expansion zone of the L2MB-T1 was made and 18 route alternatives were identified in order to reach the prioritized expansion project, these identified route alternatives were analyzed within the framework of the Contractual Terms of Conditions – TCC and agreed with the Bogotá EMB Metro Company and the National Development Finance – FDN, under the perspective of components such as: Environmental, urban-landscape impact, social benefits generated by transport and financial, and thus have a battery of indicators that provided the information required for decision making by the Technical Committee (FDN and EMB).

As a result, from the presentation of the initial alternatives to the Technical Committee of the Contract, the recommendation of the Consultancy was accepted and for Phase 2, the following were selected: Six corridors:

1. 1. 127th Street-Avenue. Rincon – Avenida Ciudad de Cali,
2. Calle 100 - Avenida. 68 – 80th Street
3. Rionegro Canal
4. Calle 80 - Avenida. Corner - Avenue. Cali
5. Calle 80-Avenida Ciudad de Cali.
6. Calle 72 – Avenida Ciudad de Cali

The alternative of Calle 80 - Av. Cali - Av. Rincón (Underground) is the alternative with the highest score among the alternatives evaluated, regardless of its typology. In second place, there is Calle 80 – Av. Cali – Av. Rincón (Elevated). The results by component are shown below. These results are ordered in descending order of score for that component Environmental Affectation:

Alt	Corredor	Tipología de línea	Tipo de Conexión línea 1	Puntaje
2.10	Calle 80 – Av. Cali – Av. Rincón	Subterránea	Línea nueva	94,6
2.09	Calle 80 – Av. Cali – Av. Rincón	Elevada	Línea nueva	92,9
2.14	Calle 72 – Av. Cali	Mixta	Línea nueva	77,6
2.12	Calle 80 – Av. Cali	Subterránea	Línea nueva	74,1
2.13	Calle 72 – Av. Cali	Subterránea	Línea nueva	72,0
2.11	Calle 80 – Av. Cali	Elevada	Línea nueva	72,0
2.06	Calle 100 – Av. 68 – Cl 80 – Av. Cali	Subterránea	Línea nueva	71,4
2.04	Calle 100 – Av. 68 – Cl 80 – Av. Cali	Elevada	Línea nueva	69,0
2.02	Calle 127 – Av. Rincón – Av. Cali	Mixta	Línea nueva	65,4
2.08	Canal Rionegro – Av. Cali	Elevada	Línea nueva	21,1

Figure 2. Results of the analysis of alternatives for the Environmental Impact Component
Source: Egis-Steer Temporary Union Bogotá Metro, Deliverable 2 – Multicriteria evaluation of alternatives. 2020

According to the methodology developed for the evaluation of the "multicriteria matrix", Multicriteria Evaluation of Alternatives (Deliverable 2) Chapter 4, prepared by Egis (2020), in which are the components, criteria and indicators that must be evaluated to determine the "Best Performance Alternative", where percentages of each of these were included and taking as reference the methodology of the document "Study of alternatives for optimize the design of the L2MB - L2MB-SYS-DOC-TOD- 0300-0C", the alternative with the best rating of the fourteen (14) alternatives studied corresponds to the alternative Calle 72 - Avenida Cali, Línea nueva tipología mixta".

The best performing alternative according to the analysis is characterized by having above-average indices in the following criteria, which represent 56.8% of the total matrix weighting:

- Overlaps with areas of biodiversity importance
- Identification of sensitive receptors
- Total construction time
- Disruption in BRT operation
- Potential for generating Public Space
- Development potential of real estate projects
- Affectation of neighborhoods with architectural and/or urban interest
- Visual impact
- Impact on social infrastructure or equipment
- Affectation of areas with heritage or communal value
- Passengers carried (HP)
- Ease of connection Metro-BRT-Tram-LRT
- Operation and maintenance costs
- Risk of subsidence, collapses or involvement of structures
- Uncertainty about construction performance

It is important to mention that within the conception of the project, the construction and operation of the electrical substation, will be in charge of the corresponding energy supplier, so it will be under its responsibility to manage the impacts and risks that the construction and operation that this system generates, as well as the coexistence of this with the Line 2 Metro de Bogotá project.

The document on the analysis of alternatives is available in the Annex. 1-1 Multi-criteria evaluation of alternatives. of the present study.

Note: It is clarified that this document cannot be modified because it is an approved product of an agreement already liquidated.

0.7. PROJECT DESCRIPTION

The L2MB has been considered as a heavy metro line with a **predominantly underground route** whose route begins in the northeast of the city (Calle 72 with Av. Caracas, where it will be integrated into station 16 of the PLMB), and ends in the northwestern area (Fontanar del Río), next to the Bogotá River, where the yard-workshop will operate. It will be 15.5 km long and will have 11 stations

Figure 3 illustrates the layout and stations of the L2MB on the map of the city of Bogotá.

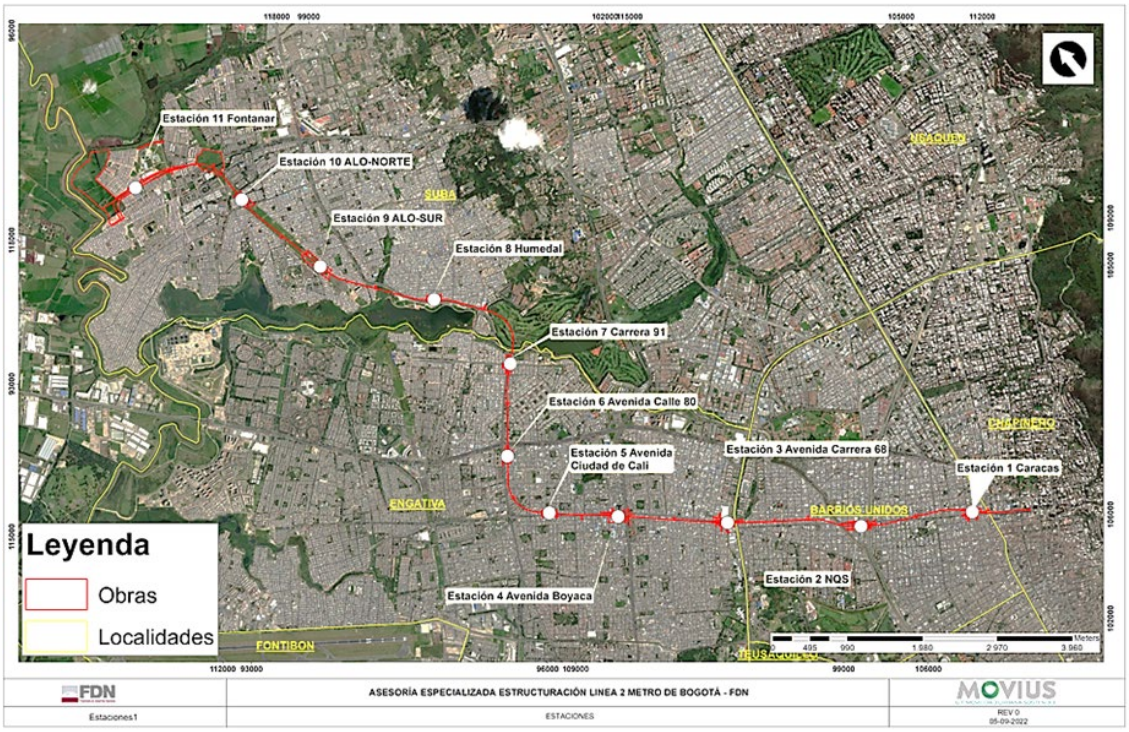


Figure 3. Layout and stations of the L2MB.
Source: Google Earth - UT MOVIUS

The L2MB is composed of three type sections:

- A 14.4 km long tunnel section (93% of the route)
- A trench section (tunnel to viaduct transition) 135 m long (1% of the route)
- A viaduct section 1 km long (6% of the route).

From the perspective of urban implementation, and considering that it is a mainly underground line, special consideration has been given to avoiding surface damage as a result of the work and its future operation. In this regard, a deep tunnel has been geometrically arranged **to** isolate it from the surface and minimize possible interactions within tolerable levels, according to national and international regulations.

The characteristics of the L2MB layout are described in Chapter 3. Description of the project, as well as in the different ETs that are part of the L2MB structuring contract.

The power supply of the project will be operated by ENEL Codensa, in the event that the utility company requires the construction of new facilities to provide the electrical service to the project, these may be considered within the related facilities of the project.

Those associated or related facilities, which are defined in the construction stage by the CONCESSIONAIRE and that are not part of the financing of the L2MB project, will have to comply with all the environmental requirements established in the current regulations and those considered in the Environmental and Social Standards of the World Bank.

The Concessionaire will design, and process the permits and authorizations before the corresponding entities for the construction of the substations, later in the stage it will be delivered of operation to ENEL Codensa. However, all actions established for the development of substations must comply with the guidelines stipulated by the Multilateral Bank.

0.8. BASELINE (ENVIRONMENTAL AND SOCIAL CHARACTERIZATION)

0.8.1. AREA OF INFLUENCE

Following the Terms of Reference that govern this Study[2] and in line with the provisions of the Multilateral Bank[3], two areas of influence are established for the project: Direct and Indirect, based on an identification of the impacts and risks that may be generated during the Project. An area of direct influence is defined as the area where the direct impacts of the project are manifested, that is, those impacts caused by the project and that arise simultaneously in the place of the same, so they are circumscribed to the area of intervention of the project. This area of direct influence is analyzed with primary information.

[2] FINANCIERA DE DESARROLLO NACIONAL - FDN. 2021. Convocatoria Pública FDN – VE – CP – 07 – 2021. ET05 – Estudio de impacto ambiental y social (EIAS). May 2021

[3] BANCO INTERAMERICANO DE DESARROLLO - BID. 2020. Marco de Política Ambiental y Social. September 2020. Pag. 28

Under the same guidelines, as an area of indirect influence, a complementary territory is established to that defined as an area of direct influence, which extends as far as the indirect impacts reach, the latter understood as those impacts caused by the project and that transcend the area of direct impact. This area is analyzed with primary and secondary information.

- The area of direct influence of the abiotic environment corresponds to the area resulting from the union of the areas defined for each component soils, geology, hydrology, landscape, hydrology, atmosphere and landscape, obtaining an area of 231.56 ha where the area of intervention of the project associated with the development of the works predominates.
- The area of definitive indirect influence of the abiotic medium corresponds to the area resulting from the union of the final areas for each component soils, geology, hydrology, hydrogeology, atmosphere and landscape, obtaining an area of 236.21 ha where it predominates in the urban area by the area of influence defined for air quality and noise.
- The area of biotic influence was defined from a methodological procedure in which several analysis factors are involved: (i) The definition of the project intervention area from the updating of the engineering designs. (ii) The preliminary area of influence identified for the biotic environment. (iii) The identification of the repercussions of the project on the different biotic components, and the current status of these from the biotic characterization. (iv) Updating the impact of abiotic components (hydrogeology, water quality, underground geology) that affect biotic components.
- Two areas of influence were defined for the biotic environment: The Area of Direct Influence - AID and the Area of Indirect Influence - AII. The AID is limited to the area of intervention of the project where the surface works will be developed with an extension of 66.60 ha. It is defined by the affectation of the elements of flora and fauna. No AID was identified for the components of hydrobiota or the Main Ecological Structure - EEP (including the Juan Amarillo and La Conejera wetlands), as they were not intervened during the construction or operation stage of the project. It is found that the evaluated components of vegetation and hydrobiota under the IIA are not affected by the project, and therefore, the fauna and PSE components define the IIA of the biotic environment. The final IIA of the biotic medium occupies an area of 120.31 ha.
- The area of direct influence for the socioeconomic environment has been defined as the area over which the direct impacts associated with this environment extend, so the area of direct influence for the socioeconomic environment is defined as; a buffer of 300 m around the surface works such as the 11 stations, the workshop yard, the pumping, evacuation and ventilation wells and in the tunnel area a block side and side, in the latter area it is necessary to specify that due to the construction method no effects or impacts on the surface are foreseen, However, it will be considered from the socioeconomic environment for the information and participation processes due to the expectations that may be presented by the tunnel and with the aim of advancing an assertive relationship with the different social actors.
- Area of Indirect Influence of the socioeconomic environment was defined after the review of the indirect areas of influence of the physical, biotic means, as well as the political-administrative jurisdiction of the territory that corresponds to the localities of Chapinero, Barrios Unidos, Engativá and Suba, it is considered that the area of preliminary indirect influence established for the socioeconomic environment is maintained and does not present variations, on these areas it is considered that the positive impacts will be presented, such as the generation of employment, the strengthening of citizen culture and the strengthening of the inter-institutional network around L2MB

Figure 4. Area of Direct and Indirect Influence of the L2MB project
Source: UT MOVIUS 2022.

0.8.2. Characterization of the abiotic medium

0.8.2.1. Geology

- The geological model of the surface and subsurface is also based on the deep direct measurements carried out in the framework of the design studies. The project carried out exploratory campaigns in two phases, both of two continuous working days, where a total of 4,959.45 meters of drilling were executed, distributed in 109 points along the route. Of the drillings carried out, piezometers were installed at 57 points.
- The L2MB project runs mostly on the deposits of the Bogotá Savannah of lacustrine origin called Sabana Formation (Qta) and the deposits of the floodplain (Qlla) of the Bogotá River. However, towards the hills of Suba sedimentary rocks of the Cretaceous-Tertiary boundary correlated with the Guaduas Formation emerge, which do not outcrop within the area of influence of the project.
- The Sabana Formation is distributed in approximately 95% of the tunnel project and is characterized by the occurrence of dark gray plastic clays, at levels of 0.4 m to 1.0 m thick, with intercalations of sand, gravel and volcanic ash lenses, the latter being abundant towards the middle part of the lake fluvio deposit. .

- The floodplain deposits are made up of clays, silts and sands, deposited on the quaternary sequence of the Sabana Formation and are approximately related from Station 11 to the Patio-Taller area.

0.8.2.2. Geomorphology

- The method of cartography and classification of terrains proposed in the study of the L2MB, is based mainly on the International System Institute for Aerospace Survey and Earth Science – ITC (Van Zuidam, 1986), Verstappen and Van Zuidam (1992) and Carvajal (2002), through the interpretation of aerospace images (Digital Elevation Model - DEM) and own of the project, whose objective is to delimit areas, relief geoforms, drainage patterns in a concise and systematic way that allows to determine the forms of the terrain and the geomorphological processes that occur in the area, where the acquired information has to be grouped and compiled through Geographic Information Systems (GIS).
- In the area of influence, two types of landscape are differentiated, originated in different geomorphological processes and that present characteristic geoforms. The mountain landscape that is made up of the rocks of the Guaduas Formation, whose morphogenetic environment is of the Structural - Denudational Mountain type and the plain landscape that includes the flat to slightly inclined relief (landscape that makes up the entire area of the L2MB project layout, represented by the Quaternary deposits whose morphogenetic environment corresponds to fluvio-lacustrine where the geoforms correspond to floodplains, fans, alluvial terraces and torrential fluvium.
- Specifically, the morphology of the project is determined by the differentiated deposits in the Sabana Formation and the floodplain deposits of the Bogotá River and main tributaries, and within the latter wetland areas as general remnants of the old lake in which the sediments of the Bogotá Savannah were deposited. Both formations are commonly affected by various anthropic activities that change their morphological perception and structure at the surface level.

0.8.2.3. Landscape

- In the landscape of the area of influence, surfaces with low to flat slopes ranging between 0 and 3% predominate, which occupy 90.31% of the AIPa (landscape area of influence).
- It is characterized by the presence of transformed land covers. The very low proportion of natural elements that contribute to the landscape of the community stands out. Urban green areas and recreational areas are those that offer the greatest potential for quality and scenic beauty.
- The results of the modeling report the predominance of surfaces with average visual quality that cover 52.90% of the entire area and a great dominance of transformed covers that do not provide attractive elements to the local landscape.
- The only noteworthy elements within the context of the project are the plant elements of urban green areas and water bodies, however, the effect of the adjacency of the urban fabric and the roads reduces their overall quality.
- As for the visual fragility of the AIPa, low values predominate with 98.84% of the total area because the project area includes areas with relief with low slopes and flat geoforms where alterations are less evident and more accepted by observers.
- Urban green areas, despite being of ecological and visual importance, are elements with a low visual fragility since their elements can be introduced or removed according to the anthropic management that is given to them.
- The landscape beauty index reports low values (46.46%), due to the predominance of homogeneous elements of anthropic character with low interest or landscape attractiveness, followed by areas of medium beauty (32.04%)

represented by canals and pastures, and to a lesser extent with high beauty (21.50%) patches of green areas, parks and wetlands.

- In general, the project occurs predominantly along the landscape unit Mbj and Bbj, taking into account the high degree of transformation and relief of the region.
- The vegetation covers of clean pastures do not present a great contribution to the elements of the landscape, being areas of little landscape importance and without greater use of space by the communities.
- The project will not have a significant impact on spaces of high visual and ecological quality, and the intervention at the landscape level (0.02%) is related to a small area of gallery forest in the workshop yard. There will be no direct effects on wetland areas.

0.8.2.4. Soils

The study of soil is based on the understanding of the nature, properties, dynamics and functions of soil as part of the landscape and ecosystems; It begins with the availability of reliable information on soil morphology and other characteristics obtained through the study and description of soil in the field[4].

Edaphogenetic environments are areas in which the geomorphological position (landscape and type of relief), the lithology or nature of the sediments (source material) and the environmental climate coincide. Therefore, the populations of soils that occur there present a relative degree of similarity, which facilitates the interpretation, both of their capacity for use and management and their vulnerability to the action of environmental factors and human activity. Therefore, its identification and analysis is very useful, in the case of this ESIA, to foresee the impacts of the project on the area of influence of the soil component and to know the limitations of the soil environment for the development of the planned works and to evaluate the current state of erosion, possible salinization, desertification and removal as recommended by the protocols published by IDEAM and IGAC.

The determination of the soil monitoring points was carried out taking into account the soil units that, according to the requirements of the project, could be susceptible to intervention. 8 soil monitoring points were chosen, where the description of profiles, the respective infiltration tests and the taking of samples for physicochemical analysis in the laboratory were carried out, all with their respective coordinates, including the corresponding geomorphological cartographic units determined for the area of influence of the soil component.

In the area of influence of the soil component, a soil mapping unit was identified, which is described below:

Table 3. Legend of soils in the area of soil influence

Landscape	Climate	Type of relief	Parental material	Terrain Shape	Component	Symbol	Phases	Profile	Area (ha)	%
Plain - Depositary	Cold	Vallecito	Fine sediments	Vega	Typic Halaquepts, fine family	RaL02	RaL02ai	Q3	40,42	56,93
Urban area									30,58	43,07

[4] FAO. (2009). Guía para la descripción de suelos.

Landscape	Climate	Type of relief	Parental material	Terrain Shape	Component	Symbol	Phases	Profile	Area (ha)	%
Total									71,0	100

Source: UT MOVIUS, 2022. Prepared with information from POMCA, 2017

In general, the soils present are superficial, are limited by fragments of irregularly shaped gravel rocks, and residues of filling materials in the second horizon making this an anthropic soil. They are well drained, no water table was found, have a moderately fast infiltration rate, medium textures and slightly acidic pH on the surface and neutral at depth.

According to the agrological capacity and the type of current land use, the variables corresponding to these parameters were classified, resulting in 7 categories of conflict of use that depend mainly on the use and management of soils and the proper management of renewable and non-renewable natural resources that allow the concordance and systemic balance of the area.

However, taking into account that the project is located in the urban area, according to the POT adopted by Decree 555 of 2021, there would be no conflict over land uses.

0.8.2.4.1. Vulnerability to soil contamination

In order to determine possible areas contaminated by hydrocarbons, service stations within the area of influence associated with the L2MB project were identified and monitored. Initially, the identification of potential sampling sites was carried out, based on satellite images of the study area and the direction of groundwater flow. From the preliminary selection of the 12 service stations and the 24 points where the drilling would be carried out, the verification was carried out in the field. Monitoring of 2 points per station was carried out, from which 7 samples were extracted by perforation. For the determination of possible pollutants, the methodology described in the "Technical Manual for the Execution of a Risk Analysis for Distribution Sites of Hydrocarbon Derivatives", published in November 2007 by the then Ministry of Environment, Housing and Territorial Development (MAVDT), was followed. The results were compared with the Generic Risk-Based Limits stipulated in the manual. The detail is presented in numeral 5.2.1.4.5, of Chapter 5.2, Part 1.

0.8.2.5. Hydrology

The hydrological characterization of the study area associated with the L2MB project was carried out from the records of the hydroclimatological stations of the area operated by the IDEAM, THE CAR, THE EAAB, the IDIGER and the District Secretariat of Environment of Bogotá, this allowed to know the altitudinal and temporal behavior of climatic variables such as: temperature and the spatial and temporal distribution of total precipitation. In addition to the climatological variables, the characterization of the sub-basins of the channels in terms of average, maximum and minimum flows and the estimation of the environmental flow using the ANLA 2013 methodology were carried out, as well as the estimation of the hydrological indices of water use, water regulation index, aridity index and water vulnerability.

The analysis of river dynamics focused on the multitemporal analysis of the channels that cross with the layout of the L2MB project, for this satellite images of the Google Earth tool for the years 2009 - 2015 - 2021 were consulted, evidencing that the channels present a low sinuosity index, and in the same way there are no changes in their alignment, this is mainly

due to the fact that the layout of the channels is covered with concrete in much of its route, only the arm of the Juan Amarillo wetland does not have a coating in its cross section.

For the water balance of the basins in the project the method of Thornthwaite and Matter was used, from the results for the different sub-basins analyzed, it was determined that, in general, the runoff throughout the area is high because most of the sub-basins are composed of artificial territories whose coverages are impermeable and therefore have high values of the runoff coefficients. For the area of Calle 72 it was concluded that the afferent urban sub-basin has less infiltration capacity because the coverage is mostly impermeable, where a percolation of 0 mm was found, while, for the rural sub-basin of the eastern hills, a percolation of 83 mm was obtained, representing 7.4% of the total precipitation. In this sense, it can be concluded as a result of the analyzes carried out, that there is no recharge of the aquifer by precipitation in the basins analyzed.

As a complement to the hydrological analysis, the water sheet levels in the Bogotá River were reviewed, specifically in the workshop yard area, in order to verify flood levels in the Patio Taller area for the L2MB project. From this analysis it was concluded that although the level of the dikes in the digital model of the CAR is lower, with the levels of the digital terrain model carried out by INGETEC it is evident that the level of the water sheet for a return period of 1000 years will not exceed the height of the dikes, reducing the risk associated with flooding in the workshop yard for the evaluated return period.

It is highlighted and made clear that the crossings of the L2MB project with the bodies of water are only in the plan view since these are located at ground level and the layout for the project is underground in much of its route including the steps with the bodies of water.

0.8.2.6. Water quality

In order to evaluate the state of water quality of the water bodies identified in the area of influence of the project, before its execution, and estimate the potential impacts on it, the physicochemical, bacteriological and microbiological characterization is carried out on 14 sampling points located in the most representative water bodies in the L2MB route. It is clarified that the project does not have permits for dumping or abstraction of surface water.

- Water Quality Indices

The surface water quality indicator is calculated from the concentration data of a set of five variables that determine the quality of surface running water. The variables are: dissolved oxygen, total suspended solids, chemical oxygen demand, electrical conductivity and pH.

Taking into account the result of the ICA index in the two monitoring campaigns, a regular and poor water quality is indicated in most points. This may be influenced mainly by high concentrations of electrical conductivity; Also, by the characteristics of the type of soils and rocks through which the water flows, by the concentration of suspended particles, the pH, the chemical oxygen demand and the concentration of nitrogen and total phosphorus, which affect the load of organic matter in the water samples.

0.8.2.7. Water uses

The axis of the water system of the city of Bogotá D.C., has three large rivers that divide the city basically into three drainage basins; Salitre, Fucha and Tunjuelo, these being the major channels that are born in the eastern hills receiving the waters of several streams thus created by their confluence.

This characterization has been carried out through the review of secondary information from the District Secretariat of Environment (SDA), Regional Autonomous Corporation of Cundinamarca (CAR), Regional Environmental and Sustainable Development Observatory of the Bogotá River (ORARBO) and the Institute of Urban Studies of the National University.

The clarification is made that despite the bodies of water or channels that are found, no area of influence will be generated in relation to the project, because the route of the metro is underground. In other words, there is no intervention at the source with respect to line 2 of the metro, therefore there will be no conflicts about the availability and uses of water.

However in 5.2.2.1.11. Identification of lentic and lotic systems, the inventory of the surface sources of the project is presented.

0.8.2.8. Hydrogeology

The study of the hydrogeological conditions of the IA contemplated the qualitative and quantitative characterization of the geological units, the estimation of their hydraulic parameters and water quality, as well as the determination of water levels in the subsoil and the definition of the recharge zones and flow directions. These essential aspects for the elaboration of the conceptual hydrogeological model (MHC) and numerical hydrogeological model (MHN) -which is developed on the first- allowed to establish the initial conditions of the system and predict the possible impacts related to the activities that make up the development of the project.

0.8.2.8.1. Conceptual Hydrogeological Model - MHC

The geological model as one of the lines of analysis within the MHC, relates the results of the detailed studies that includes the interpretation of the lithological information recorded in previous studies and complemented with the geological information recorded in the current stage through both superficial field explorations as well as the lithological information in depth that is obtained from the record of the explorations executed along the corridor of the L2MB, includes 149 probes with core recovery and reached depths ranging from 21 m to 200 m.

The longitudinal lithological distribution of the layout at vertical and lateral level exposes the following geometry:

- Between K0 + 000 and K0 + 500 there are sediments of the cone complex (Qcc) associated with the hydrogeological unit Ac-Qcc called Low productivity aquifers associated with coarse - granular sediments with specific capacity between 0.05 and 1.0 l / s / m. Under this unit, the level of rocks of the Bogotá formation (Tpb) associated with the hydrogeological unit Ac-Tpb called Acuitardo and levels of semi-confined aquifers are differentiated to local confined areas of very low productivity with average specific capacity less than 0.05 l / s / m.
- Between K0+500 and K14+480 the sediment sequence corresponds to clay levels with little thickness intercalations of fine clay sands, clay silts and lenses rich in organic matter contained within the clays of lacustrine origin Savannah Formation (Qta) associated with the hydrogeological unit Ac-Qta called aquetard in quaternary deposit of very low productivity with average specific capacity less than 0.05 l / s / m

- Between K14 + 480 and K15 + 530 the sequence of sediments at the most superficial level corresponds to the Floodplain Deposit (Qlla) that rests on the clay levels with little thickness intercalations of fine clay sands, clay silts and lenses rich in organic matter contained within the clays of lacustrine origin Sabana Formation (Qta) This lithological sequence corresponds to hydrogeological units A-Qlla Low productivity aquifers associated with sediments fine granulars with specific capacity between 0.05 and 1.0 l/s/m and Ac-Qta called aquerd in quaternary deposit of very low productivity.

The results of the hydraulic tests, evidence that for the Homogeneous zones 1, 2, the sectors where there is a predominance of granular materials, associated mainly with the Cone Complex (Qcc), the maximum permeability values obtained in the tests carried out oscillate in 1x10-7 m / s and 1x10-9 m / s which allows them to be related within a hydrogeological unit of very low permeability. The tests carried out in homogeneous zones 2, 3 and 4, particularly in the fine levels that correspond in general with the clays, lenses of fine sands and organic matter of the Sabana formation (Qta), maximum permeability values were obtained between 1x10-6 m / s and 1x10-9 m / s related within a hydrogeological unit of very low permeability.

The deepest levels are recorded in homogeneous zone 1, this variation corresponds to the presence of granular materials which were recorded in the drilling L2MB-TUN-PT-01 near the eastern hills. For homogeneous zones 2, 3 and 4 the water tables reach a maximum depth of 4.64 m maintaining a continuity that is related to the presence of clay levels identified throughout the perforations carried out with greater presence in the clay levels of the Sabana Formation (Qta).

Product of the analysis of the piezometric information (which corresponds to 54 observation points distributed along the underground line) it can be established that the underground flows are typically oriented in a direction parallel to the surface of the land, with a flow gradient that goes from the Eastern hills (main area of recharge by infiltration) and hills of Suba towards the points of natural drainage, which corresponds to the surface water sources (Salitre channel, Juan Amarillo wetland, Los Lagartos club lake and Bogota river). The position of the water table along the study area is characterized by being shallow at an average depth of 1.7 m, this in the case of the Sabana formation (unit on which most of the L2MB develops, approximately 15.0 km); in the area of Calle 72 Avenue near the Eastern Hills (on the complex formation of cones - Qcc) the water table takes greater depth, reaching 12.7 m in the drilling L2MB-TUN-PT-04 (located at the beginning of the route).

The analysis of variation in the water table in terms of mobility between dry and rainy season allowed to characterize a water table with little fluctuation, with an average maximum variation of 1.0 m between hydrological seasons, indicative of the low sensitivity of the system to recharge processes, particularly by infiltration.

0.8.2.8.2. Numerical Hydrogeological Model - MHN

The results of the numerical modeling developed on the basis of the MHC, constituted for the study area, allow to establish in a quantitative way the changes in the dynamics of exchange of the system between the current condition and operating condition (which considers the tunnel the stations and wells), as well as the potential depletions in the water table after the development of the works; Results summarized below.

- Modification in the exchange dynamics: The assessments developed along the underground line, including stations and wells, allowed to establish that neither during construction nor once the works come into operation will there be any affectation in reference to the current condition of the system; Exchange rates between geological units and surface water sources do not fluctuate once the infrastructure becomes operational.

- Modification in the water table: Together with the results of the exchange dynamics of the system, the results of the modeling do not reflect fluctuation in the water table either during construction or once the project comes into operation, except with respect to the changes associated with the construction of underground stations and wells, which involve soil removal. In the latter case, the impact is limited to the perimeter of the aforementioned works and is associated with the replacement of existing soils by stations and wells.

The non-occurrence of variations in hydrogeological dynamics or water tables (beyond underground stations and wells) is associated in the first instance with the characteristics of the proposed construction system and in the second instance with the characteristics of the terrain. The characteristics of the construction system are aimed at avoiding infiltration flows through the excavation fronts during construction and through the perimeter of the works during operation and includes concrete elements, with basically impermeable characteristics, and impermeable seals between voussoirs (in the case of the tunnel), screens or elements in general of the structure in the case of underground stations and wells. As for the characteristics of the terrain, in most of the route (throughout the area corresponding to the Sabana formation) there are clays of very low permeability, which function as a barrier of low permeability that prevents infiltration flows to tunnels, underground stations and wells; in the area corresponding to Calle 72 Avenue in the vicinity of the Eastern Hills there is heterogeneity in the soils and some of the existing materials have medium permeability, which could generate groundwater flows to the excavation fronts / to the works, however, in this area the particular characteristics of the construction system prevent such flows.

The results of the modeling show that no impacts are generated on the groundwater component, maintaining the phreatic levels and exchange dynamics in reference to the current condition, since infiltration flows to L2MB are not expected. Taking into account this for critical habitats there are no impacts, being the development of the follow-up and monitoring program at water tables the way to validate this premise.

The premise of non-affectation of the groundwater component shall be validated during the construction phase and the operation and maintenance phase of the project by tracking and monitoring the water table (as noted in Chapter 11.2.5. Follow-up and monitoring at water tables) and updating of the numerical hydrogeological model developed, this according to the progress of the project and the results of the monitors as presented in chapter 10.1.3.5. Underground Works Management Program

0.8.2.9. Geotechnics

Four homogeneous zones were defined along the route of the L2MB, based on the geological interpretation of the drilling where three types of deposits can be identified: Qcc (slope deposit), Qta (high terrace) and Qlla (floodplain). The spatial distribution of these deposits allows the identification of at least four homogeneous zones, with the Qta deposit being the largest along the L2MB.

For each homogeneous zone, the soil allocation was carried out considering its classification between granular soil and cohesive soil, this with the intention of identifying different soil behaviors associated with its gradation. For the allocation of soils, a geological description of the perforations was made and contrasted with the laboratory results. For the assignment of soil type, the content of organic matter was also considered relevant.

- The Homogeneous Zone 1, goes from the abscissa K0 + 000 to the abscissa K0 + 700 and coincides with the slope deposit (Qcc) and is characterized by being the area of the project where the greatest variation of soil types is presented due to its heterogeneity.
- The homogeneous zone 2 goes from the abscissa K0 + 700 to the abscissa K4 + 400 and its beginning coincides with the end of the slope deposit (Qcc) and where the deposit corresponding to the high terrace (Qta) or Savannah Formation begins.
- The homogeneous zone 3 goes from the abscissa K4 + 400 to the abscissa K14 + 600, and differs from zone 2 by identifying two layers of clay soil (Qta-arc2 and Qta-arc3) with variations in their natural humidity, which is presumed and later presented as a different behavior of the soil. This area presents mostly cohesive soils such as deposits of High Moisture Clay/Loamy Terrace (Qta-arc2), Low Moisture Clay/Loamy Terrace (Qta-arc3), Clay Terrace deposits with Organic Matter or Peat (Qta-mat).
- The homogeneous zone 4 goes from the abscissa K14+600 to the abscissa K15+000 and coincides with the inferred contact between the deposit of the high terrace (Qta) and the deposit of the floodplain of the Bogotá River (Qlla), which was defined with the identification of a sandy soil. This area also features granular soils such as Sandy Alluvial Plain (Qlla-are) deposits.

0.8.2.10. Meteorology

The characterization of the meteorological variables for the study area associated with the L2MB project was carried out from the records available in the hydroclimatological stations of the area operated by the IDEAM, THE CAR, THE EAAB, the IDIGER and the District Secretariat of Environment of Bogotá, this allowed to know the altitudinal and temporal behavior of climatic variables such as: temperature, sunshine, solar radiation, relative humidity, evaporation, wind speed and direction, cloudiness and the spatial and temporal distribution of total precipitation.

For the choice of the stations to be analyzed, the determination of a common period of records, analysis of consistency and homogeneity and analysis of anomalous data were carried out. Taking into account the above, the use of 18 meteorological stations to perform the characterization was determined.

The climatic classification of the study area was determined from the information available in the Environmental Information System of Colombia (SIAC), which has the Caldas-Lang climate classification for the Colombian territory and from this it was determined that the route for the L2MB project passes through a single climatic zone whose classification is established as cold semi-humid climate.

0.8.2.11. Air quality

Regarding the atmospheric component, for the study of air quality, field work was carried out in order to identify the different sources of atmospheric emissions within the study area, and thus be able to characterize the area of influence prior to the intervention of the project. At the same time, environmental monitoring was carried out in 24 surface monitoring stations, obtaining information in 24 continuous days for each receiver for the criteria pollutants defined by Colombian regulations and some toxic gases (hydrocarbons and volatile organic compounds). The results of the monitoring campaign were contrasted with data from the Bogotá Air Quality Monitoring Network (RMCAB) to refine the analysis of what was raised on the ground. Finally, by means of computational tools, the area of direct and indirect influence for all project scenarios was determined.

Air quality monitoring was executed at 24 points, in three campaigns between May 4 and July 6, 2022. In accordance with the guidelines of the protocol for the monitoring and follow-up of air quality, the use of an Industrial Air Quality Surveillance System was identified, which takes into account guidelines for location, processing and validity of data in accordance with the air quality monitoring and follow-up protocol.

In general, it was observed that the concentrations of particulate matter were variable in all monitoring stations, mainly for the coarser fraction (PM10), evidencing that only 37.5% of the stations presented daily concentrations in their entirety below the maximum permissible limit, in some cases, concentrations above the maximum permissible limit were presented, This is attributed to the different mobile sources that transit the roads surrounding the monitoring stations and the resuspension of sediment particulate matter on the surface of the tracks. With regard to gases, the vast majority of admissible immission levels were evidenced, the few exceedances registered are due to sporadic events and meteorological factors that have a minor impact on adverse effects on the exposed population.

From the analysis of the results of the computer simulations, and their comparison with the ambient air quality guide values (IFC), it is observed that by significantly reducing the maximum permissible limit, the areas in which there would be regulatory exceedances would increase significantly. This effect is evident even just evaluating the results of the Baseline scenario (without the project), where it is evident that there are critical areas such as Calle 72 with Avenida Ciudad de Cali that is strongly impacted by high vehicular traffic, with a fleet predominantly of heavy vehicles. The pollutants that would have the greatest impact would be aerosols (PM_{10} and PM2.5) and nitrogen dioxide for an annual exposure period. To illustrate the above, Figure 5 shows the results of the computational simulations for the construction scenario of particulate matter less than or equal to 10 microns (PM10) in an annual exposure period.

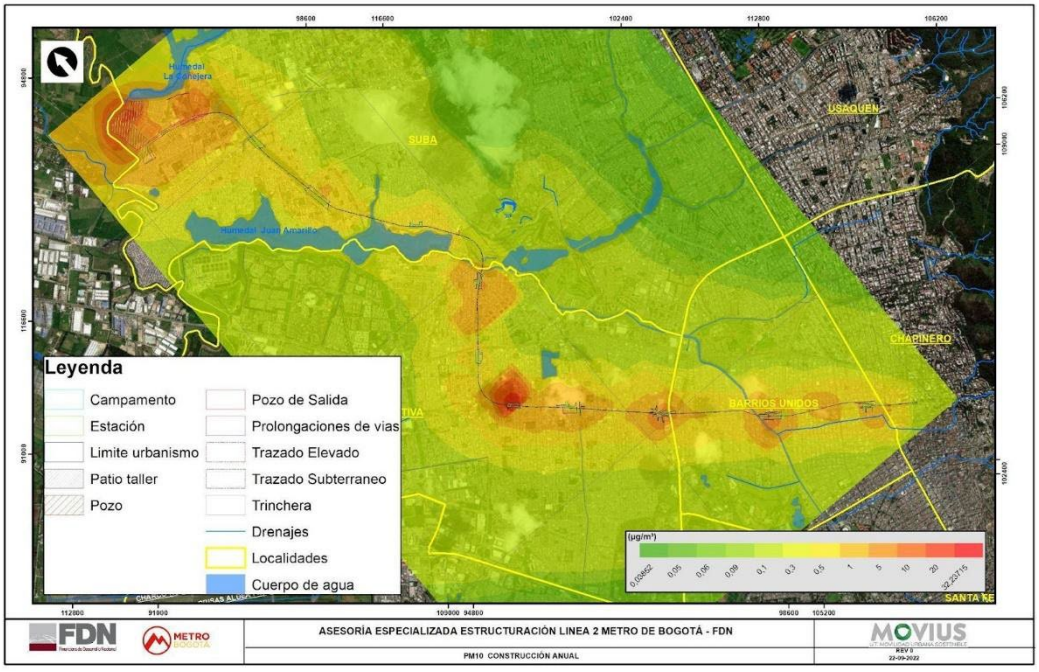


Figure 5. isopleths of concentration. Particulate matter less than or equal to 10 microns (PM10). Annual average. Construction.
Source: UT MOVIUS 2022

0.8.2.12. Noise

In the first place, it should be noted that the monitoring is carried out in accordance with the standards established by the International Standard Organization (ISO) 1996 and what is contemplated within Resolution 0627 of 2006 of the MADS. Likewise, the results of such monitoring should be compared with the maximum permissible limits of environmental noise established within the WB/IFC HSE Guidelines (Guidelines on environment, health and safety - GENERAL GUIDELINES: ENVIRONMENT - NOISE) and the Colombian Resolution. To avoid excess noise associated with the different construction and operation activities, the concessionaire must through monitoring be the guarantor of improvements and optimization of the management measures established in this document.

Noise monitoring was executed at 30 points, between April 17 and 26, 2022. In accordance with the provisions of Resolution 0627 of 2006 of the MADS, the monitoring was carried out on a working day and holiday (day and night) for one hour in each station, with intervals towards the four cardinal points and a period with the microphone in a vertical position. According to Table 1 of the Colombian regulations, the monitoring points were classified to identify sensitive receptors as centers of interest and population centers that were possibly affected by the activities, likewise, their classification according to Article 17 of the same standard, was established according to their location and relationship with the environment, comparing the results with Sector B, subsector of residential areas or exclusively intended for housing development, hotels and lodgings, subsector of parks in urban areas, other than outdoor mechanical parks and Sector C, subsector areas with permitted uses of offices with a maximum noise limit of 65 dB (A) (daytime period) and 50 dB (A) (night period) for the three subsectors in question.

Of the results reported for the daytime, on a working day and on a non-working day, 16 of the 30 monitoring points are below the respective normative limit for the daytime in the subsectors corresponding to each of the stations. With respect to the results obtained during the night day on a working day, it is evident that 25 of 30 monitoring points are above the normative limit established for each subsector under comparison, with the exception of points RA20, RA22, RA28, RA29 and RA30. With respect to the results obtained during the night shift on a non-working day, it is evident that 25 of the 30 monitoring points presented results that are above the respective regulatory limits for each subsector, with the exception of points RA7, RA23, RA28, RA29 and RA30. The main sources of noise evidenced during the monitoring carried out correspond to mobile sources, sounds produced by inhabitants and passers-by of the area, music near the monitoring points, airplane overflights, and sounds of sirens and alarms.

For the noise models, the baseline scenarios were modeled in the first instance, which seek to predict the current conditions of noise propagation where their contributions are mainly given by the passage of both light and heavy vehicles on the roads surrounding the project. In this way, it is possible to understand in a very approximate way the regulatory compliances or non-compliances associated with the dynamics of vehicular traffic for the day and night periods and how the different receivers perceive these noise levels at the level of facades for the different heights of each building. Likewise, to establish the conditions that are currently present in the study area for vehicular traffic, the model provided the characteristics of the roads in the area of influence such as the width of the roads, number of lanes, average speeds in the day and night period, number of light and heavy vehicles in the day and night period. type of soil, elevation of bridges and general characteristics, among others (Figure 6).

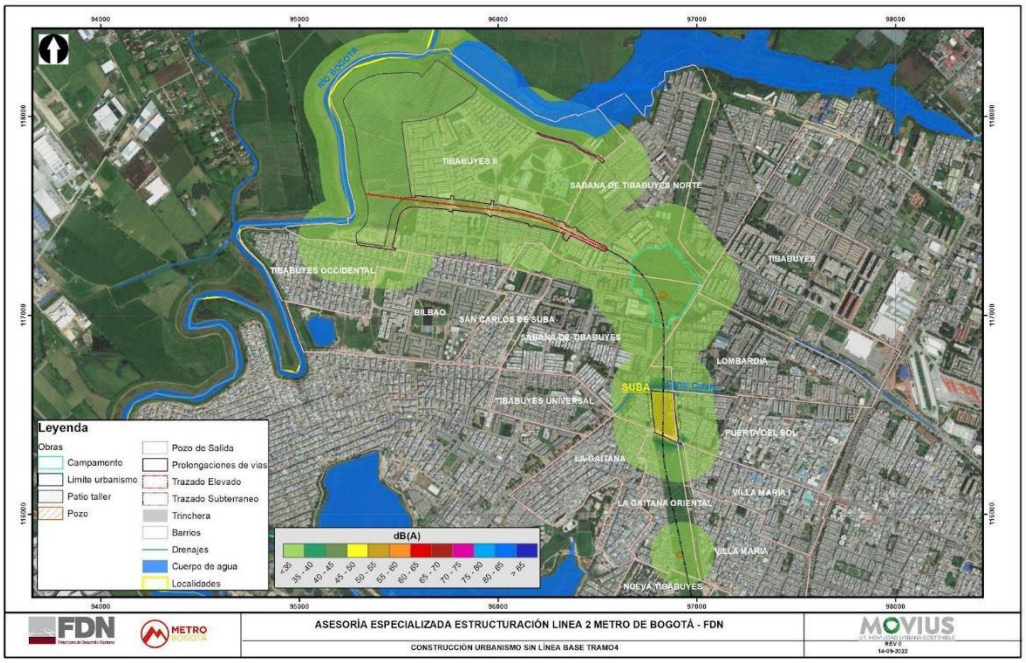


Figure 6. Noise map Construction Scenario first moment without Baseline daytime period section 4. Source: UT MOVIUS, 2022.

Based on the maximum permissible limits established in the Environmental, Health and Safety Guidelines (GENERAL GUIDELINES: ENVIRONMENT NOISE) - WORLD BANK GROUP, Table 1.7.1-Noise Level Guidelines, regulatory violations are maintained in the Baseline scenario, which generate the highest noise contributions compared to the construction scenario without Baseline. However, analyzing the results of the Construction scenario, without Baseline, it is observed that only one recipient presented regulatory leave (Receiver Integral Dentistry R & C Dental Care). In turn, the construction scenario without Baseline allows us to understand the individual contributions of this scenario, understanding that the project as individual contributions does not generate regulatory exceedances, with the exception of a single recipient. It is important to understand that the project should be understood as a set of contributions, which, when modeled in the baseline construction scenario, do not modify the trend of non-compliance, maintaining the exceedances reported in the baseline scenario (current scenario).

In the operating scenario, without the background noise (baseline scenario), there are no regulatory exceedances for any of its receivers. Likewise, the baseline operation scenario does not present changes in non-compliance trends. That is to say that once the train operation starts, there are no changes in noise levels with respect to the current scenario (Baseline).

0.8.2.13. Vibration

The characterization of the vibration levels for the condition of the Baseline required the development of a vibration monitoring plan and a subsequent analysis of results that allow defining the vibration levels in the area of influence of the project for the current condition, which served as a starting point to analyze the impacts for the condition with project (construction phase and operation and maintenance phase).

Overall, vibration levels along the projected corridor were found to range from not perceptible to people to easily perceptible to people, exceeding in 12 of the 15 of the analysis sites the defined threshold of perception of people (particle velocity equal to 0.15 mm/s). With the above, it can be concluded that in a large part of the corridor the limits of perception are currently exceeded and the average values of maximum particle velocity in the 15 measurement points corresponds to 0.48 mm / s, a value that exceeds the limit normally defined for human perception in daytime of 0.30 mm / s.

None of the registration sites identified vibration levels that may be associated with exceeding the strictest thresholds of structural damage (PGV > 3 mm/s) so the characterization of vibration levels along the corridor is defined as above the limits of human perception but significantly lower than the thresholds of structural damage.

Based on the predictive equation, it is found that for the projected conditions for the rolling stock of the project, the distance for which no impacts associated with human perception are expected is 16.5 m, 8.0 m and 2.5 m for the sectors at level or trench, underground and elevated respectively. In the case of the vibration threshold associated with a daytime (0.30 mm/s) the minimum distance required corresponds to 6.5 m for the level or trench section and is less than 2 m for underground and elevated cases. Again, it is noted that with the estimates made, the vibration levels projected by the transit of rolling stock are much lower than the damage thresholds (3 mm / s), so the analysis of impacts due to increased vibration levels is associated with levels of human perception.

0.8.3. Characterization of the biotic environment

0.8.3.1. Main Ecological Structure and sensitive areas in the intervention area of the L2MB project

- The L2MB project does not intersect areas of National or Regional Forest Reserves, nor forest reserves of Law 2da of 1959, Complementary Conservation Strategies, Strategic Ecosystems, or Biosphere Reserves. There is also no reported overlap of the project with areas of National Natural Parks, SINAP areas, CONPES 3680 National Conservation Priorities, or overlap with RUNA areas.
- The intersection of the L2MB project with the Juan Amarillo or Tibabuyes wetland Ramsar site that is part of the Urban Wetlands Complex of the Capital District of Bogotá is reported, but without intervening the surface areas or the legal limit established by the SDA and the Environmental Management Plan of this ecosystem. The underground tunnel of the metro railway route crosses deep under the northeastern arm of the Juan Amarillo wetland.
- The project is located in the AICA Humedales de la Sabana de Bogotá, an Important Area for the Conservation of Birds of Colombia and the World - AICAS. The AICA for the most part is transformed with the predominance of artificial covers, with wetlands being the main places that offer habitat and refuge for avifauna. In relation to the project, none of the wetlands that make up the AICA are affected, and the coverage of the surface works of L2MB found in the AICA (28.72 ha) includes, in its greatest extension: clean pastures (89.92%, 25.82 ha) and continuous urban fabric (5.56%, 1.60 ha); Of the remaining area, only 0.05% (0.02 ha) correspond to natural cover (gallery and riparian forest).
- The L2MB project at the local level, crosses four bodies of natural water (Cafam and Salitre channels, the Salitre River and the Juan Amarillo wetland) and an artificial body of water (Lago Club Los Lagartos 4), however, all the bodies of water of the Water System are crossed underground by the project, without affecting its channels, water rounds, parallel strips, nor the afferent protection or conservation area.

- The premise established for the optimization of engineering designs during the development of the project was not to intervene elements of the Main Ecological Structure.

0.8.3.2. Modified, natural and critical habitats - EAS 6

- Through the homologation of the coverages and ecosystems in the study area of the project, considering the Environmental and Social Standards of the Multilateral Bank, three types of habitat are defined: modified, natural and critical. Modified habitats are predominant.
- In modified, natural and critical habitats, valuable areas for biodiversity legally protected and recognized at international, regional and local levels can be located. This classification is the basic input for the compensations and the determination of possible impacts generated by the L2MB project.
- The L2MB project in its footprint and area of direct influence does NOT intersect any critical habitat and therefore does not affect them, as detailed in chapter 5.1 Area of Influence, chapter 8. Environmental Impact Assessment and chapter 10.Environmental Management Plan.

0.8.3.3. Vegetation with special connotation

- A total of 73 individuals were registered for the tree ban in the area of direct biotic influence, of 4 species belonging to 4 different families. The species found with the greatest abundance was the wax palm (*Ceroxylon quinduense*) with 32 individuals for ornamental use, the oak (*Quercus humboldtii*), represented by 4 individuals, the walnut tree *(Juglans neotropica*) with 10 individuals and the romeron pine (*Retrophyllum rospigliosii*) with 27 individuals.
- As for the flora in non-arboreal vascular closure, in the routes made along the intervention area and the area of biotic influence, no individuals of orchids, bromeliads and tree ferns were found.
- For the non-vascular flora in closed season, a total of 44 species distributed in 27 families and 35 genera was obtained, of which 12 of the 44 species were registered in the Area of Direct Influence. The most diverse plant group was lichens represented by 12 families, 17 genera and 20 species. Mosses presented a richness of 17 species distributed in 13 genera and 10 families. With regard to liverworts, 7 species belonging to 5 genera and 5 families were found. The most abundant species that represent 54.42% of the total coverage occupied by the non-vascular community registered in the Area of Biotic Indirect Influence are the mosses *Bryum argenteum* (15.74%), *Syntrichia laevipila* (10.57%) and *Meteoridium remotifolium* (9.64%), followed by the lichen *Physcia atrostriata* (9.48%) and the *Didymodon* mosssp. 1 (8,99%). The most frequently recorded species were the lichens *Physcia atrostriata* and *Flavopunctelia flaventior*.
- The species of flora in closed season reported are associated with 28 species of phorophytes, belonging to 18 botanical families, registering the highest abundance associated with the Dragon Tree (Croton coriaceus) with 10 species, and with the highest abundance of epiphytes *associated with the Urapán (*Fraxinus uhdei*).*
- As for the biomes and covers occupied by the non-vascular flora, the gallery and riparian forest and the secondary vegetation of the Andean azonal high Andean orobiome eastern cordillera were the ones that reported greater richness, with 26 and 16 species respectively, followed by the urban green areas of the high Andean orobiome of the eastern mountain range with 12 species.

0.8.3.4. Fauna

- Field work was carried out between March 14 and 24, between June 08 and 15 and July 14, 2022.
- The avifauna reported a total of 3115 records, with 60 species distributed in 55 genera, 28 families and 14 orders. This represents 41.82% of the species likely to be found in the area of influence and about 2.35% of the total wealth of birds in the country. A total of nine nests of blackbirds and torcazas were found in eight trees, most of them in the section near the Juan Amarillo wetland.
- For the herpetofauna group, the savannah frog (*Dendropsophus molitor*) was recorded by auditory detections and the savannah snake (*Atractus crassicaudatus*) by direct observation, both endemic species and in the category of Least Concern according to the IUCN.
- The group of mammals recorded the presence of the brown rat (*Rattus norvegicus) as* an invasive species and the guinea pig (*Cavia aperea*) by detecting a burrow, a species classified as Least Concern according to the IUCN Red List.
- Given the high transformation of natural covers, the fauna species found for the area of influence are mostly common species of the region that manage to tolerate a certain degree of intervention. However, the Juan Amarillo wetland, La Conejera and the Bogotá River are identified as important areas. These spaces presented a high diversity of species around these areas, taking into account the supply of resources presented by these ecosystems, which provide places of feeding, shelter and passage, presenting important sites for the connectivity of the biodiversity of the region, which include species of restricted distribution. It should be noted that the endemic species *Synallaxis subpudica* was registered outside the area of direct influence of the project, therefore, a direct intervention of its habitat or on the species is not supposed.

0.8.3.5. Aquatic ecosystems

- Hydrobiological monitoring was carried out in thirteen (13) stations located in the water bodies of influence of the project, both in dry and rainy seasons, and simultaneously with the physicochemical quality sampling of the water.
- The analysis of hydrobiological communities allows to establish conditions of the medium from mesotrophic to eutrophic.
- The periphetic rainfall community was characterized by high densities for the stations Canal Salitre downstream, Juan Amarillo Wetland downstream, Canal Cafam downstream and Juan Amarillo Wetland upstream and middle for the remaining stations. In the dry season, there were high densities for the stations Lago Club Los Lagartos, Humedal La Conejera and Canal Salitre downstream, and medium and low densities for the remaining stations. In both periods this may be related to the eutrophic characteristics that were evidenced for the seasons throughout the study. In both periods, the highest abundance and cell density was presented by the phylum Bacilliarophyta, composed of cosmopolitan species with tolerance to organic pollution, which agrees with the high values of suspended solids and coliforms reported for the seasons.
- The phytoplankton in the rainy season presented high densities in the three seasons evaluated, while in the dry season in two of the three seasons, in both cases it was even higher for the Lago Club Los Lagartos station. Communities of the Chlorophyta, Cyanobacteria and Miozoa groups are typical of areas with high organic load values; The ecological indices show alterations in the quality of the water bodies evaluated, reporting organisms with tolerance to contamination by organic matter.
- For the zooplankton community, similarities were found in the composition of each assemblage during the rainy season, but in the dry season they varied between monitoring points. In relation to densities and diversities, the average values are consistent in the community and the variations in composition of zooplanktonic organisms

between the points can be associated with the physicochemical and morphological conditions of the systems since they tend to be similar to each other.

- The establishment of the benthic macroinvertebrate community in each of the sampling points was mainly related to the conditions of the hydrological period that impacts the establishment of the species and substrates present in each one. The Insecta class was the most relevant of the community in both periods, influenced by the physical conditions of the water bodies such as the current, the type of substrate and the vegetation, an aspect reflected in the abundances of the stations sampled.
- The low representativeness of the fish community is highly influenced by the characteristics of the physicochemical quality of the water. The only species reported (*Poecilia sp.*), corresponds to a common organism in the savannah tolerant to polluting conditions and disturbances of its habitat.
- The community of aquatic macrophytes was reported in the stations of the Juan Amarillo wetland, the La Conejera Wetland and the Los Lagartos Club Lake, in the two climatic periods and mainly at the interface of the body of water. The species recorded are associated with low current waters and high nutrient content.

0.8.3.6. Ecosystem services

The identification of the SSEE in the territory where the L2MB project is framed, is carried out in the urban context and considering the processes and functions that come from the biodiversity found in urban areas and that are perceived by their inhabitants as direct or indirect benefits that provide them with well-being and better quality of life.

The SSEE that offer the territory where the L2MB project will be implemented, according to the state of the habitats that sustain biodiversity and the perception of the communities correspond to:

- **Provision services**

- Wood
- Medicinal Resources (Medicinal Plants)
- Foods

- **Regulatory Services**

- Local climate regulation
- Air purification
- Storage and capture of carbon dioxide
- Pollination
- Water regulation and water purification

- **Support services or support**

- Provision of habitat
- Photosynthesis and primary production
- Nutrient cycling

- **Cultural services**

This category of ecosystem services groups the non-material benefits obtained from ecosystems, whether through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences.

- Recreation and knowledge
- Contemplation of the natural environment

0.8.4. Characterization of the socioeconomic environment

The characterization of the socioeconomic environment was prepared in accordance with the provisions of the National Development Finance in the terms of reference ET 05 - Environmental and Social Impact Study (ESIA) of May 2021.

The framework or guide of the standards and norms of performance of the Multilateral Bank focuses on relevant and transversal aspects of the Study such as the consultation and participation of stakeholders in the process, a situation that was taken into account for the capture of primary information in the territory and in the workshops with affected communities. On the other hand, this baseline involves incident aspects for the identification of impacts and management plans such as gender aspects, identification of population to be resettled, identification and characterization of spatial aspects (roads, equipment), economic aspects, cultural heritage; topics of interest to the Bank that are reflected in the dimensions characterized.

The characterization inputs consisted of secondary and primary information sources and quantitative and qualitative information analyses were performed; The review, collection, evaluation and analysis of the information allowed to identify and size the impacts that may occur during the project in each of the stages by components.

The characterization of the Area of Indirect influence was advanced through the consultation of official information sources, such as DANE, District Planning Secretariat, Chamber of Commerce, local mayors of Chapinero, Barrios Unidos, Engativá and Suba, District Institute of Heritage and Culture, Secretary of Health, Ministry of Education, District Institute of Recreation and Sports, Secretariat of Mobility, Ministry of Culture among others.

As for the AID Area of Direct Influence, it was elaborated with primary information obtained with the different social actors, during the participation spaces such as meetings and workshops in which various methodologies were implemented with a differential approach, in order to obtain the particularity and dynamics of the territories in which the L2MB will be developed. The analyses were complemented with secondary information from official sources and the structure corresponds to a

description by dimensions (demographic, spatial, cultural, economic and political-organizational) in accordance with the requirements of the ET05 Environmental and Social Impact Study, numeral 5.2.5.9 socioeconomic characterization.

It is important to mention that the area of direct influence was established considering different criteria as explained in numeral 1.6.1.3 in a buffer of 300 m around the surface works such as the 11 stations, the workshop yard, the pumping, evacuation and ventilation wells and in the tunnel area a block side and side, In this last area it is necessary to specify that due to the constructive method it significantly mitigates the affectations or impacts on the surface, however, it will be considered from the socioeconomic environment for the processes of information and participation due to the expectations that can be presented by the tunnel and with the aim of advancing an assertive relationship with the different social actors. In accordance with the above and taking into account the organization of the territory, the characterization was advanced prioritizing the calls to the population located in these project areas and to the presidents of the Community Action Boards of the neighborhoods in which the project will be developed, likewise the characterization was complemented with data from official sources such as local administrations and district entities, which process the information and have outputs of it on neighborhoods, this being the unit considered to complement the analyzes considering that the impacts do not extend to the entire area of the neighborhoods.

Below is the list of localities and neighborhoods that make up the Project's Area of Influence:

Table 4. Localities, UPZ, Neighborhoods and project area.

Locality	Quarter	Activity
Chapinero	Porziuncola	Station 1
	Quinta Camacho	Station 1
United Neighborhoods	San Felipe	Station 1
	North Concepcion	Station 1
	Colombia	Station 1
	Alcazar	Line
	North Alcazar	Line
	The Aurora	Line
	La Merced North	Station 2
	Eleventh of November	Station 2
	October 12	Station 2
	San Fernando	Station 2
	Western San Fernando	Station 3
	Jose Joaquin Vargas	Station 3
Engativá	Metropolis	Station 3

Locality	Quarter	Activity
	The Fairs	Station 3
	West Bellavista	Station 3
	Simon Bolivar	Station 3
	The Western Fairs	Line
	La Estrada	Line
	Bonanza	Station 4
	Palo Blanco	Station 4
	Santa Maria del Lago	Station 4
	Boyacá	Station 4 and 5
	Tabora	Station 5
	Saint Helenita	Station 5
	Florence	Line
	Almeria	Line
	Soledad Norte	Station 5 and 6
	Paris	Station 6
	The Farm	Station 6
	The Cherry Trees	Station 6 and 7
	Paris Gaitan	Station 6 and 7
	Hispaniola	Station 6 and 7
	La Serena	Station 7
Suba	Los lagartos club	Station 7
	Altamar Corner	Station 8
	Suba Corner	Station 8
	Japan	Station 8
	Santa Teresa de Suba - Juan Amarillo Wetland	Station 8
	San Cayetano	Station 8
	Lech Walesa / New Corinth	Line

Locality	Quarter	Activity
	Aures II	Station 9
	New Tibabuyes	Station 9
	Villamaria	Line
	Villamaria I	Station 10
	Eastern Gaitana	Station 10
	Puerta del Sol	Station 10
	Tibabuyes Savannah	Station 10
	Lombardy	Station 10
	Northern Tibabuyes Savannah	Line
	Tibabuyes Universal	Line
	Tibabuyes II (sectors roads of Esperanza and Quintas de Santa Rita	Station 11
	Western Tibabuyes	Workshop Patio
	Bilbao	Workshop Patio
	Tibabuyes	Workshop Patio

Source: UT MOVIUS 2022

0.8.4.1. Demographic dimension

The demographic component was elaborated with district information sources and the most relevant data and perceptions of the inhabitants about the demographic dynamics in their neighborhoods were brought up. This is the result of the participatory exercise of socioeconomic characterization that was carried out in the different sectors of the project's area of influence. The importance of recognizing these particular perspectives on the evolution of the population in the UPZ and/or in the neighborhoods, lies in identifying changes in social and economic life, as well as variations, adaptations or permanence of local needs and demands.

The growth trend for the towns of Chapinero, Barrios Unidos, Engativá and Suba was evidenced from 2005 to the projection for the year 2035. In turn, DANE data show a significant growth of the population in the town of Suba, which may also be directly related to its size, as well as the real estate growth in the town that is attractive to citizens.

In turn, there was a marked difference between Suba and the other localities that are part of this study for the year 2021. This town, in addition to being one of the largest, also houses a considerable proportion of the total population of the city,

with a projection of 1,252,675 inhabitants. In Suba, the UPZ that concentrate the largest number of inhabitants are: El Rincón, Tibabuyes, Suba, among the three they group 18% of the local population.

Engativá corresponds to the second locality with the largest population in the area of influence. The UPZs that contain the largest number of populations are Engativá, Boyacá Real and Minuto de Dios. Chapinero and Barrios Unidos are the towns with the least population, with figures that are between 150,000 and 200,000 inhabitants.

Among other relevant data, the socioeconomic stratum that stands out along the corridor in the towns of Barrios Unidos and Engativá corresponds to stratum three, in the route that develops in the town of Chapinero strata four and five are observed and in the town of Suba stratum two stands out, however, areas without stratum were identified where it is possible to consider that they are related to the areas of the road reserve of the Longitudinal Avenue of the West.

0.8.4.2. Spatial dimension

Bogotá is the city with the greatest coverage in the public services network provided to its population (electricity, aqueduct, gas network, communications, sanitation and garbage collection), with a percentage that exceeds 60%. Therefore, the difference in the coverage of these services between the localities analyzed here is smaller, and this is determined in part by the commercial vocation of each sector, and the demand for services that they particularly require.

The four localities of the Area of Indirect Influence have a high percentage regarding the coverage of domestic public services (aqueduct, sewerage, garbage collection, electricity) with levels close to 100% in the homes of the 19 urban localities, for more than 15 years. Thus, the aqueduct service has a coverage of almost 100%, with a slightly lower level in the town of Suba. However, it should be considered that this locality is the largest in the sample, in addition to presenting more than presenting more than more rural areas. In Barrios Unidos, this public service is covered by 100%, similar to all urban locations in the city, which, in general, have superior coverage. In the same way as the aqueduct service, a percentage of 100% of the homes in Barrios Unidos have sewer service.

As for social security, Chapinero has 6.7% of its population served under the subsidized regime, compared to 4.6% in Barrios Unidos, 8.2% in Engativá and 6.9% of the population of Suba, where 2.1% is part of the exception regime, while the population of that locality that is not covered in social security in health amounts to 0.2% (DANE-SDP, 2017). In the town of Barrios Unidos the population affiliated to the contributory regime is 90.2%, followed by 4.6% of the population served by the subsidized regime, 2.6% are part of the exception regime, while the population of that locality that is not covered in social security in health is 0.2%. In the latter locality, 3.0% are part of the emergency regime; in Engativá Barrios Unidos and Chapinero it is 2.6%, respectively.

The population without social security coverage in health is 0.3% in the town of Suba; 0.5 in Engativá and Barrios Unidos, respectively; and 0.2 in the town of Chapinero.

Another aspect that is taken into account is the coverage in education, which is directly related to the density of young people by locality. In the 2019-2020 educational characterization study developed by the District Education Secretariat (SED), it showed that the school-age population (PEE) for the year 2019 has its greatest representation in Suba, with 227,976 people of 1,452,283 in the city of Bogotá, that is, 15.7%, which places it as the locality with the largest student-age population. For its part, Engativá has 140,910 people, Barrios Unidos with 35,508 and Chapinero with 14,871 inhabitants as PEE. According to the 2017 Multipurpose Survey, the percentage of children under 5 years of age who attend a comprehensive early childhood care institution: 58.6% boys and 49% girls. The percentage of children under 5 who do not attend a comprehensive care institution due to lack of space by locality of Barrios Unidos is 4.1% boys and 3% girls.

Regarding social and recreational facilities, it will be seen that there is a direct relationship between the number of them and the size of each locality, which for this case is also reflected in its population density and the percentage of residential and commercial areas that each sector of the locality has destined.

0.8.4.3. Economic dimension

When talking about the economic aspects in the Area of Influence, it is pertinent to mention that the project from its design involves different road corridors on which historically a territorial dynamic has been erected in which the promotion of commercial initiatives has been important both from the public institutionality and from the private sector. Calle 72 and Avenida Ciudad de Cali, stand out as the most recognized corridors that connect with other sectors located especially in the town of Suba. This condition also has a direct relationship with the advance of the city from what can be called in this case the center (72nd Street with Caracas Avenue) to the periphery (Sector of Fontanar de Suba) process in which the different residential and commercial sectors were consolidated at the same time with the development of the city, and that today they are very evident.

For example, if the number of commercial establishments is concerned, throughout the corridor of 72nd Street between Caracas Avenue and Boyacá Avenue, 52.3% of the total AI is concentrated around only four of the 11 stations that make up the project. Such a situation is hardly logical if one starts from the fact that 72nd Street during the twentieth century was one of the axes on which the city of Bogotá developed not only in its expansion to the north, but also to the northwest connecting and later integrating the dynamics of the city, the towns of Usaquén and Suba, which later became localities. In this scenario, the creation and consolidation of the Market Places played a fundamental role, because until today they remain the most important references in terms of trade, and also have a well-recognized cultural importance; In this case, the Plaza del Barrio 12 de Octubre, La Plaza de Las Ferias, and the Plaza del Siete de Agosto stand out, even though the latter is outside the Area of Influence of the project.

It should be noted that the configuration of local commerce in relation to the area of influence of the project maintains a sustained growing behavior in the consolidation of the different commercial nodes established around the projected stations, whose characteristics are presented below.

Table 5. General characteristics of commercial development in the AID

Station Sector	Establishments	Number of activities according to ISIC codes	General characteristics
Calle 72 x Avenida Caracas	696	55	-Highly diversified trade -Printing and advertising -Veterinary and agricultural inputs -Hardware stores and automotive mechanics
Street 72 x NQS	859	42	- Plaza 12 de Octubre. - Furniture and decoration area. - Automotive and industrial mechanics workshops. -Restaurants

Station Sector	Establishments	Number of activities according to ISIC codes	General characteristics
Calle 72 x Carrera 68	649	46	-Sector Plaza de las Ferias -Alkosto Sector -San Andresito Sector -Highly segmented trade
Calle 72 x Avenida Boyacá	834	52	-Highly segmented -Sector laminate floors and wood -Workshops and metalworking -Restaurants -Automotive mechanics -Concentrated on 72nd Street
Calle 72 x Avenida Cali	394	46	-Highly segmented -Concentrated on 72nd Street -Hardware stores -Restaurants -Grocery stores, china shops, and other household products
Cali Avenue x 80th Street	476	46	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products -Automotive mechanical workshops
Cali Avenue x 90th Street	231	39	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products -Automotive mechanical workshops
Avenida Cali x Carrera 93	325	38	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products -Automotive mechanical workshops
ALO x 129th Street	400	38	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products

Station Sector	Establishments	Number of activities according to ISIC codes	General characteristics
			-Automotive mechanical workshops
ALO x 139th Street	592	41	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products -Automotive mechanical workshops
Tr. Suba x Carrera 141 A	358	36	-Highly segmented -Hardware stores -Restaurants -Grocery stores, china shops, and other household products -Automotive mechanical workshops

Source: UT MOVIUS 2022

0.8.4.4. Cultural dimension

Within the corridor there is evidence of a specific cultural offer differentiated by locality. In sectors mainly of the town of Chapinero where zone G is located there is a great variety of sites around entertainment, culture, art oriented to the reception of citizens with different consumption capacities. These sites offer cultural experiences of local, regional and international references. In general, the town of Chapinero is recognized for being a special territory for the LGTBIQ community, a wide range of scenarios are presented for the development of inclusive cultural activities with diverse gender identities. On the corridor of the town of Chapinero there is constant evidence of cultural programs led by the district sector, but also the academic sector, mainly by the National Pedagogical University and private sectors that schedule specific events around themes of culture, inclusive education, design, fashion, gastronomy, among others.

A few blocks from the UPZ Chicó Lago is the San Felipe neighborhood of the town of Barrios Unidos. The neighborhood is located a few blocks from Station 1 of the L2MB and in the last decade has been a place of trend in cultural terms. Its parks such as La Araña Park, squares and houses have been transformed over time to such an extent that the San Felipe neighborhood is now considered the Art District of the capital.

The corridor of 72nd Street that includes stations 1 to 5, is characterized by a wide economic offer that includes cultural activities. For example, the presence of market squares is observed, especially the Market Square of October 12, the Market Square of Las Ferias and the Market Square of August 7. The market places have been an opportunity to maintain relations with the domestic market, especially in the central region of the country that groups the departments of Tolima, Huila, Meta, Cundinamarca, Boyacá. Around the market squares a citizen awareness is woven about diversity, the environment and the intangible cultural heritage of Creole gastronomy.

Around the three wetlands that are in the area of indirect influence of the project; Santa María de Los Lagos Wetland, Juan Amarillo Wetland and La Conejera Wetland, actions have been developed at the cultural level from the institutional and community level. From artistic training spaces, environmental awareness programs, to celebrations of festivities such as the commemoration of the years of the city of Bogotá, wetlands have always been scenarios of cultural appropriation.

In general, in the Area of Direct Influence of the Project, a desire to resume community actions and establish links between neighbors is identified. Some of the inhabitants who participated in the characterization workshops were co-founders of the neighborhoods. These people remember the first actions such as: dividing the lots, tilling the wheat fields, raising walls of future homes or houses of public function such as community action boards, schools, churches, market squares. It highlights the organization of neighborhood events such as bazaars, supported mainly by religious institutions such as the Catholic Church, to collect funds to obtain resources, construction materials and adaptation of public spaces. These actions reflect the sense of belonging, solidarity and social cohesion of people who, despite the lack of resources, mainly in Engativá and Suba, contributed to building an organized community.

As stated by several of the participants, these actions involve processes of resistance expressed through protests, closures to land, working days that, in some cases, lead to acts of violence. The development of events such as bazaars, festivals, as well as the act of enclosing a lot or building a building, is an action comparable to a cultural practice because it denotes experiences, shared experiences.

Finally, with regard to sites of cultural significance, the following are identified:

Station 1 : San Francisco de Asís Statue, La Porciúncula Church, La Estación Park, Los Alcázares Park, 7 de Agosto Market Square

Station 2 : Plaza de Mercado 12 de Octubre, Parroquia San Fernando Rey,

Station 4 and 5: New Apostolic Church, Parish of San Juan de Mata, Plaza de Mercado Las Ferias, Santa María de Los Lagos Wetland, Parroquia Nuestra Señora de la Concepción, Parque la Almeria

Station 7: Parroquia El Santísimo Redentor, Parque La Serena, Parroquia Nuestra Señora del Perpetuo Socorro, Plaza de Mercado Quirigua

Station 11: Fontanar del Rio Park, La Conejera Wetland, San Dionicio Church

0.8.4.5. Political-organisational dimension

The four localities that are in the area of the development of the project, being an integral part of the Capital District, have the presence of the secretariats and entities of the District order, which provide attention to citizens in the different aspects related to the different problems that arise in the locality.

In that sense, Bogotá, as the Capital District, is a territorial division of the first order, whose administrative structure includes: Central sector formed by the office of the Mayor of the Mayor, the secretariats and the administrative departments. The District Secretariats (General, Government, Finance, Planning, Economic Development, Education, Health, Social

Integration, Culture, Recreation and Sport, Environmental, Mobility and Habitat). The District Council, which has legislative powers and is responsible for exercising political control in the district administration, which is composed of 45 councilors representing the twenty localities.

In addition to the administrative structure of the district, at the level of the area of indirect influence (IIA), different district institutions, community organizations and participation bodies are present. According to the survey conducted by IDPAC in 2018 regarding the local participation mechanisms that govern the Capital District, it was observed that 21.9% of the population consulted in Barrios Unidos belongs to a social, community or communal organization or collective, compared to 24.69% in Chapinero, 15.04% in Engativá and 30.67% in Suba. Of these percentages, it is necessary to consider issues that have been strengthened today, such as environmental, industrial and cultural.

A representative entity in the town of Suba is the Cabildo Indígena de Suba, whose members recognize themselves as ancestral inhabitants of the territory of Bogotá. In its organizational scheme, the indigenous authority is made up of a Governor, Vice Governor, a Major Mayor, a Minor Mayor, Sheriffs, Treasurer, Secretary and Prosecutor, in addition to the councils, which are structures within the council that seek to guide, advise and teach the Indigenous community members in the different cultural branches themselves, and which are currently divided into five councils: Council of Elders, Council of Women, Council of Youth, Council of Health and Council of Education.

In turn, it is considered of special relevance in the localities of Engativá and Suba is the Wetlands Network and, which has its genesis in Citizen Projects of Environmental Education, focused on the Conservation of the Wetlands of Bogotá, in order to share information related to the wetlands of the city, their situation, goods, Environmental services, threats and problems.

In consideration of the relationship of the communities of these four localities of the IA with respect to citizen participation and the experience obtained in the development of the different spaces for its development, the different social and community organizations with the greatest impact on the IA from their relationship and dissemination strategies are presented below.

Table 6. Official entities and organizations with a presence in the AID

Entity/Group or Organization	**Location/Participating Population**	**Meeting Date/Remarks**	
Local Mayor's Office, Office Secretaries, Local Personería and Local Councils: Local Subdirectorate of Social Integration Local Safety Council for Women Local Council of Culture, Art and Heritage Local Disability Council Local Environmental Commission Local Participation Councils Local Planning Council Local Council for Social Policy Local Council of Horizontal Property	Chapinero	9/12/2021	14/09/2022
	United Neighborhoods	9/12/2021	14/09/2022
	Engativá	10/12/2021	14/09/2022
	Suba	10/12/2021	14/09/2022

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks	
Local Administrative Board	Engativá	14/12/2021	14/09/2022
	United Neighborhoods	14/12/2021	14/09/2022
	Suba	20/01/2022	14/09/2022
-Institute of Urban Development -Transmilenio -Secretariat of Mobility -Administrative Department of the Public Space Ombudsman's Office -Urban Renewal Company -Secretariat of Security and Coexistence -Metropolitan Police	District entities mobility sector	15/12/2021	Specific meetings were held according to the needs of the project such as gender issues, impact on public infrastructure, occupants of public space, mobility for people with disabilities. The details of the information can be found in Chapter 13. Participation Report.
-Institute for Social Economy - IPES -Fenalco -Secretary of Economic Development -Chamber of Commerce	District Entities Social - Economic Sector	15/12/2021	

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks	
-District Institute of Community Participation and Action -District Institute of Cultural Heritage -Secretariat of Social Integration -District Personería -Secretary of Education -District Secretariat for Women -National Institute for the Blind -INSOR | National Institute for the Deaf -Secretary of Culture, Recreation and Sport -Technical Committee on Disability -Delegated Comptroller for participation -Directorate of Citizen Culture -Directorate of Sexual Diversity	District Entities Social - Cultural Sector	16/12/2021	
Social, community and non-governmental organizations, Cabildo Indígena Muisca de Suba Foundation we count on you Wetlands Foundation INTERRA Foundation Tree Network Foundation PROBOGOTA Suba Healthy Environment Committee (CAS) GAINA SUNA Foundation- AMigos of Cultural and Natural Heritage Fundación Contar Contigo Colombia PROTERRA Collective Foundation Environmental Collective of Flora and Fauna ENGATIVA BOLSANATURA	Chapinero United Neighborhoods Engativá Suba	21/12/2021	

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks	
District Personería District Oversight Delegated Comptroller for Participation	District	13/01/2022	First meeting and accompanied the participatory process of preparing the ESIA according to its availability and will continue with the processes in the following stages.
Community of the corridor's area of influence: Community Action Boards of the AID neighborhoods, residents and merchants. First and second moment of consultation, open call and in face-to-face and virtual mode through YouTube live.	Suba	18/01/2021	20/09/2022
	Suba	19/01/2021	20/09/2022
	Engativá	20/01/2021	19/09/2022
	United Neighborhoods	25/01/2022	15/09/2022
	Engativá	24/01/2021	19/09/2022
	Engativá	28/01/2021	
	Chapinero	1/02/2021	15/09/2022
	United Neighborhoods		15/09/2022
	Suba	2/02/2021	20/09/2022
	Chapinero United Neighborhoods	16/02/2022	

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks	
Muisca Indigenous Council of Suba	Suba	17/02/2022	
Environment sector IDRD EAAB Table wetlands Botanical garden Secretary of Environment	District	24/03/2022	As a result of this meeting, other specific meetings emerged.
Information administrators and institutions Chapinero, section of the route in this locality	Chapinero	25/03/2022	Alternative strategies to ensure information and participation
Secretary of Planning and Sexual Diversity	District	31/03/2022	
Academy (Universities of Bogotá and Society Colombia and Engineer and Architects	District	1/04/2022	14/09/2022
Territorial team Secretariat of Planning, participation and sexual diversity	District	12/04/2022	
Lizards Club	Suba	18/04/2022	
Local Administrative Board of Chapinero	Chapinero	7/05/2022	
District Secretary of Environment . OPEL Participation	District	14/06/2022	
District Secretariat for Women. Protocol for the Prevention of Violence against Women	District	15/06/2022	
Muisca Indigenous Council of Suba	Suba	1/07/2022	1/07/2022
Local Environment Council	Suba	12/07/2022	
Tibabuyes Wetlands Table	Suba	13/07/2022	

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks	
La Conejera Wetlands Table	Suba	27/07/2022	
INCI work table- Accessibility, podotactile signage	District	15/07/2022	
District Secretariat for Women - Sensitive Areas	District	21/07/2022	
Plaza 12 de Octubre_ IPES Administrator	United Neighborhoods	29/07/2022	
Plaza 12 de octubre-IPES subdirectorate of design and strategic analysis	United Neighborhoods	3/08/2022	
IPES Occupants of Public Space	District	10/08/2022	
IPES Subdirectorate of entrepreneurship	United Neighborhoods	10/08/2022	
Barrios Unidos Local Administrative Board, extraordinary meeting.	United Neighborhoods	15/08/2022	
La Conejera wetland table tour	Suba	29/08/2022	
Traders of the route corridor	District	6/09/2022	
8 Participation Committees were formed Participants: Community leaders, residents, merchants, landlords, tenants, community at large. Thematic meetings: 1st Characterization of the AID 2nd Identification of ecosystem services, cultural and recreational zones 3rd Citizen recommendations to the project, stations and identity 4th Presentation of construction process identification of impacts and proposals for management of impacts 5th Citizen Culture an approach from the PLMB.	Engativá 1	Monthly from February 2022 to August 2023 (in June it was not carried out by decision of the EMB giving priority to the electoral process in the country)	
	Up 2		
	Up 1		
	Engativá 2		
	Barrios Unidos 2		
	Barrios Unidos 2		
	up 3		
	Chapinero		

Entity/Group or Organization	Location/Participating Population	Meeting Date/Remarks
Meetings with property owners or property managers in the Patio workshop area and the stations and wells. Presentation of the regulatory framework for property acquisition and Resettlement Plan.	Workshop yard	22/08/2022
	Station No. 9 ALO x Cl 129	23/08/2022
	Station No. 8 Av. Cali x Cr 93	24/08/2022
	Station No. 7 Av. Cali x Cl 90	26/08/2022
	Station No, 5 Calle 72 x Cra 80	29/08/2022
	Station No. 6 Av. Cali x Cl 80	6/09/2022
	Station No. 6 Av. Cali x Cl 80	5/09/2022
	Station No. 2 Calle 72 x Av NQS	31/08/2022
	Station No. 3 Calle 72 x Av 68	1/08/2022
	Station No. 4 Calle 72 x Av Boyacá	2/08/2022
	Station No. 1 Calle 72 x Av Caracas	5/09/2022

Source: UT MOVIUS 2022

0.8.4.6. Archaeological component

The objective of the archaeological component is the implementation of a Preventive Archaeology Program (PAP) for the project. As part of this ESIA, it is envisaged to bring forward the PAP for phases of 1. Registration 2. Diagnosis and Prospecting, 3. Approval of the Archaeological Management Plan.

These activities were carried out in accordance with ICANH regulations, in order to comply with the current legal framework on the protection and safeguarding of archaeological heritage, expressed in resolution 297 of December 5, 2019, in decree

138 of 2019, in law 1185 of 2008, decrees 763 of 2009 and 1080 of 2015 and the "Terms of Reference to implement Preventive Archaeology Programs" of ICANH.

The Registration of said PAP was carried out, which was approved by Resolution No. 1250 of August 1, 2022. Similarly, the archaeological diagnosis was prepared, which was delivered to the ICANH on November 1, 2022.

In parallel, during the month of October, field prospecting was carried out, an activity that was combined with the analysis of historical aerial photographs and satellite images, in order to establish an approximation to landscapes and interventions of the past.

The results of these activities allowed to advance the phase of Approval of the Archaeological Management Plan, which consisted of the preparation of a report in accordance with the "Terms of Reference to implement Preventive Archaeology Programs" of the ICANH. This report included the Archaeological Management Plan in which the respective preventive and mitigation measures are proposed that, subsequently, must be executed in the next phase of the Preventive Archaeology Program. In this way, the need to implement rescue measures in two areas of the project was determined. The first corresponds to the excavation of trenches in the area of the courtyard-workshop, in order to try to identify and characterize the ridges that were observed in the historical photographs, while the second corresponds to the excavation of an exploratory cut in the northern sector of Station 9 where archaeological material was found in two boreholes.

0.8.4.7. Population to be resettled

The subject affected by the phenomenon of involuntary transfer of population in the L2MB corresponds to the Social Units located in the property areas of intervention of the project.

The concept of social unit is understood as "natural or legal persons, with or without ties of consanguinity that are related to legal, physical or economic dependence on the property required for the construction of the works of the Transport System. It is the basic unit of measurement of social studies for the acquisition of land."

In specific terms, five basic types of social units are distinguished: i) Household Social Unit (USH); (ii) Social Socio-Economic Unit (USSE); (iii) Social Economic Unit (USE); iv) Rentier Economic Social Unit (USE rentista) and v) Institutional Social Unit.

Social Units can be classified, in turn, by types of tenure. The basic types of tenure are: (i) owner; (ii) registered holder; iii) holder NOT registered; (iv) lessee, (v) sublessee; (vi) usufructuary and (vii) holder.

The property acquisition process in the L2MB project and consequently the impact of involuntary population transfer and the Resettlement Plan are directly related to the planning and execution of the surface works and in particular to the planned stations.

Taking into account the above, the impact of Involuntary Population Transfer, in the case of the L2MB project, will be presented in the specific areas belonging to 23 neighborhoods of seven UPZ and three localities (Barrios Unidos, Engativá and Suba) of the city of Bogotá.

The neighborhoods with population to be resettled by the L2MB project are: Alcazares Norte, Colombia, Concepción Norte, San Felipe, Doce de Octubre, San Fernando Occidental, Bellavista Occidental, La Estrada, Las Ferias, Boyacá, Santa María, La Soledad Norte, Santa Helenita, Tabora, La Granja, Paris Gaitan, La Serena, Los Cerezos, Club de Los Lagartos, Lech Walesa, Rincón de Suba, Aures II and Tibabuyes II.

The coverage of the impact of involuntary transfer, in terms of the element affected and according to the results of the advanced census, is 1,847 Social Units located in 880 properties.

Table 7. Properties and social units identified by each of the projected stations

Season	Properties	Social Units
Station 1	81	175
Station 2	83	240
Station 3	75	142
Station 4	99	252
Station 5	68	152
Station 6	180	338
Station 7	61	139
Station 8	95	253
Station 9	10	21
Station 10	0	0
Station 11	118	123
Workshop Patio	10	12
Total	880	1847

Source: UT MOVIUS, 2022

Likewise, it is important to mention that the 880 final properties object of acquisition by the L2MB project have different uses that include housing, commercial, industrial uses, and offer of services, institutional, whose distribution is described in detail in the document presented in detail in the document of the Resettlement Plan.

In the specific areas of the surface works of the L2MB project, infrastructures that offer social services are also located, mainly education, health, citizen security, social welfare and community services. The institutional infrastructure for citizen security corresponds mainly to two Immediate Care Centres, CAI, of the National Police, and infrastructures that constitute Special Accommodation Places (LEA) that offer social services aimed at vulnerable population groups such as the elderly, girls in the process of restoring their rights and drug addicts in the process of rehabilitation are also highlighted (See Resettlement Plan Document).

In addition to the public and private infrastructures in some of the areas of intervention of the L2MB project, the affectation of areas traditionally specialized in the offer of services such as the manufacture of furniture (UPZ Doce de Octubre) and mechanical workshops (Tibabuyes) stands out. In the same way, areas that require particular management measures are affected by the presence of commercial establishments that, due to their activities, generate a high impact on the conditions of citizen security and concentration of vulnerable population in places of irregular accommodation such as the so-called pay-daily.

The majority of Social Units affected by the impact of involuntary relocation are tenants of the property in which they reside, compared to a somewhat smaller proportion of those who identify themselves as owners.

In order to respond to the situations and conditions of the population to be resettled described, nine programmes are proposed in the Resettlement Plan in which they include all the sufficient and necessary aspects of information, consultation, acquisition and replacement of private and public properties intervened by the project and the restoration of economic and social conditions. with the proper advice and accompaniment to the affected population, taking into account a differential approach, intersectionality and vulnerability for the appropriate attention and social management of particular cases that require it.

The programmes described are: (i) Information, outreach and consultation programme; ii) Program of attention to petitions, complaints and claims, PQRS; (iii) Programme for the acquisition of affected property; (iv) Property replacement programme; (v) Advisory programme for the reconstruction of partially affected buildings; (vi) Economic conditions restoration programme; (vii) Programme for the restoration of social conditions; viii) Program for the abbreviated acquisition of real estate, areas of real estate and public infrastructure affected and ix) Program for the replacement of affected real estate, public infrastructure and spaces for community use See Resettlement Plan Document).

During the preparation of the General Resettlement Plan, lessons learned from the process carried out in the First Line of the Bogotá Metro have been taken into account. These lessons learned are considered and applied in the implementation of the current Resettlement Plan, and are detailed and described in the PAR document.

0.8.4.8. Development trends

The development trends were constructed taking as a source the official information of the District Planning Secretariat and the DIAGNOSTIC REPORT OF THE AREA OF URBAN INFLUENCE carried out by the UT Movius in 2021. The objective of this component was to analyze the trends and visions of the future that were linked to the development of L2MB in accordance with the different planning instruments such as the current District Development Plan, Local Development Plans, among others that could be articulated to the impact management plan. Accordingly, some of the projects identified in the project's IIA were:

Green Runner Seventh Race

- First Line of the Bogotá Metro
- Construction of the Road Interchange of Calle 72 with Av. Caracas
- Ciclo-Alameda Medio Milenio
- TransMilenio Avenue Carrera 68
- Expansion and extension of Av. Ciudad de Cali
- Regional Connection Salitre Channel and Rio Negro

At the same time, the review of Strategic Actions was taken into account, which are integral urban interventions in specific spatial areas where projects or intervention strategies converge to specify the territorial occupation model (SDP, 2022). The development of Strategic Actions involves advancing specific processes of diagnosis, formulation, and decision-making that must be formally adopted by the city administration, to become specific interventions that lead to detonate the transformation or empowerment of the territories, for the fulfillment of this purpose and in accordance with the provisions of

article 483 of 555 of 2021. The following strategic actions proposed in the current POT are within the area of influence of the project:

- Priority Strategic Action CALLE 72
- Strategic Action RIONEGRO PIECE
- Strategic Action THE FAIRS
- Strategic Action EDUCATIONAL AND CARE CITADEL

In addition to this, the urban planning licenses of approved projects in the area of direct influence were reviewed, as well as Master Plans, Zonal Plans, among others related to the POT and the urban guidelines to be followed were considered, among which are:

- Tracks of the Metro corridor. Profiles at the basic schema level.
- Typical sections of public space: Examples of platforms, dividers, bicycle paths and roads.
- Road Intersection Guidelines: Specifications for safe crossings for mixed traffic, public transportation, bicycles, and pedestrians.
- Guidelines for the design and positioning of street furniture.

0.9. LEGALLY PROTECTED AND INTERNATIONALLY RECOGNISED AREAS

- In the study area there are three internationally recognized areas, which correspond in the first place, to two Ramsar sites that make up the Urban Wetlands Complex of the Capital District of Bogotá, belonging to the Juan Amarillo or Tibabuyes wetland and the La Conejera wetland, which are not directly intervened by the construction works of the L2MB. Secondly, and as part of the Important Area for the Conservation of Birds of Colombia and the World - AICAS, is the AICA Wetlands of the Sabana de Bogotá.
- The detailed development of wetland and AICA information is presented throughout the ESIA and the biological characterization of these ecosystems in chapter 5.3 Biotic environment. Additionally, Annex 0-5 Activities Biodiversity Action Plan presents a guide to the actions to be developed in the "Biodiversity Action Plan" during the construction stage of the project, which involves recovery activities of the Juan Amarillo and La Conejera wetlands.

0.10. BIODIVERSITY MITIGATION HIERARCHY

- An analysis of the mitigation hierarchy was carried out to the modified, natural and critical habitats identified in the area of influence and mainly in the area of intervention of the L2MB project.
- From the biotic baseline developed in this ESIA (Chapter 5.3 Biotic medium), the identification of the areas of influence from the different components of the abiotic and biotic media, which spatially represent the impacts generated by the project (Chapter 5.1 Area of influence), and the most representative impacts and risks identified for the abiotic and biotic components during the evaluation of the environmental impacts in the scenario with project (Chapter 8 Environmental impact assessment), the respective preventive, mitigating and compensatory

management measures that support the framework of the biodiversity mitigation hierarchy developed for the project were formulated. The socialization days with government and environmental entities, organized groups and associations, and communities in the area of influence contributed to the management measures received in this study, mainly with those related to critical habitats such as the Juan Amarillo and La Conejera wetlands, which although they are not directly intervened by the project. are of primary interest and underpin the environmental management actions formulated in the Environmental Management Plan of the ESIA of the L2MB.

- The biodiversity mitigation hierarchy is framed in the approach proposed by the Multilateral Bank in the development of ESIAs for the "Conservation of Biodiversity and Sustainable Management of Living Natural Resources" in accordance with the Environmental and Social Standard 6 of the World Bank[5] and the Environmental and Social Performance Standard 6 of the IDB[6]. The application of the mitigation hierarchy is also part of Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, established in the IFC Performance Standards on Environmental and Social Sustainability aimed at avoiding impacts on biodiversity and ecosystem services[7].

0.10.1. Biotic management measures in modified habitats

- The actions of management of the biotic environment in the modified habitats are aimed at preventing, mitigating and compensating the impacts generated by the constructive and operational activities of the superficial and permanent works of the project: 11 stations with access to galleries, place of camps, shafts of entrance and exit of the tunnel, the ventilation shafts, the section of excavation open in trench with semi-buried typology, the section with elevated typology and the workshop yard. About 28 management actions are of a preventive nature, 7 correspond to mitigating actions and 7 are compensatory actions.
- The compensatory measures are related to the residual impacts on the flora component, when the vegetation covers are intervened and the arboreal individuals and flora in associated non-vascular closure are removed, as well as the affectation and decrease of the habitats that they represent for the fauna and its impact on the composition and abundance of the populations. The change in the landscape due to the implementation of the project is another of the compensated impacts.
- The compensations proposed for the residual impacts at the biotic level in the modified habitats, respond to the requirements and requirements of the legislation and regulations established by the environmental authorities at the local and national level. The management measures proposed by the communities have been involved especially for those of a compensatory nature.

0.10.2. Biotic management measures in natural habitats

- The natural habitats are restricted to a small sector with a forest cover of 0.02 ha in the vicinity of the Bogotá River, which will be intervened by the construction of the workshop yard. The 22 preventive actions of a biotic nature are assimilated to those proposed for modified habitats, and are also aimed at avoiding the affectation of natural habitats adjacent to the area of intervention of the project.

[5] Marco Ambiental y Social del Banco Mundial, Banco Mundial, Washington, DC. Licencia: Creative Commons Attribution CC BY 3.0 IGO. 2016.
[6] Banco Interamericano de Desarrollo, BID. Marco de política ambiental y social. September, 2020.
[7] Corporación Financiera Internacional - IFC. Nota de orientación 6 de la Corporación Financiera Internacional: Conservación de la biodiversidad y gestión sostenible de los recursos naturales vivos. 1 january 2012 (update 27 june 2019).

- The residual impact generated by the removal of the forest cover in the workshop yard will be compensated in accordance with the criteria, scope, procedure and compensation factors established by the Ministry of Environment and Sustainable Development - MADS in the Biotic Component Compensation Manual of 2018, compensation developed in the Biodiversity Loss Compensation Plan in chapter 15 of this ESIA.

0.10.3. Environmental management measures in critical habitats

- The Juan Amarillo and La Conejera wetlands, which are part of the Ramsar Sites Urban Wetlands Complex of the Capital District of Bogotá, correspond to critical habitats that are not directly intervened by the project. In the formulation of the Environmental Management Plan for the protection of these ecosystems, it was taken into account, the implementation in large part of preventive and mitigating measures, and the residual impact that is generated, derives from the potential affectation of some species of migratory birds during the construction and at the beginning of the operation of the project. especially in the sector of the surface section of the metro and in its place of arrival to the workshop yard, because they have as a route of displacement the corridor of the Bogotá River on its arrival at the La Conejera wetland.

- About 43 actions of a preventive nature and 9 of a mitigation type are proposed in the management programs of abiotic and biotic means, which in general terms are related to the installation of auscultation systems that will inform about potential displacements of the land and water tables, records that allow monitoring and follow-up during the previous phase and the construction phase of the project of the Juan Amarillo wetland sector. in order to guide the taking of corrective measures in case of potential changes in the expected conditions. Similarly, noise and air quality modeling, as well as permanent records of representative parameters of these components, will guarantee compliance with the standard during their monitoring. Artificial screens and enclosures will also be installed on the work fronts, which mitigate noise and the eventual generation of atmospheric emissions. The restrictions in the generation of noise for some schedules in the sector of the workshop yard, contribute to the displacement of the avifauna in the vicinity of the wetland La Conejera during the twilight periods.

- Among the mitigation measures for the protection of avifauna, especially in the sector of the elevated section of the L2MB railway corridor and the workshop yard, is to previously identify the routes used by birds for their mobilization, in order to use visible warning signs or flight diverters. The Biodiversity Loss Compensation Plan developed in this ESIA, considers the potential impact on fauna species due to the implementation of the project.

- The trainings aimed at project workers informing about the ecosystem importance of wetlands and the protection of flora and fauna, as well as those related to restrictions on entry to these places during construction activities, contribute to the preventive and mitigating actions formulated.

0.11. BIODIVERSITY ACTION PLAN

- Within the framework of the Multilateral Bank's policy, it is established to ensure that the activities carried out are consistent with the state objectives of the legal protection of these areas, and also to implement additional

programs as appropriate, to promote and improve the objectives of conservation and effective management of the area.

- The development of the "Biodiversity Action Plan" or the "Biodiversity Management Plan" is proposed as part of the update of the L2MB ESMP that the consortium will carry out during the construction of the L2MB project, aimed at the protection, conservation and strengthening of the rehabilitation of the wetlands annexed to the project with the purpose of achieving a net gain in species composition, habitat structure, ecosystem function and use by people, as well as cultural values associated with biodiversity in the Juan Amarillo or Tibabuyes wetland and La Conejera wetland.
- It is recommended for the elaboration of the plan, to hire specialists with experience in the design of offsets that meet international standards, and to coordinate and work hand in hand with the SDA and local environmental organizations that have sufficient knowledge and capabilities to successfully structure and manage conservation projects that serve as compensation[8].
- The "Biodiversity Action Plan" or the "Biodiversity Management Plan" correspond to strategic instances to verify the effectiveness and viability of preventive and mitigation measures for the protection of critical habitats or with a potential risk of affectation. The "Biodiversity Action Plan" as the project's mitigation strategy, is aimed at achieving net increases in biodiversity values and may be embedded in an overall environmental and social action plan, or allude to a thematic action plan[9]. On the other hand, the "Biodiversity Management Plan" may be an independent document or be included as part of the Environmental and Social Commitment Plan - PCAS[10] which will be prepared before the start of construction of the project. In Annex 0-5. Activities Biodiversity Action Plan, a guide is presented with the minimum activities to be considered in the elaboration of the plan during the update of the ESMP and during the construction phase by the consortium, and within the framework of the Environmental and Social Standard 6 of the World Bank, the Environmental and Social Performance Standard 6 of the IDB, and IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The "Biodiversity Action Plan" will analyze in depth and emphasize the identification, evaluation and management of impacts (direct, indirect and cumulative) on sensitive wetland ecosystems: Juan Amarillo or Tibabuyes and La Conejera. In the development of the impacts on wetlands in the "Biodiversity Action Plan", the different abiotic, biotic and social issues will be considered, which will be managed with management measures.
- The structuring of the "Biodiversity Action Plan" will be developed prior to the construction of the project, and the Concessionaire will implement the activities of the plan during construction and operation, under the assurance, control and monitoring of EMB and FDN.

0.12. ENVIRONMENTAL IMPACTS AND RISKS (ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT)

0.12.1. Impact assessment

For the evaluation of the environmental impacts of the project, the methodology of the firm INGETEC was used, which is explained and developed in depth in **annex CAP02-INTR, subfolder 2-1**.

This methodology includes, adapts and complies with the provisions of the Ministry of Environment and Sustainable Development in the General Methodology for the preparation and presentation of environmental studies. The method integrates definitions and concepts of INGETEC methodologies, used in multiple studies (many of them licensed and built). Similarly, the method integrates definitions and concepts of Vicente Conesa Fernández and Jorge Alonso Arboleda

[8] Gullison, R.E., J. Hardner, S. Anstee, M. Meyer. 2015. Good Practices for the Collection of Biodiversity Baseline Data. Prepared for the Multilateral Financing Institutions Biodiversity Working Group & Cross-Sector Biodiversity Initiative.
[9] Banco Interamericano de Desarrollo, BID. Marco de política ambiental y social. September, 2020.
[10] Marco Ambiental y Social del Banco Mundial, Banco Mundial, Washington, DC. Licencia: Creative Commons Attribution CC BY 3.0 IGO. 2016.

González, although introducing variations in the procedures and approaches according to the considerations and analysis of experts of the firm.

0.12.1.1. Scenario without project

The scenario without project corresponds to the current state of the means (abiotic, biotic and socioeconomic) and the current alteration indicators that will interact with the impacts that the project will generate, thenTable 8 in the impacts that may occur in the scenario without project are mentioned.

Table 8. Impact scenario without project.

Impact Name		Classification		
		Significance	Class	Punctuation
EA-ABI-01	Use of construction materials for the reduction and reuse of construction and demolition waste	NEUTRAL	NEUTRAL	NEUTRAL
EA-ABI-02	Alteration of soil quality	Moderately Significant	-	4,58
EA-ABI-03	Impact on the groundwater component	NEUTRAL	NEUTRAL	NEUTRAL
EA-ABI-04	Alteration of air quality	Moderately Significant	-	5,46
EA-ABI-05	Alteration of sound pressure levels.	Significant	-	6,50
EA-ABI-06	Alteration of vibration levels	Insignificant	-	4,00
EA-ABI-07	Affectation by settlements	Moderately Significant	-	5,54
EA-ABI-08	Greenhouse Gas Reduction	NEUTRAL	NEUTRAL	
EA-BIO-01	Removal of vegetation cover, tree individuals and stripping of green areas	Moderately Significant	-	4,36

Impact Name		Classification		
		Significance	Class	Punctuation
EA-BIO-02	Potential alteration in the composition and abundance of fauna	Moderately Significant	-	5,12
EA-BIO-03	Potential affectation of elements of the Main Ecological Structure - EEP	NEUTRAL	NEUTRAL	NEUTRAL
EA-BIO-04	Landscape and visual quality of the landscape	NEUTRAL	NEUTRAL	
EA-SOC-01	Generation of expectations and conflicts	Moderately Significant	-	5,57
EA-SOC-02	Change in citizen participation due to new dynamics of mobility and accessibility	NEUTRAL	NEUTRAL	
EA-SOC-03	Reconfiguration of institutional network for the construction of urban life around Line 2 Bogotá Metro	NEUTRAL	NEUTRAL	NEUTRAL
EA-SOC-04	Changes in pedestrian and vehicular mobility, local connectivity and road safety.	Moderately Significant	-	5,11
EA-SOC-05	Impact on public and social infrastructure	NEUTRAL	NEUTRAL	
EA-SOC-06	Involuntary relocation of population prior to construction activities	NEUTRAL	NEUTRAL	
EA-SOC-07	Temporary employment generation	NEUTRAL	NEUTRAL	
EA-SOC-08	Change in the dynamics in establishment	Moderately Significant	-	4,92
EA-SOC-09	Employment and new dynamics of informal trade	NEUTRAL	NEUTRAL	
EA-SOC-10	Changes in land occupation and value	NEUTRAL	NEUTRAL	
EA-SOC-11	Strengthening the civic culture around mobility	Significant	+	6,14
EA-SOC-12	Impact on archaeological heritage	NEUTRAL	NEUTRAL	
EA-SOC-13	Impact on Cultural Heritage	NEUTRAL	NEUTRAL	

Source: UT MOVIUS 2022

0.12.1.2. Scenario with project.

The scenario with the project shows the effects caused by the project in the preliminary, construction and operation stages on the components of each medium (Abiotic, Biotic and Socioeconomic) then in Table 9 the possible impacts that may occur are related.

Table 9. Impacts scenario with project

Impact Name		Classification		
		Significance	Class	Punctuation
EA-ABI-01	Use of construction materials for the reduction and reuse of construction and demolition waste	Insignificant	+	3,24
EA-ABI-02	Alteration of soil quality	Insignificant	-	2,96
EA-ABI-03	Impact on the groundwater component	Insignificant	-	3,28
EA-ABI-04	Alteration of air quality	Insignificant	-	3,43
EA-ABI-05	Alteration of sound pressure levels.	Moderately Significant	-	5,55
EA-ABI-06	Alteration of vibration levels	Insignificant	-	3,98
EA-ABI-07	Affectation by settlements	Moderately Significant	-	4,15
EA-ABI-08	Greenhouse Gas Reduction	Moderately Significant	+	5,79
EA-BIO-01	Removal of vegetation cover, tree individuals and stripping of green areas	Moderately Significant	-	5,56
EA-BIO-02	Potential alteration in the composition and abundance of fauna	Moderately Significant	-	5,97
EA-BIO-03	Potential affectation of elements of the Main Ecological Structure - EEP	Moderately Significant	-	4,70
EA-BIO-04	Landscape and visual quality of the landscape	Moderately Significant	-	5,32
EA-SOC-01	Generation of expectations and conflicts	Moderately Significant	-	5,36
EA-SOC-02	Change in citizen participation due to new dynamics of mobility and accessibility	Moderately Significant	+	4,83
EA-SOC-03	Reconfiguration of institutional network for the construction of urban life around Line 2 Bogotá Metro	Moderately Significant	+	5,06
EA-SOC-04	Changes in pedestrian and vehicular mobility, local connectivity and road safety.	Moderately Significant	-	4,39
EA-SOC-05	Impact on public and social infrastructure	Insignificant	-	3,25
EA-SOC-06	Involuntary relocation of population prior to construction activities	Significant	-	6,30
EA-SOC-07	Temporary employment generation[11]	Insignificant	+	3,76

[11] Bogotá's PET working-age population figures demonstrate the capacity to absorb the demand for labor needed to carry out the works of Line 2 of the Bogotá Metro (L2MB). Due to this capacity, it is not necessary that workers come from other geographical areas, but will be hired mainly from the localities where the project is developed or from nearby localities.

Impact Name		Classification		
		Significance	Class	Punctuation
EA-SOC-08	Change in the dynamics in establishment	Moderately Significant	-	4,92
EA-SOC-09	Employment and new dynamics of informal trade	Moderately Significant	-	5,44
EA-SOC-10	Changes in land occupation and value	Moderately Significant	+	5,88
EA-SOC-11	Strengthening the civic culture around mobility	Moderately Significant	+	5,16
EA-SOC-12	Impact on archaeological heritage	Moderately Significant	-	5,84
EA-SOC-13	Impact on Cultural Heritage	Moderately Significant	-	5,36

Source: UT MOVIUS 2022

0.12.2. Environmental and social risks

In Chapter 8 Environmental and Social Impact and Risk Assessment Part 6. Environmental and social risks, the evaluation of environmental and social risks is presented, where a semi-quantitative assessment was used in order to identify and assess exogenous risks and endogenous risks. This methodology applied to this PGRD is in compliance with the provisions of the guidelines of Decree 2157 of 2017.

Risk assessment is the overall process of risk identification, risk analysis and risk assessment. GTC 137 (ISO Guide 73:2009, definition 3.4.1).

- Risk identification

It is the characterization of risk from the evaluation of different threatening events present in the area of interest, taking into account which elements can be affected in different scenarios and in different phases of the project.

- Identification of threatening events: This identification consists of defining the types of exogenous and endogenous threats of the project both in its constructive and operational stage. For the L2MB Project, three types of threats were defined: natural, anthropic and operational, based on the knowledge of the conditions of the area and the possible influence of the project on it. The identification includes threats regardless of whether or not their origin is under the control of the project.

Table 10. Identification of the type of threat.

Therefore, it is possible to affirm that there will be no impact associated with the migration as a result of the implementation of the project.

Threat Type		Description
Exogenous	Natural Hazards	The events of natural, unintentional anthropic origin are obtained from the design criteria for the L2MB project, the historical records of events materialized in the municipality and the estimation methodologies by official entities such as the Colombian Geological Service (SGC), the Agustín Codazzi Geographic Institute (IGAC) and the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM).
	Anthropic Threats	Based on the social characterization of the area of influence, the socio-cultural and public order conditions that may affect the normal functioning of the project are evaluated.
Endogenous	Threats Technical / Design / Engineering / Operations	To identify technical-operational threats, a risk workshop was held on July 6, 2017, in which the criteria of Hillson and other authors that relate the combined application between Work Breakdown Structure (WBS) were adopted, that is, the activities and facilities that are part of the project phases (both constructive and operational) and the identified threats that could affect each of them (Risk Breakdown). Structure (RBS)). Relating the threat-infrastructure of the project, a search for possible significant technical failures was carried out qualitatively, that is, based on the experience of the consultant and using the expert judgment technique with professionals in the specialties of geology, hydrology, hydraulics and geotechnics.

Source: UT MOVIUS, 2022

- Identification of vulnerable and sensitive elements: For each of the possible areas of affectation previously estimated, the possible vulnerable (sensitive) elements to be affected by the materialization of a risk both in the construction and operational stages are identified. This identification is based on the environmental characterization (abiotic, biotic and social) of the area of influence that was previously carried out in Chapter No. 5. The identification criteria are mentioned in Table 11.

Table 11. Identification criteria for vulnerable elements.

Vulnerable public and private infrastructure	Description
Physical Elements (Project Structures)	They are all those physical elements that make up the infrastructure of the project (existing and projected)

Vulnerable public and private infrastructure	Description
Environmental elements	They are all those environmental elements that can be altered by the unforeseen activities of the project in its constructive and operational stages, such as: Groundwater, terrestrial ecosystems, aquatic ecosystems, areas with relevance for the maintenance of biodiversity, special management areas, protected natural areas, conservation areas, areas of restriction and exclusion.
Social elements	They are all those social elements present in the area of possible affectation that in one way or another are susceptible to be affected by any of the identified threats, such as: Territorial unit (villages), populated nuclei and municipal capitals, dispersed housing, productive uses, recreational and cultural uses, places where public activities are developed, resources of social use for mobility (roads) and social services equipment.

Source: UT MOVIUS, 2022.

In risk analysis and assessment, it determines which risks are acceptable and which are not, establishing the acceptability criteria, in order to provide a basis that provides consistency in all its risk assessments (see Table 12).

Table 12. Acceptability of risk

Risk level	Meaning
I	Not acceptable
II	Not acceptable or acceptable with specific control
III	Improvable
IV	Acceptable

Source: MOVIUS, 2022.

According to Law 1523 of 2012, risk assessment includes the steps related to its identification, analysis and evaluation, in such a way that potential damages and losses can be estimated, comparable with the security criteria already established, in order to define types of intervention through risk reduction or disaster management. Once the risk scenarios have been consolidated, the analysis of those that affect the project or may be generated due to its execution is carried out.

The results of the superposition and geoprocessing of the affected areas and the thematic variables contained in the information of exposed elements, such as: sensitive social elements and vegetation cover, shows that in the system, no scenario presents a risk with potential for environmental and socioeconomic disaster. The risks that require the intervention of several authorities for their prompt response, are associated with: damage to public service networks, collisions in urban intersection areas, malicious acts by third parties, blockades on railroads, riots and riots, and hostile actions against the

execution of the project, in these cases additional actions will be implemented, such as; articulation of contingency plans and mutual aid plans between the contractor company, Empresa METRO, and municipal and district authorities[12].

0.12.3. Cumulative impacts

Cumulative impacts are those resulting from the successive, incremental and/or combined effects of an action, project or activity. Its analysis is a systematic process for assessing the direct or indirect environmental consequences of policies, plans or programmes to ensure that they are fully incorporated and adequately addressed at the earliest stage of decision-making, on a par with economic and social considerations. The evaluation and management of cumulative impacts was carried out based on the methodology established by the International Finance Corporation – IFC of the World Bank Group. The implementation of the methodology and the results obtained are detailed in Chapter 8, Part 7. Table 13 presents the results of the qualitative analysis carried out, from which the following are identified:

- Although the affectation of the different projects analyzed is the majority, the additional relative portion of the L2MB project is lower in all cases, in this way it can be said that the greatest risks are associated with the current conditions of the city and not for specific cause of the L2MB project.

- The effects on mobility, derived from the increase in road closures, constitute the greatest impacts identified by the execution of the works. Projects such as the Transmilenio Trunk of Carrera 68 and Section 1 of the First Line of the Bogotá Metro have a direct impact on the mobility of the city, due to their current state of execution. Therefore, the impact on the mobility of the city will increase during the construction stage of the L2MB project, for which it will be necessary to implement the respective management measures during its execution.

- The construction method for the tunnel (tunnel boring machine, concrete voussoir system), wells and stations (concrete screen walls) and the characteristics of hydraulic conductivity of the soils in which the works will be developed, do not affect the hydrological component. Nor is there any impact on the water tables along the corridor of the works except inside the perimeter of direct intervention in station and wells, where the soil is removed for the conformation of the works. Therefore, it is not considered that such affectations can constitute cumulative impacts.

- The impact on biodiversity by the execution of the L2MB project is not considerably significant due to the type of fauna present there, which has a capacity to adapt to anthropic interventions. Therefore, it is not considered that the simultaneous execution of the other projects considered can mean accumulation or increase of the impact, since they are planned to be executed in areas where this type of species predominates. In addition, there is no evidence of execution of activities in areas of greater importance for fauna such as the Juan Amarillo wetland, La Conejera wetland, Bogotá river, Los Lagartos Club, by these projects.

Table 13. Results of the cumulative impact analysis

[12] Chapter 8, numeral 8.2.3.4. Análisis y valoración del riesgo.

VEC	POTENTIAL CUMULATIVE IMPACTS?	"IF" SIGNIFICANCE: BENEFICIAL (+) OR ADVERSE (-)	CONTRIBUTION: 0: NO, MINOR 5: MAJORITY, SIGNIFICANT
Air	Yes, the projects and activities mentioned are potential cumulative impacts to which is added the generation of particulate matter and gas concentration.	Charity (+) BOGOTÁ METRO LINE 2 PROJECT Adverse (-) CIVIL, ROAD AND TRANSPORT WORKS PROJECTS	1: BOGOTÁ METRO LINE 2 PROJECT 5: CIVIL, ROAD AND TRANSPORT PROJECTS The operation of the Line 2 Project of the Bogotá Metro alone does not have a significant impact, however when redistributing public and/or private transport it does have an effect on the generation of particulate matter, and generation of gases, translated into an expected increase.
Environmental noise	Yes, the projects and activities mentioned are potential cumulative impacts to which is added the generation of noise and increase in sound pressure.	Adverse (-)	3: BOGOTÁ METRO LINE 2 PROJECT 5: ACTIVITIES OF THE CITY The operation of the Line 2 Project of the Bogotá Metro has a significant impact, but the current conditions of the city have a great effect on noise generation.
Mobility	Yes, the projects and activities mentioned above generate potential cumulative impacts such as the alteration of air quality and noise, to which is added the alteration of mobility.	Charity (+) BOGOTÁ METRO LINE 2 PROJECT IN OPERATION Adverse (-) BOGOTÁ METRO LINE 2 PROJECT UNDER CONSTRUCTION Adverse (-) ACTIVITIES OF THE CITY	4: BOGOTÁ METRO LINE 2 PROJECT 5: ACTIVITIES OF THE CITY The operation of the Line 2 Project of the Bogotá Metro has a significant impact, but the current conditions of the city have a great effect on mobility.
Economy	Yes, the impacts mentioned above have a potential cumulative condition such as the increase of informal activity in public space	Charity (+) BOGOTÁ METRO LINE 2 PROJECT IN OPERATION Adverse (-) BOGOTÁ METRO LINE 2 PROJECT UNDER CONSTRUCTION	4: BOGOTÁ METRO LINE 2 PROJECT IN OPERATION 4: BOGOTÁ METRO LINE 2 PROJECT UNDER CONSTRUCTION
Clearing Areas	Yes, the projects and activities mentioned are potential cumulative impacts.	Adverse (-)	3: BOGOTÁ METRO LINE 2 PROJECT 5: ACTIVITIES OF THE CITY The operation of the Line 2 Project of the Bogotá Metro has a significant impact, but the current conditions of the city have an effect on the decrease of available areas
Areas for disposal of CDW	Yes, the projects and activities mentioned are potential cumulative impacts.	Adverse (-)	3: BOGOTÁ METRO LINE 2 PROJECT 4: ACTIVITIES OF THE CITY The operation of the Line 2 Project of the Bogotá Metro has a significant impact, but the current conditions of the city have an effect on the decrease of the areas available for the disposal of CDW.

It is clarified that although there is no surface intervention in the Juan Amarillo and La Conejera wetlands or in their legal limits, it is possible that impacts (direct, indirect or cumulative) on these elements are generated by the development of the project, which will be managed with management measures. The evaluation and definition of the risks of affectation and

impacts on wetlands will consider the different abiotic, biotic and social issues to be developed in the "Biodiversity Action Plan" which will be prepared prior to the start of construction and will be part of the PCAS.

The Concessionaire, with the support, participation and leadership of Empresa Metro de Bogotá (EMB), will carry out inter-institutional negotiations with other district companies that have projects in the area of influence. This in order to articulate and monitor the possible environmental and social impacts identified in the area, for this the Concessionaire must submit a document called Articulation Plan within the update of the PMAS prior to the start of the construction stage, which includes an evaluation of cumulative impacts based on the projects that are being executed at the time.

0.12.4. Benefits of environmental and social impacts

The L2MB is a project whose main objective is to provide Bogotá with a means of mass passenger transport that is integrated into the current public system that allows improving the mobility of the population and the existing vehicular congestion in the metropolitan area of the city, for which, from the outset, it implies a project committed to the social development and economic development of the city, favoring millions of inhabitants in a critical and fundamental issue such as mobility and incidentally promoting economic growth by improving competitiveness conditions.

If the project is analyzed from the environmental and social sustainability, it must first focus on the defined fundamentals (performance, pollution and depletion), and oriented towards the natural resources that the project will demand in the construction phase and / or in the operation and maintenance phase, where what corresponds to the depletion of resources, does not require the capture of water from surface or natural underground resources, therefore, no recourse to exhaustion is exposed. In the same way, it does not require the direct use of material sources by the construction contractor, these will be supplied by suppliers that have permits and environmental management plans approved by the corresponding environmental authority and with the mining permits in force.

All surplus materials will have an adequate treatment depending on the type of waste to be generated, framed in the Environmental and Social Management Plan of the impacts of the project, in relation to handling and disposal of surplus excavation materials, handling of materials and construction equipment and management of solid, industrial and special waste.

A fundamental aspect that should be highlighted, and that is directly linked to the issue of pollution, and especially to climate change, is the issue of greenhouse gas emissions (GHG) such as Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Ozone (O_3), chlorofluorocarbon compounds (CFCs) and water vapor (H_2O), in which the PLMB Extension, is shown as an effective reducer of this type of gases, since GHGs come from the burning of the combustion of fossil fuels, fuel manufacturing activities and leaks in the handling of them, being in the transport sector, the activities of the burning of fuels corresponding to used fuels (Diesel, gasoline, fuel alcohol and Vehicular Natural Gas (NGV)), while the railway viaduct will operate entirely with electric energy, which generates a reduction in GHG, mainly CO_2.

With the above, it is considered that the L2MB will not have environmental and social conflicts because it proposes a solution to the mobility problem of the city of Bogotá, without compromising natural resources, reducing GHG emissions in the context of climate change, providing effective management and management plans for the management of waste and surplus material and guaranteeing social inclusion as it improves the quality of life of millions of inhabitants.

With respect to the Juan Amarillo or Tibabuyes wetland and the La Conejera wetland in the category of Ramsar sites, although they are not intervened by the L2MB project, ecological restoration measures are formulated for the recovery of a sector of the La Conejera wetland, as a compensatory measure for the intervention of 0.02 ha of gallery or riparian forest

that will be affected by the construction of the workshop yard. This is part of the World Bank's policies in Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources and in the IDB's[13] Environmental and Social Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources[14] in which, when a natural habitat is intervened and residual impacts are recorded despite efforts to avoid, Minimize and mitigate impacts, offsets for biodiversity losses that conform to the "comparable or better" principle may be included. This compensation is formulated in detail in the Biodiversity Loss Compensation Plan of this ESIA.

0.12.5. Environmental liabilities

In the area of influence associated with the L2MB project, no environmental liabilities were identified, mainly due to the fact that the project is developed in an already consolidated city. However, possible sites that could have some direct impact on the project were analyzed, such as the twelve service stations identified in the area of direct influence, which could be subject to soil contamination due to possible hydrocarbon leaks through underground containers. According to the laboratory results and taking as reference the Technical Manual for the Execution of Risk Analysis of the Ministry of Environment, these concentrations are not toxic to direct contact or potential migration to groundwater.

0.13. ENVIRONMENTAL MANAGEMENT MEASURES (ESMP AND MSMP)

0.13.1. Environmental and social management plans. (PMAS)

Management programs were designed to effectively prevent, mitigate, correct, or compensate for the impacts identified in **Chapter 8. Environmental and Social Assessment, the management programs that are defined are divided into the themes of Environmental Management and OSH, on the other hand for the Abiotic, Biotic and Socioeconomic means are associated between the environment to which they are directed and the impact or impacts they serve, as presented in Table 14** below :

Table 14. Management programs defined for Abiotic, Biotic and Socioeconomic media

Impacts	Programmes
Management	
There are no direct impacts associated with compliance with environmental, social and OSH obligations.	PMA-GES-01 Social, Environmental and Occupational Health and Safety (OSH) Management Compliance Program
There are no direct impacts associated with the supervision and follow-up of utilities.	PMA-GES-02 Network Relocation Monitoring and Follow-up Program

[13] BID. Marco de política ambiental y social. September, 2020.
[14] Marco Ambiental y Social del Banco Mundial, Banco Mundial, Washington, DC. Licencia: Creative Commons Attribution CC BY 3.0 IGO. 2016.

Impacts	Programmes
Abiotic / Physical Medium	
EA-ABI-01 Use of construction materials for the reduction and reuse of construction and demolition waste	PMA-ABI-01 Program for the handling and disposal of surplus excavation materials
EA-ABI-02 Alteration of soil quality	PMA-ABI-02 Material Handling Program
	PMA-ABI-03 Conventional Solid Waste Management Program
	PMA-ABI-04 Integrated hazardous waste management plan
EA-ABI-03 Impact on the groundwater component[15]	PMA-ABI-05 Underground Works Management Program
EA-ABI-02 Alteration of soil quality EA-ABI-03 Impact on the groundwater component	PMA-ABI-06 Environmental Liabilities Management Program: Contaminated Soils
EA-ABI-04 Air quality disturbance	WFP-ABI-07 Emissions Sources Management Program: Air
EA-ABI-05 Alteration in sound pressure levels	PMA-ABI-08 Noise Management Program
EA-ABI-06 - Vibration level variation	PMA-ABI-09 Structural Vibration and Noise Management Program
EA-ABI-07 - Affectation by settlements	PMAS-ABI-02 Material Handling Program
	PMAS-ABI-05 Underground Works Management Program

[15] It should be clarified that there will be no direct impacts on the wetlands, considering that the project does not intervene in the area of the La Conejera wetland (the patio-workshop will be located in an area adjacent to its limits), it will only cross one of the arms of the Juan Amarillo Wetland underground. The above, supported in baseline sampling, the results of conceptual and numerical modeling, and the results of environmental assessment. Similarly, in a preventive way, it is indicated that prior to construction, the groundwater model and analysis will be updated and the groundwater management plan will be reviewed in case there is divergence between the modeling and the situation during construction.

Impacts	Programmes
EA-ABI-08 Greenhouse Gas Reduction	PMA-ABI-10 Greenhouse Gas Management Program
EA-ABI-02 Alteration of soil quality	PMA-ABI-11 Waste Oil Management Program
	PMA-ABI-12 Management Programme for Water Rounds, Sinks and Surface Water Bodies
EA-ABI-02 Alteration of soil quality EA-ABI-04 Air quality disturbance EA-ABI-05 Alteration in sound pressure levels	LDC-ABI-13 Temporary Facilities Management Program
There are no direct impacts associated with the management for the efficient use of water	LDC-ABI-14 Management for efficient water use
No direct impacts associated with management for the efficient use of energy	LDC-ABI-15 Management for efficient use of energy
Biotic Environment	
EA-BIO-01 Removal of vegetation cover, tree individuals and stripping of green areas	WFP- BIO 01 Program for the management and removal of vegetation cover and stripping
	WFP- BIO 02 Forestry Management Program
EA-BIO-04 - Landscape and visual quality of the landscape	PMA- BIO 03 Management program for the biotic environment due to the impact of the visual quality of the landscape
EA BIO 01 - Removal of vegetation cover, arboreal individuals and stripping of green areas. EA-BIO-04 - Landscape and visual quality of the landscape	PMA- BIO 04 Compensation management program for the biotic environment due to landscape affectation

Impacts	Programmes
EA-BIO-02. Potential alteration in the composition and abundance of fauna	PMA- BIO 05 Wildlife Management Program
EA-BIO-03 Potential affectation of elements of the Main Ecological Structure - EEP	PMA- BIO 06 Management Program of areas of the Main Ecological Structure
Social Media	
EA-SOC 01 Generating Expectations and Conflicts	WFP- SOC 01 Public Information and Communication Programme PMA- SOC 02 Metro Program listens, Metro resolves PMA- SOC 03 Citizen Participation Program
EA-SOC 02 Change in citizen participation due to new dynamics of mobility and accessibility.	PMA- SOC 04 Citizen strengthening program for the construction of urban life.
EA-SOC 03 Reconfiguration of institutional network for the construction of urban life around Line 2 Bogotá Metro	PMA- SOC 05 Inter-institutional articulation program for the construction of urban life.
EA-SOC 04 Changes in mobility and accessibility of road actors.	PMA- SOC 06 Sustainable Mobility Culture Program
EA-SOC 05 Impact on public and social infrastructure.	PMA- SOC 07 Program for the protection of infrastructure and assets of third parties.
EA-SOC 06 Involuntary transfer of population prior to construction activities.	WFP- SOC 08 Resettlement Program.
EA-SOC 07 Temporary Job Creation	PMA- SOC 09 Social and Labor Inclusion Program WFP- SOC 16 Management Program for Labor Flux and Gender-Based Violence.
EA-SOC 08 Change in Establishment Dynamics	LDC- SOC 10 Management Program for the Economic Sustainability of Formal Trade
EA-SOC 09 Employment and new dynamics of informal trade.	PMA- SOC 11 Management program for occupants of public space.
EA-SOC 10 Changes in land occupation and value.	PMA- SOC 12 Land Occupation and Value Observatory Program.
EA-SOC 11 Strengthening the civic culture around mobility.	PMA- SOC 13 Program for the construction of urban fabric

Impacts	Programmes
EA-SOC 23 Impact on archaeological heritage	PMA- SOC 15 Management Program Assets of Cultural Interest intervention station No. 1
EA-SOC 13 Impact on Cultural Heritage	PMA- SOC 15 Management Program Assets of Cultural Interest intervention station No. 1

Source: UT MOVIUS 2022

0.13.2. Monitoring and Follow-up Plans (PMS)

The follow-up and monitoring plan was designed in accordance with the terms of reference of the technical specification ET 05[16] and the general methodology for the preparation and presentation of Environmental Studies[17]. Consequently, it is divided into follow-up and monitoring of plans and programs and follow-up and monitoring of the quality of the environment. The files presented are aimed at evaluating the effectiveness of the management measures planned to address the abiotic, biotic and socioeconomic impacts of the project (Chapter 8. Environmental and Social Assessment) and to have the basic tools to determine in a timely manner the adjustments that require the planned management, according to the results obtained.
Table 15 below lists the PMS developed in this study:

Table 15. Environmental management programs and associated monitoring and follow-up program

Middle	Management Program		Monitoring and Follow-up Program	
	Code	Name	Code	Name
Abiotic	PMA-ABI-01	Program for handling and disposal of surplus excavation materials	PMS-ABI-01	Follow-up and monitoring of the integral management of solid waste and CDW
	PMA-ABI-02	Material Handling Program	PMS-ABI-01	Follow-up and monitoring of the integral management of solid waste and CDW
	PMA-ABI-03	Conventional Solid Waste Management Program	PMS-ABI-01	Follow-up and monitoring of the integral management of solid waste and CDW
	PMA-ABI-04	Integrated hazardous waste management plan	PMS-ABI-01	Follow-up and monitoring of the integral management of solid waste and CDW

[16] FINANCIERA DE DESARROLLO URBANO- 2021. Términos de referencia Estudio de Impacto Ambiental y Social (EIAS)
[17] AUTORIDAD NACIONAL DE LICENCIAS AMBIENTALES - ANLA. 2018. Metodología general para la elaboración y presentación de estudios ambientales

Middle	Management Program		Monitoring and Follow-up Program	
	Code	Name	Code	Name
	PMA-ABI-05	Underground Works Management Program	PMS-ABI-05	Tracking and monitoring at water tables
	PMA-ABI-06	Environmental Liabilities Management Program: Contaminated Soils	PMS-ABI-08	Follow-up and monitoring of environmental liabilities: contaminated soils.
	PMA-ABI-07	Air Emissions Source Management Program: Air	PMS-ABI-02	Follow-up and monitoring of atmospheric emissions management and noise control
	PMA-ABI-08	Noise Management Program	PMS-ABI-02	Follow-up and monitoring of atmospheric emissions management and noise control
	PMA-ABI-09	Structural Vibration and Noise Management Program	PMS-ABI-04	Tracking and monitoring to vibration control
	LDC-ABI-10	Greenhouse Gas Management Program	PMS-ABI-07	Tracking and monitoring of greenhouse gases
	LDC-ABI-11	Used Oil Management Program	PMS-ABI-01	Follow-up and monitoring of the integral management of solid waste and CDW
	LDC-ABI-12	Management program for water rounds, sinks and surface water bodies	PMS-ABI-03	Follow-up and monitoring of water resources management - crossings in water bodies
	LDC-ABI-13	Temporary Facilities Management Program	PMS-ABI-09	Follow-up and monitoring of the management of temporary facilities.
Biotic	WFP-BIO 01	Program for the management and removal of vegetation cover and stripping	PMS-BIO 01	Follow-up and monitoring of the management and removal of vegetation cover and stripping
	PMA-BIO-02	Forestry Management Program	PMS-BIO 02	Follow-up and monitoring of silvicultural management
	WFP-BIO-03 -	Management program for the biotic environment due to the impact of the visual quality of the landscape	PMS-BIO 03	Follow-up and monitoring of management for the biotic environment due to the impact of the visual quality of the landscape
	PMA-BIO-04	Compensation management program for the biotic environment due to landscape affectation	PMS-BIO 04	Follow-up and monitoring of compensation for the biotic environment due to landscape affectation

Middle	Management Program		Monitoring and Follow-up Program	
	Code	Name	Code	Name
	PMA-BIO-05	Management program for the repelling, rescue, relocation and protection of fauna	PMS-BIO 05	Follow-up and monitoring of wildlife management
	WFP-BIO 06	Management program of areas of the Main Ecological Structure	PMS-BIO 06	Follow-up and monitoring of the management of the areas of the EEP
Partner economic	PMA-SOC-01	Public information and communication programme	PMS-SOC-01-	Follow-up and monitoring of the Public Information and Communication Program
	PMA-SOC-02	Metro Listens Program, Metro Solves	PMS-SOC-02	Follow-up and monitoring of the Metro Program listens, Metro resolves
	PMA-SOC-03	Citizen participation program.	PMS-SOC-03	Follow-up and monitoring of the Citizen Participation Program
	PMA-SOC-04	Program for the promotion of citizen participation of Line 2 of the Bogotá metro	PMS-SOC-04	Monitoring and follow-up plan for the Program for the promotion of citizen participation of Line 2 of the Bogotá metro
	PMA SOC-05	Inter-institutional articulation program for the construction of urban life of the Second Line of the Bogotá Metro	PMS-SOC-05	Monitoring and follow-up plan for the Inter-institutional Articulation Program for the construction of urban life of the Second Line of the Bogotá Metro
	PMA-SOC-06	Sustainable mobility culture plan	PMS-SOC-06	Monitoring and follow-up plan for the Sustainable Mobility Culture Program
	PMA-SOC-07	Program for the protection of infrastructure and assets of third parties. "Metro good neighbor"	PMS-SOC-07	Monitoring and follow-up plan for the Program for the protection of infrastructure and assets of third parties. "Metro good neighbor"
	PMA-SOC-08.	Resettlement scheme	PMS-SOC-08	Monitoring and follow-up plan for resettlement
	PMA-SOC-09	Social and labor inclusion program	PMS-SOC-09	Monitoring and follow-up plan for the Social and Labour Inclusion Program.

Middle	Management Program		Monitoring and Follow-up Program	
	Code	Name	Code	Name
	PMA-SOC-10	Management program for the economic sustainability of formal trade	PMS-SOC-10	Monitoring and follow-up plan for the Management Program for the economic sustainability of formal trade.
	PMA-SOC-11	Program for occupants of public space	PMS-SOC-11	Monitoring and follow-up plan for the Management Program for occupants of public space (informal sales component).
	PMA-SOC-12	Land Occupation and Value Observatory Program	PMS-SOC-12	Monitoring and follow-up plan for the Land Occupation and Value Observatory.
	PMA-SOC-13	Management program for the construction of the urban fabric of Line 2 of the Bogotá Metro	PMS-SOC-13	Monitoring and Follow-up Plan for the Management Program for the construction of the urban fabric of Line 2 of the Bogotá Metro

Source: UT MOVIUS 2022

0.13.3. Compensation for the biological environment

The residual impacts generated by the L2MB project in the biotic environment pose compensatory measures for its management, which are formulated in accordance with the standards established by the SDA, and for those in which this environmental authority is developing the guidelines for its management or does not yet have criteria or associated regulations, are considered those of MADS. Table 16 summarizes the types of compensation of the biotic medium for the L2MB project at the feasibility level.

Table 16. Types of compensation for the L2MB project at the feasibility level

Type of compensation	Reason that defines it	Mode of realization	Structuring parameter
By silvicultural treatments	Intervention of urban trees, defined by Resolution 7132 of 2011, which establishes the compensation for forest use of isolated trees in the urban perimeter of the city of Bogotá D.C. and is updated by Resolution 03158 of 2021 that includes new factors for	Minimum logging compensation of 1:5 for trees that are felled. Felling of 623 individuals and 7 hedges and the blocking and transfer of 77	SDA Regulations

Type of compensation	Reason that defines it	Mode of realization	Structuring parameter
	the calculation of compensation for forest use of isolated trees	individuals (including closed trees)	
By affectation of arboreal individuals in closed or in special category, non-vascular epiphytes	Threatened wildlife species mentioned in Resolution 1912 of 2017. According to the Technical Guidelines for the assignment of management measures for the affectation of the MADS[18] wild flora ban, the flora in non-vascular closure, being organisms of small size and with an aggregate type of growth, the compensation is not made by number of individuals but by habitat area affected (0.74 ha)	Offset the 0.74 ha in a lumped manner with the Biodiversity Loss Offset Scheme proposed in Chapter 15 of this ESIA	Guidelines under development according to Decree 2106 of 2019. MADS Circular 8201-2-208 of December 9, 2019.
By hardening of green areas	Joint Resolution SDA-SDP 001 of 2019, which establishes the guidelines and procedure for compensation for hardening of green areas for the development of infrastructure works, in compliance with District Agreement 327 of 2008.	Compensation equivalent to the area of green areas to be hardened (387,927.86 m2). To be defined according to SDA criteria	SDA Regulations
By landscape affectation	Article 15 of District Decree 531 of 2010 which regulates urban forestry, green areas and gardening in Bogotá and defines the responsibilities of the District Entities in relation to the subject.	991 trees to be planted (871 trees in the cover of clean pastures, with a planting density of 3 x 3 m; while for the cover of riparian forest 120 individuals are estimated for enrichment)	There are no criteria or regulations associated with compensation for landscape affectation by the SDA
Biodiversity offsetting	Affectation of important natural covers (0.02 ha of gallery forest)	The buffer area of the La Conejera wetland is proposed for compensation of 0.165 ha	Manual of Compensations of the Biotic Component. Resolution 256 of February 22, 2018, of the Ministry of Environment and Sustainable Development

Source: UT MOVIUS 2022

0.13.4. Biodiversity compensation scheme

[18] MINISTERIO DE AMBIENTE Y DESARROLLO SOSTENIBLE. Lineamientos técnicos para la asignación de medidas de manejo por la afectación de veda de flora silvestre. En Anexo Metodología medidas de manejo de especies de flora amenazadas, Circular 8201-2-208 del 9 de diciembre de 2019 "Lineamientos técnicos para la conservación de especies de flora en veda", Ministerio de Ambiente y Desarrollo Sostenible. Bogotá, D.C.: Colombia. 2019. 23 p.

- The biotic component compensation plan allows the establishment of all the technical, legal and financial elements necessary for effective compensation within the framework of the Policy for the Integrated Management of Biodiversity and its Ecosystem Services (PNGIBSE).

- This will be implemented maximum six months after the impact of the project, in the times and forms indicated by the environmental authority, in accordance with legal requirements and in order to ensure that the environmental impacts generated are compensated. Offsets are based on a demand for natural resources (see Chapter 7. Use of natural resources) carried out specifically in the workshop yard area, and therefore have repercussions on adjacent ecosystems.

- In accordance with the compensable areas (0.02 ha) and the compensation factors established for each natural ecosystem, it is established that 0.165 ha must be compensated for the alteration of the Andean High Andean Cordillera Oriental Orobiome due to the affectation of the gallery and riparian forest covers.

- Based on a normative and ecological analysis and taking into account the prioritized areas within the Main Ecological Structure (EEP) of the city, La Conejera Wetland was selected to carry out the compensatory activities. The general objective is to ensure the non-net loss of biodiversity of the areas intervened by the project through a restoration plan based on preservation and rehabilitation strategies, with a positive impact on ecological connectivity.

- Two areas are proposed to carry out restoration actions: (1) in the buffer zone in accordance with the Environmental Management Plan of the La Conejera wetland, located in an area that does not have a protective forest strip in the northern zone far from the urbanization and (2) in areas that urgently require ecological restoration.

- Eight goals are proposed with their indicators for monitoring and follow-up for the fulfillment of each of the specific objectives of the compensation plan.

- The Biodiversity Loss Offset Plan formulated in this ESIA should be aligned with the "Biodiversity Action Plan" or the "Biodiversity Management Plan" as part of the L2MB ESMP update to be carried out by the consortium during the construction of the L2MB project.

0.14. DEMAND, USE AND EXPLOITATION OF NATURAL RESOURCES (INCLUDES MENTION OF PERMITS AUTHORIZATIONS)

The management and obtaining of the following permits and authorizations is required prior to the construction of the project and during the upgrade of the LDCs:

- Forest harvesting permit
- Permit to lift the ban
- Permit for the collection of specimens of wild species of biodiversity
- Compensation for hardening of green areas
- Presentation of the landscape designs proposed for implementation in the construction project
- Act of review and approval of the landscape design and balance of green areas
- Wood handling laissez-passer
- Act of delivery of trees transferred to the JBB
- Act of delivery of trees planted to the JBB
- Safe conduct for the mobilization of flora and trees
- Compensation for hardening of green areas

Note: During the feasibility stage, no needs are identified to process permits for occupation of riverbed, dumping, training, emissions by concrete or asphalt plants, however if for the purposes of adjustments of the final designs this need is identified, these must be processed by the Concessionaire, supported with the monitoring and evaluation procedures by the authority

0.14.1. Forest harvesting

For the forest use of the project, a forest inventory was carried out between the months of May and August of the year 2022, census 100% of the forest individuals in the intervention area of the L2MB project. As a result, a total of 960 inventoried individuals were obtained, of which 700 individuals registered and 7 hedges are destined for forest use for a total of 707 records through the 15.6 km that the project is estimated to have, both in the stations with their due area of urbanism, the wells, the area destined for the camp and the northern area of the workshop yard property administered by the IDRD.

The proposed silvicultural management for urban trees corresponds to the felling of 623 individuals and 7 hedges, and the blocking and transfer of 77 individuals. Table 17 shows the silvicultural treatments proposed for urban trees.

Table 17. Silvicultural treatments proposed to urban trees L2MB

Urban wooded vegetation	Treatment	Number of Individuals	Individuals (%)
Individual	Blocking and transfer	77	10,89%
	Conservation	0	0,00%
	Felling	623	88,12%
Hedge	Conservation	0	0,00%
	Felling	7	0,99%
Grand total		707	100%

Source: UT MOVIUS 2022

The volume of total forest use is 637.08 m3 which corresponds to the felling of 623 individuals and 7 hedges, where the highest values are provided by the species *Eucalyptus spp*. with 384.06 m3 and *Fraxinus chinensis* with 51.37 m3, the minimum values found in volume correspond to species of smaller size with a single individual registered in the intervention area as *Cestrum nocturnum* and *Citrus limonum* among others.

Within the intervention area of the L2MB it was possible to evidence the existence of 73 individuals of 4 species, which according to current regulations, have silvicultural management restrictions (logging specifically), 32 individuals of the species *Ceroxylon quindiuense*, 10 of Juglans neotropica, 4 of *Quercus humboldtii* and 27 of *Retrophyllum rospigliosii*, which in total represent 10.41% of the census conducted. The suggested treatment for these individuals is blockade and transfer.

In the area of intervention of the project, no individual classified as patrimonial or of public interest for the city of Bogotá D.C. according to Resolution 6971 of 2011 of the SDA was registered.

In total, the calculation of compensation for felling individuals and hedges for the realization of project works is 3,758.3 IVP (Planted Plant Individual). As indicated in SDA RESOLUTION 3158 OF 2021 in Article 13. OPTIONS FOR IMPLEMENTING COMPENSATION. This compensation can be implemented in the following ways:

1. Planting of new trees.
2. Planting of larger trees
3. Conversion of hard zone in order to generate spaces for tree planting
4. Payment of the monetary equivalence in IVP.
5. Mixed (combination of two or more options).

0.14.2. Balance of green areas.

In general, in the green areas the Kikuyo grass cover predominates combined with different ornamental species. Table 18 lists the different constituent elements of the public space that are distributed along the surface intervention area of the L2MB.

Table 18. Existing green areas in the area of intervention for works of the L2MB

Constituent element of public space	Description	Green areas before the project (m2)
Public Space Articulators	Parks (metropolitan, zonal, neighborhood and pocket)	5.072,72
	Squares	
	Squares	1.177,57
Pedestrian and Vehicular Circulation	Ecological road corridor - Environmental control areas of urban roads.	194.000,88
	Roundabouts	
	Road separators	1.885,08

Constituent element of public space	Description	Green areas before the project (m2)
Water System	Ecological corridor of ronda	241.571,05
Total		443.707,30

Source: UT MOVIUS 2022

Based on the analysis of existing green areas; as well as, in the estimation of the areas to be hardened and the new ones generated, by the implementation of the proposed urban designs, the balance of green areas was made in accordance with the requirements of Joint Resolution 001 of 2019, where the guidelines and procedures for compensation for hardening of green areas for the development of infrastructure works are presented, in compliance with District Agreement 327 of 2008. Table 19 shows the balance of green areas due to the implementation of the landscape designs of the L2MB.

Table 19. Balance of green areas by implementation of landscape designs of the L2MB

Constituent element of public space	Description	Greenery			Balance (m2)
		Before the project (m2)	To harden (m2)	New generated (m2)	
Public Space Articulators	Parks (metropolitan, zonal, neighborhood and pocket)	5.072,72	4.878,44	0	-4.878,44
	Squares				0,00
	Squares	1.177,57	943,05	11.418,22	10.475,17
Pedestrian and Vehicular Circulation	Ecological road corridor - Environmental control areas of urban roads.	194.000,88	156.099,31	1.773,23	-154.326,08
	Roundabouts				0,00
	Road separators	1.885,08	758,99	3.131,53	2.372,54
Water System	Ecological ring road corridor[1]	241.571,05	241.571,05	0	-241.571,05
Total		443.707,30	404.250,84	16.322,98	-387.927,86

[1] NOTE: It is clarified that the ecological ring road corridor reported by the JBB in the workshop yard property, does not appear as the Main Ecological Structure in the POT of Bogotá D.C. adopted by Decree 555 of December 29, 2021.

Source: UT MOVIUS 2022

The development of the project proposes the hardening of 404,250.84 m2 of green areas and the generation of 16,322.98 m2 of new areas. Thus, the implementation of the proposed designs implies a negative balance with the loss of 387,927.86 m2 of existing green areas. which must be compensated in accordance with the provisions of the Technical Support Document, Joint Resolution SDA-SDP No. 001 of 2019.

0.14.3. Permit to lift the ban

The request for the survey of the flora in closed for the polygon of the area of intervention of the project is made, In Annex 7 - 4 Coordinates of polygons of lifting of closure, the coordinates of the polygons for the request of the survey of the species of flora in closed are presented.

0.14.4. Permit for the collection of specimens of wild species of biodiversity

Although the L2MB project does not require an environmental license, it is necessary to obtain the respective permits considered in paragraph 3 of Article 2.2.2.3.5.1. Environmental Impact Study (EIA) of Decree 1076 of 2015, on the application for permits related to activities involving the collection of specimens of biodiversity and/or the demand for natural resources by the project, and for the activities proposed in the Environmental and Social Management Plan of the L2MB project that require for its implementation, The collection of samples or organisms of flora, fauna and hydrobiology.

0.15. OCCUPATIONAL SAFETY AND HEALTH

The Occupational Health and Safety Management System SG-SST implemented to the L2MB project, is developed within the framework of Law 1562 of 2012, Decree 1072 of 2015 and Resolution 0312 of 2019, is aligned within the terms of reference of the technical specifications ET04 and ET05 of the Environmental and Social Impact Study -ESIA, document "Environmental and Social Framework" of the World Bank, document "Environmental and Social Protection Framework (SPMP)" of the Inter-American Development Bank, GA-MN-001 Manual of Environmental Monitoring and Control and Occupational Health and Safety and Health at Work of the Bogotá Metro Company, and other applicable standards.

The concessionaire within the SG-SST and in compliance with the WB Environmental and Social Standards and OSH, will implement what is described in Chapter 14. Occupational health and safety management system and its annexes, so as to minimize the risks associated with the project's own activities, are summarized as follows:

- Compliance with contractual OSH obligations
- Current legal regulations applicable to project activities
- Manage the necessary OSH resources (human, physical, financial, structure and infrastructure, etc.)
- Working conditions are issued that will serve as a guide for implementation
- Roles and responsibilities of those responsible for the OSH System are defined
- OSH-SG Policies
- Matrix of legal and contractual requirements
- Annual work plan - schedule
- Guidelines for the implementation of the Joint Committee on Safety and Health at Work COPASST.
- Guidelines for the implementation of the CCL Labor Coexistence Committee
- Health management (Profession, occupational medical evaluations, job relocation, health diagnosis)
- Equipped office for occupational medical care of workers who require this service, or implement agreements with entities or offices equipped to provide the service exclusively
- PVE Epidemiological Surveillance Programs.
- SG, accident, road safety indicators
- Hazard and Risk Management
- Hazard matrix by project stages and phases
- Threat management (Vulnerability analysis, emergency plan, indicators, responsible, resources, etc.)
- Procedures, formats, minutes implementation guide
- Management data sheets on occupational safety and health

As guiding mechanisms for the concessionaire, the following annexes are attached for implementation:

Annex 14 - 1 OSH Work Plan

Annex 14 - 2 Hazard Matrix
Annex 14 - 3 OHSMS Procedures

- PR-01 Internal Audit Procedure
- PR-02 Control and Treatment of NC Opportunities for Improvement
- PR-03 Occupational Medical Evaluations
- PR-04 Identification and evaluation of legal requirements
- PR-05 SGSSS Affiliations
- PR-06 Confined spaces
- PR-07 Safe Electrical Work
- PR-08 Safe Work at Heights
- PR-09 Report, investigation and registration of incidents, occupational diseases and environmental events
- PR-10 Contractors and suppliers
- PR-11 Workplace Harassment
- PR-12 Training, induction and reduction
- PR-13 Petition, complaint, claim, suggestion, denunciations or congratulations
- PR-14 Work absenteeism
- PR-15 Code of Conduct

Annex 14 - 4 Matrix of Legal and Other Requirements L2MB 2022
Annex 14 - 5 SST Budget L2MB
Annex 14 - 6 Emergency Plan
Annex 14 - 7 Act of formation of brigades
Annex 14 - 8 PPE Matrix
Annex 14 - 9 Minutes of CCL formation
Annex 14 - 10 Act of conformation COPASST
Annex 14 - 11 MSDS
Annex 14 - 12 PQRSDF Format

The Concessionaire must send to the audit the annual plan of the SG-SST with all its supports within five (5) business days following the filing with the Ministry of Labor in the Pre-operational stage, likewise this Plan will be sent with all its supports within the same period for the Operation and Maintenance stage to the EMB

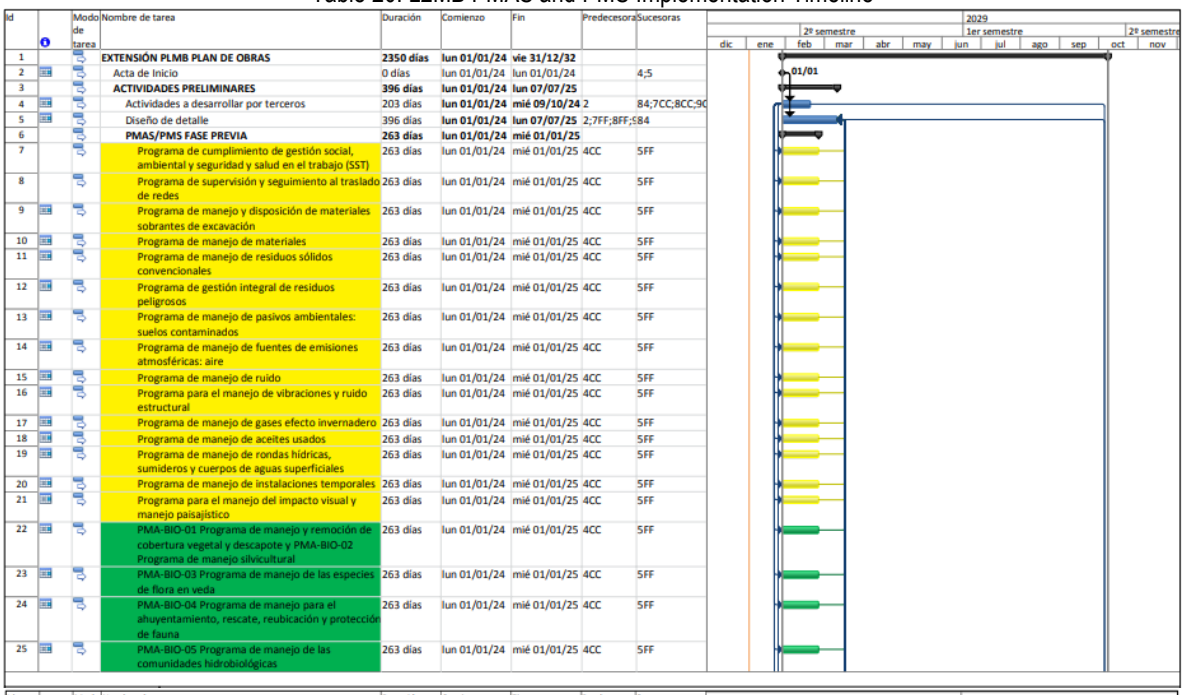
The Concessionaire must card all Project workers regardless of their type of relationship. A personnel control must be defined, which allows to know in real time the total number of workers linked and in operation for each of the work fronts that are active. It must incorporate a control of entry of personnel and validation of social security.

The Concessionaire must report any occurrence of any type of work accident, operational accident, affecting third parties, environmental contingency (spills, leaks, explosions, among others) and social, inform the Audit Office and the EMB within a maximum period of twenty-four (24) hours from the occurrence of said events, regardless of the notification, formats and actions that must be carried out before the Government Authorities in accordance with the provisions of the Applicable Law.

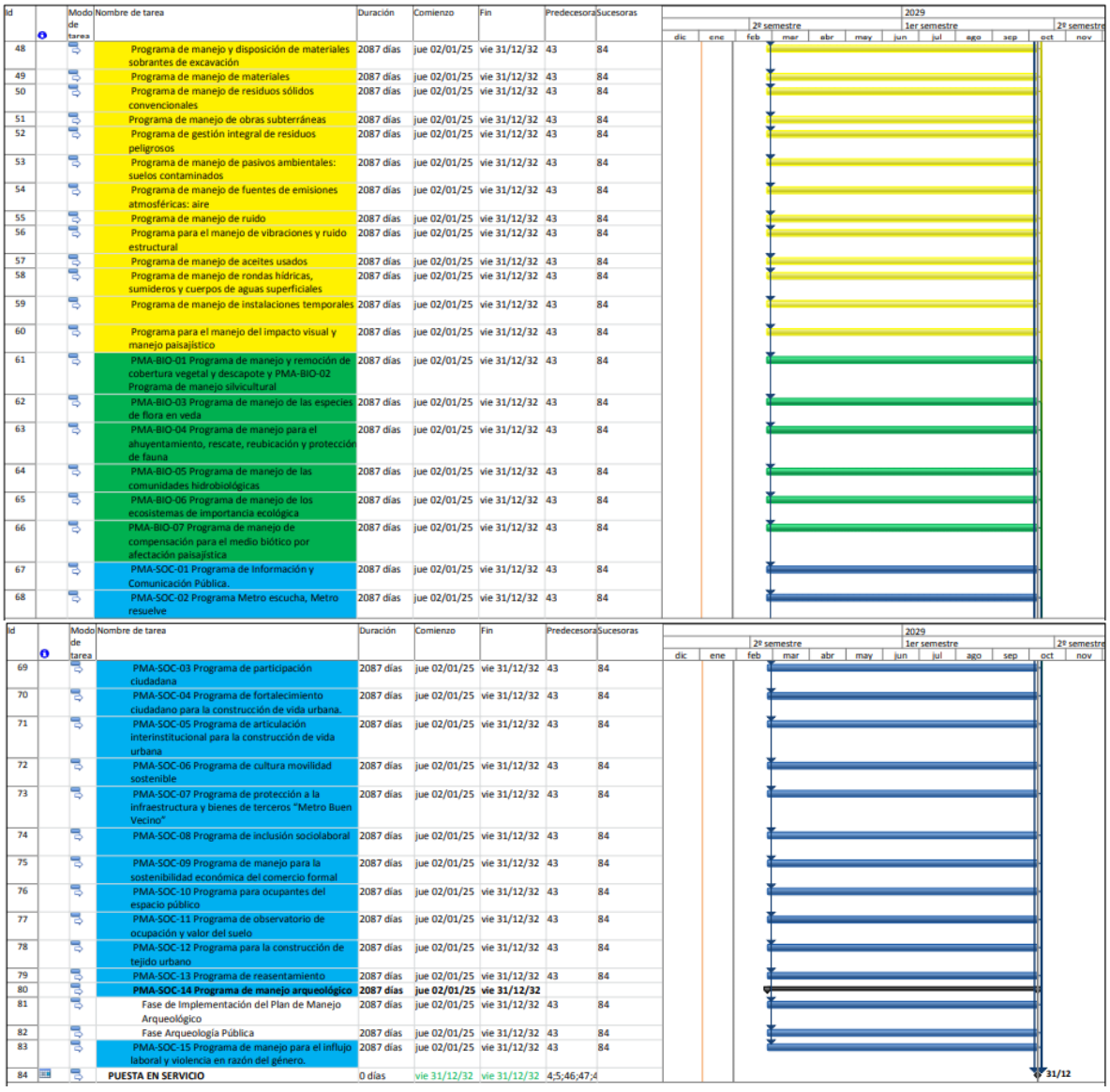
0.16. SCHEDULE

Below is the project schedule, which is based on the general schedule or plan of works of the project in its three established stages, the first of the previous phase of 1 year, the second of construction phase of 7 years and the third of the operation and maintenance phase projected to 22 years. For the first two there are activities that can intersect, however for the purposes of the development of the implementation of the PMAS and the PMS, all activities are constant over time.

Table 20. L2MB PMAS and PMS Implementation Timeline



Id	Modo de tarea	Nombre de tarea	Duración	Comienzo	Fin	Predecesoras	Sucesoras
1		**EXTENSIÓN PLMB PLAN DE OBRAS**	**2350 días**	**lun 01/01/24**	**vie 31/12/32**		
2		Acta de Inicio	0 días	lun 01/01/24	lun 01/01/24		4;5
3		**ACTIVIDADES PRELIMINARES**	**396 días**	**lun 01/01/24**	**lun 07/07/25**		
4		Actividades a desarrollar por terceros	203 días	**lun 01/01/24**	**mié 09/10/24**	2	84;7CC;8CC;9
5		Diseño de detalle	396 días	**lun 01/01/24**	**lun 07/07/25**	2;7FF;8FF;8	84
6		**PMAS/PMS FASE PREVIA**	**263 días**	**lun 01/01/24**	**mié 01/01/25**		
7		Programa de cumplimiento de gestión social, ambiental y seguridad y salud en el trabajo (SST)	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
8		Programa de supervisión y seguimiento al traslado de redes	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
9		Programa de manejo y disposición de materiales sobrantes de excavación	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
10		Programa de manejo de materiales	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
11		Programa de manejo de residuos sólidos convencionales	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
12		Programa de gestión integral de residuos peligrosos	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
13		Programa de manejo de pasivos ambientales: suelos contaminados	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
14		Programa de manejo de fuentes de emisiones atmosféricas: aire	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
15		Programa de manejo de ruido	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
16		Programa para el manejo de vibraciones y ruido estructural	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
17		Programa de manejo de gases efecto invernadero	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
18		Programa de manejo de aceites usados	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
19		Programa de manejo de rondas hídricas, sumideros y cuerpos de aguas superficiales	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
20		Programa de manejo de instalaciones temporales	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
21		Programa para el manejo del impacto visual y manejo paisajístico	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
22		PMA-BIO-01 Programa de manejo y remoción de cobertura vegetal y descapote y PMA-BIO-02 Programa de manejo silvicultural	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
23		PMA-BIO-03 Programa de manejo de las especies de flora en veda	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
24		PMA-BIO-04 Programa de manejo para el ahuyentamiento, rescate, reubicación y protección de fauna	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
25		PMA-BIO-05 Programa de manejo de las comunidades hidrobiológicas	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
26		PMA-BIO-06 Programa de manejo de los ecosistemas de importancia ecológica	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
27		PMA-SOC-01 Programa de Información y Comunicación Pública.	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
28		PMA-SOC-02 Programa Metro escucha, Metro resuelve	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
29		PMA-SOC-03 Programa de participación ciudadana	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
30		PMA-SOC-04 Programa de fortalecimiento ciudadano para la construcción de vida urbana.	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
31		PMA-SOC-05 Programa de articulación interinstitucional para la construcción de vida urbana	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
32		PMA-SOC-06 Programa de cultura movilidad sostenible	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
33		PMA-SOC-07 Programa de protección a la infraestructura y bienes de terceros "Metro Buen Vecino"	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
34		PMA-SOC-08 Programa de inclusión sociolaboral	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
35		PMA-SOC-09 Programa de manejo para la sostenibilidad económica del comercio formal	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
36		PMA-SOC-10 Programa para ocupantes del espacio público	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
37		PMA-SOC-11 Programa de observatorio de ocupación y valor del suelo	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
38		PMA-SOC-12 Programa para la construcción de tejido urbano	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
39		PMA-SOC-13 Programa de reasentamiento	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF
40		**PMA-SOC-14 Programa de manejo arqueológico**	**133 días**	**lun 01/07/24**	**mié 01/01/25**		
41		Fase Diagnóstico y Prospección (de requerirse por nuevas áreas)	133 días	lun 01/07/24	mié 01/01/25	4CC+130 días	5FF
42		Fase Aprobación del Plan de Manejo Arqueológico (de requerirse por nuevas áreas)	133 días	lun 01/07/24	mié 01/01/25	4CC+130 días	5FF
43		PMA-SOC-15 Programa de manejo para el influjo laboral y violencia en razón del género.	263 días	lun 01/01/24	mié 01/01/25	4CC	5FF;46;47;48;
44		**OBRA CIVIL Y MR + SISTEMAS**	**2087 días**	**jue 02/01/25**	**vie 31/12/32**		
45		**PMAS/PMS CONSTRUCCION**	**2087 días**	**jue 02/01/25**	**vie 31/12/32**		
46		Programa de cumplimiento de gestión social, ambiental y seguridad y salud en el trabajo (SST)	2087 días	jue 02/01/25	vie 31/12/32	43	84
47		Programa de supervisión y seguimiento al traslado de redes	2087 días	jue 02/01/25	vie 31/12/32	43	84



Id	Modo de tarea	Nombre de tarea	Duración	Comienzo	Fin	Predecesoras	Sucesoras
48		Programa de manejo y disposición de materiales sobrantes de excavación	2087 días	jue 02/01/25	vie 31/12/32	43	84
49		Programa de manejo de materiales	2087 días	jue 02/01/25	vie 31/12/32	43	84
50		Programa de manejo de residuos sólidos convencionales	2087 días	jue 02/01/25	vie 31/12/32	43	84
51		Programa de manejo de obras subterráneas	2087 días	jue 02/01/25	vie 31/12/32	43	84
52		Programa de gestión integral de residuos peligrosos	2087 días	jue 02/01/25	vie 31/12/32	43	84
53		Programa de manejo de pasivos ambientales: suelos contaminados	2087 días	jue 02/01/25	vie 31/12/32	43	84
54		Programa de manejo de fuentes de emisiones atmosféricas: aire	2087 días	jue 02/01/25	vie 31/12/32	43	84
55		Programa de manejo de ruido	2087 días	jue 02/01/25	vie 31/12/32	43	84
56		Programa para el manejo de vibraciones y ruido estructural	2087 días	jue 02/01/25	vie 31/12/32	43	84
57		Programa de manejo de aceites usados	2087 días	jue 02/01/25	vie 31/12/32	43	84
58		Programa de manejo de rondas hídricas, sumideros y cuerpos de aguas superficiales	2087 días	jue 02/01/25	vie 31/12/32	43	84
59		Programa de manejo de instalaciones temporales	2087 días	jue 02/01/25	vie 31/12/32	43	84
60		Programa para el manejo del impacto visual y manejo paisajístico	2087 días	jue 02/01/25	vie 31/12/32	43	84
61		PMA-BIO-01 Programa de manejo y remoción de cobertura vegetal y descapote y PMA-BIO-02 Programa de manejo silvicultural	2087 días	jue 02/01/25	vie 31/12/32	43	84
62		PMA-BIO-03 Programa de manejo de las especies de flora en veda	2087 días	jue 02/01/25	vie 31/12/32	43	84
63		PMA-BIO-04 Programa de manejo para el ahuyentamiento, rescate, reubicación y protección de fauna	2087 días	jue 02/01/25	vie 31/12/32	43	84
64		PMA-BIO-05 Programa de manejo de las comunidades hidrobiológicas	2087 días	jue 02/01/25	vie 31/12/32	43	84
65		PMA-BIO-06 Programa de manejo de los ecosistemas de importancia ecológica	2087 días	jue 02/01/25	vie 31/12/32	43	84
66		PMA-BIO-07 Programa de manejo de compensación para el medio biótico por afectación paisajística	2087 días	jue 02/01/25	vie 31/12/32	43	84
67		PMA-SOC-01 Programa de Información y Comunicación Pública.	2087 días	jue 02/01/25	vie 31/12/32	43	84
68		PMA-SOC-02 Programa Metro escucha, Metro resuelve	2087 días	jue 02/01/25	vie 31/12/32	43	84
69		PMA-SOC-03 Programa de participación ciudadana	2087 días	jue 02/01/25	vie 31/12/32	43	84
70		PMA-SOC-04 Programa de fortalecimiento ciudadano para la construcción de vida urbana.	2087 días	jue 02/01/25	vie 31/12/32	43	84
71		PMA-SOC-05 Programa de articulación interinstitucional para la construcción de vida urbana	2087 días	jue 02/01/25	vie 31/12/32	43	84
72		PMA-SOC-06 Programa de cultura movilidad sostenible	2087 días	jue 02/01/25	vie 31/12/32	43	84
73		PMA-SOC-07 Programa de protección a la infraestructura y bienes de terceros "Metro Buen Vecino"	2087 días	jue 02/01/25	vie 31/12/32	43	84
74		PMA-SOC-08 Programa de inclusión sociolaboral	2087 días	jue 02/01/25	vie 31/12/32	43	84
75		PMA-SOC-09 Programa de manejo para la sostenibilidad económica del comercio formal	2087 días	jue 02/01/25	vie 31/12/32	43	84
76		PMA-SOC-10 Programa para ocupantes del espacio público	2087 días	jue 02/01/25	vie 31/12/32	43	84
77		PMA-SOC-11 Programa de observatorio de ocupación y valor del suelo	2087 días	jue 02/01/25	vie 31/12/32	43	84
78		PMA-SOC-12 Programa para la construcción de tejido urbano	2087 días	jue 02/01/25	vie 31/12/32	43	84
79		PMA-SOC-13 Programa de reasentamiento	2087 días	jue 02/01/25	vie 31/12/32	43	84
80		**PMA-SOC-14 Programa de manejo arqueológico**	**2087 días**	**jue 02/01/25**	**vie 31/12/32**		
81		Fase de Implementación del Plan de Manejo Arqueológico	2087 días	jue 02/01/25	vie 31/12/32	43	84
82		Fase Arqueología Pública	2087 días	jue 02/01/25	vie 31/12/32	43	84
83		PMA-SOC-15 Programa de manejo para el influjo laboral y violencia en razón del género.	2087 días	jue 02/01/25	vie 31/12/32	43	84
84		**PUESTA EN SERVICIO**	0 días	vie 31/12/32	vie 31/12/32	4;5;46;47;4	

Source: UT MOVIUS 2022

0.17. BUDGET

The budget is developed according to the applicable terms of reference for this projec[19]t, includes the budget of the Environmental and Social Impact Study for the previous stage, construction and operation of the L2MB Project and its associated infrastructure.

The budgets included, in itself are the analysis of unit prices of each stage and component, including the costs corresponding to personnel, equipment, transportation, however it is important to bear in mind that many of the activities involved are part of the general budget of work.

It is foreseen in the overall costs of the project, to readjust the annual costs with the CPI according to the estimates of the general budget of the project.

Chapter 16 presents the breakdown of the environmental and social budget for each of the phases of the project, the following table presents the consolidated budget.

Table 21. Consolidated Environmental and Social Budget

REALIZAR LA ESTRUCTURACIÓN INTEGRAL DEL PROYECTO LÍNEA 2 DEL METRO DE BOGOTÁ, INCLUYENDO LOS COMPONENTES LEGAL, DE RIESGOS, TÉCNICO Y FINANCIERO					
Estudio de Impacto Ambiental y Social L2MB					
1. PRESUPUESTO PLAN DE MANEJO AMBIENTAL				TOTAL	$ 176,361,119,017
PRESUPUESTO AMBIENTAL FASE DE PRECONSTRUCCIÓN (1 AÑO)		PRESUPUESTO AMBIENTAL FASE DE CONSTRUCCIÓN (7 AÑOS)		PRESUPUESTO AMBIENTAL FASE DE OPERACION (22 AÑOS)	
PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 300,000,000	PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 600,000,000	PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 220,000,000
SUBTOTAL SUBPROGRAMAS GES	$ 271,082,720	SUBTOTAL SUBPROGRAMAS GES	$ 13,939,715,760	SUBTOTAL SUBPROGRAMAS GES	$ 6,419,290,680
SUBTOTAL PROGRAMAS PMA_ABI	$ 161,259,466	SUBTOTAL PROGRAMAS PMA_ABI	$ 6,722,020,624	SUBTOTAL PROGRAMAS PMA_ABI	$ 962,276,751
SUBTOTAL PROGRAMAS BIOTICOS	$ 0	SUBTOTAL PROGRAMAS BIOTICOS	$ 3,820,658,539	SUBTOTAL PROGRAMAS BIOTICOS	$ 1,185,140,000
SUBTOTAL PROGRAMAS SOCIOECONÓMICOS	$ 23,659,477,283	SUBTOTAL PROGRAMAS SOCIOECONÓMICO	$ 83,672,469,594	SUBTOTAL PROGRAMAS SOCIOECONÓMICOS	$ 34,427,727,600
SUB-TOTAL (1+2+3+4)	$ 24,391,819,469	SUB-TOTAL (1+2+3+4)	$ 108,754,864,517	SUB-TOTAL (1+2+3+4)	$ 43,214,435,031
		COMPENSACIÓN ADICIONAL POR ENDURECIMIENTO DE ZONAS VERDES	$ 26,454,167,853		
2. PRESUPUESTO PLAN DE MONITOREO Y SEGUIMIENTO				TOTAL	$ 16,678,756,415
PRESUPUESTO AMBIENTAL FASE DE PRECONSTRUCCIÓN (1 AÑO)		PRESUPUESTO AMBIENTAL FASE DE CONSTRUCCIÓN (7 AÑOS)		PRESUPUESTO AMBIENTAL FASE DE OPERACION (22 AÑOS)	
PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 0	PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 0	PROYECCIÓN PERMISOS AMBIENTALES EN CASO DE SER REQUERIDOS	$ 0
SUBTOTAL SUBPROGRAMAS GES	$ 10,112,601	SUBTOTAL SUBPROGRAMAS GES	$ 424,729,242	SUBTOTAL SUBPROGRAMAS GES	$ 222,477,222
SUBTOTAL PROGRAMAS PMA_ABI	$ 170,438,080	SUBTOTAL PROGRAMAS PMA_ABI	$ 8,197,220,230	SUBTOTAL PROGRAMAS PMA_ABI	$ 2,003,320,000
SUBTOTAL PROGRAMAS BIOTICOS	$ 0	SUBTOTAL PROGRAMAS BIOTICOS	$ 910,269,040	SUBTOTAL PROGRAMAS BIOTICOS	$ 2,610,190,000
SUBTOTAL PROGRAMAS SOCIOECONÓMICOS	$ 170,000,000	SUBTOTAL PROGRAMAS SOCIOECONÓMICO	$ 1,170,000,000	SUBTOTAL PROGRAMAS SOCIOECONÓMICOS	$ 790,000,000
SUB-TOTAL (1+2+3+4)	$ 350,550,681	SUB-TOTAL (1+2+3+4)	$ 10,702,218,512	SUB-TOTAL (1+2+3+4)	$ 5,625,987,222

Source: UT MOVIUS 2022

0.18. CONSULTATIONS AND SOCIALISATIONS WITH INTERESTED PARTIES

The ESIA was developed through a participatory and consultation process, with milestones during its development as the first moment at the beginning, focused on the socialization of the scope, activities, schedules and other aspects, and a second moment oriented to the consultation of the ESIA, in which the different chapters of the study were fed back, such as impacts, Management plans and recommendations, in order to have a document built in a participatory and collaborative way with the interested parties, this process was continuous and had spaces for participation such as monthly meetings

[19] ET-05. Convocatoria pública FDN – VE – CP – 07 - 2021. Prestar los servicios de asesoría especializada de estructuración integral en los componentes legal, de riesgos, técnico y financiero para el acompañamiento a la FDN en la estructuración de la Línea 2 del Metro de Bogotá.

with participation committees and thematic or extraordinary meetings. Detailed processes, activities and outcomes are presented in Chapter 13. Participation report.

The process began with the identification of stakeholders through field surveys, review of secondary information from official sources and the support of local administrations, as well as district entities that develop programs in the localities, Chapinero, Barrios Unidos, Engativá and Suba, through which the project runs.

In each of the moments of participation, the different actors that are part of the project were linked, such as local administrations, district entities, communities in the area of influence, community leaders, property owners, universities, NGOs and interest groups.

Likewise, the participation was carried out considering different levels and interests in front of the project. The socializations were carried out with local authorities, convening the mayors, personerías and local administrative boards of Chapinero, Barrios Unidos, Engativá and Suba, with entities of the District with agendas or issues associated with the development of infrastructure, mobility, cultural heritage, security, economic sector and gender issues, as well as with the personería, comptroller and district oversight.

In total, 102 meetings were held from December 9, 2021 to September 5, 2022, of which 51 were held in person with the support of virtual means and 50 using virtual platforms, as for the consultation processes, 47 were focused on these processes.

The first moment was fundamental in the beginning of relations and communication with district entities, local administrations, sectors such as academia represented in the city's universities, environment, community action boards and relevant community leaders in the corridor. In addition to the control entities, entities such as the Secretariat of Planning, Participation and Sexual Diversity and the District Secretariat for Women were involved in the project, not only participating in the socialization meetings, but also contributing to the participation strategies and supporting the call by multiplying the invitations with social organizations and community leaders.

Among the extraordinary meetings there are meetings with actors such as Club los Lagartos, Mesa Humedal Juan Amarillo Tibabuyes, Mesa Humedal La Conejera, Cabildo indigéna Muisca de Suba and Merchants. The characterization of the social units of the properties located in the infrastructure area of the L2MB was also carried out and 10 meetings were held with property owners.

With respect to the Muisca de Suba indigenous council, according to the results of the information obtained in the characterization, it is identified that this community is developed in the urban environment of the town of Suba, which do not have a titled territory that is affected by the project, likewise it is identified that there are no impacts on this community on the occasion of the works and stages of the project and additionally the request for the prior consultation to be admissible with the Ministry of the Interior, which indicates that the consultation does not proceed. Regarding multilateral banking standards, the analysis is carried out with respect to EAS7 Indigenous Peoples/Local Communities
Historically Neglected Traditional Sub-Saharan Africa of the World Bank, with respect to the criteria for determining the implementation or applicability of the standard identifying that: i) The project assessed the nature and degree of direct and indirect economic, social, cultural (including cultural heritage) and environmental impacts on indigenous peoples/communities, identifying that these impacts will not occur or will affect indigenous peoples or communities. (ii) the project avoided adverse impacts on indigenous peoples, iii) The project did not identify significant impacts on the cultural

heritage of indigenous peoples that are relevant to the identity or cultural, ceremonial or spiritual aspects of indigenous peoples' lives, iv) The project will not locate or develop natural resources commercially on lands that are traditionally owned or subject to indigenous use or occupation. Therefore, for L2MB it does not consider the activation or implementation of standards related to ethnic communities or indigenous peoples. Similarly, the four criteria of the ESS7 were reviewed and it is found that:

. self-identification as members of a distinct indigenous social and cultural group, and recognition of this identity by other groups. It is considered that it APPLIES according to the characteristics of the Cabildo.

b. collective attachments to geographically differentiated habitats, ancestral territories or areas of seasonal use or occupation, as well as to the natural resources of those areas. The project is developed in urban areas and the Cabildo does not have urban or rural collective territories, therefore it is considered NOT RELEVANT.

c. traditional cultural, economic, social or political institutions that are well differentiated and independent of those of the prevailing society or culture. As presented in the diagnosis, the Cabildo has its own institutions, therefore it is considered that it DOES APPLY.

d. a distinctive language or dialect, often different from the official language or languages of the country or region in which they reside. As indicated this community is immersed in the locality, attending local educational institutions, they are employed in conventional jobs, the language of this organization is the same as the country and the region, therefore it is considered NOT RELEVANT.

The result is that this organization is considered as of special attention, it is an independent and collective treatment stakeholders and in this way the socializations of the project have been carried out during the preparation and this is proposed in the implementation stage.

For this second moment that took place in the months of August and September 2022, a call was also made through the delivery of flyers distributed property by property along the corridor and in 300 m around in the area of stations delivering more than 25,000 flyers. At the same time, informative posters with the same contents of the flyer were installed in places of high attendance of the community such as shops, murals, community halls, among others. In total, 500 posters were installed along the corridor, stations and yard-workshop.

For this second moment, the concerns were concentrated on issues such as the processes of acquisition of the properties, the affectation to the properties on the surface, the execution times of the project and some recommendations made were the following: Combine virtual means with face-to-face means to guarantee access for all owners, consider the total demolitions of the properties and not partial in order not to generate insecurity in the surrounding sectors, consider inter-institutional coordination in the areas where several district projects are carried out, such as station No. 1 with the ERU and station No. 5 and 6 with IDU projects, feedback the project with the lessons learned from the property acquisition and Resettlement Plan of the First Line of the Bogotá Metro, which were considered in the PMAS.

For the level of dissemination, printed material was delivered to the AID with general data, information on the progress of activities and answers to frequently asked questions of printed material, and social networks such as YouTube and Facebook

As for dissemination pieces, flyers and posters of call and information flyers related to the field work of geotechnical campaigns were prepared and delivered, and information related to the frequently asked questions of social actors such as property acquisition and service channels of both the EMB and the consultant. A total of 65,649 dissemination pieces were distributed.

Finally, in terms of attention to citizens, channels were available (telephone line and email for exclusive use for the project) and access flows were ensured for any interest group. This social care system was articulated with the one provided by the District for this purpose, the SDQS *Bogotá te Escucha*.

In total, 204 citizen attentions were registered that were attended in their entirety and closed, of which 41% are concerns presented in the meetings of the beginning of the feasibility stage and the second moment of participation and consultation by the people connected virtually by the YouTube channel, which did not manage to be attended during the development of the meetings that had mixed modality (face-to-face and virtual). Telephone attentions occupy the second most used medium with 37%, in third place is email and finally virtual meetings and participation committees with 5.9%.

0.19 CONCLUSIONS

Line 2 of the Bogotá Metro is a project whose main objective is to provide Bogotá with a means of mass passenger transport that is integrated into the current public system that improves the mobility of the population and the existing traffic congestion in the metropolitan area of the city, therefore, From the outset, it implies a project committed to the social development and economic development of the city, favoring millions of inhabitants in a critical and fundamental issue such as mobility and at the same time promoting economic growth by improving competitiveness conditions.

The environmental and social viability seen from the concept of compliance of the projects in order to obtain the approval of the local environmental authorities and from the fulfillment of the Environmental and Social Standards of the WB that are considered applicable to the project, is fully aligned, the ESIA presented an analysis of the environmental and social conditions of the scenario without project, showing the real and physical transport needs for remote locations with high population density. This is compared to the structuring of a high-performance technical project, including recommendations from citizens and analyzing the possible environmental and social impacts to be presented and presenting impact mitigation solutions to avoid, prevent and reduce any significant adverse effects, demonstrating sustainable environmental and social viability.

If the project is analyzed from the environmental and social sustainability, it must first focus on the defined foundations (yield, pollution and depletion), and oriented towards the natural resources that the project will demand in the construction and / or operation phase, where what corresponds to the depletion of resources, does not require the capture of water from surface or natural underground resources, therefore, no recourse to exhaustion is exposed. In the same way, it does not require the direct use of material sources by the construction contractor, these will be supplied by suppliers that have permits and environmental management plans approved by the corresponding environmental authority and with the mining permits in force.

With the above, it is considered that the L2MB will not have environmental and social conflicts because it proposes a solution to the mobility problem of the city of Bogotá, without compromising natural resources, reducing GHG emissions in the context of climate change, providing effective management and management plans for the management of waste and surplus material and guaranteeing social inclusion as it improves the quality of life of millions of inhabitants.