REDD + PROJECT

RESGUARDO INDÍGENA UNIFICADO – SELVA DE MATAVÉN (RIU-SM)

Document prepared by

Asociación de Cabildos y Autoridades Tradicionales Indígenas de la Selva de Matavén – **ACATISEMA**

MEDIAMOS F&M S.A.S

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Prepared by	Asociación de Cabildos y Autoridades Tradicionales Indígenas de la Selva de Matavén – ACATISEMA MEDIAMOS F&M S.A.S.
Contact	Address: Alto del Rosario, Km 12 vía El Otoño, La Buitrera, Cali, Colombia Phones: (57) 320 687 89 84 / (57) 314 830 48 69 e-mail: contacto@mediamosfym.com, mataven@mediamosfym.com Skype contact: gerencia_mediamos Website: www.selvamatavenredd.org

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DEFINITIONS AND ACRONYMS

DEFIN / ACRON	DESCRIPTION
ACATISEMA	Asociación de Cabildos y Autoridades Tradicionales Indígenas de la Selva de Matavén (Association of Indigenous Councils and Traditional Authorities of the Matavén Jungle)
ANH	Agencia Nacional de Hidrocarburos (National Hydrocarbons Agency)
Cabildo	Representative of a sector within Resguardo Indígena Unificado – Selva de Matavén
CMC	Catastro Minero Colombiano (Colombian Mining Cadastre)
CONPES	Consejo Nacional de Política Económica y Social (National Council of Economic and Social Policy)
Conuco	Small plot of land under cultivation
CORPORINOQUIA	Corporación Autónoma Regional de la Orinoquía (Regional Autonomous Corporation of the Orinoquía)
DANE	Departamento Administrativo Nacional de Estadística (National Administrative Department of Statistics)
Digital Kiosk	"Vive Digital" kiosks are community access points to the Internet, for children, youth and adults ..., located in the most remote areas of Colombia where they can connect to the Internet and receive free training in use and appropriation of TIC
DNP	Departamento Nacional de Planeación (National Planning Department)
DPS	Departamento para la Prosperidad Social (Department for Social Prosperity)
FAPUS	Family Agrifood Production Units System
Fustal	Trees over 10 cm in diameter at breast height (*AFE-COHDEFOR, ITTO http://www.itto.int/files/user/pdf/publications/PD47%2094/pd%2047-94-9%20rev%203%20(I)%20s.pdf*)
HRP	Historical Reference Period: the historical period prior to the project start date that serves as the source of data for defining the baseline
IDEAM	Instituto de Hidrología, Meteorología, y Estudios Ambientales (Institute of Hydrology, Meteorology and Environmental Studies), attached to Minambiente
IGAC	Instituto Geográfico Agustín Codazzi (Geographic Institute Agustín Codazzi)
INCODER	Instituto Colombiano de Desarrollo Rural (Colombian Institute of Rural Development)
INCORA	Instituto Colombiano de Reforma Agraria (Colombian Institute of Agrarian Reform)
MADS	Ministerio de Ambiente y Desarrollo Sostenible (Ministry of Environment and Sustainable Development) (2011-current)
MAVDT	Ministerio de Ambiente, Vivienda y Desarrollo Territorial (Ministry of Environment, Housing and Territorial Development) (MADS 2002-2011)
MININTERIOR	Ministerio del Interior (Ministry of Interior)
MLS	Matrix of Logic Structure
NBI	Necesidades Básicas Insatisfechas (Unsatisfied Basic Needs)

DEFIN / ACRON	DESCRIPTION
PND	Plan Nacional de Desarrollo (Development National Plan)
PNN	Parque Nacional Natural (Natural National Park)
PRA	Participatory Rural Appraisal
RESA	Red de Seguridad alimentaria (Food Safety Network)
RIU-SM	Resguardo Indígena Unificado – Selva de Matavén (Unified Indigenous Reservation – Matavén Jungle)
SENA	Servicio Nacional de Aprendizaje (National Learning Service)
SIGOT	Sistema de Informacion Geografica para la Planificacion y Ordenamiento Territorial (Geographic Information System for Planning and Land Management)
TIC	Tecnologías de la información y la comunicación (Technologies of the information and communication)

1 PROJECT DETAILS

1.1 Summary description of the Project and its Implementation Status

1.1.1 Summary description of the Project

The REDD+ Project Resguardo Indígena Unificado–Selva de Mataven (REDD+ RIU-SM) aims to develop a participatory process to achieve the establishment of a integrated management system of forests and lands of the reserve, to ensure its sustainability and to mitigate threats of its conservation, particularly avoiding deforestation through the implementation of a REDD+ Project (Reducing Emissions from Deforestation and Forest Degradation + conserving carbon stocks, sustainable management of forests and enhancement of forest reserves in developing countries) that allows providing compensation payments for ecosystem services.

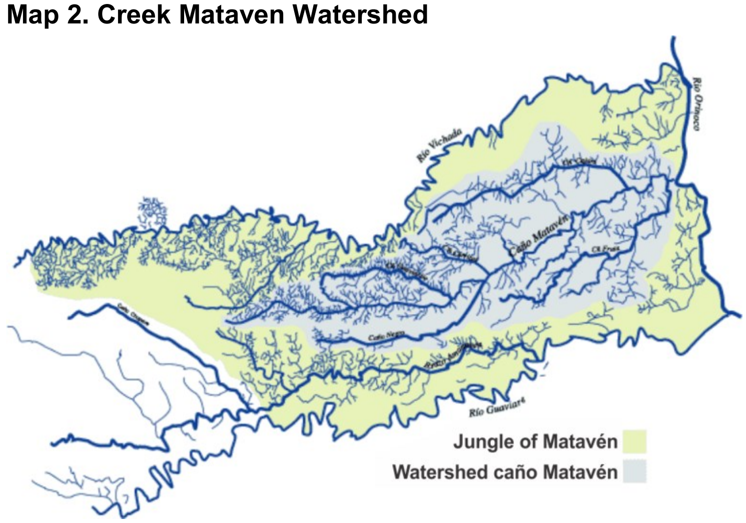
The technology corresponds to a REDD Project in accordance with standards established by the VCS. Specifically an activity "*Avoiding Unplanned Deforestation and Degradation* (*AUDD*)".

The Indigenous Reservation is located east of the high plain Orinoco colombian region in the transition belt between the savannas of the Orinoco and the Amazon forests, in the eastern part of the Department of Vichada, in the municipality of Cumaribo (Map 1). Consists of 16 sectors and one center, corresponding to the 16 ancient Indigenous reservations that were unified under "Resolution 037 of 2003 INCORA" (INCORA, 2003) [1].

Map 1. National Location of RIU-SM

Source: REDD+ project RIU-SM, GIS

Map 2. Creek Mataven Watershed



Source: ACATISEMA

[1] *Copy of this document may be found in "Colombian Institute for Rural Development - INCODER -in liquidation" (formerly called INCORA), Calle 43 No. 57-41 Bogotá D.C. Colombia.*

The climate corresponds to the Holdridge Life Zone: Tropical Rainforest (TRF). Contrasts are remarkable in terms of the degree of soil evolution, there are some highly evolved that were developed from ancient sediments (Plio-Pleistocene) and have experienced a long process of weathering and other very young that have evolved from very recent alluvial sediments (Holocene) [based on (Villarreal Leal , et al., 2009)].

Illustration 1. Mataven Jungle, Laguna Negra

Source: REDD+ project RIU-SM

The Indigenous Reservation is rich in water resources, 78 sub-basins and numerous watersheds have been identified (Map 2).

The eigth activities, according to logic structure, aimed at reducing deforestation, according to 3 products are:

- **Product 1**: Measures to reduce the vulnerability of the RIU-SM generated by external factors, designed and implemented.

  Activity A1.1: To monitor and to control the conservation and recovery of forests and lands of the RIU-SM.

  Activity A1.2: To develop and to implement a communication and information system at the RIU-SM.

Activity A1.3: To design and to establish a system of governance for development and sustainability of ACATISEMA Association.

- **Product 2**: Implemented auto-sustainable production system.

  Activity A2.1: To establish and to develop a Family Agrifood Production Units System - FAPUS.

  In annex "4.1 sustainable management plan for land and forest" was explained:

  "Strategic Element 4: Implement actions for food security of communities in Heterogeneous Agricultural Areas (HAA) y Grasslandes (known in the Indigenous Reserve as "conucos") in areas of Savannah and in some areas of natural regeneration. These shares can be agro-forestry and pasture systems, which provide food (plant and animal) and wood products from plantations with native species in combination with agricultural crops or livestock systems. These systems can be a source of small timber for building houses, fences, barns and other facilities that are required by the RIU-SM, so that they can replace those from secondary forests and ensure that these forests can be transformed to primary forests."

  Activity A2.2: To design and to develop a training and education program plan for the administration and management of natural resources RIU-SM.

  Activity A2.3: To manage resources for project design and establishment of production chains.

- **Product 3:** A mechanism for valuation and compensation for environmental services generated in the RIU-SM, validated and verified.

  Activity A3.1: To validate a REDD+ Project with international standards.

  Activity A3.2: To verify the project and to record the units of forest compensation for avoided deforestation.

Project Size

The following considerations are taking account:

- Resguardo Indígena Unifcado – Selva de Matavén (RIU-SM) has an area of 1,856,836 hectares.
- Resguardo Indígena Unifcado – Selva de Matavén (RIU-SM) has a forest area of 1,477,115 hectares (79.6% of RIU-SM is forest). 1,233,250 hectares are primary forests, 232,536 hectares are flooded primary forests and 11,329 hectares are secondary forests.
- The Region Reference to project deforestation rate (RRD) has an area of 1,444,805 hectares.
- The Project Area (PA) has an area of 1,150,212 hectares.
- The Leakage Belt (LB) has an area of 486,211 hectares.
- The Region Reference to project the location of deforestation (RRL) has an area of 2,028,439 hectares, of which 1,636,423 hectares are forests and 392,016 hectares are not forests.

It is expected to avoid the emission of **140,487,762** tons of CO2 equivalent (***t CO_2e***) in the baseline scenario during the lifetime of the project (30 years) (average annual emission of **4,682,925** tons of CO_2). Project emissions are **21,876,151** tons of equivalent CO_2 (***t CO_2e***) (with an annual average of **729,205** tons of CO_2); shifting leakage emissions due to the project activities are **9,941,049** tons of equivalent CO_2 (***t CO_2e***) (with an annual average of **331,368** tons of CO_2), involving the addition of emissions within the leakage belt in the baseline scenario (9,054,489 *tCO_2e*) and emissions outside the leakage belt in the baseline scenario (886,560 *tCO_2e*).

The net total emission reduction discounting Project emissions and leakage is **108,670,562** tons of equivalent CO_2 (***t CO_2e***) (with an average of **3,622,352** tons of CO_2).

The net total of GHG reductions for project activities adjusted for uncertainty in the baseline scenario is equal to the net total of emission reduction of the Project, which is deducted to obtain a cumulative uncertainty of 8.4%, with a probability of 95%, which is 15% below of defined by the standard.

The value of discount credits to be deposited into the buffer is **20,163,974** tons of equivalent CO_2, with an annual average of **672,132** tons of CO_2.

The estimated total number of VCUs in the lifetime of the project is **83,578,228**, with an annual average of **2,785,941** and for the first crediting period of Baseline (during its first 10 years) have *3 million* net / year VCUs.[2]

1.1.2 Implementation Status of the Project

Product 1:

- Activity A1.1: Captains, zone coordinators and members were trained and they apply environmental knowledge (Annex 1). Approximately 600 indigenous guards patrol the territory to apply the surveillance, control and monitoring of forests of the RIU-SM (Annex 25).

- Activity A1.2: A system of communication and information has been established and implemented. Communities have improved communication due to events, workshops, meetings and participatory mechanisms (Annex 1), including women and young people, using technical and community reports, posters, newsletters and traveling to the area by ACATISEMA leaders to inform and explain the Project.

- Activity A1.3: Members of the Coordination Committee, Councils, zonal coordinators and captains were trained and they apply knowledge in their laws and organizational elements of the Association (statutes). Agreement 310 of 2015, signed between ACATISEMA and the Ministry of Environment and Sustainable Development, was conducted to strengthen governance of the Association.

Product 2:

- Activity A2.1: There is an established Familiar Agricultural Food Production Units System (FAPUS) and it have accomplished with the targets of the “three year plan of food production”.

[2] *Source: Annex 9. VM0007 Methodology Framework REDD-MF. More details on page 39 in this PDD*

- Activity A2.2: In early 2014 began negotiations with the SENA, both at regional level in Vichada and Guainia, as Central in Bogota, with agreements about the type of programs and their embodiment; also was made managing the Youth in Action Program with the Department of Social Prosperity in coordination with SENA that supported this activity. Negotiations with the Ministry of TICs to locate digital kiosks to support the implementation of the programs were also made.

- Activity A2.3: A management has started to participate in the Food Security Program (RESA) of the Department of Social Prosperity. It is expected in early 2017 concrete efforts to initiate this program are achieved. Productive Projects have been identified by the several communities of RIU-SM, which will be executed with the resources of sales of VCus.

Product 3:

- Activities A3.1 and A3.2: Currently the project is in validation and verification process with ICONTEC. It expects to have the registration and certification of the project in the second semester of 2016.

1.1.3 Developed actions

2012

June: Agreements between ACATISEMA and MEDIAMOS were signed to develop a REDD+ Project.

July-December: Study of International Standards and Methodologies about REDD+ projects. Meetings of Socialization and Training about REDD+ projects.

2013

January: Project REDD+ RIU-SM starts activities. Design of PDD begins with definition of spatial boundaries, similarity criterions, study of deforestation in HRP, application of spatial model to localizate the projected deforestation.

February: Indigenous guard initiated monitoring of deforestation.

April – May: A fieldwork to quantify the biomass and carbon of forests and soils of RIU-SM was developed.

September: ACATISEMA General Assembly was done and the REDD Project RIU-SM is treated.

November: Strategic Alliance Agreement for the Protection, Conservation and Recovery of Natural Forest of the Unified Indigenous Reservation of the Mataven Jungle was signed between ACATISEMA y MEDIAMOS F&M S.A.S.

Details of the actions taken during 2013 is in Annex 25.1.2.

2014

January: Project REDD+ RIU-SM continues activities. Design of PDD continues with application of calculates of results in baseline and construction of document.

April: Meetings with public and privates institution to support the development of Project activities: Ministry of Enviromental, Fundación Natura, Fondo Acción, SENA.

June: Interinstitutional agreements: Ministry of Enviromental, Fondo Acción, Fundación NATURA, ACATISEMA and MEDIAMOS.

July: Superior Court of the Judicial District of Villavicencio endorses the project.

December: Definition of an Action Plan with the participation of Ministry of Enviromental, Fondo Acción, Fundación NATURA, ACATISEMA and MEDIAMOS

Details of the actions taken during 2014 is in Annex 25.2.2.

2015:

March: Supreme Court of Justice upheld the judgment of the Superior Court of the Judicial District of Villavicencio. Development of a process of pre-valiation of REDD+ Project RIU-SM with resoruces of "Banco Interamericano de Desarrollo".

May: Interadministrative Agreement No. 310 of 2015 between the Ministry of Environment, and Sustainable Development and ACATISEMA to combine technical, administrative and financial efforts for the formulation and implementation of strategies aimed at strengthening forest governance with a view to reducing deforestation and degradation of forests RIU SM is executed.

December: Process of validation and verification of REDD+ Project RIU-SM started with ICONTEC.

Details of the actions taken during 2015 is in Annex 25.2.3.

1.1.4 Summary of total GHG emission reductions or removals generated in this monitoring period (2013 and 2014-2015 periods)

GHG emission reductions or removals in period 2013: ***4,468,852 t CO_2e***

GHG emission reductions or removals in period 2014-2015: ***8,769,222 t CO_2e***

Total GHG emission reductions or removals in 2013 and 2014-2015: ***13,238,074 t CO_2e***

Source: Based on file "monitoring.xlsx" (in folder "calculation_tables"), section "7.5 GHG Emission Reductions and Removals"

1.1.5 Monitoring of leakage and non-permanence risk

In Annex 12, the procedures to measure and monitor the deforestation in and out Leakage Belt are presented. Annex 4 describes the Management Plan of Forests and Lands and leakage mitigation measures, particularly through the Family Agrifood Production Units System (FAPUS) (Annex 5).

In Annex 23, the procedures to measure and monitor the Non-permanence risk factors are presented. Overall non-permanence risk rating is distributed so: Internal Risk 16%, External Risk 0%, Natural Risk 1% = Total Risk Assessment 17%, which determinates "buffer" and total number of credits to be deposited in the afolu pooled buffer account = 20,163,974.

1.2 Sectoral scope and Project type

- **SECTORAL SCOPE**: 14 - Agriculture, Forestry and Other Land Use (AFOLU)
- **AFOLU PROJECT CATEGORY**: Reduced Emissions from Deforestation and Degradation (REDD)
- **ACTIVITY TYPE**: Avoiding Unplanned Deforestation and Degradation (AUDD)

VM0007, Identification of the Most Plausible VCS-eligible Activity(s)

<table>
<tr><td colspan="4">A) Is the forest land expected to be converted to non-forest land in the <u>baseline case</u>, or expected to be subject to authorized conversion to a managed tree plantation in the baseline case?</td></tr>
<tr><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td colspan="2">B) Is the land legally authorized and documented to be converted to non-forest or a managed tree plantation?</td><td colspan="2">C) Is the forest expected to degrade by fuelwood extraction or charcoal production, in the baseline case?</td></tr>
<tr><td>YES</td><td>NO</td><td>YES</td><td>NO</td></tr>
<tr><td>D) Avoided planned deforestation/planned degradation</td><td>E) Avoided unplanned deforestation</td><td>F) Avoided forest degradation</td><td>G) Proposed project is not a VCS REDD activity currently covered by the module framework</td></tr>
<tr><td colspan="4">H) Is part of the land non-forest land or with degraded forest?</td></tr>
<tr><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td colspan="2">I) Suitable for ARR</td><td colspan="2">J) No additional activity</td></tr>
</table>

Taking this decision tree, with the following results:

Questions and answers:

A) Yes.
B) No.

Decision: **E) That is, it is an avoided unplanned deforestation project**.

H) No.

Decision: **J) There is not an additional activity**.

This is not a clustered project.

1.3 Project proponent

The project proponent is the **Strategic Alliance** between the **Asociación de Cabildos y Autoridades Tradicionales Indígenas de la Selva de Mataven – ACATISEMA y MEDIAMOS F&M S.A.S.**

Contact person	Francisco A. Quiroga Zea
Title	Project Director
Telephone	(57) 314 830 48 69
Email	franciscoquiroga@mediamosfym.com

Background

ACATISEMA and MEDIAMOS F&M S.A.S. celebrated an agreement on July 6, 2012 for the establishment of a Strategic Alliance (Temporary Union) to offer environmental services with the irrevocable objetive to preserve, to improve and to manage natural forest and to restore territories with existing forest land, so they can be useful in reducing greenhouse gas (GHG) emissions from deforestation and forest degradation, as in the conservation and enhancement of forest carbon stocks, under a project to consider the Life Plan, worldview, cultural integrity, autonomy and dignity of their communities, in compliance with the guidelines and rules on forest conservation and protection of the inhabitants rights of the territories inside of the natural forest areas defined by the National Environmental Authority - Ministerio de Ambiente y Desarrollo Sostenible - taking into account the legal and regulatory framework of the country and the requirements of international standards (ACATISEMA, MEDIAMOS, 2012)[3].

Illustration 2. Meeting ACATISEMA-MEDIAMOS, September 2012

Source: REDD+ project RIU-SM

[3] *Annex 1.9.1.1 First agreement, july 06/2012*

Expressing, therefore, in order to make the necessary management for environmental, social, community and climate benefits generated by the project that is developed and implemented, and to negotiate and to sell in domestic and/or international markets, on behalf of this strategic alliance, the GHG certificates that can be quantified and verified, and to receive the agreed payments for environmental services generated by the Project.

This negotiation and Strategic Partnership should be governed by principles of transparency, loyalty, ethics and equitability

Ratifications

This agreement was ratified on July 22, 2012 and unanimously endorsed by the members of ACATISEMA Board of Councils and Coordinator Committee, attending the "The 4th Workshop Training REDD+ RIU-SM Project" (ACATISEMA, MEDIAMOS, 2012)[4].

It was also ratified by leaders and captains at meetings of socialization and training, in zonal meetings of the Unified Indigenous Reservation and the Summit of Indigenous Chiefs, which is included in their respective records. In ACATISEMA General Assembly, held in Laguna Cacao Community (Lagunas Negra y Cacao Sector) on September 7th to 9th 2013 Zonel Meetings Proceedings were approved.[5]

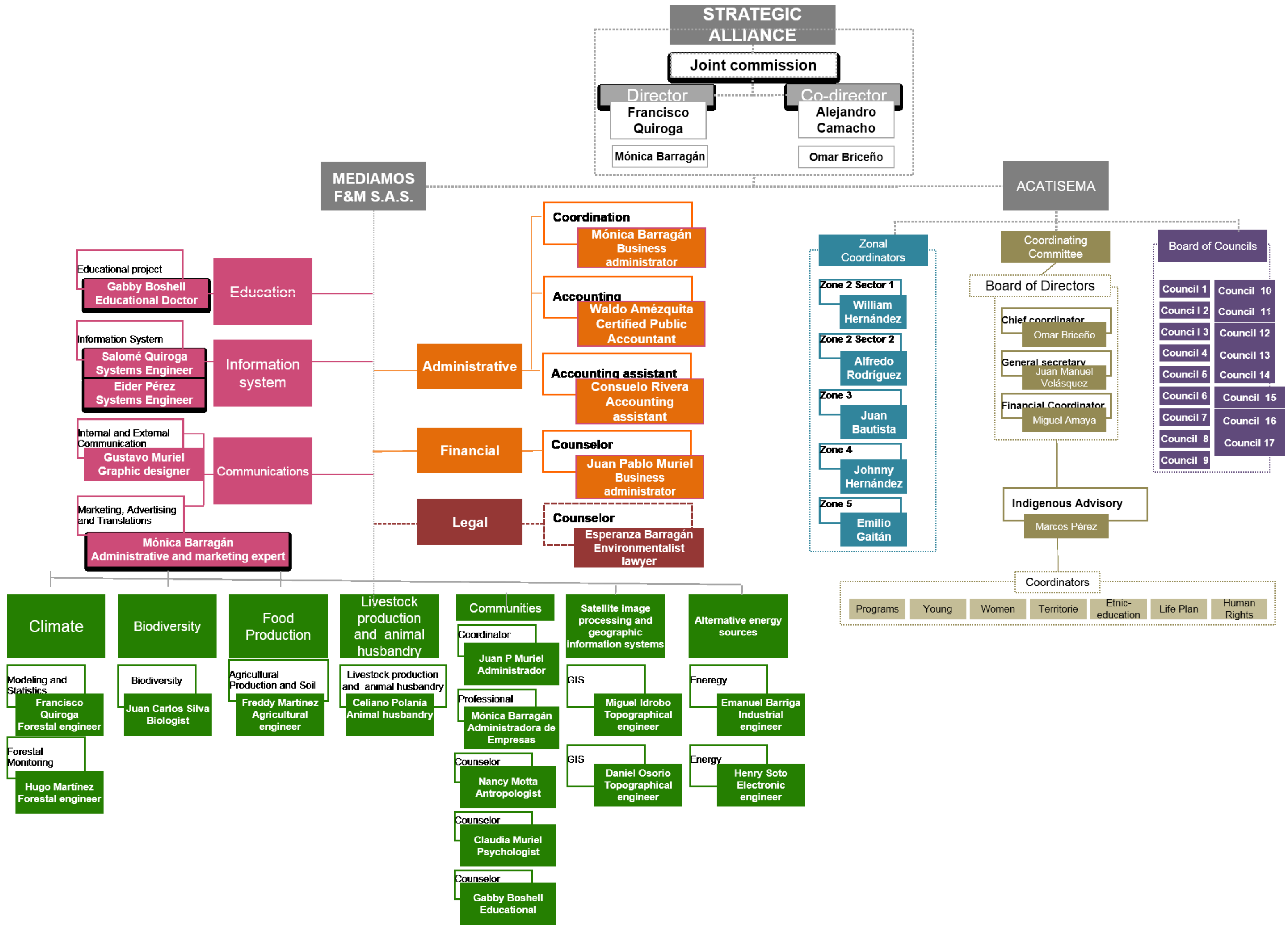
On November 22nd and 23rd, 2013, the Board of Councils and the Coordinator Committee, gathered in Laguna Negra Community (Lagunas Negra – Cacao Sector), authorized the continuation of the REDD + RIU-SM Project and the Strategic Alliance Agreement for the Protection, Conservation and Recovery of Natural Forest of the Unified Indigenous Reservation of the Mataven Jungle between ACATISEMA y MEDIAMOS F&M S.A.S (ACATISEMA, MEDIAMOS, 2013)[6].

Annex 1 contains information on the process of socialization, training and consultation that has occurred in the stages of design and implementation of REDD+ Project Resguardo Indígena Unificado - Selva de Matavén (REDD+ RIU-SM); in this Annex are also evidence of concerted action that have been placed in a sequence of agreements, up to the current Strategic Alliance Agreement ACATISEMA - MEDIAMOS F&M S.A.S. Annex 1.2.2.2 includes the text of the final agreement.

The following diagram illustrates the organizational structure of the Strategic Alliance.

[4] *Annex 1.9.1.2 Ratification of first agreement, july 22/2012*
[5] *Annex 1.8. Minutes XIII Ordinary General Assembly of ACATISEMA, september 7/2013*
[6] *Annex 1.2.2.2. Agreement of strategic alliance between Acatisema-Mediamos, november 22/2013*

Illustration 3. Organizational structure of the Strategic Alliance



Source: REDD+ project RIU-SM

Association of Councils and Traditional Indigenous Authorities of the Mataven Jungle - ACATISEMA

Contact person	Omar Augusto Briceño Chipiaje
Title	Legal Representative - General Coordinator – **ACATISEMA**
Address	Cumaribo Municipality (Departament of Vichada, Colombia)
Telephone	Cell phone: 320 522 72 70
Email	omar.a.brice@gmail.com

ACATISEMA is an association formed by Councils and Traditional Authorities of 17 indigenous groups that make up the Unified Indigenous Reservation of Mataven Jungle (ACATISEMA, 2010) [7] (Article 10). It is a public entity of a special nature with legal status, with own assets and administrative autonomy. It has the capacity to acquire, to own and to dispose of property, to accept donations, to hold national and international conventions, scientific and cultural exchanges and generally, to celebrate all kinds of negotiations and agreements with which the Association can achieve its objectives (ACATISEMA, 2010) (Article 3).

The main objective of the Association is to foster the integral development, social and cultural preservation of the indigenous communities in the Mataven Jungle and to consolidate the territory, self-government by partners, the defense, conservation and preservation of the environment and biodiversity of the Mataven Jungle (ACATISEMA, 2010) (Article 5).

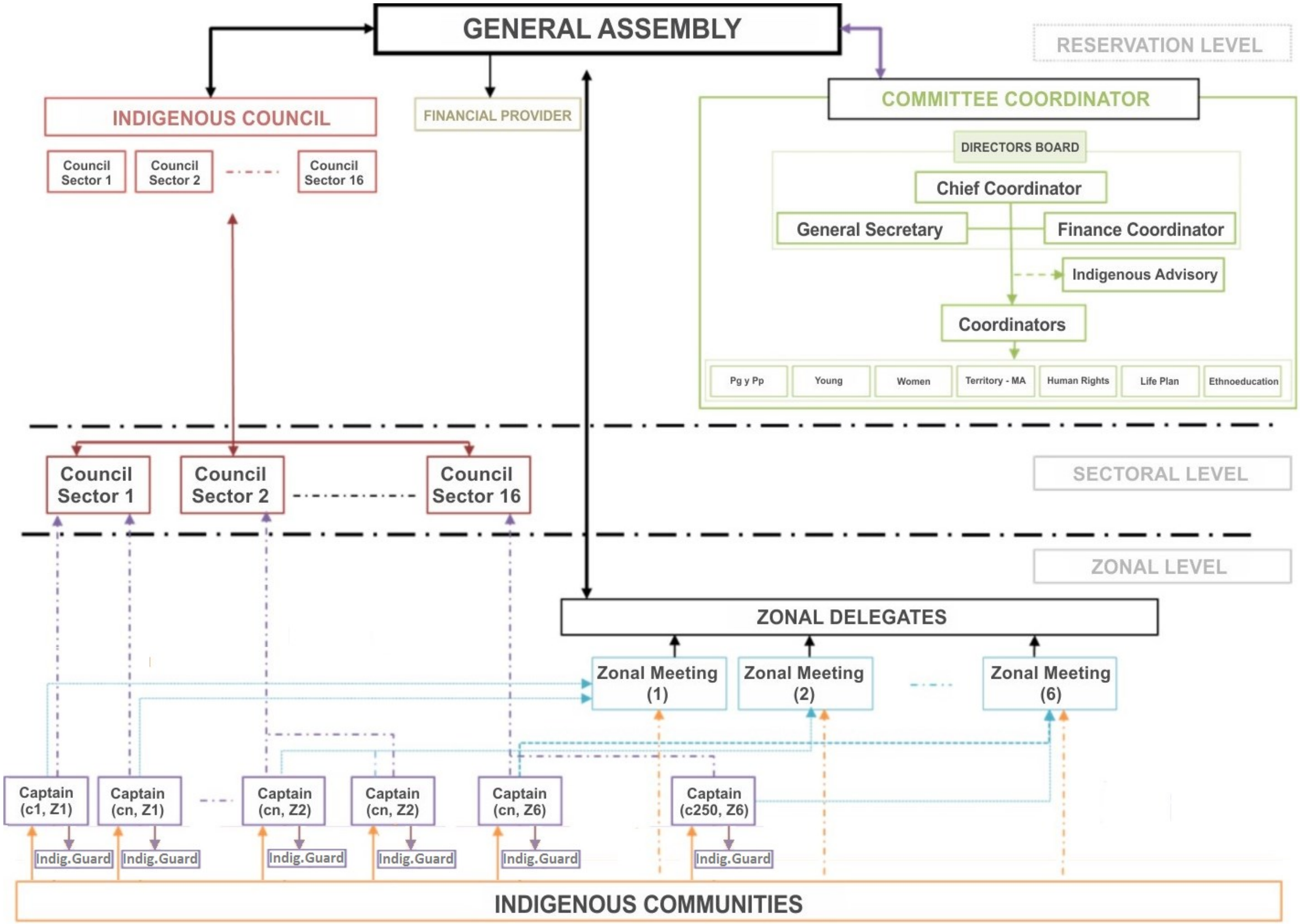
By Resolution No. 0177 of December 9th, 2002, issued by the Department of Indigenous Affairs, Minorities and ROM of the Interior and Justice Miniistry, the contitution of the Association of Councils and Traditional Indigenous Authorities of Mataven Jungle "ACATISEMA" was enrolled and recorded, with jurisdiction in the departments of Guainia and Vichada. Tax Identification Number is 842000174-8 (MININTERIOR, 2002) [8].

Annex 2. Information about ACATISEMA and Indigenous Unified Reservation contains legal, statutory and organizational information related to ACATISEMA and legal and organizational information about the Indigenous Unified Reservation Mataven Jungle (RIU-SM).

The following diagram illustrates the organizational structure of ACATISEMA.

[7] *Annex 2.1.2 Acatisema's statutes*
[8] *Annex 2.1.1 Resolution No. 0177/2002 MinInterior*

Illustration 4. Organizational structure of ACATISEMA



Source: ACATISEMA

Illustration 5. Indigenous Guards

Explanation of above diagram:

In the Articles in Chapters VII, Article 14; Chapter VIII, Articles 15, ..., 26; Chapter IX, Articles 27, ... and 30; Chapter X, Articles 31 and 38 .....; and Chapters XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX and XX, Articles 39, ... and 59, the composition of the direction entities and their functions are presented (ACATISEMA, 2010).

Illustration 6. Managers ACATISEMA-MEDIAMOS

Source: REDD+ project RIU-SM

This composition and organization is outlined in the diagram indicating the zonal, sector level and related to the Reservation. Three Management Entities are: the General Assembly, the Coordinator Committee and the Board of Sector Councils. The diagram indicates the form of composition and hierarchical relationships between these entities indicated by the arrows. The details of this organization may be revised in ACATISEMA Statutes on the above points. In Annex 2 related to Information of ACATISEMA and Resguardo Indígena Unificado (Annex 2.1.2) the Articles are presented.

MEDIAMOS F&M S.A.S.

Contact person	Monica Barragán Salas
Title	Administrative Coordinator
Address	Alto del Rosario, Km 12 vía El Otoño, La Buitrera, Cali, Colombia
Telephone	(57) 320 687 89 84
Email	monikabasa@yahoo.com

MEDIAMOS F & M S.A.S. is a Colombian company founded by Deed No. 1555[9] on May 12th, 1999 of Notary Sixth of Cali, registered at the Chamber of Commerce on May 26th, 1999 under No. 3589 of Book

[9] *Annex 3.1.1 Mediamos's Deed*

IX, with commercial registration No. 511356-16 on May 26th, 1999 and domiciled in the city of Cali. Tax Identification Number is 805017493-2 (CCC, 2015) [10].

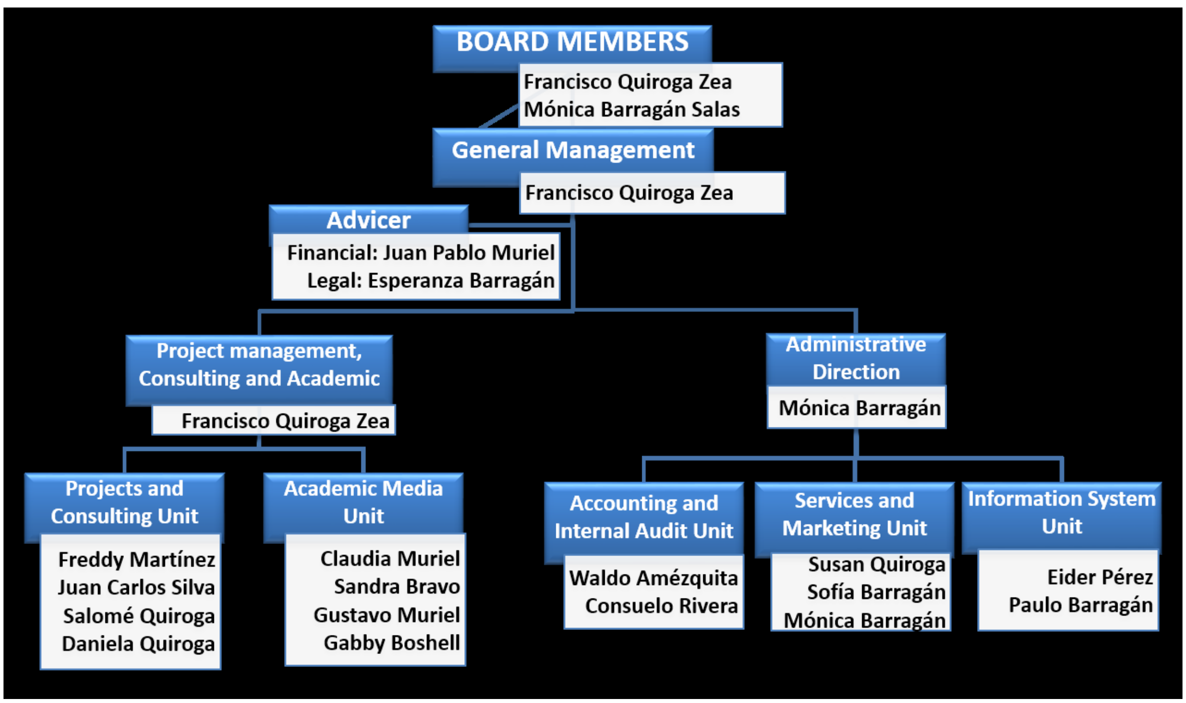
Its social objective is to develop environmental and educational activities, in areas of consultancy, research, development of environmental and productive projects, innovation and technology transfer, including in these structuring, development and marketing of projects that generate reductions of greenhouse gases (GHGs) under any standard of voluntary or compliance market, in particular projects of Reduction of Emissions from Degradation and Deforestation avoided under the REDD+ scheme.

In the implementation of its social objective, the company may be associated with other natural or legal persons performing the same or similar object or related directly or indirectly with it, and in general can celebrate all kinds of contracts suitable for achieving its social objetive.

Annex 3 contains MEDIAMOS F & M S.A.S. legal, statuary and organizational information.

The diagram below illustrates the organizational structure of MEDIAMOS F & M S.A.S.

Illustration 7. Organizational structure of MEDIAMOS F&M S.A.S.



Source: MEDIAMOS F&M S.A.S.

1.4 Other entities involved in the Project

There are not other entities involved in the REDD+ Project RIU-SM.

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[10] *Annex 3.1.2 Mediamos's Chamber of Commerce certificate*

1.5 Project start date

1.5.1 Readiness events of REDD + project RIU-SM

The following is a summary of the various events made before project start (January 1st, 2013) in which he was treated, study, investigate and socialize the proposed implementation of a REDD + project for Resguardo Indigenous Unified Forest Matavén RIU-SM. detailing; government entities of ACATISEMA, public entities and private entities involved in this process.

ANEX	DATE	PLACE	EVENT	ASSISTANTS	OBJECTIVES	ACTIVITIES
1.1.1	July 6th - 2012	Bogotá	Meeting Joint Commission	For ACATISEMA: Omar Augusto Briceño, General Secretary, Alejandro Camacho Ortiz Finance Coordinator For MEDIAMOS: Mónica Barragán: Legal Representative, Francisco Quiroga; Project Manager REDD+ RIU SM	To develop a REDD+ project in the Unified Indigenous Reservation jungle Mataven - RIU SM	- Establishing the Working Group to participate in the development of the project by the community. - Planning a Training Workshop (pre-consultation) made up of 16 members of the Coordination Committee, plus the indigenous Advisory, Fiscal Veedor and 3 Area Coordinators allocated for the project.
1.9.1.1	July 6th -2012	Bogotá	Signed Temporary Union Agreement	General secretary of ACTISEMA: Omar Briceño, Legal Representative of MEDIAMOS F&M; Mónica Barragán	To establish an agreement for the creation of temporary union between MEDIAMOS F & M and ACATISEMA for lend environmental services	- Signing the agreement with a maximum duration of 30 days. - Once the activities under this agreement were made, the parties proceeded immediately to establish a final contract between them.
1.1.2	July 22th - 2012	Inírida - Guainía	Meeting Joint Commission and ACATISEMA Coordinator Committee	Coordinator Committee ACATISEMA: Alexander López; General Coordinator, Omar Briceño; General Secretary, Alejandro Camacho; Finance Coordinator, Jorge Marín y José Wilmer Hernández; Ethnoeducation Coordinators, Jomari Melo and Jose Arsenio Gomez; Comprehensive Health Coordinators, Miguel Marin and Pedro Medina Roa; Coordinators Planning and the Environment, Noralba Garrido and Elizabeth Ponare; Plans Life Coordinators, Delcia Fuentes; Women Coordinator, Luis Carlos Catinay;	To present the basic outlines of a proposal for the design and development of a REDD+ project in the RIU SM	- Presenting the basic outlines of a proposal for the design and development of a REDD+ project.

ANEX	DATE	PLACE	EVENT	ASSISTANTS	OBJECTIVES	ACTIVITIES
				Human Rights Coordinator, Emiliano Orozco and Antonio Garcia Gaitan; Program and Project Coordinator, Rodolfo Rodríguez Chipiaje; Indigenous Advisory and six representatives from various sectors.		
1.9.1.2	July 22th - 2012	Puerto Inírida	Signing the Will Agreement of Will	Legal Representative of ACATISEMA, Alexander López and Legal Representative of MEDIAMOS; Mónica Barragán, Members of the Coordinator Committee ACATISEMA.	The agreement was signed for the establishment of a voluntary union between MEDIAMOS F & M and ACATISEMA for the provision of environmental services through a REDD+ project.	- Signing the agreement with the members the Coordinator Committee of the Association ACATISEMA including its legal representative.
1.1.3	July 24th - 2012	Inírida - Guainía	Meeting Joint Commission and ACATISEMA Coordinator Committee	Committee Coordinator ACATISEMA: Alexander López; General Coordinator general, Omar Briceño; General Secretary, Alejandro Camacho; Finance Coordinator, Jorge Marín y José Wilmer Hernández; Ethnoeducation Coordinators, Jomari Melo and Jose Arsenio Gomez; Comprehensive Health Coordinators, Miguel Marin and Pedro Medina Roa; Coordinators Planning and the Environment, Noralba Garrido and Elizabeth Ponare; Life Plans Coordinators, Delcia Fuentes; Women Coordinator, Luis Carlos Catinay; Human Rights Coordinator, Emiliano Orozco and Antonio Garcia Gaitan; Program and Project Coordinator, Rodolfo Rodríguez Chipiaje; Indigenous Advisory and six representatives from various sectors.	- Presentation of the proposal for the design and development of a REDD+ project in the RIU SM - To describe the boundaries and location of the zones with their respective sectors, the demographic composition of the communities and economic activities. Characterizing deforestation and degradation zones (type, agents and cause) - To identify possible measures to mitigate deforestation and forest degradation.	- Conducting a feasibility study (social, environmental and economic) of REDD+ project RIU SM - Creation of a Joint Commission between ACATISEMA and MEDIAMOS.

ANEX	DATE	PLACE	EVENT	ASSISTANTS	OBJECTIVES	ACTIVITIES
1.1.4	September 24th -2012	Sarrapia - Vichada	Meeting Joint Commission and Members of the Coordinator Committee ACATISEMA	Omar Briceño; General Secretary, Alejandro Camacho; Finance Coordinator, Juan Bautista Nariño; Ethnoeducation Coordinators, Jomari Melo; Comprehensive Health Coordinators, Camilo Pulido Source; Coordinators Planning and the Environment, Noralba Garrido and Elizabeth Ponare; Life Plans Coordinator, Delcia Fuentes; Woman Coordinator, Vilio Moreno Gonzalez and Antonio Garcia Gaitan; Program and Project Coordinator, Rodolfo Rodríguez Chipiaje; Youth Coordinator, Hugo Chequemarca; Indigenous Advisory, Luis Emilio Gaitan (E); Fiscal Overseer and four local knowing, local teachers, local students, women and children, Missionaries of Mother Laura and Director of the Foundation Purunã.	Presentation of the progress of the design and development of a REDD+ project RIU-SM	Implementing a necessary training workshop for the Sarrapia community and representatives of other areas to publicize the proposed implementation of a REDD+ project RIU -SM
1.4.3.1	September 25th -2012	Inírida - Guainía	Meeting Joint Commission	Joint Commission Omar Briceño; General Secretary, Alejandro Camacho; Finance Coordinator, Antonio García Gaitán; Program and Project Coordinator, Hugo Chequemarca; Indigenous Advisory. Monica Barragan; MEDIAMOS Manager., Francisco Quiroga; Project Manager	To perform a program with the proposed activities during the meeting in the indigenous community of Sarrapia during September 23rd and 24th - 2012	- Appointing the position of Director to the REDD+ project to the engineer Francisco Quiroga for a 5 years period. From this date, this position will be gradually giving away under the conditions of professional skills of the ACATISEMA members. - Administrative management and audit of the resources to achieve the project will be conducted by the administrator, Monica Barragan, for a 5 years period. From this date, it will gradually giving away under the conditions of professional skills of the ACATISEMA members.
1.5.1	October 7th - 2012	Caño Bocon Cumaral Yuri Giro Morocoto Buenvista	Zonal meeting	Cabildos: Efrén Parra Rodríguez, Jairo Camacho Pérez, Jairo Rosales, Gilberto pinto, Daniel González. Teachers, members of the Coordinator Committee, leaders, women, youth and sector communities.	To develop the training process proposed by the Coordinator Committee to design and formulate the REDD+ RIU-SM project.	- Socializing initiative REDD+ project and the stages of training on the proposed design and formulation of the project - Socializing the agreement signed between ACATISEMA and MEDIAMOS.

ANEX	DATE	PLACE	EVENT	ASSISTANTS	OBJECTIVES	ACTIVITIES
1.5.2	October 10th - 2012	Barranquito laguna Colorada	Zonal meeting	Cabildos: Efrén Parra Rodríguez, Jairo Camacho Pérez, Jairo Rosales, Gilberto pinto, Daniel González. Teachers, members of the Coordinator Committee, leaders, women, youth and sector communities.	To develop the training process proposed by the Coordinator Committee to design and formulate the REDD+ RIU-SM project.	- Socializing initiative REDD+ project and the stages of training on the proposed design and formulation of the project - Socializing the agreement signed between ACATISEMA and MEDIAMOS.
1.5.3	October 24th - 2012	Sector Caño Cawasi	Zonal meeting	Cabildos: Efrén Parra Rodríguez, Jairo Camacho Pérez, Jairo Rosales, Gilberto pinto, Daniel González. Teachers, members of the Coordinator Committee, leaders, women, youth and sector communities.	To develop the training process proposed by the Coordinator Committee to design and formulate the REDD+ RIU-SM project.	- Socializing initiative REDD+ project and the stages of training on the proposed design and formulation of the project - Socializing the agreement signed between ACATISEMA and MEDIAMOS.
1.4.4.1	November 22nd - 2012	Bogotá	Meeting Joint Commission with representatives and senators of Congress of the Republic	Joint Commission General secretary ACATISEMA Omar Briceño, Finance Coordinator: Alejandro Camacho, Legal representative MEDIAMOS: Mónica Barragán, project manager REDD+ RIU-SM: Francisco Quiroga, Senator Mauricio Ospina - Congress of the Republican, President GLOBE international	To establish a relationship with Senator Mauricio Ospina (President of GLOBE International Colombia), representatives and senators of Congress of the Republic	- Visiting the Congress of the Republic and presenting the REDD+ project RIU SM to senators and representatives to the Chamber. - Establishing a relationship with Senator Mauricio Ospina, President of GLOBE International Colombia, to publicize the REDD+ project RIU SM..
1.4.4.1	November 22nd – 2012	Bogotá	Meeting Joint commission and officials IDEAM	Joint Commission General Secretary ACATISEMA Omar Briceño, Finance Coordinator: Alejandro Camacho, Legal Representative MEDIAMOS: Mónica Barragán, Project Manager REDD+ RIU-SM: Francisco Quiroga , for the IDEAM: engineer Ederson Cabrera and his assistant Natalia Córdoba	To conduct a meeting with IDEAM a technical group to review various aspects of the VCS standard, in which the IDEAM can give us information on the particular application to a REDD+ project.	- IDEAM engineers demonstrated the importance of achieving a joint between IDEAM and local and regional projects that allow an adequate supplementation. From their point of view, they expressed their willingness to perform this type of work with the project REDD+ project RIU SM - The articulation between IDEAM and developers of REDD+ project RIU SM, would be of great benefit because communities are the best known of the territory and would allow clarifications on the ground. - Offering by IDEAM for the use of its software and performing verifications if necessary by professionals of the REDD+ project

ANEX	DATE	PLACE	EVENT	ASSISTANTS	OBJECTIVES	ACTIVITIES
1.4.4.1	November 22nd - 2012	Bogotá	Meeting Joint Commission and Representative of the Ministry of Environment and Territorial Development	Joint Commission: General Secretary ACATISEMA Omar Briceño, Finance Coordinator: Alejandro Camacho, Legal Representative MEDIAMOS: Mónica Barragán, Project Manager REDD+ RIU-SM: Francisco Quiroga, Martín Pérez, REDD+ projects the Ministry of Environment and Sustainable Development.	To present the REDD+ project RIU SM to the Ministry of Environment and Sustainable Development, and to participate in various training meetings regarding this theme in this Ministry.	- Meeting with the representative of the Ministry of Environment to present the REDD+ project SM RIU
1.4.4.1	November 22nd - 2012	Bogotá	Meeting Joint Commission and Representatives of the Ministry of Interior.	Joint Commission General Secretary ACATISEMA Omar Briceño, Finance Coordinator: Alejandro Camacho, Legal Representative MEDIAMOS: Mónica Barragán, Project Manager REDD+ RIU-SM: Francisco Quiroga, Ministry of Interior: Rafael Torres, Director prior consultation and advisor el Dr. Yeison Villalba.	To check with the Ministry of Interior the feasibility of conducting a REDD+ project RIU SM	- Starting certification process Presence of Ethnic Groups in Mataven Jungle. - Meeting with the Director of the National Environmental Licensing Authority (ANLA) to know if there is need for environmental license in the development of a REDD+ project
1.4.6	December 1st - 2012	Inírida - Guainía	Meeting Joint Commission	Omar Augusto Briceño - General Secretary ACATISEMA. Mónica Barragán - Legal Representative MEDIAMOS	To define initiation date of the activities of the REDD+ project RIU-SM	- Defining proposed activities according to the Matrix of Logic Structure of the project and according to plan land management and forest shelter, designed under this agreement.
1.4.7	December 3rd - 2012	Inírida - Guainía	Meeting Joint Commissionrd of Indigenous Communitty	General secretary: Omar Briceño, Finance Coordinator: Alejandro Camacho, Indigenous Advisory, Hugo Chequemarca. Legal Representative MEDIAMOS: Mónica Barragán, Project Manager: Francisco Quiroga.	To prepare training workshop to be held on the RIU-SM	- Establishing the themes for the workshop. - Organizing the logistics and movement of participants.
1.1.5	December 4th - 2012	Inírida - Guainía	Meeting Joint Commission, Members of the Coordinator Committee y Cabildos.	Board of Indigenous Community - Committee Coordinator	To present progress on the designed and development of REDD+ project RIU-SM.	- Presenting work and achievements - Approving the continuity of the agreement between ACATISEMA and MEDIAMOS

Source: Annex 1 of PD

1.5.2 Start date

The project start date was January 1st, 2013.

Project activities began on January 1st, 2013, with the implementation of the Plan of lands where these are to reduce deforestation and the consequently generation of greenhouse gases.

This initiation of activities was agreed by ACATISEMA and MEDIAMOS on December 1st, 2012, according to the signed agreement of July 22nd, 2012 [11], according to act accepted by Omar Briceño and Monica Barragan, legal representatives of the two entities in the city of Puerto Inirida. This minutes is attached (Annex 1.4.6).

On January 1st, 2013 the following activities were launched:

- Activity A1.1: To monitor and to control the conservation and recovery of forests and lands of the RIU-SM, which corresponds to the strategic elements 1, 2 and 3 of the Sustainable Land and Forest Management Plan (Annex 4)
- Activity A1.2: To design and to implement a system of communication and information at the RIU-SM, which corresponds to all the strategic elements of the Lands Plan.
- Activity A1.3: To design and to implement a system of governance for the development and sustainability of ACATISEMA Association. Corresponding to all the strategic elements of the Lands Plan.
- Activity A2.1: To establish and to develop a Familiar Agrifood Production Units System (FAPUS), corresponding to the strategic element number 4 of the Lands Plan (Annex 5- FAPUS).
- Activity A2.2: To design and to develop a training and educational plan to the administration and managing of RIU-SM natural resources, which corresponds to all the strategic elements of the Lands Plan.

1.5.3 Historical reference period (hrp) [12]

Start: 2001

End: 2011

[11] *Annex 1.4.6 Minutes for project start*
[12] *Annex 10 VMD0007, PART 1 Definition of boundaries, 1.2 temporal boundaries*

1.6 Project crediting period

REDD Project crediting period [13]

Start: January 1st, 2013

End: December 31st, 2042

Total number of years: 30 years

Communication addressed by the Board of the Association and the Board of Councils of ACATISEMA, about life and the crediting period of the project. *(Annex 2.1.13)*

"The Directve Association Board and the Board of Councils of ACATISEMA communicate to all members of different ethnic groups, regions, sectors and communities of the reservation that according to the design of the project with the company MEDIAMOS and knowing the different socialization and training workshops, the project cycle and accreditation period is 30 years.

The various documents and in particular the PDD (Project Description Documen) shall record this joint decision by ACATISEMA and MEDIAMOS, which is also entered in the Strategic Partnership Agreement for the Protection, Conservation and Recovery of Natural Forest in the Unified Indigenous Reservation - Matavén jungle.

The different documents and in particular the PDD (Project Description Document) shall record this joint decision by ACATISEMA and MEDIAMOS, which is also included in the Strategic Partnership Agreement for the Protection, Conservation and Recovery of Natural Forest Unified Indigenous Reservation - Matavén Jungle.

For the record, this document is signed by the General Coordinator of ACATISEMA,

Omar Augusto Briceño Chipiaje

ID 18.262.305

Date at which the Project baseline will be revised

Each 10 years

Duration of Monitoring Period

The first period will be annual, and the following periods will be bi-annuals

The first period annual: 2013

The second period bi-annual: 2014-2015

The third period bi-annual: 2016-2017

And so successively.

Monitoring start date: 1st January 2013”

[13] *Annex 1.4.6. Minutes of Start Project*

1.7 Project scale and estimated GHG emission reductions or removals

Table 1. Project scale

Project Scale	
Project	
Large Project	**X**

Source: (VCS, 2013) VCS Standar, Requirements Document, 8 October 2013, version 3.4. 3. Project Requirements, 3.9 Project scale: 2: Large Projects: Greater than 300.000 tonnes of CO_2e per year (see next Table 2)

This is a large project, because its estimated average annual GHG emission reductions or removals are greater than 300,000 tonnes of CO_2e per year (average of net emmisions reductions of 3,622,352 tons of CO_2/year)

The following table supports this definition.

Table 2. Estimated GHG emission reductions or removals (t CO_2e)

Year	**Total net GHG emission reductions of the REDD project activity up to year t*** NER_{REDD+}
Year 1 (2013)	3,840,053
Year 2 (2014)	3,549,920
Year 3 (2015)	4,126,550
Year 4 (2016)	4,157,144
Year 5 (2017)	2,824,977
Year 6 (2018)	3,394,234
Year 7 (2019)	4,967,059
Year 8 (2020)	4,465,986
Year 9 (2021)	3,790,794
Year 10 (2022)	5,473,502
Year 11 (2023)	5,030,098
Year 12 (2024)	4,117,587
Year 13 (2025)	2,714,125
Year 14 (2026)	2,506,608
Year 15 (2027)	3,522,386
Year 16 (2028)	1,965,876
Year 17 (2029)	826,797
Year 18 (2030)	726,143
Year 19 (2031)	3,641,866
Year 20 (2032)	4,475,631
Year 21 (2033)	3,338,518
Year 22 (2034)	4,914,685
Year 23 (2035)	2,465,166
Year 24 (2036)	2,715,367
Year 25 (2037)	3,157,097
Year 26 (2038)	5,049,569
Year 27 (2039)	5,371,191
Year 28 (2040)	5,241,170
Year 29 (2041)	4,740,967
Year 30 (2042)	1,559,494
Total estimated	**108,670,562**
Total number of crediting years	**30**
Annual Average	**3,622,352**

Source: Annex 9 VM0007 - REDD-MF, 8.4 Summary of GHG emission reduction and/or removals, 8.4.2 REDD, Equation 3, Table 10.

The total estimated of emission reductions of REDD+ RIU-SM Project in the 30 years period is **140,487,762** tonnes of equivalent CO_2 (**t CO_2e**) in the baseline scenario during the lifetime of the project (30 years) (with an average of annual emission of **4,682,925** t CO_2)[14]. Project emissions are **21,876,151** t CO_2e (with an annual average of **729,205** t CO_2)[15]; shifting leakage emissions due to the project activities are **9,941,049** t CO_2e (with an annual average of **331,368** t CO_2[16]) consisting of the addition of emissions within the leakage belt in the baseline scenario (9,054,489 t CO_2e)[17] and emissions outside the leakage belt in the baseline scenario (886,560 tCO_2e)[18].

The net total emission reduction discounting Project emissions and leakage is **108,670,562** t CO_2e (with an average of **3,622,352** t CO_2, as shown in the above table) [19]

The total net of GHG reductions for project activities adjusted for uncertainty in the baseline scenario is equal to the net total emission reduction of the Project, which suggests uncertainty to obtain a cumulative **8.4%[20],** with a probability of **95%**, which is below **15%** of defined in the standard.

The value of discount credits to be deposited into the buffer is **20,163,974** t CO_2e, with an annual average of **672,132** t CO_2[21].

The estimated total number of VCUs in the lifetime of the project is **83,578,228**, with an annual average of **2,785,941** and for the first crediting baseline period (during its first 10 years) have 3million net / year VCUs [22].

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[14] *Annex 9 VM0007 - REDD-MF, 8. Quantification of GHG emission reductions and removals, 8.4 Summary of GHG emission reduction and/or removals, 8.4.2 REDD, Equation 3, Table 10*

[15] *Annex 11 VMD0015 – M-MON, 5 Procedures, Equation 1, Table 1*

[16] *Annex 12 VMD0010 – LK-ASU, 5 Procedures, 5.7 Step 7: Estimation of total leakage due to the displacement of unplanned deforestation, Equation 16, Table 16*

[17] *Annex 12 VMD0010 – LK-ASU, 5 Procedures, 5.3 Step 3: Estimation of unplanned deforestation displaced from the Project Area to the Leakage Belt, 5.3.1 Ex ante assessment Equation 1, Table 7*

[18] *Annex 12 VMD0010 – LK-ASU, 5 Procedures, 5.4 Step 4: Estimation of unplanned deforestation displaced from the Project Area to outside the Leakage Belt, 5.4.5 Estimation of leakage outside the Leakage Belt, as a proportion of Baseline deforestation, Equation 6, Table 11*

[19] *Annex 9 VM0007 - REDD-MF, 8. Quantification of GHG emission reductions and removals, 8.4 Summary of GHG emission reduction and/or removals, 8.4.1 General, Equation 1 , Table 8*

[20] *Annex 16 VMD0017 – X-UNC, 5 Procedures, 5.1 Part 1: Uncertainty in REDD Baseline estimates, 5.1.2 Step 2: Assess uncertainty of emissions and removals in Project Area in Baseline scenario, Equation 6* $Uncertainty_{REDD\_BSL,t}$ *= 8,36%*

[21] *Annex 9 VM0007 - REDD-MF, 8. Quantification of GHG emission reductions and removals, 8.4 Summary of GHG emission reduction and/or removals, 8.4.3 Calculation of VCS buffer, Equation 7, Table 12*

[22] *Annex 9 VM0007 - REDD-MF, 8. Quantification of GHG emission reductions and removals, 8.4 Summary of GHG emission reduction and/or removals, 8.4.5 Calculation of Verified Carbon Units, Equation 13, Table 14*

Illustration 8. Guaviare river

Source: REDD+ project RIU-SM

1.8 Description of the Project activity

The project is not located inside a jurisdictional REDD program.

The proposed project activities were derived from the analysis of the problem. The “Diagnosis of the problem” and the diagram "Problem Tree" presented on section 1.10.10.

In solving this problem the topics to address with this project, respond to the needs and interests of the indigenous communities of Mataven jungle, while being part of the priority identified by the Government for this area. It aims to manage the lands and forests of this region, establishing measures to reduce vulnerability to external agents, to set self-sustaining production systems and to manage a funding mechanism.

This alternative solution is justified because it requires an integration of actors, inputs and resources. It is a forest innovation to adapt a forest management plan with new approaches, processes and practices to achieve adequate economic, social and environmental sustainability.

Also it is important to note that is necesary the positioning of ecosystem services as an alternative source of services and management of natural resources that enable communities to find complementary and viable alternatives to improve their quality of life.

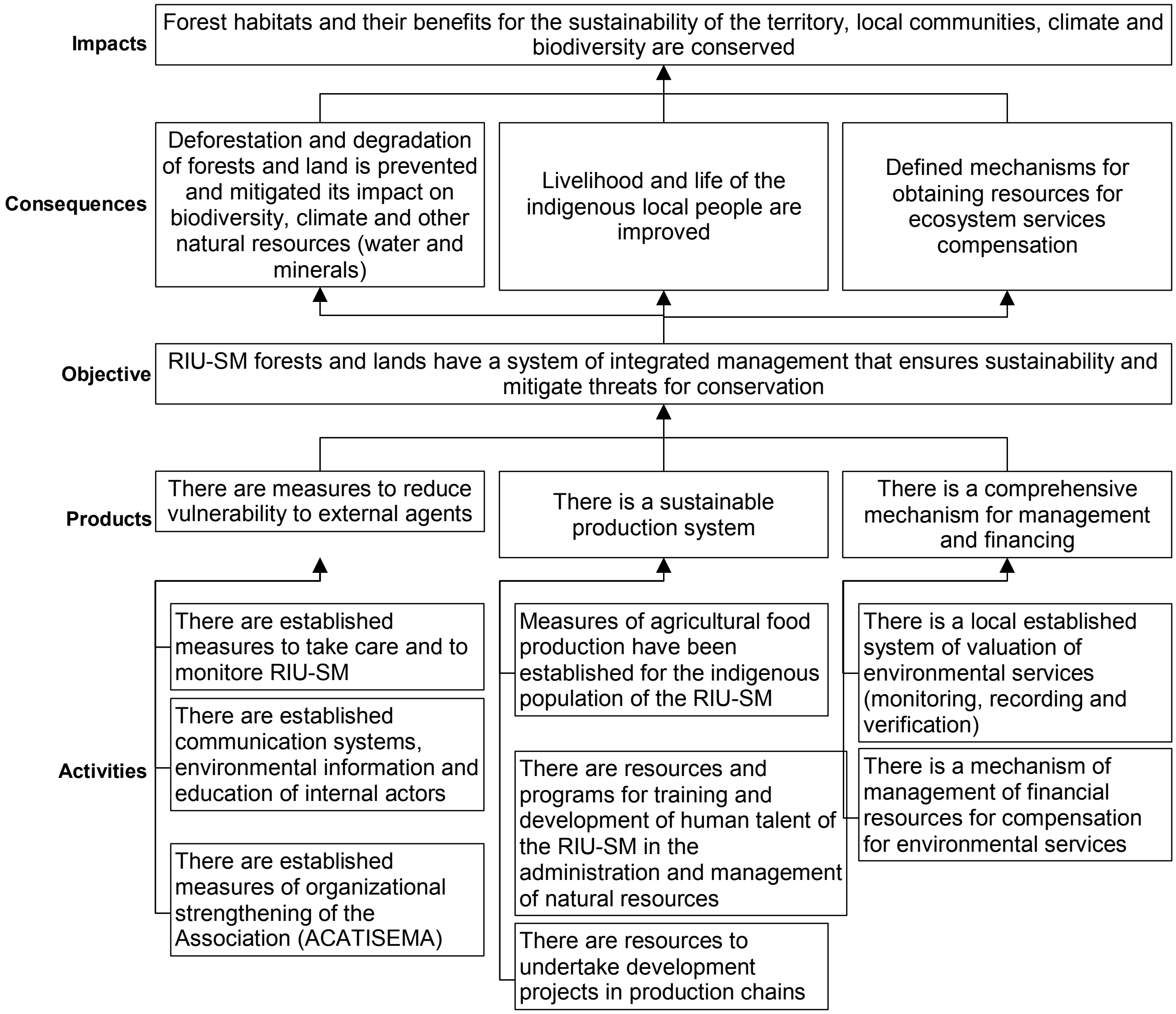
It is essential to overcome the implementation of partial actions (scattered in time, resources and space) unable to achieve sufficient impacts to mitigate the consequences.

The statement of Resguardo Indígena Unificado – Selva de Matavén constitutes not only a response to the right of indigenous groups to own their traditional lands, right stated in the Constitution, but also with the aim of ensuring the protection and timely conservation of this territory of the greater biodiversity in the region. The Reservation can and has contributed to the protection of biodiversity and its resources, for what is needed those indigenous communities and authorities have the technical and legal instruments and necessary funding mechanisms to achieve it.

The central strategy that integrates the activities carried out in the Project Plan is the sustainable management of land and forests, as described in Annex 4.

Based on the problem tree presented on section 1.10, the following objective´s tree was defined:

Illustration 9. Objectives tree



Source: REDD+ project RIU-SM

Following the Matriz of Logic Structure (MLS) of REDD+ project RIU-SM ispresented, acording with the management plan (Annex 4) and containing specific objectives and products with their own indicators, means of verification and assumptions.

Matrix of Logic Structure (MLS)

Project components	Indicators	Means of Verification	Assumptions
Development objective To contribute to sustainable environmental development of the Colombian Orinoco region through conservation and restoration of forest habitats and their eco-systemic services as a factor for the sustainability of the territory, local communities, climate and biodiversity.	1) By 2018 RIU-SM forests and lands are managed sustainably with a plan that meets national and international standards ensuring the conservation of forest biomass and soil carbon, at least 1.1 million hectares. 2) By 2018 deforestation and degradation at the RIU-SM has been stopped, at least 90% compared to the deforestation of the period from 2001 to 2011. 3) By 2018 the 250 communities of the RIU-SM produce 7,000 tons of agricultural food needed for food security. 4) By 2018 at least 1,200 RIU-SM young people (between 15 to 26 years old) have attended and have been certified in technical and technological programs related to the sustainable management plan. 5) By 2020 the sustainable management of land and forests in the Colombian Orinoco has spread to at least 2 million hectares.	1) Annual reports of progress and partial results of the comprehensive sustainable management of forests and Lands Plan of the RIU-SM. 2) Annual monitoring reports of deforestation and degradation. 3) Reports on annual amounts of agricultural food produced in the sector and area. 4) List and number of participants trained in the development of the Project by sector and area. 5) List and number of students enrolled and certified in technical and technological programs related to the sustainable management plan and reports of academic results. 6) Records of meetings, seminars and events in the development of the Project. 7) Audiovisual recording media.	• Governmental changes do not affect the development of the Project. • The key development strategy of environmental sustainability projects in Colombia continues, as defined by the National Council for Economic and Social Policy through the document CONPES 3700 (2011). • The institutional and legal framework on indigenous communities is respected.

Project components	Indicators	Means of Verification	Assumptions
Specific objective To develop a participative process to achieve the establishment of an integrated management system of forests and lands of the RIU-SM, to ensure its sustainability and mitigate threats to their conservation.	At the end of 2016: 1) Integrated sustainable system of forest and land management of RIU-SM established through the direct involvement of 250 communities of the Reservation, based on its sectorial and zonal organization (1,465,786 hectares of primary forest, 11,329 hectares of secondary forest; 30,707 hectares of heterogeneous agricultural areas and pastures, 318,314 hectares of savannah). 2) At least 80% of the captains, 20% of women and 25% of young of the Reservation have participated in establishing the system of integral-sustainable management of forests and lands of the RIU-SM. 3) The Coordination Committee, the Board of Councils and Zonel Coordinators of ACATISEMA have increased their capacity for management and organizational governance in order to conservate forests and lands in the Reservation. 4) It has increased by at least 1,500 tonnes, for sustainable food production and food security of the inhabitants of the RIU-SM. 5) The 250 communities of the 17 sectors and 5 zones have improved their communication. 6) There shall be no intimidating events for the people of the Reservation. 7) At least 80% of users express satisfaction about participating in the project	1) Progress reports of establishment of sustainable integrated management plan of forests and lands of the RIU-SM. 2) List of communities and captains participants. 3) Reports on the results of surveillance, control and monitoring. 4) Management Reports of Coordinator Committee, Board of Councils and Zonel Coordinators. 5) Reports on food production by sector and area. 7) Reports on the results and evaluation of the communication system. 7) Reports on the management of REDD+ Project. 8) Records of meetings and events. 9) Audiovisual records.	• Captains, Board of Councils, Coordination Committee and Zonel Coordinators undertake and participate in the development of the Project. • National institutional support for the development of the project is maintained. • The autonomy of indigenous peoples are respected in accordance with the legal framework.

Project components	Indicators	Means of Verification	Assumptions
Product 1 Measures to reduce the vulnerability of the RIU-SM generated by external factors, designed and implemented.	At the end of 2016: 1) 220 captains, 5 zone coordinators and 250 members of the Indigenous Reservation applied environmental knowledge in the surveillance, control and monitoring of the RIU-SM. 2) A system of communication and information for the 5 areas of the RIU-SM has been established and implemented. 3) 17 members of the Coordination Committee, 17 Councils, 5 zonal coordinators and 220 captains of ACATISEMA Association apply knowledge in the statutory and organizational aspects.	1) Reports on results, monitoring and evaluation of the surveillance and control of the Reservation. 2) Reports on results, monitoring and evaluation of communication and information system of the RIU-SM. 3) Reports on results, monitoring and evaluation of the established governance system. 4) List of participants in the different events. 5) Records of meetings and events. 6) Audiovisual records.	• External actors involved in Project participate in the implementation through an appropriate institutional coordination. • External actors do not interfere with the stability of the ACATISEMA governance.
Product 2 Sustainable production system implemented.	At the end of 2016: 1) There is an established Family Agrifood Production Units System (FAPUS) to produce at least 4,000 tons of agricultural / food per year. 2) 800 graduated high school students have started their training and educational programs for the integral-sustainable management of forests and lands of the RIU-SM. 3) Representatives of the 250 communities of the 16 sectors and 5 zones apply environmental knowledge in the design Project for the participation of 2,500 families in the Food Security Network Program (RESA) of the Departamento para la Prosperidad Social (DPS).	1) Progress reports on the results of the establishment of the Family Agrifood Production Units System (FAPUS) 2) List and number of producers participating in the Family Agrifood Production Units System (FAPUS) by sector and region. 3) List and number of plots of land and hectares established in Family Agrifood Production Units System (FAPUS) by sector and region. 4) Total of agricultural products harvested by sector and region. 5) List of graduated high school students enrolled in training and educational programs.	• Community leaders, by the statutory entities of the organization, resolve internal conflicts that hinder the development of the Project and maintain work disposition integrated and concerted. • The unit of local communities and their willingness to work together manteins integrated and concerted.

Project components	Indicators	Means of Verification	Assumptions
		6) List of the representatives of the 250 communities participating in the project design for the participation of 2,500 families in the Food Security Network Program (RESA) of the Departamento para la Prosperidad Social (DPS). 7) List and number of beneficiary families enrolled in the Program for Food Security Network (RESA) of the Departamento para la Prosperidad Social (DPS). 8) Records of meetings and events. 9) Audiovisual records.	
Product 3 A mechanism for valuation and compensation for environmental services generated in the RIU-SM, validated and verified.	At the end of 2016 1) It has been designed and validated a mechanism for valuation and compensation for environmental services according with international standards. 2) Project has been verified and forest compensation units have been registered to contribute avoiding deforestation. 3) It has managed the compensation for environmental services for avoided deforestation.	1) Project Design Document (PDD). 2) Report of established monitoring system. 3) Reports on the results of the validation of REDD+ Project. 4) Reporting of results of monitoring, verification and registration of forest compensation units. 5) Records of meetings and events. 6) Audiovisual records.	• It maintains and strengthens the strategic partnership between ACATISEMA and MEDIAMOS F & M S.A.S.

Bottlenecks in the forestry sector that Project helps to solve (regional and national)

Bottlenecks, in regional and national levels, are related to:

- The ability to implement projects that protect, preserve and recover the forests and land and others associated to forest carbon through the adoption of sustainable management plans of forests with new approaches, processes and practices, in order to increase the value added of eco-systemic services and forest products.
- The valuation of forest ecosystem services and products, focused on the integration of economic benefits and costs in the financial analysis of forest management and the inclusion of more products and services from the forest.

  The availability and improvement of basic and thematic information, particularly relating to national and international markets for environmental services, which facilitates investment in forestry sector.

Objectives

Development objective and impact indicators

To contribute to sustainable environmental development of the Colombian Orinoco region through conservation and restoration of forest habitats and their eco-systemic services as a factor for the sustainability of the territory, local communities, climate and biodiversity. According to the problem tree the following objectives tree defined.

Impact indicators

1. By 2018 RIU-SM forests and lands are managed sustainably with a plan that meets national and international standards ensuring the conservation of forest biomass and soil carbon, at least 1.1 million hectares.
2. By 2018 deforestation and degradation at the RIU-SM has been stopped, at least 90% compared to the deforestation of the period from 2001 to 2011.
3. By 2018 the 250 communities of the RIU-SM produce 7,000 tons of agricultural food needed for food security.
4. By 2018 at least 1,200 RIU-SM young people (between 15 to 26 years old) have attended and have been certified in technical and technological programs related to the sustainable management plan.
5. By 2020 the sustainable management of land and forests in the Colombian Orinoco has spread to at least 2 million hectares.

Means of Verification

1) Annual reports of progress and partial results of the comprehensive sustainable management of forests and Lands Plan of the RIU-SM.
2) Annual monitoring reports of deforestation and degradation.
3) Reports on annual amounts of agricultural food produced in the sector and area.

4) List and number of participants trained in the development of the Project by sector and area.
5) List and number of students enrolled and certified in technical and technological programs related to the sustainable management plan and reports of academic results.
6) Records of meetings, seminars and events in the development of the Project.
7) Audiovisual recording media.

Assumptions

- Governmental changes do not affect the development of the Project.
- The key development strategy of environmental sustainability projects in Colombia continues, as defined by the National Council for Economic and Social Policy through the document CONPES 3700 (2011).
- The institutional and legal framework on indigenous communities is respected.

Specific objective and impact indicators

To develop a participative process to achieve the establishment of an integrated management system of forests and lands of the RIU-SM, to ensure its sustainability and mitigate threats to their conservation.

Impact indicators

At the end of 2016:

1) Integrated sustainable system of forest and land management of RIU-SM established through the direct involvement of 250 communities of the Reservation, based on its sectorial and zonal organization (1,465,786 hectares of primary forest, 11,329 hectares of secondary forest ; 30,707 hectares of heterogeneous agricultural areas and pastures, 318,314 hectares of savannah).
2) At least 80% of the captains, 20% of women and 25% of young of the Reservation have participated in establishing the system of integral-sustainable management of forests and lands of the RIU-SM.
3) The Coordination Committee, the Board of Councils and Zonel Coordinators of ACATISEMA have increased their capacity for management and organizational governance in order to conserve forests and lands in the Reservation.
4) It has increased by at least 1,500 tonnes, for sustainable food production and food security of the inhabitants of the RIU-SM.
5) The 250 communities of the 17 sectors and 5 zones have improved their communication.
6) There shall be no intimidating events for the people of the Reservation.
7) At least 80% of users express satisfaction about participating in the project.

Means of Verification

1) Progress reports of establishment of sustainable integrated management plan of forests and lands of the RIU-SM.
2) List of communities and captains participants.
3) Reports on the results of surveillance, control and monitoring.

4) Management Reports of Coordinator Committee, Board of Councils and Zonel Coordinators.

5) Reports on food production by sector and area.

7) Reports on the results and evaluation of the communication system.

7) Reports on the management of REDD+ Project.

8) Records of meetings and events.

9) Audiovisual records.

Illustration 10. Community Cajaro

Source: REDD+ project RIU-SM

Assumptions

- Captains, Board of Councils, Coordination Committee and Zonel Coordinators undertake and participate in the development of the Project.
- National institutional support for the development of the project is maintained.
- The autonomy of indigenous peoples are respected in accordance with the legal framework.

Description of Project interventions

Products and activities

Products

Product 1: Measures to reduce the vulnerability of the RIU-SM generated by external factors, designed and implemented.

Impact indicators

At the end of 2016:

1) 220 captains, 5 zone coordinators and 250 members of the Indigenous Reservation applied environmental knowledge in the surveillance, control and monitoring of the RIU-SM.

2) A system of communication and information for the 5 areas of the RIU-SM has been established and implemented.

3) 17 members of the Coordination Committee, 17 Councils, 5 zonal coordinators and 220 captains of ACATISEMA Association apply knowledge in the statutory and organizational aspects.

Means of Verification

1) Reports on results, monitoring and evaluation of the surveillance and control of the Reservation.

2) Reports on results, monitoring and evaluation of communication and information system of the RIU-SM.

3) Reports on results, monitoring and evaluation of the established governance system.

4) List of participants in the different events.

5) Records of meetings and events.

6) Audiovisual records.

Assumptions

- External actors involved in Project participate in the implementation through an appropriate institutional coordination.
- External actors do not interfere with the stability of the ACATISEMA governance.

Product 2: Sustainable production system implemented.

Impact indicators

At the end of 2016:

1) There is an established Family Agrifood Production Units System (FAPUS) to produce at least 4,000 tons of agricultural / food per year.

2) Representatives of the 250 communities of the 16 sectors and 5 zones apply environmental knowledge in the design Project for the participation of 2,500 families in the Food Security Network Program (RESA) of the Departamento para la Prosperidad Social (DPS).

At the end of 2016:

1) 800 graduated high school students have started their training and educational programs for the integral-sustainable management of forests and lands of the RIU-SM.

Means of Verification

1) Progress reports on the results of the establishment of the Family Agrifood Production Units System (FAPUS)
2) List and number of producers participating in the Family Agrifood Production Units System (FAPUS) by sector and region.
3) List and number of plots of land and hectares established in Family Agrifood Production Units System (FAPUS) by sector and region.
4) Total of agricultural products harvested by sector and region.
5) List of graduated high school students enrolled in training and educational programs.
6) List of the representatives of the 250 communities participating in the project design for the participation of 2,500 families in the Food Security Network Program (RESA) of the Departamento para la Prosperidad Social (DPS).
7) List and number of beneficiary families enrolled in the Program for Food Security Network (RESA) of the Departamento para la Prosperidad Social (DPS).
8) Records of meetings and events.
9) Audiovisual records.

Assumptions

- Community leaders, by the statutory entities of the organization, resolve internal conflicts that hinder the development of the Project and maintain work disposition integrated and concerted.
- The unit of local communities and their willingness to work together manteins integrated and concerted.

Product 3: A mechanism for valuation and compensation for environmental services generated in the RIU-SM, validated and verified.

Impact indicators

At the end of 2016:

1) It has been designed and validated a mechanism for valuation and compensation for environmental services according with international standards.
2) Project has been verified and forest compensation units have been registered to contribute avoiding deforestation.

3) It has managed the compensation for environmental services for avoided deforestation.

Means of Verification

1) Project Design Document (PDD).

2) Report of established monitoring system.

3) Reports on the results of the validation of REDD+ Project.

4) Reporting of results of monitoring, verification and registration of forest compensation units.

5) Records of meetings and events.

6) Audiovisual records.

Assumptions

It maintains and strengthens the strategic partnership between ACATISEMA and MEDIAMOS F & M S.A.S.

Activities

Activities for products with corresponding tasks are presented below. These activities and tasks that are, ultimately, seek to avoid deforestation threats in influence area of the Project Area (PA) where sustainable management plan of RIU - SM land and forests will be implemented.

Product 1: Measures to reduce the vulnerability of the RIU-SM generated by external factors, designed and implemented.

Activity A1.1: To monitor and control the conservation and recovery of forests and lands of the RIU-SM.

Tasks Activity

- Design specific plan
- Divulgation plan
- Training of guards and captains indigenous
- Implementation of the plan
- Monitoring plan
- Systematization of monitoring and evaluation results
- Divulgation of monitoring and evaluation results.

This activity constitutes an important axis of the Project and is an essentially activity of conservation and sustainable management of land, forests and other natural resources of the territory, avoiding deforestation and degradation in all sectors of the RIU-SM.

Activity A1.2: To develop and to implement a system of communication and information at the RIU-SM.

Tasks Activity

• Design specific plan

• Divulgation plan

• Training of community leaders

• Implementation of the plan

• Monitoring plan

• Systematization of monitoring and evaluation results

• Divulgation of monitoring and evaluation results.

Activity A1.3: To develop and to implement a governance for development and sustainability system of ACATISEMA Association.

Tasks Activity

• System design and three-year plans

• Divulgation of the system and the three-year plans

• Training of members of the Coordinator, Board of Councils and Zonel Coordinators Committee

• Implementation of the system and the three-year plans

• Monitoring system and three-year plans

• Systematization of monitoring and evaluation results

• Divulgation of monitoring and evaluation results.

This activity aims to strengthen the governance and organization of the Association, seeking also generate other forms of organization compatible with ACATISEMA such as cooperatives of production and services.

Product 2: Implemented sustainable production system.

Activity A2.1: To establish and to develop a Family Agrifood Production Units System (FAPUS)

Tasks Activity

• FAPUS design, the three-year plans and the Project for the participation of 2,500 families in the Food Security Network Program (RESA) of the Department for Social Prosperity (DPS)

• Dissemination of FAPUS, the three-year plans and the Food Security Network Program (RESA) of the Department for Social Prosperity (DPS)

• Training of captains

• Implementation of FAPUS and three-year plans

- Monitoring FAPUS and three-year plans
- Systematization of monitoring and evaluation results
- Divulgation of monitoring and evaluation results.

This activity aims to ensure food production for food security, implemented in plots of land already deforested.

In annex “4.1 sustainable management plan for land and forest” was explained:

> *“Strategic Element 4: Implement actions for food security of communities in Heterogeneous Agricultural Areas (HAA) y Grasslandes (known in the Indigenous Reserve as "conucos") in areas of Savannah and in some areas of natural regeneration. These shares can be agro-forestry and pasture systems, which provide food (plant and animal) and wood products from plantations with native species in combination with agricultural crops or livestock systems. These systems can be a source of small timber for building houses, fences, barns and other facilities that are required by the RIU-SM, so that they can replace those from secondary forests and ensure that these forests can be transformed to primary forests.”*

Activity A2.2: To design and to develop a training programs plan to administration and management of natural resources of the RIU-SM.

Tasks Activity

- Design training plan and training programs
- Divulgation of training programs plan
- Training of teachers and leaders
- Implementation of the training programs plan
- Monitoring of training programs plan
- Systematization of monitoring and evaluation results
- Divulgation of monitoring and evaluation results.

This activity will be based on three components:

1) Training of RIU-SM teachers
2) Work training for adults and youth.
3) Program articulation in formative chain: primary, secondary, technical, technological and professional education.

This activity is programed and budgeted taking into account institutional supports (Ministerio de Ambiente y Desarrollo Sostenible, SENA y Departamento de Propsperidad Social -DPS).

The training of the activity of Product 2 (A2.2) (educational program) is essential to organize and develop an indigenous university in which will form to indigenous who administered and implemented the project activities.

It is intended that in the same place students acquire the skills to manage the natural resources of the RIU-SM. The design and implementation of the project will be the practical basis for the design of university academic programs and the groups of MEDIAMOS and ACATISEMA will be the basis of future teachers and leaders of this university.

Illustration 11. School community Sarrapia

Source: REDD+ project RIU-SM

Activity A2.3: To manage resources for project design and establishment of production chains.

Tasks Activity

- Design specific plan
- Divulgation of the plan
- Training of captains
- Implementation of the plan
- Monitoring plan
- Systematization of monitoring and evaluation results
- Divulgation of monitoring and evaluation results.

This activity seeks to complement the FAPUS. There will be a prioritization of these initiatives in the initial phase.

Product 3: A mechanism for valuation and compensation for environmental services generated in the RIU-SM, validated and verified.

Activity A3.1: Validate a REDD+ Project with international standards.

Tasks Activity

- Management and support to audit for validation of the project.
- Resolution of the points of the audit findings.
- Review and approval of the draft audit report.

Activity A3.2: To verify Project and to register units of forest compensation for avoided deforestation.

Tasks Activity

- Development of the monitoring report for verification Project
- Management and support to audit for verification Project
- Resolution of the points of the audit findings
- Review and approval of the draft audit report
- Registration of units of correspondingforest compensation.

1.8.1 Benefits and beneficiaries for sustainable management Plan of land and forests of REDD+ RIU–SM Project

The direct beneficiaries of the project are all indigenous communities in different sectors of the RIU-SM.

Collective projected benefits in economic terms will be for the direct participation of ACATISEMA as an entity of the Alliance and the corresponding implementation of project activities, and is also a beneficiary in the implementation of the Project in the Unified Reservation.

Direct individual benefits will be for compensation in the execution of project activities and in a colective way for the activities impacts of social and environmental component.

These beneficiaries will be involved directly through the alliance between ACATISEMA and MEDIAMOS F&M S.A.S.

Regionally the other communities and people will benefit by the immediate environmental and social impacts.

Nationally, the country will benefit by the contribution in mitigating the effects of climate change, particularly by reducing CO2 emissions, as a continental and global levels.

Conservative approximations of the profits and reserves associated were made with the estimatations obtained from VCUs carbon inventory under the Strategic Partnership Agreement for the Protection, Conservation and Recovery of Natural Forest in the Resguardo Indígena Unificado – Selva de Matavén, signed by ACATISEMA and MEDIAMOS (Annex 1.2.2.2, Clause Eleventh) and Annex 8. "Projected Cash Flow and Project Schedule" information concerning the economic benefits presented in the "Investment

Flow table and complements project resources" throughout the project cycle with a value of U$ 5 each VCU and a number of VCUs / year of 2.6 million.

Environmental benefits

- Reducing emissions from deforestation and forest degradation.
- Conservation of the ecological and cultural diversity of the region.
- Protection of wetlands and water networks.
- The defined in the regulations established for projects of Reducing Emissions from Deforestation and Forest Degradation.

Local benefits

- Improving the quality of life of indigenous communities.
- Protection of soils, wetlands and adjacent watersheds, due to conservation of existing forests.
- Reduction and mitigation of adverse environmental impacts from deforestation.
- Preservation of ethnic cultural wealth of indigenous communities living in Mataven Jungle.
- Organizational strengthening of indigenous communities.

Global benefits

- Contribution to the mitigation of global warming, due to conservation of carbon stored in Mataven Jungle.
- Conservation of biodiversity in fauna and flora, which is one of the highest in the world, being the Mataven Jungle one of the most important exponents of the ecosystems of the Colombian Amazon.

1.8.2 Divulgation and socialization of Project experiences

- To disseminate the project results, instructional materials will be produced needed for workshops with masters, teachers and community leaders.
- For the socialization of Project experiences an evaluation will be made, also an institutional follow-up of seminars and workshops according to the established system.
- Audiovisual and periodic book with the results of the Project for the divulgation and training of social actors (institutions and communities) will be developed.

1.9 Project location

1.9.1 Location

Resguardo Indígena Unificado – Selva de Matavén (RIU-SM) is located east of the Colombian Orinoco high plain, at the eastern end of the Department of Vichada, municipal jurisdiction of Cumaribo, between the following geographical coordinates: North: 4º56'23 'N - 3º45'48''N and 70º16'50''W - 67º46'W[23].

1.9.2 Geographic limits

Vichada River borders the north, Guaviare River to the south, Orinoco River to the east and Creek Chupabe to the west. Hydrographically it is located in the lower basin of Creek Mataven. By physiographic and geological characteristics, the Project Area (PA) is part of the western edge of the Escudo Guayanes and corresponds to the Mataven Jungle.

It belongs to the Colombian Orinoco region and is one of its four subregions called Transition Fringe between the Orinoco and Colombian Amazon, coinciding with the natural boundary of the transition among natural savannas of the Orinoco and the Amazon rainforest.

The spatial and geographic boundaries of the project will be presented in Section 2.3

The description of biomes and their caractreristicas will be presented, likewise, in Section 2.3.

The table 3 presents areas of geographic and spatial limits of REDD+ Project (Project Area (PA) Leakage Belt (LB) and the Reference Regions (RRD and RRL).

Table 3. Project Area (PA) Leakage Belt (LB) of the Reference Regions (RRD and RRL)

Space limit	Area (has)
PA	1,150,212
LB	486,211

Space limit	Area (has)
RRD	1,444,805
RRL	2,028,439

Source: Annex 15. Methods for stratification of the Project Area (X-STR - VMD0016 Module) in their appendix characterization of biomes, landscapes and soil types in the region of reference are presented.

1.9.3 Resguardo Indígena Unificado – Selva de Matavén (RIU-SM)

The Project Area consists of 17 sectors corresponding to ancient indigenous reservations, which are now called Resguardo Indígena Unificado – Selva de Matavén (RIU-SM), according to Resolution 037 of July 2003 the Colombian Institute of Agrarian Reform (INCORA)[24] with a total area of 1,856,836 hectares and which are part of the following sectors: (1) Cawasi, (2) Aiwa Cuna Tsepajivo y Warracaña, (3) Río Vichada I, (4) Río Vichada II, (5) Mataven Fruta, (6) Atana Pirariami, (7) Berrocal-Ajota, (8) Caño Zama,

[23] *Source: Annex 17 Geographic Information System (GIS)*
[24] *Source: Annex 2.2.1*

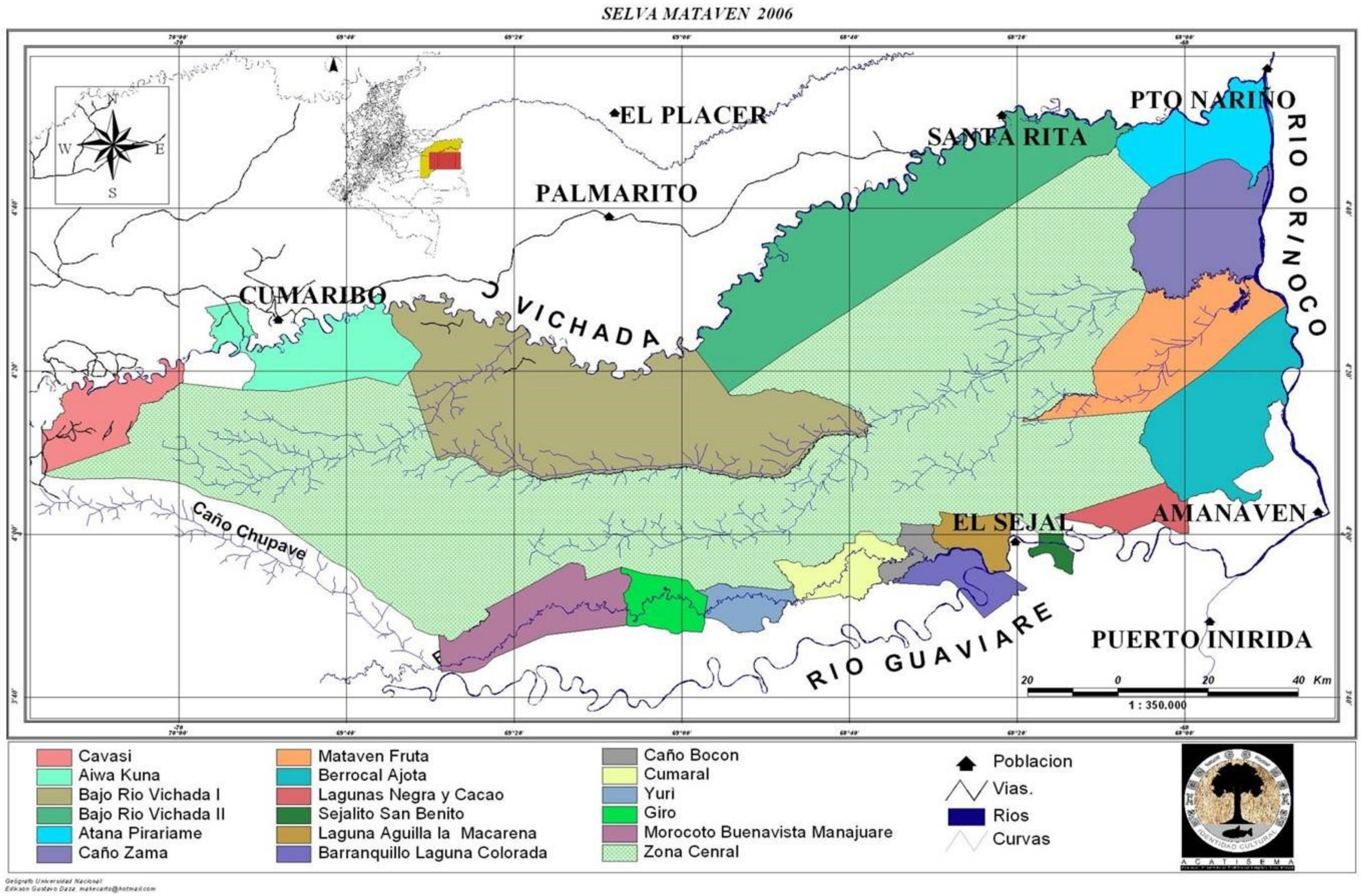
(9) Laguna Negra y Cacao, (10) Laguna Anguilla-La Macarena, (11) Caño Bocón, (12) Yuri, (13) Giro, (14) Morocoto-Buenavista-Manajuare, (15) Cumaral, (16) Barranquito-Laguna Colorada y (17) Sejalito-San Benito.

The following map shows the territorial distribution of the RIU-SM according to sectors and areas.

This distribution is the basis of the technical and administrative organization of the Project.

Table 4 quantifies the distribution.

Map 3. RIU-SM Territorial Division according to sectors and areas



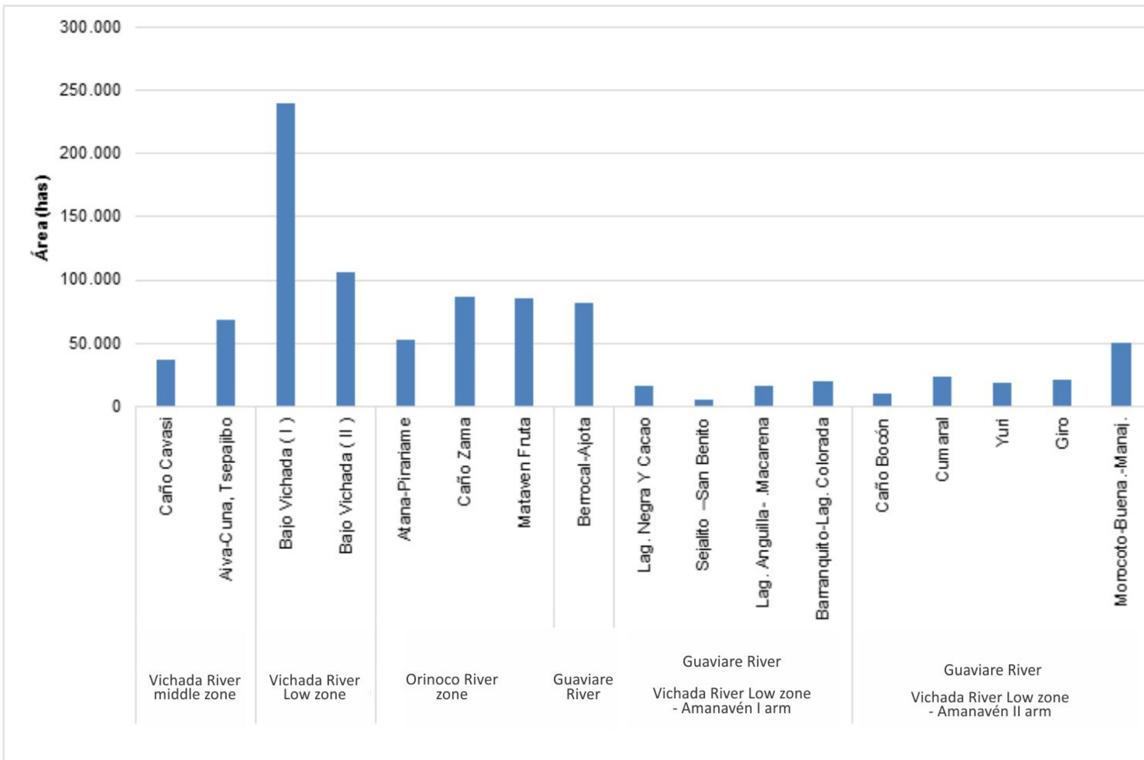
Source: based on Resolution 037 of 2003 issued by the INCORA, by which16 indigenous reserves are unified under the name of Indigenous Unified Reservation – Mataven Jungle (INCORA, 2003).

Table 4. Distribution of RIU-SM by sectors and areas

#	Sectors	River	(ha)	%
	VICHADA RIVER MIDDLE ZONE			
1	Caño Cavasi	Vichada	36,229	2.0
2	Aiva-Cuna, Tsepajibo	Vichada	68,861	3.7
Subtotal			**105,090**	**5.7**
	VICHADA RIVER LOW ARE			
3a	Bajo Vichada (I)	Vichada	239,607	12.9
3b	Bajo Vichada (II)	Vichada	105,798	5.7
Subtotal			**345,405**	**18.6**
	ORINOCO RIVER ZONE			
4	Atana-Pirariame	Orinoco	52,335	2.8
5	Caño Zama	Orinoco	86,552	4.7
6	Mataven Fruta	Orinoco	85,181	4.6
7	Berrocal-Ajota	Guaviare	82,302	4.4
Subtotal			**306,371**	**16.5**
	GUAVIARE RIVER – Brazo de Amanavén I – LOW ZONE			
8	Lagunas Negra y Cacao	Guaviare	16,285	0.9
9	Sejalito –San Benito	Guaviare	4,669	0.3
10	Laguna Anguilla- La Macarena	Guaviare	15,869	0.9
11	Barranquito-Laguna Colorada	Guaviare	19,542	1.1
Subtotal			**56,365**	**3.0**
	GUAVIARE RIVER – Brazo de Amanavén II – LOW ZONE			
12	Caño Bocón	Guaviare	10,341	0.6
13	Cumaral	Guaviare	23,636	1.3
14	Yuri	Guaviare	18,522	1.0
15	Giro	Guaviare	20,619	1.1
16	Morocoto-Buenavista-Manajuare	Guaviare	49,617	2.7
Subtotal			**122,735**	**6.6**
	Subtotal Sectors		**935,965**	**50.4**
	Central Zone	C. Mataven	920,871	49.6
		TOTAL	**1,856,836**	**100**

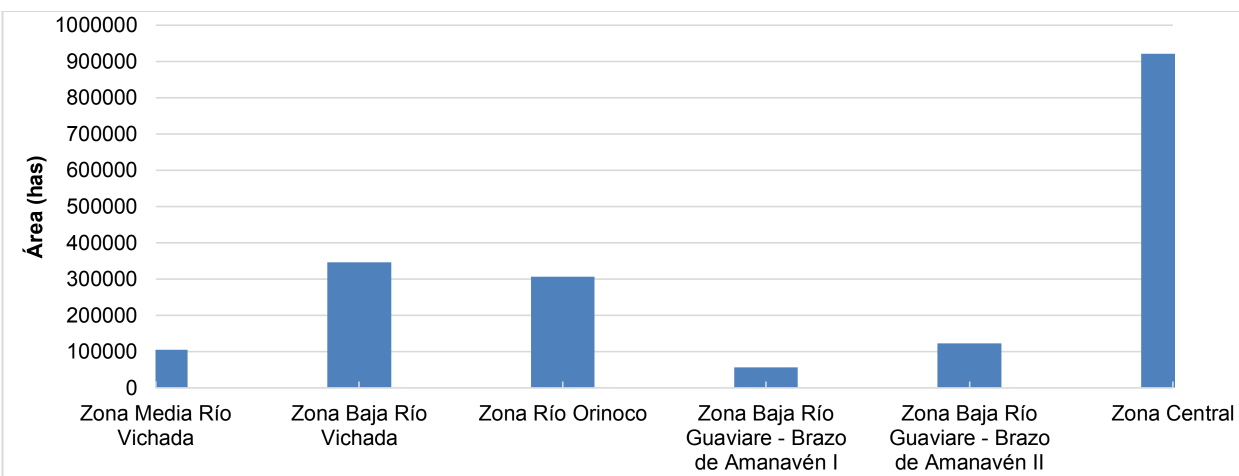
Source: REDD+ Project RIU-SM, GIS

Illustration 12. Graph of the distribution of the RIU-SM by sectors and areas



Source: REDD+ project RIU-SM, GIS

Illustration 13. Graph of the distribution of the RIU-SM areas by Central Zone



Source: REDD+ project RIU-SM, GIS

1.10 Conditions prior to Project initiation

1.10.1 Colombian Orinoquia subregions

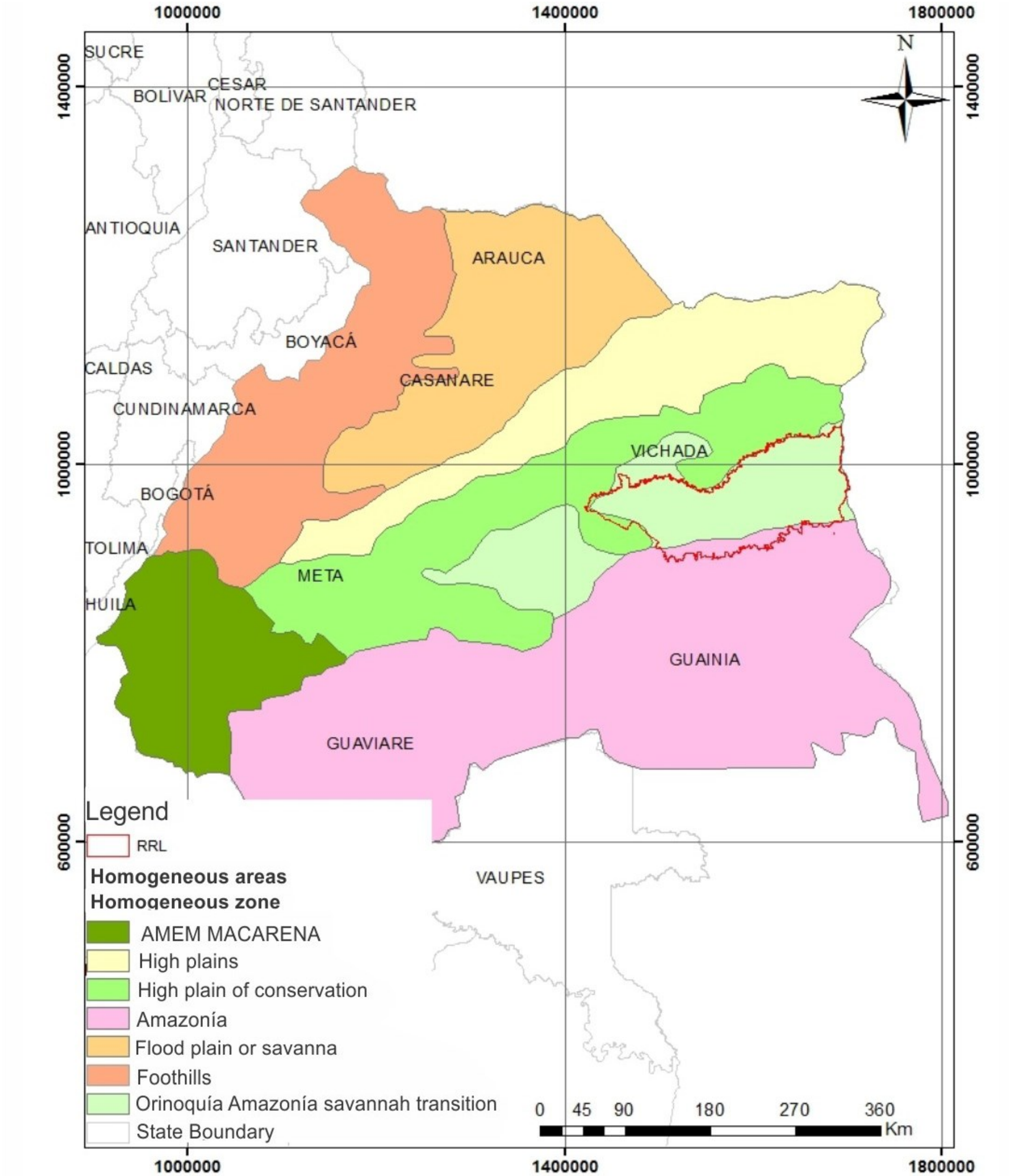
Data of National Plan of Development 2014-2018 about the sub-regions of Colombian Orinoquía are based on "ACTION PLAN IN BIODIVERSITY OF ORINOCO WATERSHED – COLOMBIA 2005-2015" (Correa, Ruiz, & Arévalo, 2005), dated in 2005, before of project initiation date, so the following table 5 corresponds to prior conditions to the project initiation. This research, at the same time, is based in "ORAM Project, which is the research that covers the largest area that has been mapped in Colombia on physiographic landscapes in the knowledge of Colombian south-east provinces. This publication is the result of the investigations about aspects related with physiographic, natural regions (physiographic provinces) of Orinoquia and Amazonia, deepening in themes such as bio-climate, hydrology, geology, physiography, fauna and vegetation" (IGAC, MinHacienda, 1999).

The National Development Plan (2014-2018) become Law 1753 / 2015 (Congreso de Colombia, 2015), recognizes the subregions of the Colombian Orinoco, in one of which, Transition Orinoco-Amazon, is the RIU-SM.

The maps and graphs of the section 2.3 present the locations of these subregions and the RIU-SM with their areas and spatial boundaries and the relationship between these subregions and the RIU-SM.

Map 4 shows the subregions of the Orinoco and the location of the RIU-SM and Table 5 shows the distribution of the intersections of the subregions of the Orinoco with the departments. Note that Vichada, where is the RIU-SM, has the highest extension Orinoco area, has 9,920,988; 24.6%.

Map 4. Subregions of the Orinoco and location of the RIU-SM



Source: (Congreso de Colombia, 2015) Plan Nacional de Desarrollo - Colombia (2014-2018)

The following table presents the distribution of the intersections of the areas of the subregions of the Orinoco with the Departments.

Table 5. Distribution of the intersections of the subregions of the Orinoco with the Departments

Departments	Subregions of the Orínoquia															
	High plains of conservation		Productive high plain		Amazons		AMEM Macarena		Flood plain or savanna		Foothills		Transition savanna Orinoco - Amazon		Grand Total	
	Area (has)	%	Area (has)	%	Area (has)	%	Area (has)	%	Area (has)	%	Area (has)	%	Area (has)	%	Area (has)	%
Arauca			75	0.0					1,723,187	4.3	633,531	1.6			2,356,794	5.8
Bogota											1,186,167	2.9			1,186,167	2.9
Caqueta					16,989	0.0	54,147	0.1							71,136	0.2
Casanare			43,914	0.1					3,126,427	7.8	1,257,648	3.1			4,427,990	11.0
Cundinamarca											690,801	1.7			690,801	1.7
Guainia					7,005,072	17.4							75	0.0	7,005,146	17.4
Guaviare	6,359	0.0			5,481,631	13.6	40,264	0.1							5,528,254	13.7
Huila							26,008	0.1							26,008	0.1
Meta	2,795,278	6.9	872,757	2.2	160,214	0.4	3,225,365	8.0	28,378	0.1	1,237,778	3.1	255,885	0.6	8,575,655	21.3
Norte de Santander											342,008	0.8			342,008	0.8
Santander											127,783	0.3			127,783	0.3
Vaupes					37,896	0.1									37,896	0.1
Vichada	2,791,256	6.9	3,363,234	8.3	616,274	1.5			33,749	0.1			3,116,475	7.7	9,920,988	24.6
Total general	**5,592,894**	**13.9**	**4,279,980**	**10.6**	**13,318,075**	**33.1**	**3,345,785**	**8.3**	**4,911,741**	**12.2**	**5,475,717**	**13.6**	**3,372,435**	**8.4**	**40,296,626**	**100**

Source: REDD+ project RIU-SM, based on Plan Nacional de Desarrollo - Colombia (2014-2018) (Congreso de Colombia, 2015)

1.10.2 Biomes

Biomes considered in all areas of space limits are based on official information Instituto Geográfico Agustín Codazzi (IGAC), Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM) under the Ministerio de Ambiente y Desarrollo Sostenible (MADS), entities authorized to provide official information on this subject.

A biome is defined as a set of ecosystems characterized by species and a variety of plants with a condition of climate and land cover characteristic. They are usually defined by the structure of the vegetation and climate. The biome is also defined by geographic components (latitude and altitude) and local names are used for designation, for example: Biome of Valle del Cauca.

This is the basis for defining the stratification (Annex 15).

The map of biomes in Colombia was prepared from synthesis units established by superposition of three key thematic layers: land cover, climate and geo-pedology (INVEMAR, et al., 2007) [25].

The territory in which *is* located the RIU-SM is characterized by being sub-divided into the following biomes naturally, which become identified forest strata.

Table 6. Biomes (strata) of the RIU-SM

Biome		Description	Characterized landscapes
1	Heliobiome	Floodplain forest without underwood	Lowland forest on flood site of creek Mataven
2	Litobiome	Floodplain forest with underwood	Highland forest on flood site of creek Mataven
3	Peinobiome	Forest rocky hill	Residual granite forest rocky hills in Guiana shield
4	Zonobiome	Forest land	Forest moderately segmented ancient sedimentary plains

Source: Annex 15 – VMD0016 X-STR Methods for Stratification of the project area

Savannas on sandy plains (white sand) slightly segmented not characterized as stratum of the RIU-SM, for the purposes of the Project.

[25] *Source:* (*INVEMAR, et al., 2007*) *Biomas. Escala 1:500000. República de Colombia. Año 2007*

Illustration 14. Mataven Jungle

Source: REDD+ project RIU-SM

1.10.3 Vegetation

The fringe of transition between the Amazon forest and savannahs typically from Orinoco contains associated rocky outcrops, forests in flood and not flood plains, bushes and savannas.

Forests are composed of layers of different thicknesses establishing canopies. No flood heterogeneous forests, very extensive lower areas covered with kaolin clay or sand called "overflows" swamp forests are found. There are also sand-covered highlands where growing shrubs and herbaceous, locally called savannas.

Savannah is an ecosystem of the tropical lowlands, dominated by a grass cover consisting primarily of clumps of grasses and cyperaceous with heights up to 30 cm tall at the time of peak activity. Show a clear seasonality in its development, with a period of low activity related to water stress. Savannah may include woody species (shrubs, trees and palms), but these species do not form a continuous coverage and pastures. The diversity of the sheets is present at all scales, with differences in the structure of vegetation and floristic composition.

Below these types of vegetation are characterized:

Forest rocky hills (BR): is located on rocky outcrops, crossed by small streams that increase with each downpour level and generally is little eroded. Plants are usually evergreen with subcoriaceous. Its canopy is open and reaches 15 meters high; it presents emerging arboreal individuals of 20-25 meters tall, belonging to the family *Leguminosae (Senna sp., Abarema sp., Macrosamaneae sp.), Myristicaceae (Virola sp.)* and *Moraceae (cf. Maquira calophylla)*. Are frequent palms as *Manicaria saccifera (seje)* and trees like *Pouteria sp. (Sapotaceae), Protium sp. (Burseraceae), Brosimum cf. alicastrum (Moraceae)*.

The understory is dense in places and reaches 6-8 meters high. Both understory and canopy are open. There are ways that the site is used for hunting cusumbos, borugas, monkeys, fish and frogs.

Floodplain forest (BI-a): Is commonly known as overflow forest. It is characterized by low with a sparse underwood with thin trees and thickened bark for protection for long periods of flooding; has a low area that remains flooded for long periods per year, reason for which there is no undergrowth developed. The upper area is better developed with underwood, presents trees reaching 15 to 17 meters high, families *Chrysobalanacaeae (cf. Licania wurdacki)* and *Tiliaceae (Mollia speciosa)*, and legumes as *Heterostemon mimosoides, Tachigali sp.* and *Swartzia argentea*. The underwood reaches 5-7 meters high.

Floodplain forest (BI-b): Commonly called "varillal", has intermittent streams of sizes that depend on rainy and level of creek Mataven. The terrain is hilly with areas that accumulate water in the forest. It presents emerging individuals 17 to 19 meters high of *Leguminosae, Chrysobalanaceae, Myrtaceae, Sapotaceae, Sterculiaceae* and *Vochysiaceae* families. The canopy reaches 12 to 14 meters, is open and is composed mainly *Parinari sp. (Chrysobalanaceae), leguminous Swartzia schomburgkii, Heterostemum mimosoides, Macrosamanea pubiramea* and *Tachigali sp.*; also *Pachira sp. (Bombacaceae)* and the *Hevea sp. (Euphorbiaceae)*.

Forest on sedimentary plains (BT-A): This landscape presents two sectors: one low and one on a higher deck. The differences are in the thick of trees since the lower part floods and upper part do not receive input from the water.

Emerging trees reach 18 to 20 meters high with species like *Xylopia sp. (Annonaceae), Sloanea sp. (Elaeocarpaceae) conceveiba sp. (Euphorbiaceae)* and *Micropholis sp. (Sapotaceae)*. The canopy is between 10 and 13 meters and is open in the presence of a human settlement for 20 years. The underwood has species like *Tapirira guianensis (Anacardiaceae), Iryartella setigera (palm) Leopoldinia* and *neat (palm)*; *Protium sp. (Burseraceae), Hirtella Guainíae, Licania sp. and Parinari sp. (Chrysobalanaceae)*.

Forest on sandy plains (BA): This landscape has emergent trees of 17 to 20 meters from the family *Apocynaceae*. The canopy is discontinuous and presents tree species as *Parinari sp. (Chrysobalanaceae), Protium sp. (Burseraceae), Ferdinandusia sp. (Rubiaceae)* and *Qualeaparaensis (Vochysiaceae)*.

Savannas on sandy plains (SA): In this landscape three types of vegetation are recorded: savannas (SA-h), forest edge of creek (BBC) and mountain bushes (MM).

- Savannas (SA-h) vary with the water content, the microrelief and its floristic composition. The presence of bushes related to the site flood level, conditions to overcome the excess water in the rainy season and the storage of nutrients and water to the driest period.
- Physiognomically they correspond to shrubby savannah, savannah grass with predominance of grasses (*Poaceae* and *Cyperaceae*) and savannas dominance of species of *Bromeliaceae Rapateaceae* and family.
  Among the bushes is *Byrsonima sp. (Malpighiaceae)*, *Bonnetia sp. (Theaceae)*, *Ternstroemia sp. (Thernstroemianeae)* and species of the *Bombacaceae* family. In the herbaceous species *Axonopus schultesii (Poaceae)* and are widely distributed *Paepalanthus sp. (Eriocaulaceae)*, which reduce coverage and presence as the water content increases in the substrate or on the surface thereof.
- The forest edge creek (BBC) is characterized by sparse and present emergent trees of 12 to 16 meters as *Guatteria sp. (Annonaceae)*, *Qualea sp. (Vochysiaceae)* and *Caraipa sp. (Clusiaceae)*.
- Mountain bushes (MM) differ in their state of development. A montain bush in advanced stage of development presents emergent trees of 15 to18 meters as *Parahancornia oblong (Apocynaceae)*; the canopy is between 8 to 12 meters and has elements of *Xylopia sp. (Annonaceae), Hevea sp. (Euphorbiaceae)* and *Sterigmapetalum sp. (Rhizophoraceae)*, there are also *Lauraceae, Sapotaceae* and palms. (Villarreal Leal , et al., 2009)

Floristic composition

688 species, 183 genres and 72 families have been recorded. At low neo-tropical forests there are different patterns of beta diversity; particularly the differences observed between flooded and non-flooded forests; the former are less diverse forests of the mainland and both have relatively few species in common.

The more diverse in terms of number of species, genera and families place was Savannah (SA) and this is related to the variety of environments and physiognomic types of vegetation that brings the landscape. These included forest edge of the channel (BBC), to kill bush (MM), arbustadas savannas, herbaceous, and grassy savannas graminoides graminoides savannas. The next two sites in terms of diversity of species are forest rocky hills (BR) and forest on sedimentary plains (BT-A), which have greater vertical complexity, thus providing greater number of niches available. The flooded forests (BI and BI-a-b) have fewer species (Table 7). (Villarreal Leal, et al., 2009).

The following tables (7 – 11) show data about the great biodiversity in RIU-SM.

Table 7. Number of families, genres and species recorded by landscape and in total, in the characterization of vegetation

Location	Families	Genre	Species
Forest rocky hill (BR)	39	64	102
Forest under the flood plane of the pipe Matavén (BI-a)	26	41	67
Lowland forest high up the spout Matavén (BI-b)	30	47	77
Forest sedimentary plains (BT-A)	32	64	102
Forest on sandy plains (BA)	20	27	37
Savanna on sandy plains (SA)	31	51	107
Total	**72**	**183**	**688**

Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 3.2, page 108

The group of 10 families with more genres landscape shown in Table 8 and yielded a total of 22 families. Table 9 shows groups of 10 families with more species are presented, giving a total of 29 families for the six landscapes. Families *Rubiaceae*, *Melastomataceae*, *Arecaceae* and *Legumes* had a high number of genera and species, a result also found in a study Prieto-C. (2001) (Villarreal Leal , et al., 2009)

Table 8. Families with the highest number of genres landscape

Family	BR	BI-a	BI-b	BT-a	BA	SA	Total
Rubiaceae	6	5	3	6	3	4	19
Arecaceae	3	2	2	5		2	6
Caesalpiniaceae	4	2	3	3	1		7
Melastomataceae	3				1	6	11
Apocynaceae	3	1	1		1	4	8
Fabaceae	4	3		3			7
Euphorbiaceae			3	3	3		8
Mimosaceae		2	3	2		2	
Annonaceae	4		2			2	6
Clusiaceae				3		3	6
Chrysobalanaceae			1	3	2		
Moraceae	4				1		5
Bombacaceae	3	1	1				
Flacourtiaceae	3				1		
Ochnaceae		2				2	
Sapindaceae				3			
Burseraceae				2	1		
Bignoniaceae		1	1				
Eriocaulaceae						2	
Vochysiaceae						2	
Boraginaceae		1					
Lecythidaceae					1		
Total	31	14	17	27	11	25	64
Sampling genres Total	**73**	**41**	**47**	**64**	**27**	**51**	**183**

Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 3.3, page 108

Table 9. Families with the highest number of species in the different landscape

Family	BR	BI-a	BI-b	BT-a	BA	SA	Total
Rubiaceae	7	5	4	7		7	101
Arecaceae	3	2	2	5		2	
Caesalpiniaceae	4	3	4	4			18
Fabaceae	4	3	2	3			22
Melastomataceae	8		2	3		6	68
Mimosaceae	6		3			2	20
Annonaceae	4		2				14
Apocynaceae						5	20
Clusiaceae				3		3	21
Euphorbiaceae			3	5			19
Bombacaceae	5	2					
Chrysobalanaceae		3		6			
Flacourtiaceae			2				
Lecythidaceae				3			
Moraceae	10						14
Aquifoliaceae						3	
Burseraceae	5						
Combretaceae		2					
Elaeocarpaceae				3			
Eriocaulaceae						4	
Malpighiaceae		2					
Myristicaceae		2					
Ochnaceae		3					
Vochysiaceae						3	
Xyridaceae						3	
Total number of species / Scenery	**39**	**13**	**22**	**30**	**0**	**25**	**303**
Total number species in the sampling / Landscape	**102**	**67**	**77**	**102**	**37**	**107**	**688**

Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 3.4, page 109

Alpha Diversiity

BT-a forest presented the highest alpha index and high dominance, which indicates that the distribution of individuals in the species is unfair: a few species have the greatest number of individuals. The high forest flood plane (BI-b) was the most equitable and the second alpha diversity. In the sheets themselves (SA-h) the dominance of a few species were observed, contrasting forest edge of the channel (BBC) and clumps of forest (MM) (Table 10).

Table 10. Diversity alpha landscapes counted for the sheets on sandy plains (SA).

						SA		
Índex	**BI-a**	**BI-b**	**BT-a**	**BR**	**BA**	**BBC**	**MM**	**SA-h**
Alpha Fisher	10.40	21.58	47.38	9.55	12.35	4.93	12.81	12.41
Equitatividad	0.79	0.66	0.90	0.644	0.81	0.67	0.75	0.91
Berger-Parker Dominance (d)	0.17	0.43	0.06	0.44	0.34	0.53	0.21	0.12

Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 3.6, page 112

It differed according to the types of vegetation: forest to themselves (SA-h) spout edge (BBC), kills bush (MM) and savannas.

Beta Diversity

The index values of complementarity [complementarity index (IC) assesses how different are two landscapes in terms of species composition of biological interest group. This index ranges from 1 to 0. The values close to 1 indicate that the two landscapes are very different in species composition and thus complement each other in a regional scale. The IC is calculated as 1- Jaccard index (similarity index)]. Among the landscapes sampled were higher than 0.95. This indicates that the landscapes have a high turnover of species of woody plants (Table 11).

Table 11. Complementarity index values (IC) of woody plants between the sampled sites

Landscape	BA	BI-a	BI-b	BR	BT	SA
BA	37	5	2	0	4	0
BI-a	9.95	67	2	0	0	0
BI-b	0.98	0.99	77	1	3	0
BR	1	1	0.99	102	1	0
BT	1	1	0.98	1	102	0
SA	1	1	1	1	1	107

Diagonal (gray): Number of recorded species; Superior diagonal: IC

Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 3.7, page 112

The vegetation of the area is highly diverse and sites are complementary; in a relatively small area like the wide range of environments and the differences between them, then leaving without support the idea of forest as a green, homogeneous and continuous spot (Villarreal Leal , et al., 2009) it is evident.

Illustration 15. Mataven Jungle

Source: REDD+ project RIU-SM

1.10.4 Phisiography

Geomorphology and materials that make up the high plains of the Orinoco are closely related to the geology and genesis of the Andes and the denudation of the geological structures of the Escudo Guayanés.

In the east of the country, the foundation of the Escudo is represented mainly by Complejo del Mitu composed of the oldest rocks of Colombia, formed during the Trans orogeny (2200-1800 m). Lithologically it is composed of metamorphic rocks (gneisses, schists, quartzites and amphibolites). The central-western edge of the complex geological consists of the batholith Parguaza (Parguaza granite), which emerges in Colombia in a narrow strip between Puerto Carreño and Puerto Inirida. This geological structure is part of a series of large Precambrian batholith, tectometamórficos related events occurred during the orogeny mentioned to him belong the most prominent reliefs formed by rocky hills isolated inselberg type.

The occurrence of marked dry periods, accompanied by strong winds during the Pleistocene, had an effect on the origin of some landforms and the type and distribution of materials that make up the high plains; Natural National Park (NNP) El Tuparro is located north of the Vichada River, 90 km from the Mataven Jungle.

At the eastern end continuous coverage of white sand, product of altered granitic rocks that buried the basement of El escudo is presented; as evidenced by the existence of quartz sands from the dismantling and alteration of crystalline rocks that make up El Escudo, which constitute the Periguayanesa altillanura. The southern end with great influence wind dune formation recorded in areas surrounding the Tomo river.

At the eastern end continuous coverage of white sand, product of altered granitic rocks, that buried the basement of El escudo is presented; as evidenced by the existence of quartz sands from the dismantling and alteration of crystalline rocks that make up El Escudo, which constitute the Periguayanesa altillanura. The southern end with great influence wind dune formation recorded in areas surrounding the Tomo River.[26]

1.10.5 Temperature

The temperature regime of the Orinoco is isomegatérmico, that is to say, the temperature difference between the coldest and warmest month is below 5 ° C. However, no temperature data are available closest stations to Mataven Jungle. In Puerto Inirida station, south of the study area, the average annual temperature is 26.5 ° C. Maximum temperatures occur in the dry season (January to March), while the minimum (25.6 to 25.9 ° C) coincide with the period of maximum rainfall (May to July). [27]

1.10.6 Rainfall

Regionally, the rainfall in the north of the Orinoco and Amazon increases from east to west and north to south. It ranges from 1500-2000 mm / year in the northern departments of Arauca and Vichada, and increases towards the south until reaching 2500-3000 mm / year; the highest values of precipitation are presented in the foothills of the Cordillera Oriental (3000-3500 mm).

The annual rainfall distribution has a single mode behavior, i.e. a period of rains between April and November and another drought between December and March.

The type of climate in north of Vichada is semi-wet; gradually becomes more humid the center and south of Vichada (moderately moist and wet), and even more humid in the north of Guainía. Within the Koppen climate classification, in the Orinoco Colombian predominantly rainy tropical of savanna ligthly humid (AWI) and tropical forest (AMI) (north of Guainia). They are characterized by the occurrence of a well-defined drought period of four months, with the precipitation of the driest month less than 60 mm in the first, and above this value in the second.

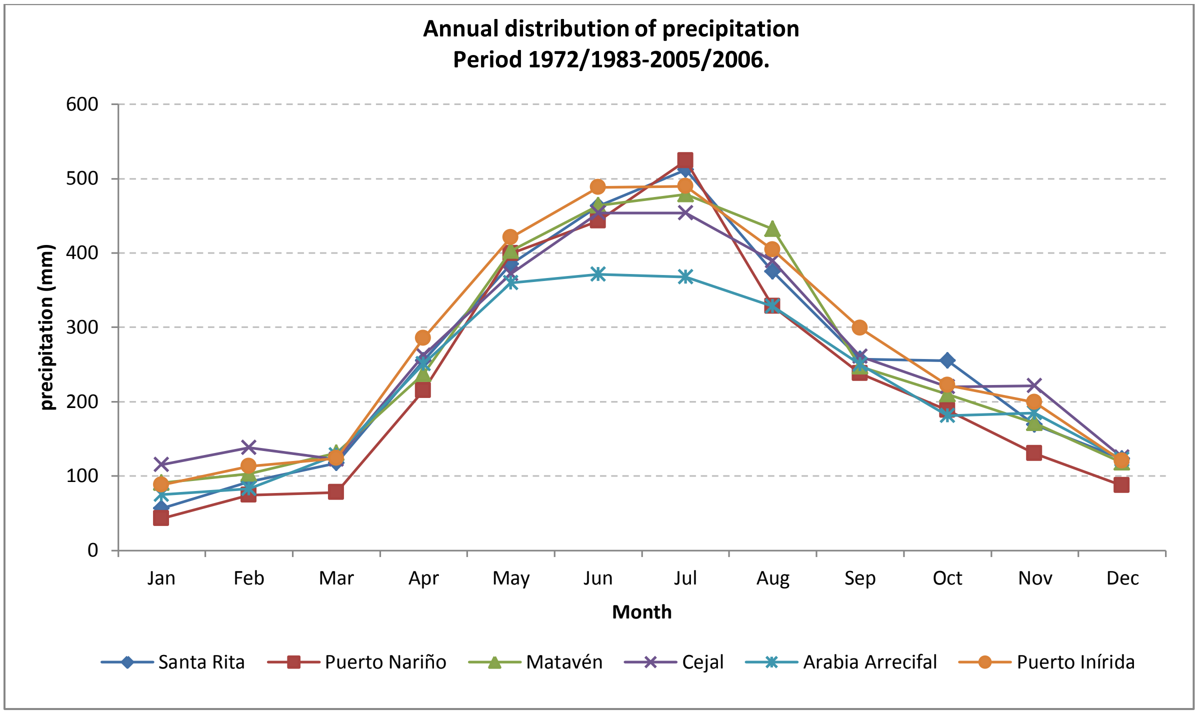
Related to the moisture factor (Fh), the Mataven Jungle belongs to moderately humid climate type (B2).

On the outskirts there are six meteorological stations located along the Vichada, Guaviare and Orinoco rivers. The data provided by the stations let you regional description regarding the distribution and amount of annual rainfall.

The amount of annual rainfall in the stations considered fluctuates between 2746 and 3253 mm / year, showing an increase of rainfall from north to south along the Orinoco River, in effect, the annual rainfall is 2746 mm / year north (Puerto Nariño station), 3,086 mm in the middle (Mataven station) and 3253 mm / year in the south (Puerto Inirida station). The difference in precipitation between opposite stations is 507 mm / year. This behavior of the rains is likely to have an effect on increasing of forest cover and decreasing of savannahs going south. [28]

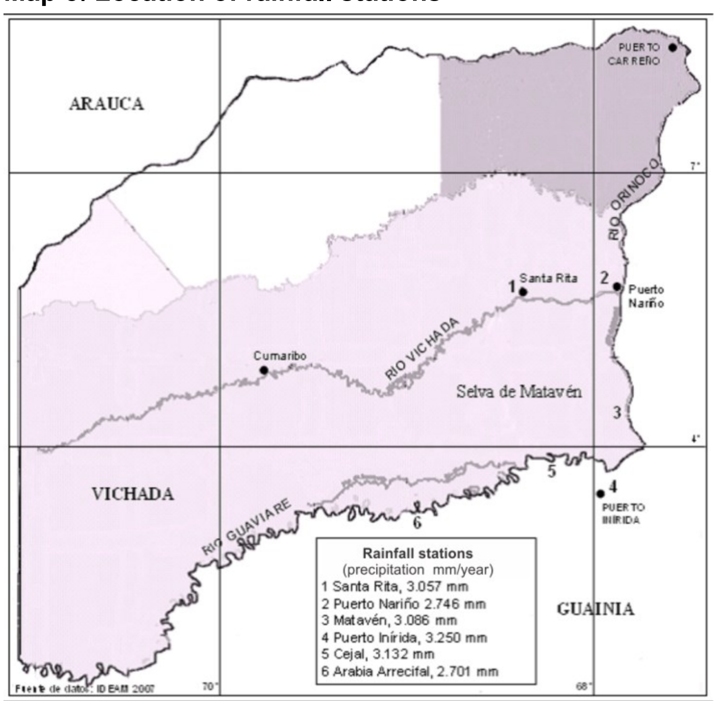
[26] *(Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, page 74*
[27] *(Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, page 76*
[28] *(Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, page 74*

Illustration 16. Graph of the annual distribution of precipitation, period 1972/1983 - 2005/2006



Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, figure 1.4, page 76

Map 5. Location of rainfall stations



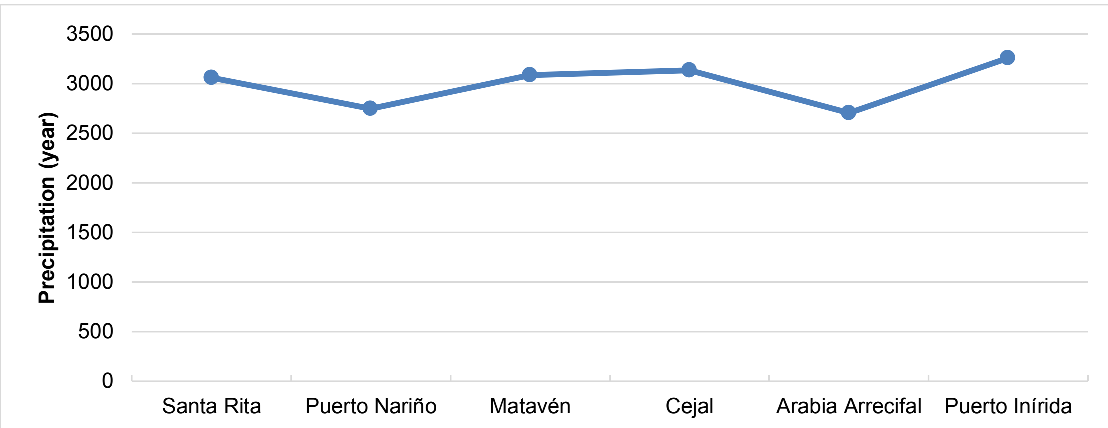
Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, figure 1.3, page 75

Table 12. Monthly average precipitation multiyear stations (mm)

Station	Period	Lat / Long	Altitude (m)	Precipitation (year)
Santa Rita	1983-2006	04° 51' N; 68° 24' W	87	3,057
Puerto Nariño	1984-2005	04° 56' N; 67° 51' W	79	2,746
Mataven	1983-2006	04° 17' N; 67° 49' W	88	3,086
Cejal	1983-2006	03° 59' N; 68° 21' W	94	3,132
Arabia Arrecifal	1983-2006	03° 30' N; 69° 03' W	96	2,701
Puerto Inírida	1972-2006	03° 35' N; 67° 55' W	100	3,253

Source: Based on (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, table 1.2, page 76

Illustration 17. Graph monthly multiyear rainfall stations (mm)



Source: (Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, page 76

In all seasons, the annual distribution of rainfall shows a monomodal behavior. In just three months (May, June and July) falls between 43% and 50% of the total annual rainfall, being the rainiest months. After the rainy season, rainfall occurs significantly decreasing and a period of lower rainfall (October to March), during which the 12% and 16% of the annual total, being particularly dry January and February (4% to 8% is recorded of the total annual rainfall). [29]

1.10.7 Soils

Drain conditions (internal and external) of savanna soils allowing to know that there is a close relationship between this factor and vegetation structure. For this reason, the species are highly adapted to the availability and permanence of water in the soil during the year.

[29] *(Villarreal Leal , et al., 2009) Caracterización de la biodiversidad de la Selva de Matavén, page 76*

The savannas of the eastern end of the Mataven Jungle are characterized by a continuous coverage of variable thickness of quartzite white sands, the product of altered granitic rocks that buried the basement of the Escudo Guayanés. In the Tuparro PNN there is also a coverage of sands buried the same geological structure, but unlike Mataven Junglet, is wind power.

The location of Mataven Jungle in transition between the savannahs of the Orinoco to the north, and the rainforests of the Amazon to the south, gives a biogeographical interest of special importance. Mataven Jungle has, however, a greater affinity with the latter, to the domain of large, continuous areas of forest. This contributes to further strengthening its ecosystem and landscape uniqueness already recognized, despite the low level of biological knowledge available.

There is a high contrast between the landscapes forming factors regarding the genesis of geographical forms, geology, parent materials of soil and hydrological conditions. Each landscape and contributes to the overall geographical and ecological complementarity of the studied area of east-central sector of the jungle Matavén.

Similarly, striking contrasts are in terms of the degree of evolution of soils. On the one hand, there are some highly evolved that developed from ancient sediments (Plio-Pleistocene) and who have experienced a long process of weathering. On the other hand, are very young soils that have evolved from very recent alluvial sediments (Holocene).

Although there are contrasts in the nature of the parent materials, without exception all soils are characterized by a marked paucity of nutrients (oligotrophic) evidenced by extreme acidity, high aluminum content change and very low contents of bases (Ca, Mg, K, Na), phosphorus and organic matter; the content of the latter parameter significantly improves the landscapes of flood plane of the Creek Matavén.

Conditions (internal and external) drainage savanna soils allowed to know that there is a close relationship entreeste factor and vegetation structure. For this reason, the species are highly adapted to the availability and permanence of water on the floor during the year.

The savannas of eastern end of the Forest Matavén are characterized by continuous coverage of variable thickness of quartzite white sands, product alteration of granitic rocks, which buries the basement of the Guiana Shield. In the National Park there Tuparro likewise coverage sands buried the same geological structure, but unlike the Forest Matavén, is wind power. (Villarreal Leal , et al., 2009).

1.10.8 Fauna

In terms of wildlife, the Mataven Jungle also houses a rich, it contains a considerable number of rare and endemic species of high potential for Colombia that give great importance for conservation, for example, 33% of bird species are restricted to areas of endemism. The Matavén Creek is the second highest fish diversity in the region.

Illustration 18. Macaws

Below is a table summarizing the characterization registered wildlife occurs.

Table 13. Main features wildlife registered

Group	Number Species	Percent representativeness	Beta diversity	Sensitivity	Landscape diversity
Birds	249	17 %	≥ 0.7	Average (35 %) Low (40%)	51% (BT-a)
Insects	33		0.56		BI-a, BI-b
Ants Subfamilies	196 11	43%	0.63		BT-a, SA
Butterflies Families Sp endémics	198	48% 44.7% 2%	≥ 0.7		BT-a
Fishes Sp registered	137	77%			

Source: Based on (Villarreal Leal , et al., 2009). Caracterización de la Biodiversidad de la Selva de Matavén. Pages 27 – 30.

Some important characteristics about the **birds** are:

- ✓ The vast majority of species of birds caught Thamnophilidae belong to families (17%) and Tyrannidae (12%).

- ✓ There have been 8 species of migratory birds in North America, in upland forests (BT-A) and rocky hills (BR) and Savannah (S).
- ✓ The composition of bird communities is very different from landscapes, showing high levels of replacement or beta diversity (complementarity index> 0.7).
- ✓ No captured species is endemic or is under some threat to extinction.
- ✓ The total of registered species, 62 (25%) are habitat specialists, that is only found in a habitat.
- ✓ Forest land (BT-A) has the community of more specialist bird habitat use, with more than half (51%) of the species using only this habitat.
- ✓ Most birds recorded have an average sensitivity and low to disturbances (35% and 40% respectively), while the minority has high sensitivity (26%).

Some important characteristics about the **bugs** are:

- ✓ They have collected 33 dung beetle species, genera with more species were Canthon 6 and Dichotomius and Eurysternus 5.
- ✓ Communities dung manure have a high dominance by 2 species in 2 units under forest landscape in the flood plane (BI-a) the species Canthon sp.and Uroxys sp.
- ✓ At the highest lowland forest plan (BI-b) it is the dominant species Uroxys sp.
- ✓ The complementarity index values were above 0.56, indicating a high turnover between all landscape units.

Some important characteristics about the **ants** are:

- ✓ There are 196 species recorded, represented in 11 subfamilies of neotropical ants, the most common subfamily is Myrmicinae 43% of the species recorded.The most common genre is Pheidole (Formicidae: Myrmicinae) with 25 species (12.7%).
- ✓ Of the species identified to species level, about 75% are taxa.
- ✓ The greatest wealth of ants found in the woods of sedimentary plains (BT-A) with 63 species, less wealth is high forest flood plane (BI-b) with 24 species.
- ✓ There is a high turnover of ant species among all landscape units.
- ✓ Landscapes higher value of complementarity are the savannah on sandy plains (SA) and the forest of sedimentary plains (BT-A).

Some important characteristics about the **butterflies** are:

- ✓ They have recorded 198 species.
- ✓ The families with the highest number of species are Nymphalidae and Lycaenidae, each representing 37.8%, the most abundant family Lycaenidae, followed by Nymphalidae.
- ✓ 15% of the species found in Amazon's distribution.
- ✓ 6% are exclusive species of the Guiana Shield.
- ✓ 18% of the Guiana Shield is distributed to the base of the Amazon.
- ✓ 2% are endemic to Colombia.
- ✓ 59% are widely distributed species.
- ✓ For greater diversity of landscape species richness and abundance of individuals to the forest of sedimentary plains (BT-A) with 94 species and 294 records are recorded.
- ✓ The highest lowland forest plan (BI-b) with 28 species and 68 individuals, and Savannah (SA) with 26 species and 108 individuals, had the lowest richness and abundance.

- ✓ In high parts betapresenta diversity of butterfly species between landscapes with rates above 0.7 complementarity.

Some important characteristics about the **fish** are:

- ✓ The pattern of diversity is recorded in lower areas of the Neotropics, where the dominant orders were Characiformes, Siluriformes and Perciformes.
- ✓ 77% of the total abundance recorded displayed only 15 of the 137 recorded species, excelling the species Hemigrammus analis with the equivalent of 23% of the individuals captured.

Using the fishing of the 137 species recorded 64 are used by the bocachico local communities for subsistence, for example, peacocks, head mantecos, piranhas, mataguaros. 33 species are marketed as fish consumption, 57 are used as ornamentals commercial species such as tetras, cardinal, kennels, old juna and scalar. However, the highest number of registered area are ornamental species.

Some aspects of **fishing:**

- ✓ The capture of ornamental species for marketing focuses on the Vichada, Orinoco and Matavén Creek rivers. The Matavén Creek constitutes first fish collection center in the area, later to continue the marketing chain to Puerto Inirida, inside the country and abroad.
- ✓ The fishing for commercial use is restricted mostly to the communities at the bottom of the Guaviare River.
- ✓ The fishing for consumption in the Matavén Creek is basically to meet the needs of animal protein for communities living there.

Matavén Jungle is a transition zone between the great forests of the Amazon and the vast savannas of the Orinoco, so that has particular biological interest, not only for its biogeographical position, but for its well-preserved, with less than 5% of the total area converted into cultivation areas and stubble.

As mega-diverse territory is classified within the group of the 14 zones hosting the highest rate of biodiversity on earth. This is superimposed on a political, economic and social, equally complex and diverse history (MADS, PNUD, 2014) [30].

Endemic species

Matavén Jungle is an area of great importance for bird conservation at national and global level, because it meets many of the requirements that have been identified to designate these areas: species distribution are restricted to biogeographic regions (6%), areas of endemism (1%), specialist species habitat use (25%) and highly sensitive to human disturbance (26%) species. Also lots of congregarías species are concentrated there and at the right time you can register large numbers of migratory species. In addition,

[30] *(MADS, PNUD, 2014). Ministerio de Ambiente y Desarrollo Sostenible, Programa de las Naciones Unidas para el Desarrollo. 2014. Quinto Informe Nacional de Biodiversidad de Colombia ante el Convenio de Diversidad Biológica. Bogotá, Colombia. Page 9*

Matavén Jungle lies within an area of endemic birds and at the confluence of two zoogeographic regions. (Villarreal Leal , et al., 2009)

Yapacana anthill of the Orinoco and carpinterito antwren barbiamarillo are restricted to an area of approximately 62,000 km between Colombia, Venezuela and Brazil. These three species, along with nine other, inhabit an endemic bird area (EBA porsus acronym) called "forests of white sands of the Orinoco-Black" which has been identified as a priority area for the conservation of birds worldwide (Stattersfield et al. 1998). This EBA extends from Puerto Ayacucho along the Orinoco River and its tributaries, as Ventuari (in southern Venezuela), Tomo and Vichada (Colombia) and in the tributaries of the Black River as Casiquiari (Venezuela), Guainía and Vaupés (Colombia) and Cauaburi, Xie, Icana, Uapes and Curicuriari (Brazil). Protecting this EBA is restricted to the Biosphere Reserve of the Upper Orinoco-Casiquiare, Black River Forest Reserve and several Indian reservations in the three countries Stattersfield et al. 1998). Matavén Jungle is within this EBA and conservation of birdlife contributes to the worldwide conservation of endangered species and probably restricted. (Villarreal Leal , et al., 2009)

Matavén Jungle 12 species that are restricted to biome or zoogeographic region of the Northern Amazon (AMN) and two other species restricted to northern South America (NSA) are recorded. A biome can be defined as a major regional ecological community characterized by forms of vidaparticulares and plant species own. In the Neotropics, biomes are classified as proposed by Stotz et al. (1997). Species restricted to AMN are: grosbeak hermit hummingbird (*Phaethornis malaris*), the jacamar gab (*Galbula albirostris*), ashen batará (*Blackish-Grey Antshrike*), the nagüirrojo curassow (*Mitu tomentosum*), the collared manakin (*Heterocercus flavivertex*), the Amazon bunting (*Hylophilus brunneiceps*), the pechiblanca parrot (black-headed parrot), the white-shouldered tangurú (*Monasa atra*), the leaden eufonia (*Euphonia plumbea*), the barbiamarillo antwren (*Myrmotherula ambiguous*), the mound of Yapacana (*Myr - meciza disjuncta*) and carpinterito del Orinoco (*Picumnus pumilus*). NSA species are restricted to Venezuelan flytrap (Myiarchus venezuelensis) and bobtail cuclillo (*Coccyzus pumilus*). These species, to completely be within a biome, in particular, they are of global importance. Additionally, in the Forest of Matavén confluence of the AMN and NSA biomes, which makes this area an area of zoogeographical transition. In these transition zones contact species that they are geographically separated, resulting unique ecological communities and varied. For this reason, their protection is a priority. (Villarreal Leal , et al., 2009).

The table below presents the wildlife identified according ethnic groups in the RIU-SM.

Table 14. Wildlife identified by ethnic groups Sikuani, Piapoco, Piaroa y Puinave en la Selva Matavén, Vichada.

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Amphibians						
Bufo granulosus	Sapo	Busuto	Jua'u	Baluta	Busuto	Taló
Epipedobates mvsersi	Rana	Tucue		Baizl	Kuaito	
Hyla hobbsi	Rana	Tukure	Urema	Baisi	Kumo	
Leptodactylus fuscus	Rana	Buluwakuai	Jua'u	Baluta	Busuto, Buluwato, barruli	
Birds						
Aburría pipile	Pava, Rajadora		Culluvi, Cuyuwi		Cutuwi	

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Amazona amazonica	Lora Cariamarilla	Cuchal, cutsali	Utuhuäyu	Dulewa-Kulikuli	Kutsali	
Amazona ochrocephala	Loro común	Ono	Pera'ka,	Dukewa	Ono	Shrn
Amazonetta brasiliensis	Pato	uara	Patu	Unana	Nejübü	
Ahima cornuta	Buitre de ciénaga	Kawípí	Doidoi	Kamekui, Amukui	Camecuai	Cancuí
Anhinga anhinga	Picua, pato aguja	Kayawa	Cachuhuä Kächuhuä	Katzuwa	Cayawa, Coduguá	Kadu-wa
Anthracothorax niaricollis	Colibrí pechinegro	Sisibarüto	Jiude	Eipi	Tsilipi	Pri
Anurolimnas viridis	Polluela cabecirufa	Waeso pakueto	Mä,'kä,n,i	Kuzare	Waeso, pakueto	Kotcheret
Ara ararauna	Guacamayo azul y amarillo	Uwai	Käppa	Atalu	Arü	
Ara chloroptera	Guacamaya Roja	Maja	Ara, Pappä	Atalu	Maja, Uwai	
Ara macao	Guacamayo Bandera	Maja	Ara	Atalu	Maja, Atalli	Yü
Ara severa	Guacamayo	Tsepavi, tsebavi	E'ara	Tzeepa	Tsépa	Yuen
Aramidas cajanea	Chilacoa colinegra	Cochajato, Cotsagato	Ma'kan	Kuzare	Kotsajato	
Aratinga pertinax	Perico carisucio	Jowaito	erehua,	Kulikuli	Kuchali, Kutsali	
Ardea cocoi	Garzón azul	Guatarrama	Rasa	Wataram	Wararrama	
Brachygalba /ugubris	Jacamarlúgubre	Sipido	Jlude	Zipi	Sipito	
Brotogeris cyanoptera	Perico, periquito aliazul	Quiniquinito	Hue'ka,		Kinikinito	
Cacicus cela	Arrendajo	Ketsuli	Chirahuä	Ketzulí, Kechull	Ketsuli, Quechili	Qrtsaü
Cairina moschata	Pato real	Najibü	Patu	Kumata	Najibü, Naiübü	
Casmerodlus a/bus	Garza real	Mali, Mani	Teamari	Mali	Mali	
Cathartes aura	Zamuro	Wayuli	Ejo	Watzulí	Wayuli	
Celeus flavus	Carpintero Amarillo	Jetsoro	Maya'ca	Zuwa	Gechorro	
Cephalopterus ornatus	Paragüero amazónico	Wawalljule			Wawllitu, Wawlaiijurrto	Yauyasipu
Colinus cristatus	Perdiz común	Tsacanito				
Columba subvinacea	Paloma	Wanalereto	Wnucu	Unuku	Ukukuto, Yaje	
Columbina talpacoti	Tortolitacomún	Wanalereto	Du'uo	Unuku	Ukukuto	Ití
Coragyps atratus	Zamuro común	Quequerre	Ejo	Watzull	Come pitso, Kekerre	
Crax alectar	Paujil	Kawipi	Mocuijurę Ajave	Kawipi, Kuizi, Cuisi	Kawipi	
Crax tomentosa	Pajuil	Ütjübürü	Ijurę Ajave	Kuzu, Kuisi, Cuisi	Uthübürü, itjübüru, utnübür	
Crotophaga ani	Garrapatero común	Walawala, Uini	Huarahuara	Duini	uini	
Crotophaga major	Garrapatero mavor	Wakialijuleto	Huarahuara	Duluba	Kolokolo	
Crypturelfus caslauiare	Gallineta	Dakato	Huehua	Zipiali	Dacato	
Crypturellus cinereus	nnamú cenizo	Dakato	Huehua	Apaiwa	Dakato	Boü
Crypturellus soui	Tinamú chico	Dakato	Huehua	Apaiba	Dakato- Pucali	
Crypturellus varleaatus	Gallineta	Jovato	Huehuct Güettua	Taka	Dakato, Pusksll	
Daptrius americanus	Halcon avisoero	Amarru	Seremari	Tziyali	Tsiyaly	
Daptrius ater	Halcon	Kukuwi	Serema ri	Tziyali	Atotolí	
Dendrocygna autumnalis	Pato	Najübü	Junä, un, ä,, Huis,iyu	Unana, Wirlrl	Uarra, Üara, Üaunra	Wlriri

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Dryocopus lineatus	Carpintero	Jetsoro	Mayaka	Zuwa, Suva	Jetsorro	
Eurypyga helias	Garza del sol	Yole	Jua,ra,	Araalí	Akalí, Tiland io	Zoolro
Falco rufigularis	Haicon murcielaguer o	Jitijitiwabo, ntlwabo	D hua,d hu a,	Awa	Jitijitiwabo	
Falco sparverius	Cernícalo	Jitijitíwabo	Ppiyupare			Jüisrntí
Forpus sclateri	Periquito piquinegro	Aquirchanf, Aquirtsaní	Hu 'ka,	Kilikili	Kinikinito	
Galbula dea	Colibrí negro	Silipututu	Hua'c Huía huari		Sllípu, Tsilip	
Galbula leucogastra	Colibrí broncInero	Jutubai, Kobüto	Hua'c Hu[a,huari	Tutuli	Sllípu, Tsilip, Jutubai	Urjún
Glaucis hirsuta	Colibrí	Sipi	Jiude		Sipito, SisJbarüto	
Gymnostinops vurucares	Mochilero	Tsoco	A'atta	Dulrí	Tsoko, Hojo	
Harpia harpyja	Águila hapfa	Kuyawisi, Cotsala	Pare	Amalu	Amarru	
Herpetotheres cachinnans	Halcón culebrero	Turupiali, Turpiali	Dehuä,dehuä		Wakawa	
Hylocharis cyanus	Colibrí barbiblanco	Sipi, Sisibarüto	Jiude	Zipi	Sipito, Sislbarroto	
Icterus chNsoceohalus	Turpial morichero	Turupiall	Huarl Poivuhua		Tsipuiny	
Leptotila rufaxilla	Paloma, Caminera	Topipiboto	Teyu	Waneler u	Wanalerto	
Leucoptemis albicollis	Aguila blanca	Amaru	Pare	Awa	Kokopl	Taan
Leucopternis melanoos	Aguila carlneara	iaiato	Huacahua		laiato	
Leucopternls schistacea	Agulla oatirroia	laia.to	Pp¡yupare	Awa	üaüato	Jü
Micrastur gilvicolis	Halcónoiiblanco	iaiato	PpiyuPare	Awa	Kokopi	
Mjlvago chimachima	Gavilánprimito	Siliali	Pp¡yuPare		Iñaiñato,Smarru	
Mycteria americana	Gaván	Tsaki	Duhui	AtawinaliÁtalinawi	Chaqui	
Odontophorusquianensis	Perdizcorcovada	Tsakanito	Dü'cara	Tzakani	Tsacanito	
Opisthocomushoazin	Pavahedionda	Jirali,Tsetseto	Hä,chä,pua	Tzentze	Chenche,Tsentse	
Ortalis motmot	Guacharaca	Marai	Tä,bí	Malai	Watsaraca	Joripí
Otus choliba	Cucurrutúcomún	Jororoto	Yodo Rare	Tamorokoko	Jorrorroto,Jororoto	
Pandion haliaetus	Aguilapescadora	Kuyawisi	Anä,sjajya'che	Amalu	Kuyavisi	
Paroaria gularis	Pato	Kowaramat ajajara	Ppiyuhuä	Kiraiwita, Kumata	Sipuini	
Penelope jacquacu	Pava carroza	Marray, Maral, kujabü	Tä,bj Häbí	Malai	Maray, Marray	
Phaetornissunerciliosus	Colibrírabudo	Sipi	Ji'ude	Zípi	Sisibarüto,Sipito	Prí, Pri
Phaetomis supersiliosus	Colibrí ermitaño rabudo	Sisibarüto				
Piaya cayana	Picué, Cuco ardilla	Tjikue	S¡cuä,	Tzikué	Tsikue,Jükue	Bigte
Pionitesmelanocephala	Guajibo	Sikulitsa	Pudi	Tzinapailo	Sikulitsa	
Pionus menstruus	Cotorracheja Loro	Thuito	Kuhuijere	Zuitu	Tjüito	Shir
Popelairia langsdorffi	Colibrí colade lira tronador	Tsipito	Jiude	Zipí	Sisibarto, Zipí	
Porphyrio martinica	Jacana, Poila azul	Kotsajato	Ma'ka,n,i	Anatzuiru	Cotsajato	Corcheret
Porzana albicollis	Polluela cienaguera	Waesopaku e- to	Ma'kä,ní,	Anatzulru	Tobojünajüna, Tabüjünana	
Psaracoliusdecumanus	Oropéndulacrestada	Tsoko	A'atta	Duirí	Tsoko	
Psaracolius viridis	Mochilero	Tsoko	A'atta	Juiri	Tsoko	

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Psophia crepitans	Tente	Tsapimali	Yuätä	Matzalí,Matzaly	Matsali	
Pteroglossus flavirostris	Pichi pico de marfil (tucan)	Pilipili	Ppuri	Pidipidí, Manuiri	Pilipili	
Pteroglossus pluricinctus	Pichi de doble banda (Tucán)	Pilipili	Ppurl	Pidipidí	Pilipili	Ñyapí
Pyrrhura melanura	Loro	Kamathuito	Erehuä,	Zerewaa	Jura, Xura	
Ramphastos culminatus	Yátaro, Tucán	Tukueko	Yäjo	Tzaze,Kallgueny	Tukueco	
Rupicola rupicola	Gallo de roca	Dowatjicobüto			Uni	
Saltator maximus	Saltator oliva	Tsipulni	Ppíyuhua			Zit
Sarcoramphus papa	Rey zamuro	Canucali	Teaejo	Eda	Cano	
Scaphiduraorvzivora	Chamóngigante	Kumiya	Copitu	Trupiall	Tsipuini	Turnan
Schistochlamysmelanopis	Pizarritasabanera	Tsipuini				
Sporophila nigricollis	Espiguerocapuchino	Sipuini,Sipuana		Zipiali	Tuparre	
Thraupis palmarum	Azulejopalmero	Tsipuiní,Sipuini		Tzipuina	Waiwaitso	Shrí
Tigrisoma lineatum	Garza	Jonko	Janare	Jonko	Jonko	
Tinamus guttatus	Gallineta	Dacato	Huehua	Taka	Dakato	
Tinamus major	Gallineta	Jowato	Huehua	Taka	Dakato	
Traupis episcopus	Azulejo	Sipuini	Pä,jä,re 'chj	Tzipulna	Sipuini	
Trogon rufus	Trogónesmeralda	Kobuto	Juru'ku	Tutuli	Kobüto	
Trogon viridis	Trogóncoliblanco	Cobëto	Juru'cu	Tutulí	Kobüto	
Turdus albicolis	Mirla collereja	Watsilutsiluwa	Ppiyuhuä	collareia	wa	
Turdus obsoletus	Mirla selvática	Watsilitsi		Zipiali	Sipuini	
Xiphorhynchusquttatus	Trepadorsllvador	Petsaunae,Jetsoro	Daurä,ba	Zuwa	Jetsoro	Utjun
Invertebrates						
	Abeja	Momoto	Imuro		Jabümanto	
	Abejorro	Momoto	Maya'cha	Zimunalí, Zimunulito		Trn
Atta spp.	Hormiga	Japokoto	Bachaco	Bachaco	Bachaco	Bachaco
	Avispa	Imuru manüto			Momoto	
Caligo illioneus	Mariposa	Kokoto	Pperepä	Madawi	Sonoto	
Catenophele numilia	Mariposa	Matsalertonto	Pperepä	Matutu	Sonoto	
Coleoptera sp	Mariquita	Tasimumito				
Cryphanis polyxena	Mariposa	Sonoto	Pperepä	Madawi	Sonata	
Dryadula phaetusa	Abeja	Kokoto,Maduduto	Pperepä		Cocoto,Sonoto	Jabí
Emesis mandana	Abeja	Sonoto	YodoPperepa	Matutu	Maduduto,Madultuito	Jabí
Escorpión sp	Escorpión	Saliquito	Idiyu	Kalia	Aketo	
	Libélula	Sanunupalito		Kumelu	Sunupalito	
Morpho peleides	Mariposa	Sonoto	Pperepä	Madawi	Sonoto vajeni	
Nymphiduam aseolia	Abeja	Kokoto, Matsaler	Pperepä	Matutu	Kokoto	Jabí íjut
Panaque niarolineatus	Mariposa	Tátá,a			Tátá,a	
Papilio polyxena	Mariposa	Cocóto	Pperepä	Madawi	Sonóto	
Rhetus periander	Mariposa	Sonoto	Pperepä	Madawi	Cocoto	
Saltamontes	Saltamontes	Boseseto	Maracayuhuä	Kamapua	Sesebeto	
Zaretis itus	Mariposa	Kokoto	Pperepä	Madawi	Sonoto	Jabí
Mammals						
Agouti paca	Lapa	Ofaebë	Jara	Taba	Ofaebü	Det

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Alouatta seniculus	Araguato	Nujü	Imu	Izï, Iisl	nüjü	
Anoura geoffroyi	Chenguele	Javaëto	Coyuhuäca	Aawai	Jawacito	
Aotus sp.	Mico nocturno	Mukuali		Mokualí	Mukualí	
Ateles belzebuth	Mono araña	Wánall			Kapatu	
Atelocinus microtis	Zorro sabanero	Namo	Ahuria	Yalidu	Namo	
Basaricyib gabbii	Huron, marteja	Mucuali	Cuoclä	Kutsikutsi		Nazo
Bradypus variegatus	Perezoso de tres dedos	Wiji	Ihua	Adei, Kabalu	Wiji	Jum
Cabassous centralis	Ocarro, armadillo	Colitrepo	Remu	Ukala, Manacacheé	Okara	
Cabassous unicinctus	Ocarro, armadillo colaetrapo	Okara	Remu	Alitali	Okarra	
Cacajao melanocephalus	Mico colimocho chucuto	Kuwairi			Kuwairi	Cuairi
Callicebus torquatus	Viuda	Ojo-ojo	Huäcui	Wakui	Ojo-ojo-o,ojöjö	Tü
Caluromis lanatus	Marmosa	Wani		Wani	Wani	
Carollia perspicillata	Chenguele	Jawasirto	Cojuhuä			
Cebus albifrons	Mono blanco	Wanali	Jich	Wanalu	Guanali, Guanalu	
Cebus apella	Mono maicero	Cuwairri, Capalu	Ichi´ca	Puwai	Papabü	
Cebus nigrivitattus	Mono blanco	Wanali	Jichu	Wanalu	Wanalu	Zuli
Cerdocyon thous	Zorro	Namo	Ahuri	Yaliclu	Namo	
Chironectes minimus	Ratón de agua	Papani		Wani	Wani	
Chiropotes satanas	Sakí, Barbudo negro	Gualipato			Nutju	
Choloepus didactilus	Perezoso	Wiji	Ihua	Adai	Wiji	
Coendou melanurus	Puerco espín	Baubali	Ikäya	Tzala	Chala, tsala	
Coendou prehensilis	Puerco espín	Müjübü, yala, tsala				
Cyclopes didactylus	Trueno	Kofia, abaubali	Huu'o	Idaí	Abuabali, amuabali	Boí
Dasyprocta fuliginosa	Chaqueto, picure					
Dasypus kappleri	Cachicamo montañero	Kayure	Acui	Tzee	Kayure	
Dasypus novemcinctus	Cachicamo	Cayuré, Tujubë	Acui	Tzee, Chee	Tujubü	
Dasypus sabanicola	Cachicamo sabanero	Tujubü	Acui	Alitali, Cheé	Tujubü	
Desmodus rotundus	Chenguele	Jawaütu	Cojuhuä	Jawa	Jawayaüto	Tín
Didelphis marsupialis	Rabipelao	Isiri, tsika	Yähuäre	Isirí	Chika, Tsika	
Eira barbara	Ulamá	Mayawi	huërä		Mayawí	
Eumops auripendulus	Chenguele	Javasirito	Cojuhuä	Iwayu		
Felis (leopardus) pardalis	Tigrillo (león)	Newütjü	Yähui	Tzaiwikare	Newütjü	
Felis (Leopardus) tigrinus	Tigrillo	âiâito	Ru´tubä	Tzawikare	Newütjü	
Felis (Leopardus) wiedii	Tigrillo	Tsawikera	Buó yähui	Tzaíwikere	Tzaíwikeru	Watyaö
Galictis vittata	Marteja	Menetsamuito, torhoro				
Hydrochaeris hydrochaeris	Chigúiro	jomocobi	Hualy	Kuzu, Guezo	Jomokobi	Rrde
Fish						
Boulengerella maculata	Agujón	Tsutsubo	Susuppi	Yuyu	Umabo, Tsutsipabo	Pore

Scientific name	Spanish	Sikuani río Vichada	Piaroa*	Piapoco	Sikuani bajo Guaviare	Puinave
Brachyplatistoma filamentosum	Dorado	Pitaxutotsü	Duraü	Maliziari	Kalawanü	Macapa
Brachyplatystoma vaillanti	Pujón, Valentón, Capaz, Dorado	Minulibo, Manulibo		Zalikui	Pekor, ejuwinü, Malisi	
Brycon melanopterus	Bocona	Kuejato		Wiriuli	Batarro	
Brycon siebienthalae	Cherna	Kuejeto		Tzamuzi		
Colossoma macropomum	Cachama	Tatama	Kä,sä,mä,	Kadų Caduu	Tatama	
Hidrolicus scomberoides	Payara, Cachorro, dientón	Wemai	Bäyärä	Atuba	Wemani	
Hoplosternum unitaeniatus	Curito	Enobü	Ta´chä	Inuiri	Enobü	Pusón
Leporinus fasciatus	Omima amarilla y negra, Aracu	Karasito	Dähuä, cumü,ä,	Kalutzi	Kartsito	
Megalodras irwini	Sierra	Jorojoro	Su´ki	Ulu	Jorojoro	Zrrt
Myleus rubripinnis	Pampero	Tarapabo	Pampana	Pampano	janerribo	
Mylossoma aureum	Pámpano	Felelewato	Ä,nä,si	Zalabada	Tarrapavo	
Mylossoma duriventris	Palometa	Janeribo	Ä,nä,si	Munu	Tarrapavo	Sarapata
Paracheirodon innesi	Neón cardena, tetra cardenal	Akairito				
Piaractus brachypomus	Morocoto	Kowarabo	Kä,sä,mä,	Kazama	Tarrapabo	
Potamotrigon hystrix	Raya	Pone	Sibäri	Yaduli	Pone	
Prochilodus nigricans	Bocachico	Jakato	Änabäri	Kutza, Chanabali	Yanapanito	Kutza
Pseudoplatystoma fasciatum	Bagre tigre, rayado, pintado	Bunuju	Curiri	Kulirri	Bunujü	Yen
Rhaphiodon gibbus	Perro	Patiribo	Bäyärä	Ziribali	Wemai, Patirrabo	
Salminus hilarii	Picuda, salmón, dorado	Yomatito		Dupo	Kowirto	
Schizodon fasciatum	Platanote	Cudalu	Cųmųä,, Dähuo	Dali	Capinawato	
Semaprochilodus laticeps	Falsa sapuara	Yanapanito	Baji	Kuta, Tzarumali	Yanopanito, Kutsutsito	Ikrn
Serrasalmus rhombeus	Cherna	Tatama	Caribį ´Kädu	Kadú	Cachama, Tatama	
Triportheus angulatus	Arenca	Manulibo	Nahuodä, Piya	Ménuli	Menulibo	Manon

Source: (Ariza Vera, Eduardo; Polanco Ochoa, Rocío; Yepes Guzmán, Adriana; Suárez Navarro, Alvaro E., 2006) Matavén: territorio, cultura y paisaje : Sikuani, Piaroa, Piapoco, Curripaco, Puinave, page 94

1.10.9 Social, cultural, economic and environmental aspects of the indigenous population

Illustration 19. Children from the community of Berlin 1

Source: REDD+ project RIU-SM

There are 12,312 indigenous people belonging to 2,517 families and 250 communities currently living in the RIU-SM, in which 48.5% is made up of women and 51.5% men. [31]

Next the list of the sectors and its corresponding communities is presented according to their geographic location, zone and sector of RIU-SM.

[31] *Source: Annex 2.2.7 Socio-economic Survey conducted under the Project (December 2013, January and February 2014)*

Table 15. Communities in the project area by zones and sectors

#	COMUNITY
Zona 1 - Sector 1	
1	Arbolito
2	Barranco Lindo
3	Bellavista
4	Campo Alegre
5	Cañoaraco
6	Caracol
7	Cumaral
8	Curicagua
9	Guayaquil
10	La Fortuna
11	La Milagrosa
12	La Zanja
13	Llanura Aleba
14	Lucerito
15	Makokoba
16	Miralejos
17	Miraluz
18	Morichalito
19	Morocoy
20	Ocupamo
21	Puerto Lucía
22	Punto Esperanza
23	Restrepo
24	Retiro
25	Retiro
26	Rincon Guamal
27	San Agustin
28	San Juan de Dios
29	San Martin
30	San Miguel
31	Santa Gloria
32	Santa Isabel
33	Santa Maria
34	Santa Maria
35	Villamaria
36	Villanueva
37	Vista Hermosa
38	Wisirianae
39	Yopalito
Zona 1 - Sector 2	
40	Bopone
41	Brisas
42	Capturama
43	Carraba
44	Cerrito

#	COMUNITY
45	Chaparral
46	Cumariana
47	Guayabetal
48	Kirey Central
49	Kirey Loma
50	Kirey Rincon
51	la venturosa
52	Malsuldani
53	Mangal Yopalito
54	Maniare
55	miraflores
56	Okarraba
57	Palmita
58	Remanzo
59	simeria
60	Siracusa
61	Tamude Jordan
62	Tsawatawali
63	Vaturiba
64	Warakane
Zona 2 - Sector 3a	
65	1 Virginia
66	Amue Tsenebo
67	Autana
68	Awiribo
69	Bachaquero
70	Buenavista
71	Buenos Aires
72	Camuniana
73	Caribello
74	caribello uno
75	Cheguarama
76	Dume
77	Guayame central
78	Guayame Loma
79	Guayame Puerto
80	Jajaraba
81	Kuloya
82	La Urbana
83	Loma Verde
84	Makiribo
85	Maleza
86	Mangal Perdido
87	Merey Danubio
88	miralejos
89	Montaña Fria
90	Nazareth
91	Nueva Esperanza - Kalifina - Kalifina

#	COMUNITY
	Loma
92	Platanillal
93	puerto infante
94	Puerto La Miel
95	Raya
96	Remanso Carinagua
97	Sabanita
98	San Pedro
99	Sibo Chenebo
100	Sibo Rincon
101	Siloe
102	Tirana
103	Uruy
104	Xuperibo
Zona 2 - Sector 3b	
105	Arebe Central
106	Azulejo
107	Baliba
108	Belen
109	Bonaire
110	Boponae Central
111	Bopone Sarrapia
112	Creek Sardina
113	Cocotoba
114	Dorado
115	Evergel
116	Furace
117	Furere
118	Guanape
119	Guayabal
120	Kukurital
121	La Esmeralda
122	La Garcita
123	La Rompida
124	Laguna Samaricuna
125	Lejania
126	Loma Primitivo
127	Macedonia
128	Mangal
129	Marimba
130	Mawia soledad
131	Nueva Esperanza
132	Nuevo Oriente
133	Palometa
134	Pilon
135	Progreso Integral
136	Pueblo Viejo
137	Puerto Arebe

#	COMUNITY
138	Puerto Guanico
139	Pukama
140	Rincon Ceiba
141	Rincon Cotoba
142	San Juan
143	San Piñalito Morichal
144	Santa Cecilia
145	Santa Cruz
146	Santa Elena
147	Santa Rosal
148	Sejal
149	Serrania
150	Sirare
151	Siria Palmira
152	Siviare
153	Sucuara
154	Tirso Atana
155	Toforoto
156	Wereto
Zona 3 - Sector 4	
157	Barranco colorado
158	Cajaro
159	Campo Alegre
160	Cotsibo Nuevo
161	Guabina
162	Miralejo
163	Nueva Esperanza
164	Palmar
165	Pirariame
166	San Antonio
167	Santa Cruz
168	Tonina
Zona 3 - Sector 5	
169	Márida
170	Pueblo Nuevo Zama
Zona 3 - Sector 6	
171	Pueblo Nuevo Matavén
172	Sarrapia
173	Urbana Matavén
Zona 3 - Sector 7	
174	Berrocal
175	Guayabal Anapo
176	La Ceiba
177	Pueblo Escondido
Zona 4 - Sector 8	
178	Laguna Cacao
179	Laguna Negra
180	San Luis

#	COMUNITY
181	Veraniego
Zona 4 - Sector 9	
182	Sejal Esperanza
183	Sejalito 1
184	Sejalito 2
Zona 4 - Sector 10	
185	Berlín 1
186	Creek Onoto
187	Creek Pavita
188	La Libertada Barranco
189	La Macarena
190	Laguna Anguilla
191	Monte Rey
192	San Rafael
193	Santa Isabel
Zona 4 - Sector 11	
194	Barranco Guarura
195	Barranquito
196	Higuerón
197	Laguna Colorada
198	Mapisiare
199	Monte Bello
200	Palmarito
201	Puerto Esperanza
202	Puerto Guamal
Zona 4 - Sector 12	
203	Creek Bocón
Zona 4 - Sector 13	
204	Cumaral
205	La Cabaña
Zona 4 - Sector 14	
206	Yurí
Zona 4 - Sector 15	
207	Finca el Bambú
208	Giro
209	Giro Sabanitas
210	Picúa
Zona 4 - Sector 16	
211	Bambú Trupialito
212	Barranco tigre
213	Belén
214	Buenavista
215	Caserío L Actitud
216	Charco mure
217	Cumaralito
218	Manajuare
219	Miraluz
220	Morichal
221	Palmarito
222	San Rafael morocoto
223	Turpialito
224	Yarumal

Source: REDD+ project RIU-SM. This information is estimated with data of the workshop with the representatives of 16 sectors in Inírida (Guainía), July 22.24, 2012.

Table 16. Estimation of distribution of the human population of RIU-SM per zone at project start

	# children (1-15 years)		# young adults (15-25 years)		# adults (25-60 years)		# older adults (>60 years)		Total individuals
	W	M	W	M	W	M	W	M	
Total estim. / RIU-SM	2,690	2,729	1,409	1,422	1,845	2,101	281	345	12,814(1)
Percentage(2)	21%	21.3%	11.0%	11.1%	14.4%	16.4%	2.2%	2.7%	100.0%

W: women; M: men

(1) Source: PGAR Vichada – Corporinoquía (Department Secretary of Indigenous Matters) actualized in 2012

(2) Source: DANE Census 2005.

The indigenous reservation located in the Selva de Mataven is composed in its majority of a young population approximately 64.3% of the population is between the ages of 0 and 25. The 95.1% of the population correspond to people younger tan 60 years and only a 4.9% correspond to people older tan 60 years.

The following table presents the distributionof population in communities and families.

Table 17. Distribution of population in 17 sectors of the Resguardo Indígena Unificado – Selva de Matavén (estimated at project start)

#	Sectors	# communities(1)	# family(1)	% # family	# people (2)	% # people	# people / family
	Vichada River Central Zone						
1	Caño Cavasi	44	323	12.9	3,480	27.2%	10.8
2	Aiva-Cuna, Tsepajibo	25	366	14.5	1,259	9.8%	3.4
Subtotal		**69**	**689**	**27.4**	**4,739**	**37.0%**	**6.9**
	Vichada River Low Zone						
3a	Bajo Vichada (I)	46	444	17.6	2,211	17.3%	5.0
3b	Bajo Vichada (II)	52	475	18.9	2,001	15.6%	4.2
Subtotal		**98**	**919**	**36.5**	**4,212**	**32.9%**	**4.6**
	Orinoco River Zone						
4	Atana-Pirariame	15	106	4.2	418	3.3%	3.9
5	Caño Zama	3	29	1.1	50	0.4%	1.7
6	Mataven Fruta	5	55	2.2	152	1.2%	2.8
7	Berrocal-Ajota	8	110	4.4	450	3.5%	4.1
Subtotal		**31**	**300**	**11.9**	**1,070**	**8.4%**	**3.6**
	Guaviare River – Brazo de Amanavén I – Low Zone						
8	Lagunas Negra Y Cacao	4	71	2.8	321	2.5%	4.5
9	Sejalito –San Benito	5	77	3	293	2.3%	3.8
10	Laguna Anguilla- La Macarena	11	128	5.1	516	4.0%	4.0
11	Barranquito-Laguna Colorada	9	108	4.3	421	3.3%	3.9
Subtotal		**29**	**384**	**15.3**	**1,551**	**12.1%**	**4.0**
	Guaviare River – Brazo de Amanavén II – Low Zone						
12	Caño Bocón	2	24	1	53	0.4%	2.2
13	Cumaral	2	17	0.7	256	2.0%	15.1
14	Yuri	1	14	0.6	103	0.8%	7.4
15	Giro	4	22	0.9	263	2.1%	12.0
16	Morocoto-Buenavista-Manajuare	14	148	5.9	567	4.4%	3.8
Subtotal		**23**	**225**	**8.9**	**1,242**	**9.7%**	**5.5**
		250	**2,517**	**100**	**12,814**	**100.0%**	**5.1**

(1) Source: REDD+ project RIU-SM. This information is estimated with data of the workshop with the representatives of 16 sectors in Inírida (Guainía), July 22.24, 2012.
(2) Source: PGAR Vichada – Corporinoquía (Department Secretary of Indigenous Matters) actualized in 2012

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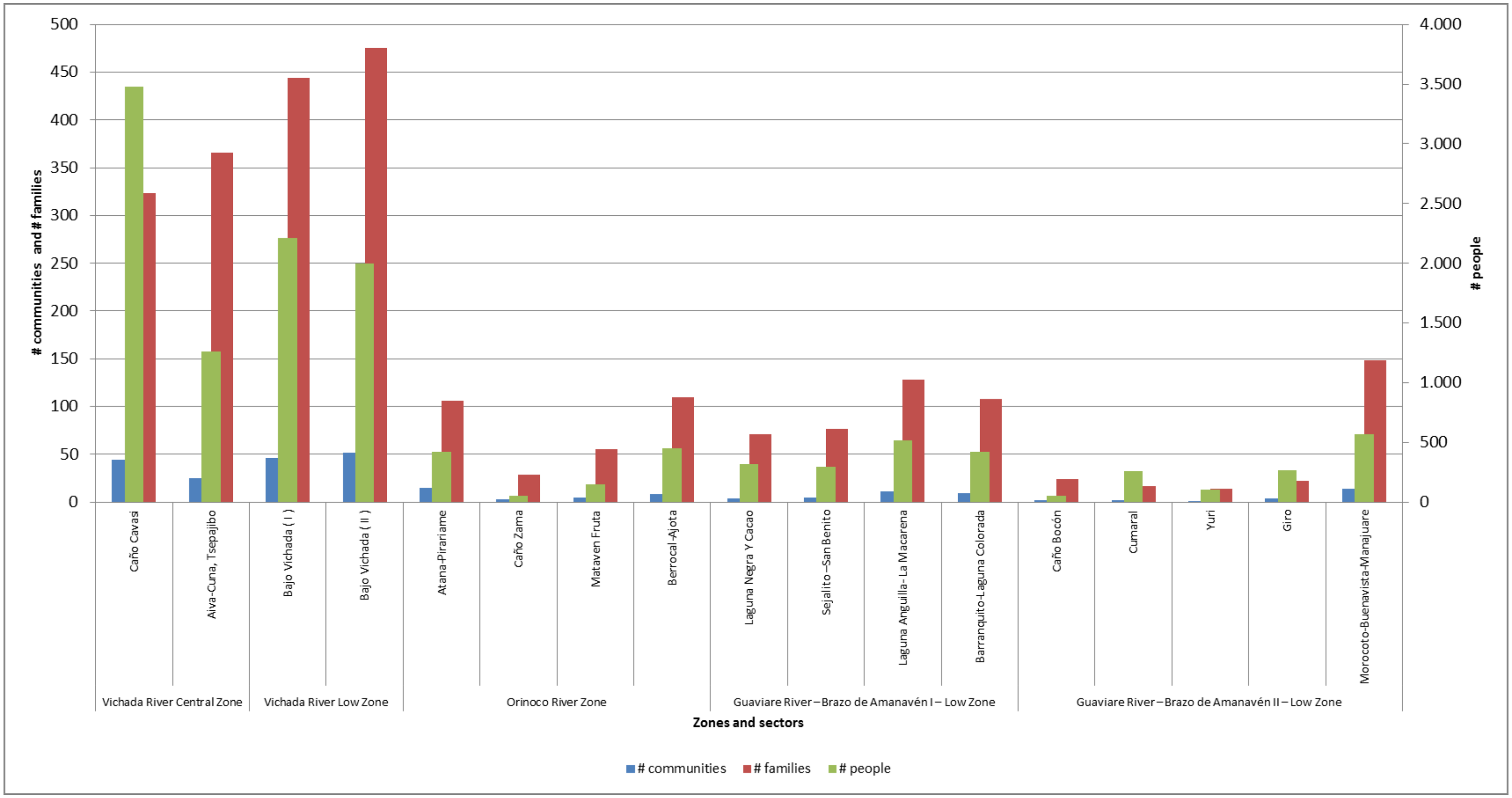
Illustration 20. Distribution of the population in the 16 sectors of the Indigenous Unified Reservation- Mataven Jungle (estimated 2012)



(# communities and # families) Source: REDD+ project RIU-SM. This information is estimated with data of the workshop with the representatives of 16 sectors in Inírida (Guainía), July 22.24, 2012.
(# people) Source: PGAR Vichada – Corporinoquía (Department Secretary of Indigenous Matters) actualized in 2012

Indigenous communities have practiced hunting, fishing and gathering wild fruits and traditional subsistence activities; recently incorporated in subsistence agriculture or as called, conucos or chagras. Also crafts are an important item in their economy; from these indigenous activities they have achieved their self-sufficiency. This self-sufficiency has been lost as these communities are not immune to the economic dynamics of the modern market, which has meant the growing generation needs for goods and services, and that has meant the transformation of their modes of production, in some cases, drastically.

Illustration 21. Guaviare River Fisherman

Source: REDD+ project RIU-SM

Currently, the economic forms that prevail in the indigenous communities of the Mataven Jungle are unequal relations with traders and settlers, which favor speculation in commercial and financial transactions. These settlers and traders incursion into the territory in order to develop activities such as logging, fishing, hunting of wildlife and (illegal) mining activities, generating constant pressure on natural resources, as have the means (technology, transport among others) and a relative disadvantage and vulnerability of indigenous against their interests; the boundary condition increases the difficulties, with heterogeneous users and different conditions and institutional skills associated with care and control of these resources.

Consequently, the best known work mode is the debt, that economic relationship in which the merchant advances goods, supplies or services in exchange of work rate and is paid always arbitrary and insufficiently to settle a debt, keeping so indefinitely a permanent reservoir of indigenous labor needed.

For its part, the local market does not absorb fairly generated surpluses for sale, due to their traditional way of production and use of natural resources. Indigenous communities sell the little surplus price imposed by the trader or broker, always being disadvantageous for communities.

Additionally, the above situation alters the vital relationship of indigenous peoples with the territory, since these communities conceive the territory from a holistic perspective. That is, not only understanding as the means of their livelihood but also is the source of their identity and worldview. So, the entry of other actors to exploit resources, could lead to food safety problems and damage to the sacred and vital areas for indigenous peoples.

The food security of indigenous communities is violated by its dependence on products that complement their staple diet, the limited availability of financial resources to meet these demands and loss of traditional knowledge. In this sense, the production and cultivation of traditional products is increasingly limited, with a restricted number of crop species in their conucos with traditional practices or mismatched with the conditions of natural ecosystems offer.

Families have an average of 5 persons per family. It is easy to find in the living room houses grandparents, parents and children, affecting power relations that influence the differential access to resources and opportunities of each of the members; so we can not say that the distribution of resources is homogeneous or that the situation of one of its members may be indicative of the status of everyone else.

The concept of head of household is a subjective judgment about who is perceived as leader by all household members, regardless of the responsibilities or duties fulfilled; when at home there is a presence of a man (woman companion) he will be in charge.

The location of the rural population is due to the jungle and humid conditions prevailing in the area, hampering settlements inside the Mataven Jungle; location on the banks of rivers facilitates the transport, food and communication. Migration is one of the promising alternatives for some families in the city who see a possibility of improving their living.

The existence of six ethnic groups (Sikuani, Piapoco, Piaroa, Puinave, Curripaco and Kubeo), is an undeniable social fact in the region; according to the historical genesis it has presented the process of settlement of various groups that can be classified as natives and settlers, and this factor as an indicator that identifies the degree of ownership of the territory of each of them.

Housing

In the region they are considered as indigenous natives only, not only for the time spent in the area (ancestral inhabitants), but to preserve their own forms of cultural identity. The mestizo settlers group does not exhibit this same behavior and are due to other cultural patterns; the territory is not part of their identity but is a means of external productive exploitation of their social organization, thus becoming a form of survival or storage.

Illustration 22. Typical Housing

Source: REDD+ project RIU-SM

In the following table we will observe the deficiency in housing present in Colombia according with the 2005 census, parameters established as the quantitative deficiency makes reference to the amount of families that share one space, the cohabitation, the lack of housing and overcrowding. On the other hand, the qualitative deficiency that refers to the minimal conditions of salubrity, basic services like drinking wáter, sewage, structure and cooking that must be part of a house.

Table 18. Housing deficiency

Reference	Total homes			Homes without deficiencies			Homes in deficiency			Homes with quantitative deficiency			Homes with qualitative		
	Total	Urbano	Rural	Total	Urbano	Rural	Total	Urbano	Rural	Total	Urbano	Rural	Total	Urbano	Rural
Colombia	10,570.899	8,210,347	2,360,552	6,742,844	5,993,484	749,360	3,828,055	2,216,863	1,611,192	1,307,757	1,031,256	276,501	2,520,298	1,185,607	1,334,691
Vichada	8,355	3,778	4,577	683	345	338	7,672	3,433	4,239	2,517	910	1,607	5,154	2,522	2,632
Cumaribo	4,967	1,319	3,648	474	304	170	4,493	1,015	3,478	1,866	543	1,323	2.627	472	2,155

Source: DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta

Pertaining to Cumaribo which is the municipality where it is located the área of the project REDD+RIU-SM, in 2005 there were 4,967 homes of which 9.5% or 474 homes were homes without any kind of deficiency. 90.5% of the homes presented a quantitative or qualitative deficiency. Of the total homes in the rural sector, 3,648, only 4.6 or 170 homes have no deficiency that leaves a 95.4% of the homes located in the rural sector of Cumartibo with quantitative and qualitative deficiencies.

It is estimated that for 2014 of the 2,517 families still living in the RIU-SM according with the census and it is considered that 100% of those homes have deficiencies of quantitive or qualitive type.

The vast majority of homes in the indigenous communities that inhabit the Indian Unified Forest Stewardship Mataven are built with thatched roofs, shingles zinc. Wood-paneled walls, adobe (mud with straw attached) and palm leaves. Floors almost always land; homes lack a system of wastewater treatment; the population lacks drinking water. The water supply is made by housing through transport from rivers and rain water collection, storage tanks and is occasionally transporting water hoses ago. [32]

Education

In reference to the population that lives in the área of the project REDD+RIU-SM, we can say that there is no study that shows the level of education receive in the indigenous communities. According to inquiries done, we know that it exist a high level of illiteracy and only a 5.9% of the population in RIU-SM have made it to high school.

We can observe in the following table that in the municipality of Cumaribo about 80% of the population have completed an elementary education and there is no access to a high school. The level of illiteracy reach the 24.5% in the municipality of Cumaribo. These numbers are higher than the national level which has more access to higher education.[31]

Table 19. Educational level

	None	Pre-school	Elementary	High school	Technical	Normalista	Superior
Colombia	10.2%	4.7%	37.2%	31.8%	3.9%	0.2%	11.9%
Vichada	21.1%	5.1%	44.7%	22.3%	2.7%	0.9%	3.2%
Cumaribo	25.7%	5.4%	49.1%	17.7%	0.7%	0.4%	1.1%
RIU - SM				5.9%			

Source: DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta

[32] *DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta*

Illustration 23. Children Population

Source: REDD+ project RIU-SM

Table 20. Illiteracy rates. Población de 5 a 15 años y más de 15 años

	Urban Area		Rural Area		Total	
	5 years o +	15 years o +	5 years o +	15 years o +	5 years o +	15 years o +
Colombia	6.2%	5.5.%	17.9%	18.5%	8.9%	8.4%
Vichada	8.4%	8.5%	24.5%	23.7%	17.4%	16.9%
Cumaribo	8%	9.2%	24.7%	24%	21.7%	21.3%

Source: DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta

Attendance to educational centers by people between the ages of 3 and 24 in the municipality of Cumaribo is of 36.7% in the rural área. This rate is superior than the one from RIU-SM that as noted before does not have access to educational centers in all the communities, limiting the access to this services by young adults.

Table 21. Percentage of the population between the ages of 3 and 24 that attend a educational facility

	Urbana	Rural	Total
Colombia	66.7%	52.6%	63.2%
Vichada	61.9%	36.8%	47.8%
Cumaribo	61.1%	36.7%	40.8%

Source: DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta

Within the Resguardo Indigena Unificado de la Selva de Matavén, there are 4 high schools, they are all basic education from pre-school to nineth grade, mix schools and boarding school:

- The school located in the community of Raya, belongs to the secretary of departamental education and covers all the students from the alto Vichada.
- The school located in the community of Progreso, belongs to the secretary of departamental education and covers all the students from the low Vichada.
- The school located in the community of Sarrapia, belongs to the secretary of departamental education and covers all the students in the Orinoco axis.
- The school located in the community of Segal and runs due to an agreement with the secretary of departamental education of Vichada and it covers the students of low Guaviare and arm of the river Amanaven.

In the arm of the Amanaven there are 6 schools for 1st to 4th grade.

In the arm of the Guaviare there are 3 schools for 1st to 4th grade.

In the Orinoco medio there are 9 schools for 1st to 4th grade.

The schools do not have a good quality education due to the lack of teachers with the right preparation and training.

Health system

Institutional Structure of conformity with the information provided by the State, the municipality of Cumaribo has the infrastructure to service the health needs of its community taking into account the location and personal support.

Illustration 24. Skin disorders in children

Source: REDD+ project RIU-SM

Table 22. Infrastructure to provide health services in Cumaribo. Taking into account the location and personal support

Infrastructure	Location	Level of attention	Personal support
Local Hospital	Urban zone	First level	2 rural Doctors, 1 Bacteriologist, 7 Aides, 1 dentis
Clinic Guerima 1	Population center Guerima		1 Doctor, 1 Chief nurse, 1 Aide, 1 Dentist, 1 Bacteriologist
Clinic Santa Rita	Population Center Santa Rita		1 Doctor, 1 Chief nurse, 1 Aide, 1 Dentist, 1 Bacteriologist
Clinic Sejal	Population Center Sejal		1 Doctor, 1 Chief nurse, 1 Aide, 1 Bacteriologist

Source: Based on (Acevedo Jaimes, 2012). Analysis of the health situation of borders (ASIS) Vichada (Puerto Carreño, La Primavera y Cumaribo). Health Sectional Secretariat of Vichada.

Communities living along the river Guaviare, proximity are treated in health centers in the municipality of Inirida, located in the department of Guainia

Medical facilities are generally insufficient and lack of resources, endowments, medicines and staff who treats lacks sufficient training to administer first aid. Drinking water comes from streams and rivers, it lacks of a control and maintenance program, involving infectious and gastrointestinal diseases.

According with the data base of the affiliates to the subsidised regime in 2011, there were 43,479 people registered in the "Fondo de Solidaridad y Garantía – FOSYGA"[33]. This indicated a coverage of 74.8% taking into account the population of 58,100. [Based on (Acevedo Jaimes, 2012)].

Table 23. EPS present in the Municipality of Cumaribo

EPS	Women	Men	Total
Confamiliar Huila	20,825	21,553	42,378
Ecoopsos	339	362	701
Mallamas EPS	109	201	310

Source: Based on (Acevedo Jaimes, 2012). Analysis of the health situation of borders (ASIS) Vichada (Puerto Carreño, La Primavera y Cumaribo). Health Sectional Secretariat of Vichada.

In the Municipality of Cumaribo in 2011, there were 46 deaths with their own death certificate in which it can be verified the cause of death specially those affecting children. There are cases of malnutrition, respiratory problems, tuberculosis, infection diseases and parasites that ended the life of 13 children, corresponding with 28%. There were also 5 homocides 10.8% and accidents that ended the life of 5 people.

Next, we are presenting a table demostrating the infant mortality in the Colombian territory and especifically in the state of Vichada and the municipality of Cumaribo. There is a reduction tendency in each of the territories, but exist a marked difference in 2011 in Cumaribo with the death of 44.4 children compared with the average in Colombia of 17.8. We can note that the majority of causes can be prevented and controlled. [Based on (Acevedo Jaimes, 2012)].

Table 24. Infant mortality rates (TMI). 2005 2011

	2005	2006	2007	2008	2009	2010	2011
Colombia	20.4	20.0	19.6	19.1	18.8	18.4	17.8
Vichada	41.6	40.59	39.5	38.5	35.5	36.4	36.8
Cumaribo	50	48.9	47.8	46.7	45.6	44.4	44.4

Values given in thousands

Source: (DANE, 2014). No fetal deaths -preliminar 2014. Departamento Administrativo Nacional de Estadística, http://www.dane.gov.co/index.php/esp/component/content/article/118-demograficas/estadisticas-vitales/5584-defunciones-no-fetales-2014-preliminar

[33] *"Fondo de Solidaridad y Garantía – FOSYGA" (Solidarity and Guarantee Fund) is a account attached to the Ministry of Health and Social Protection, managed by fiduciary commision, without legal status or own personnel, whose resources are allocated for investment in health.*

The causes of infant mortality are as follows:

- Generic factors and related to the birth:
  - Low birth weight.
  - High risk births (young women under the age of 18 or older than 45).
  - Short gestation periods
  - No prenatal care
  - Place and who atended the birth
- Care of the infant in his first year:
  - Inmunization against preventable sickness - vaccination.
  - Breastfeeding, feeding and child care.
  - Health practices at home.
- Variables related to the environment and sanitation and sewage control.
- Variables related to the home and people.
- Variables corresponding with the community and the government.
  - Basic public services.
  - Health programs and subsidiaries for the protection.
  - Educational campaigns for the prevention of sickness.

The same way there is a closed relation between the levels of infant mortality and the patterns of mortality per causes. The epidemiological profile is associated to the levels infant mortality. The general view observed in different countries shows that when there are a high level of infectual diseases (diarrea, respiratory infections), the infant mortality rate is high, when the Acute Diarrea – EDA and the Acute Respiratory Infection – IRA stop being the most important causes of the mortality (they are placed in second or third grade) and the perinatal conditions and the congenital anomalies have a great relative weight, the incidence of infant mortality is less. In another state where the mortality is relatively lower, the perinatal conditions and congenital anomalies constitute the two main causes of death, while the infectiones of the digestive and respiratory system stopped being in the top five most frequent causes. In this state, the infant mortality is being lower. The changes in the prevalence of certain sickness and causes of death are a consecuence of the advance in medicine, access to health services that the population can obtained. The education in the prevention of sickness and better higiene; in other words, a more advanced level of development in a country and its territorial entities.

In the Colombia's case, the set of causes of death, for the year 1998, represents the 73% of all causes of death for children under one year of age, while in 2005, this percentage was reduced to 63%. [Based on (DANE, 2014)]

Basic services in the RIU-SM

Drinking water

Indigenous communities belonging to RIU_SM to date do not have a network of drinking water, having to make use of mechanisms to capture water through deep wells and rainwater as a base for daily consumption for other purposes as grooming and cleaning clothes, uses water from rivers and streams where they are located.

Sewerage

Regarding the use of health, none of the indigenous communities of the RIU-SM have sewerage what they should do their basic needs latrines built for this purpose, or in most cases in the woods, with the discomforts and risks this implies.

Solid waste

There is no protocol for handling solid the vast majority of the indigenous communities in the area of RIU-SM waste, these solid wastes are disposed of in the woods and in the riverbeds.

Energy

There is no electricity supply from Cumaribo and other cities to the communities in the RIU-SM, so in some communities make use of power plants that are handled gasoline community or individually according to the possibilities, because the extensive territory and the remoteness of many communities do not have access to these teams and at any time of the day have energy.

Cooking fuel

The most commonly used fuel for cooking is wood or plant fuel.

The results of the census are presented in terms of the basic services required for families in Colombia.[34]

Table 25. Services that include housing

	Electric Power	Sewerage	Aqueduct	Natural gas	Phone
Colombia	93.6%	73.1%	83.4%	40.4%	53.7%
Vichada	52.8%	6.2%	43.5%	0%	7.8%
Cumaribo	30.3%	8.5%	26%	0%	0.7%

Source: DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta

[34] *DANE (2005). Census General for the Republic of Colombia. National Administrative Department of Statistics, query system (online). https://www.dane.gov.co/index.php/poblacion-y-demografia/sistema-de-consulta*

Poverty and development

Illustration 25. Living conditions of the population

Source: REDD+ project RIU-SM

The following chart shows the rural zone in the municipality of Cumaribo where the majority its population is indigenous, there is an alarming unsatisfied basic needs NBI. This is demonstrated by the data obtained from the National Administrative Department of Statistics DANE, corresponding with 90.71% of the rural population and a misery rate of 75.04%. (DANE, 2005)[35]

Table 26. Unsatisfy basic needs - NBI, according to municipality, state and national

Reference	Unsatisfied Basic Needs - NBI					
	Urban		Rural		Total	
	Proportion of people in NBI (%)	Proportion of pleople in misery	Proportion of people in NBI%	Proportion of people in misery	Proportion of pleople in NBI (%)	Proportion of people in misery
Total nacional	19.66%	5.88%	53.51%	25.71%	27.78%	10.64%
Vichada	41.94%	15.40%	84.40%	67.46%	66.95%	46.06%
Cumaribo	46.43%	13.46%	90.71%	75.04%	82.43%	63.53%

Source: (DANE, 2005). Bulletin General Census 2005 - Basic Needs Insatisfechas. .Bogotá. 4 pages.

[35] *DANE (2005). Bulletin General Census 2005 - Basic Needs Insatisfechas.Bogotá. 4 págs.*

The simple indicators to determine the unsatisfied basic needs NBI are:

Unsuitable housing, critical overcrowded homes, homes with inadequate services, homes with high economic dependency and homes with school age children that do not attend school.

Homes are classified as poor or with NBI if they present a lack of the above indicators or in the case of homes in misery if they have two or more of the indicators of unsatisfied basic needs.

The indigenous communities that are located within the REDD+ RIU-SM área have at least two of the mentioned indicators, which indicates that 100% of its population leaves in misery

Main economic activities

The main economic activities developed in the Unified Indian Reservation of the Selva de Mataven are, agricultura, fishing, hunting, cattle ranching, and a small portion turism and crafts, according to traditionals common practices recording as results of workshops by zones with captains, sector's authorities and community leaders (between January and February 2013) (Annex 1.3)

Illustration 26. Economic activities

Source: REDD+ project RIU-SM

There are talks about mining activities in the área which are not approved by the indigenous communities within the sector covered by the project REDD+RIU-SM. These activities seem to be growing in alarming proportions.

Fishing is done in the old fashion way using nylon and hook, harpoon and atarraya, the fish collected are used for the comsumption of the community and commercialization in the main commerce centers in the neighboring cities and communities on the river edge.

Hunting is the consumption of the community and variety of animals are: Cajuche, lapa, deer, danta, saino, pajuil, duck, heron, monkey, tapir, armadillo, picure, cahicamo, turkey hen, palm bear, turtle, chigüiro, shigueto and others.

Other economic activities done by the indigenous communities are the crafts but very few of the communities are using natural fibers to elaborate vessels, containers and other articules to be taken to the neighboring cities to sell or to have in hand for turist. There are some communities that are especialized in weaved articles like hammacks. Last, other communities work in ceramics.

Turism is another economic activity use by some communities but it does not generate much of an income. The visitors go up to Puerto Inirida and Cumaribo in search of beautiful locations, especial fishing and places to rest and meditation.

Current RIU-SM crops (crop and livestock production)

The basic need of feeding the Mataven Indigenous Reservation community, undertakes to carry out the deforestation of the forests and to use these spaces called "conucos" for the production of food of agricultural and animal origin.

Traditional culture is finding new land to new plantings; to apply the rotation after a certain time (8-10 years), you get back to the previous conucos, which have been decreasing their production capacity due to the loss of the natural fertility of these soils (Annex 6).

Types of conucos

Each type of conuco manifests specific techniques for implementation and a precise knowledge of the annual course of the climate.

The following types of conucos and crops are distinguished:

- Conuco de Mata de Monte: Also called chagra, roza o mipa, with slash and burn farming, traveling, nomadic, migratory. The main crop is yuca (Manihot esculenta). Associated crops are plátano topocho, tavena, mapuey, ñame, caña *(Saccharum sp)*, piña, sandía, parsha, lulo, ahuyama, zapallo, ocumo and ajíes. There are 20 breeds of yuca within Sikuanis, and 30 to 40 races within Puinaves, Piapocos, Curripacos, each with specific use and durability. The corn is harvested sometimes as mitaca, "Tapao" style.
- Conuco de Vega with a preference for corn (*Zea mays*) as the main crop.
- Conuco Playon, Várzea, Summer Sereno: Common in the Amazon and the Caribbean; beaches (part of the riverbed in drought), which are dry for longer than 60 days are used. These beaches (cutting and burning herbs) are prepared in summer; the following year, to the extent that the flats appear (October to May), it proceeds to planting.
- Conuco Morichal: In disuse in the colombian plains; still practiced by Karina communities in Venezuelan flat lands. In this type of conuco, dirt ridges, alternating with drainage ditches are constructed; seeding runs on the ridges with yuca, papaya and banana.

- Conuco Sabana: Some vestiges in Barinas, fart pipe (Venezuela). Gumilla Father wrote: "raise the land on either side of the groove, covering straw and hay with soil taken from one to the other side, then planting their corn, yuca or manioc and other roots, in all parts a bis amount of pepper.... " (Fajardo, Urbina, & Mejía, 1978) (Mejía, 1991).

Common name	Scientific name	Photograph
Ají Amazónico	*Capsicum chinense*	
Arazá	*Eugenia stipitata*	
Cocona o lulo amazónico	*Solanum sessiliflorum*	
Piña amazónica	*Ananas comosus*	
Caucho	*Hevea brasiliensis*	

Common name	Scientific name	Photograph
Chontaduro	*Bactris gasipaes*	
Copoazú	*Theobroma grandiflorum*	
Maraco (cacao)	*Theobroma bicolor Bonple*	
Guanábano	*Annona muricata*	

Other crops: Citrus, soursop banana, guama, mango, papaya, mamey (cashew nuts), peanuts, beans, corn, rice, pumpkin, watermelon, tomatoes, tavena, mapuey, yams, sugarcane (Saccharum sp), parsha, squash, taro and peppers.

Table 27. Crops and Landscapes

Crop	Sikuani (language)	Crop location
Avocado	Aguacate	Mainland
Auyama	Ailla	Threshing floor
Chili pepper	Nonaji	Threshing floor
Chili pepper	Nonaji	Threshing floor
Anon	Unono	Highland
Sweet potato	Dautju	Stubble
Sweet potato	Nunaku	Mainland

Crop	Sikuani (language)	Crop location
Cocoa	Cacao	Lowland
Caimaron	Catsawa	Low plot
Caimaron	Catsabua	Mainland
Cane	Basue	Threshing floor
Barley		Mainland
Chontaduro	Jipiri	Highland
Guama	Wiripa	Highland
Lemon	Limon	Mainland
Lulo	Maliata	Threshing floor
Lulo	Maliata	Lowland
Corn	Jetsa	Lowland
Corn	Jetsa	Threshing floor
Orange	Nuluja	Mainland
Ñame	Nonoji	Stubble
Papaya	Mapalla	
Pineapple	Dunusi	Stubble
Pipire	Jipirre	Mainland / Lowland
Banana	Banano	Plot
Banana	Yalatanu	Lowland
Banana	Balutuna	Threshing floor
Manioc	Newaju	Mainland
Bitter manioc	Peyanae Newaju	Highland
Bitter manioc	Newaju	Highland
White manioc	Peniojai Newaju	Threshing floor
Sweet manioc	Bawa	Threshing floor

Source: (Ariza Vera, Eduardo; Polanco Ochoa, Rocío; Yepes Guzmán, Adriana; Suárez Navarro, Alvaro E., 2006) Matavén: territorio, cultura y paisaje : Sikuani, Piaroa, Piapoco, Curripaco, Puinave, page 87

Table 28. Crops in Conucos and Plots, and their production times

Crop	Sikuani	Crop location	Planting time	Harvest time
Chili pepper	Nonoji	Plots or conuco	April	May
Cane	Basue	Conuco	April	January-March
Chontaduro	Jipiri	Conuco - Plot	April	Novem-Decem
Guama	Wiripa	Plot - Conuco	April	January-Decem
Lulo	Maliata	Conuco	April	March
Madura Verde	Emali	Bush or Conuco	April	May
Corn	Jetsa	Conuco	March- April	August-Septem
Mango	Mako	Front of house.	April	April-May
	Bautju	Conuco	April	August-Novem
Mapoy	Emairi	Conuco	April	Novem-Decem
Cashew nut	Jurui	Bush or Conuco	July	February
Orange	Nalaja	Courtyard	Decem-January	October
Yam	Nonoji	Conuco	April	Septem-Novem
Watermelon	Patilla	Conucos	April	January-Decem
Pineapple	Dunusi	Bush or Conuco	April	April-May
Banana	Platunu	Plot - conuco	April	Novem-Decem
	Makulakula	Conuco	April	February-March

Source: (Ariza Vera, Eduardo; Polanco Ochoa, Rocío; Yepes Guzmán, Adriana; Suárez Navarro, Alvaro E., 2006) Matavén: territorio, cultura y paisaje : Sikuani, Piaroa, Piapoco, Curripaco, Puinave, page 88

Table 29. Collection products

Middle Zone and Lower Rio Vichada				
Product	**Name**	**Crop location**	**Time**	**Collectors**
Maporosi	Maporosi	Stubble	December	Women and Children
Cucurito	Na"jarebo	Threshing floor, Gallery forest	May-July	Men
Moriche	Inojô	Low morichales	May-July	All
Ceje	O´´joü	Gallery forest	June-August	Men and Women
Lechozas	Pawa	Gallery forest	April-May	Men and Women
	Samarue	Gallery forest	November-February	All
	Abi	Gallery forest	April-May	All
	Wamu	Lowland	April-May	Men
	Yaruru	Near the river	May-July	Men and Women
	Pitsali	River bank	May-July	All
	Tsukü	Gallery forest	April-May	All
	Domati	Shrubbery	November- December	Women and Children
Cumare	Kumali	Stubble	November-March	Men and Women
	Daraü	Threshing floor	May	Hombre
Guayaba	Popo	Beaches	August-September	Hombre
	Oto	Gallery forest	November-February	Men and Women
	Anini	Gallery forest	May	All

Source: (Ariza Vera, Eduardo; Polanco Ochoa, Rocío; Yepes Guzmán, Adriana; Suárez Navarro, Alvaro E., 2006) Matavén: territorio, cultura y paisaje : Sikuani, Piaroa, Piapoco, Curripaco, Puinave, page 90

1.10.9.1 Food and nutritional deficit in the RIU – SM

The population of the Reservation faces a food and nutritional deficit, approximately 500 g / person / day (Annex 18 Socio-Economic Survey), well below 1 kg / day / person or 540 kg / person / year (approximately), is the minimum amount required by a person [36]; this causes a serious deterioration in the health of adults and children. Therefore we have designed and implemented a Family AgriFood Production Unit System (Annex 5 FAPUS).

[36] *Confederation of Food and Drink Industries of the EU, CIAA (http://www.eurocarne.com/daal?a1=informes&a2=guia-gda-cdo-alimentum.pdf), page 35*
Hannah B Lewis et a (2012)l. How much should I eat? A comparison of suggested portion sizes in the UK. MRC Human Nutrition Research, Elsie Widdowson Laboratory, Fulbourn Road, Cambridge (http://journals.cambridge.org/download.php?file=%2FPHN%2FPHN15_11%2FS1368980012001097a.pdf&code=fca27c7e9940e0a790aecae20ceafeb1)

1.10.10 Diagnosis of the problem

The diagnosis of forestry in Colombia concludes that their activities are one of the sectors with the greatest potential for economic, social and environmental growth, given the advantage of the country for its tropical location with natural forest coverage of the highest biodiversity (55%) of its territory. The country contains 10% of biodiversity in less than 0.8% of the land surface of the planet, a figure that places the country as the second most biodiverse in the world. This comparative advantage provides opportunities to develop production projects, conservation and generation of ecosystem services, which also contributes to the conservation of biodiversity, improves the living conditions of indigenous, peasant and black communities. However, this advantage has not been exploited properly. By contrast, in regions such as the Colombian Orinoco, where the RIU-SM are, activities have generated progressive alterations of the natural environment as:

- The destruction and deterioration of the primary forest and land use change resulting from the improper exploitation and undirected colonization and its consequences in the increase of the emissions of GHG.
- The limited availability of suitable land for agriculture, with a superficial organic layer, in most cases non-existent.
- The deterioration of water sources.
- The low level of transformation of forest products that generate low purchase costs of intermediaries and force to increase the number of felled trees to keep the loggers income.
- The modification of the landscape and vegetation with the reduction of biodiversity.

Also, many areas with forestry potential are isolated, have a weak institutional presence, a low management capacity, high levels of corruption and lack of basic infrastructure and services, creating an overall picture of poverty and marginalization, aggravated by the presence of illicit crops and public order problems.

Given this type of situation has the challenge of, on the one hand, forest policies need to be addressed within a framework of regional development strategies, as well as boosting incentives at the local level, supporting the integration of remote regions that have remained aloof from the benefits of economic and social progress experienced in other areas of the country and, moreover, is required to promote and to support projects like those mentioned above, in which a direct participation of the communities involved is guaranteed, particularly in the establishment of plans for sustainable management of forests and lands, adopting a holistic approach, understanding that it is the combination of the application of different measures aimed at the causes of these problems, allowing the conservation of forest habitats and their benefits in the sustainability of the territory, local communities, climate and biodiversity, and, in particular, by avoiding deforestation and degradation forest and the consequent increase in GHG emissions.

The specificity of the problem

The situation described above is applicable to forests and land in the territory of the referenced area and the RIU-SM, identifying as a **key problem** the lack of an integrated management system to achieve its sustainability and to mitigate conservation threats, highly related with the factors that determine the fragility of the social and cultural conditions being experienced by communities, in terms of the loss of values and traditions linked to ethnic identity, situation that limits the ability of participation, management and control of the territory by the communities, affecting the conditions of governance and security in the area.

RIU-SM is an area of environmental importance (progress) at regional, national and global level which has been threatened by various human activities. External threats serve the interests of not only unsustainable exploitation of biological resources (flora and fauna), but also of mineral wealth. Internal threats are attributable to various causes. The first relates to organizational weaknesses and gaps in the Reservation to take care and to monitor the collective territory, situation which results in low levels of environmental governance and poor communication systems, information and environmental education. The second reason is related to poor self-sustaining system of food production for the indigenous population in the Reservation and sustainable livelihoods, a situation that leads to generate pressure on natural resources, while violates the cultural and economic autonomy of the indigenous communities. The third cause is related to the absence of an efficient management mechanism and funding to the implementation of successful strategies of comprehensive land management and biodiversity.

As noted, an aspect of particular importance as a cause of vulnerability to external agents has to do with the governance of the RIU-SM. The organization that gathers RIU-SM, ACATISEMA communities, does not have the existence, identified as priorities to achie high levels of environmental governance.

Therefore, in this project, one of the actions needed to help reducing and preventing the negative impact on natural resources is the promotion of models of participatory environmental governance at the local level, working on schemes of concerted decision making.

Associated with this threat, we have the absence of a system of communication, information and environmental education that allows all levels of the community to have basic information, not only to recognize their role in integrated land management and biodiversity but also to recognize the role of ACATISEMA as their own autonomous government with a high incidence in the processes of decision making. It is expected, therefore, to establish an adequate system of communication and information and improve training of leaders and representatives of indigenous communities in the management of strategic issues with a high relevance in their territory.

Moreover, the wealth of biodiversity, makes the area has an interest in marketing of wildlife and fish by external actors to Reservation, generating misuse of such resources that affect food security of local communities.

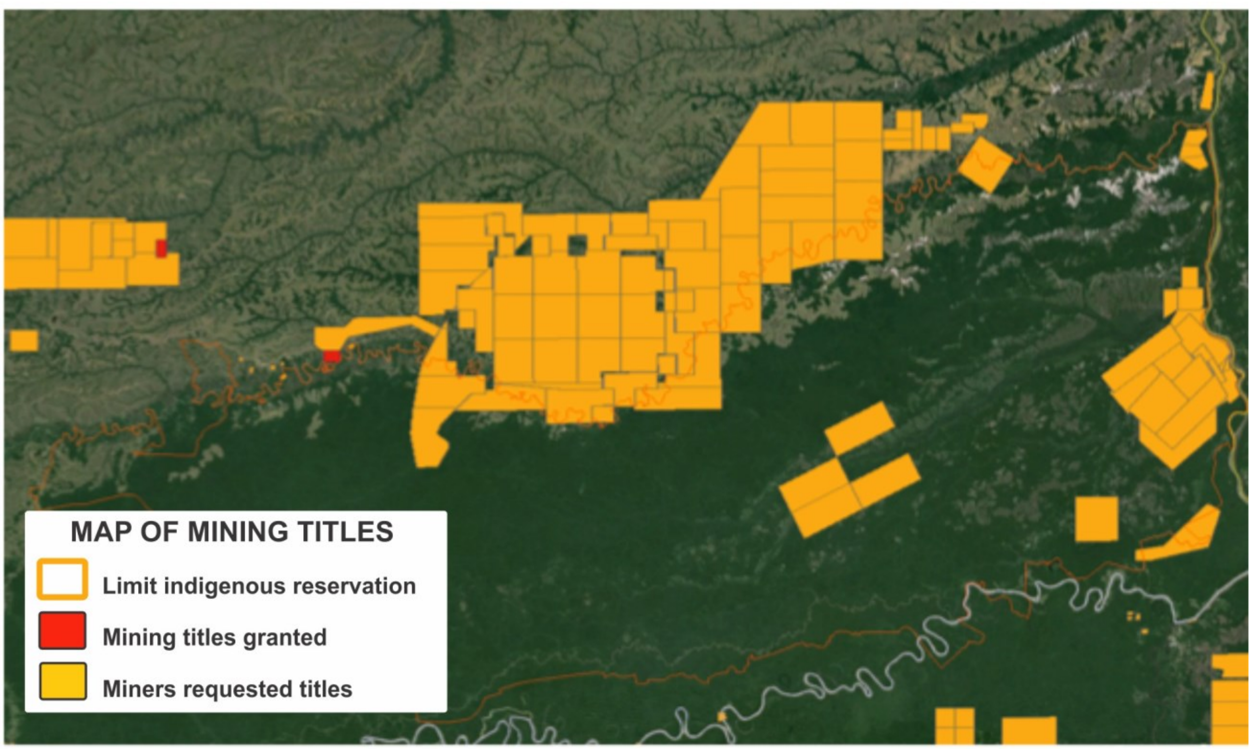
Parallel to the wealth of biodiversity, there is also a high mineral wealth of commercial interest and other non-renewable natural resources, including gold, oil and the black sands.

The following maps show the location of the requested titles and lands of oil requesting Riu-SM and surrounding areas.

Illustration 27. Children from the community of Berlin 1

Source: REDD+ project RIU-SM

Map 6. Requested Mining Titles



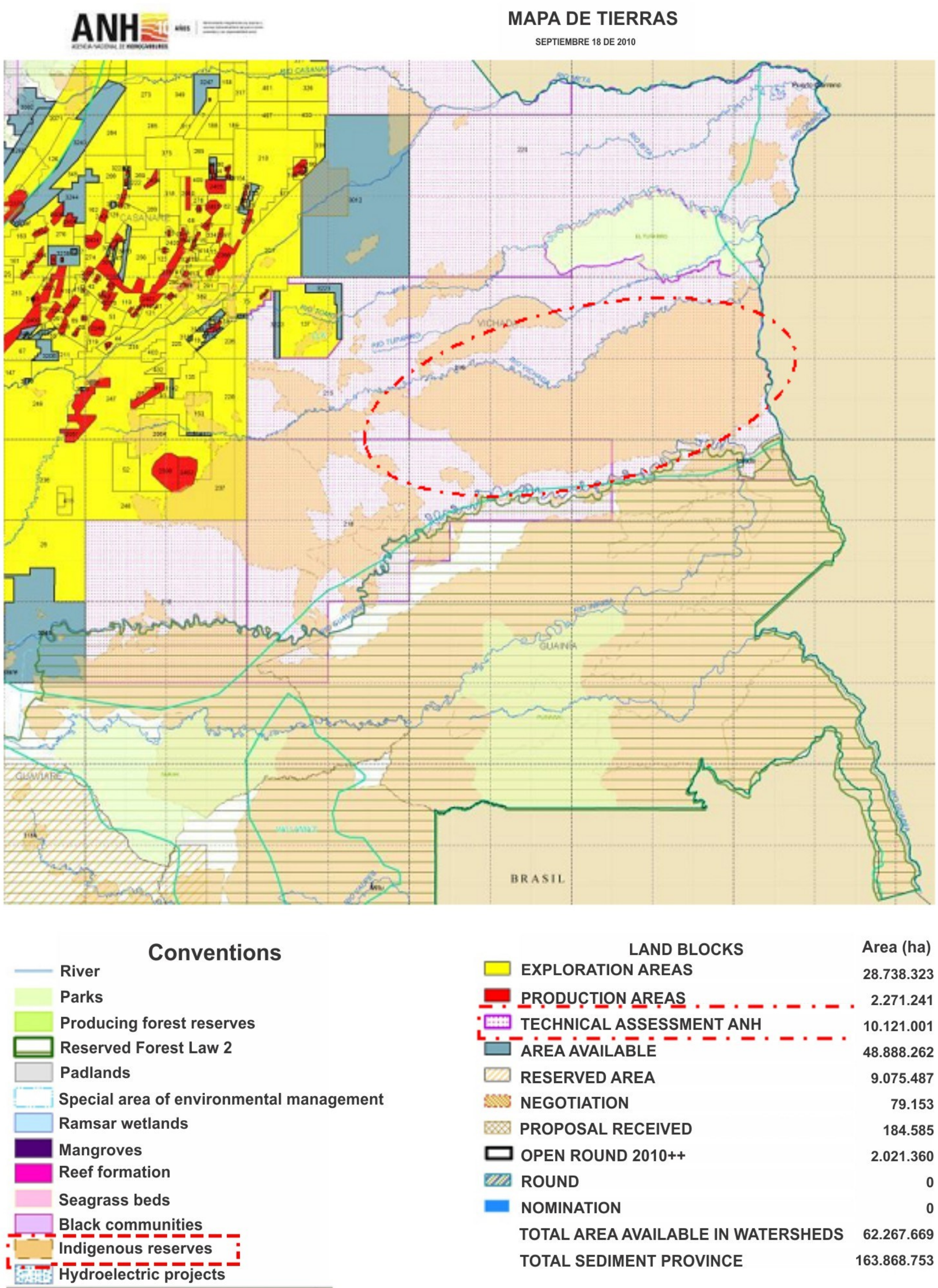
Source: Requested Mining Titles (TMS 2010); Mining titles granted (TMC 2011).

Such wealth generated a great economic interest in the area and a complex situation around mining processes and exploitation of hydrocarbons that are taking place within limits of the Reservation and also the processes of illegal mining as the black sands bonanza (coltan).

The threat by hydrocarbons explotation is clear around the Reservation, as can be evidenced in the following map.

It is also important to note that in recent years, indigenous communities in this region have experienced a growing dynamics of migration of individuals and families, explicable phenomenon by isolation and the difficultie to access to services and markets that provide satisfactions of new needs.

Map 7. Lands - Oil Interest

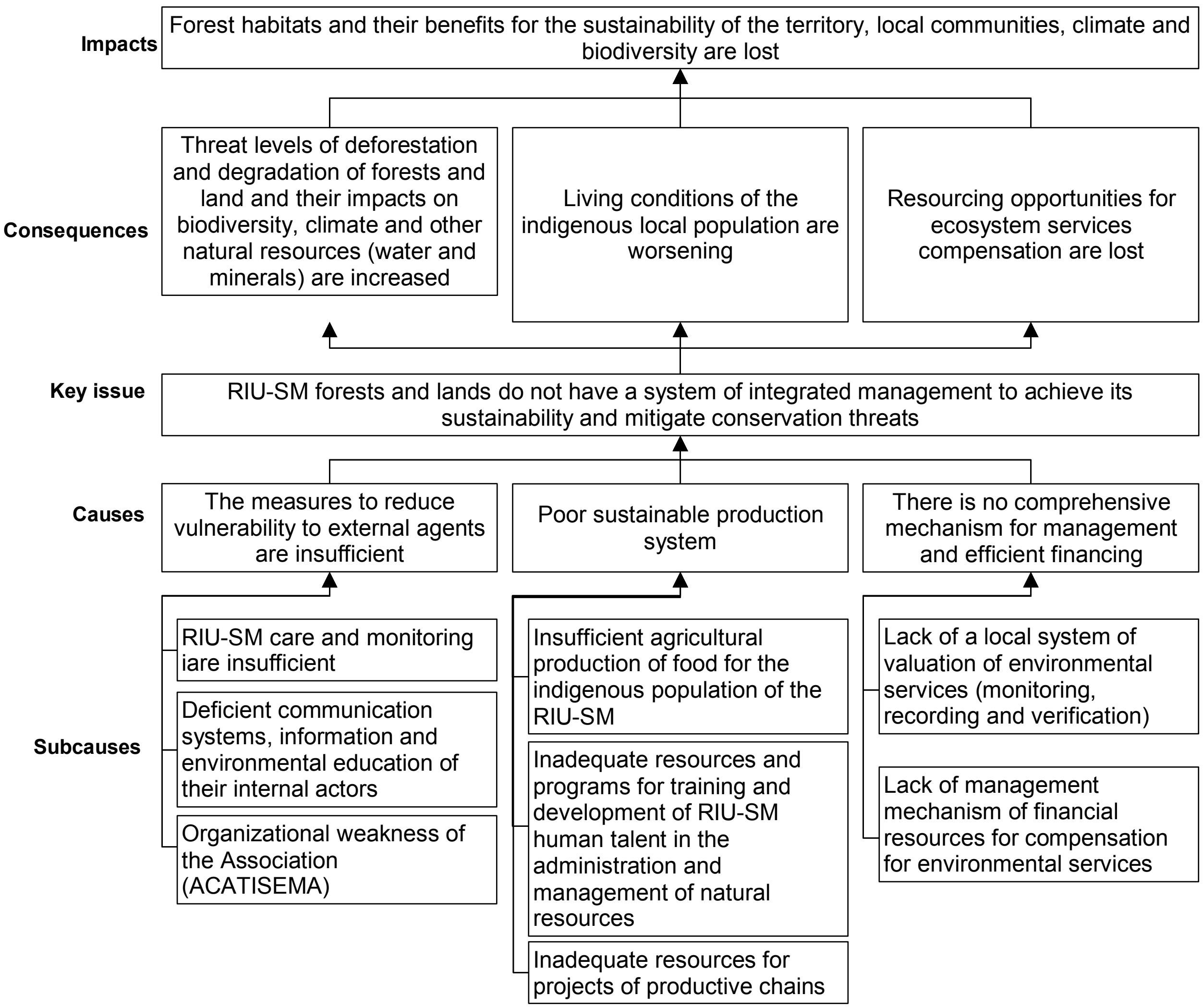


Source: (ANH, 2013). Agenca Nacional de Hidrocarburos. Mapa de tierras 2013 (Map of Lands 2013)

These pressures have impacts in the area, an indicator of which is the rates of deforestation (presented in section 3.1.2.5). This process of deforestation brings direct impacts on biodiversity, on water resources, climate and other environmental goods and services that depend on the quantity, quality and integrity of RIU-SM forest as well as the welfare of the communities there seated.

The above situation can be summarized in a specific scheme of problem tree for RIU-SM. This "Problem Tree" diagram for the project is as follows:

Illustration 28. Problem Tree



Source: REDD+ project RIU-SM

1.11 Compliance with laws, statutes and other regulatory frameworks

The National Government considers as a key strategy to develop REDD projects in Colombia, as defined by the National Council for Economic and Social Policy approved by CONPES Document 3700 (DNP, 2011), four routes for critical work or actions achieve sustainable national development by reducing the negative impacts generated by climate change.

These routes work are:

- Plan Nacional de Adaptación al Cambio Climático - PNACC (National Plan for Adaptation to Climate Change), as mandated by the 1450 Act in its Article 217 - PND 2010-2014 (Congreso de Colombia, 2011)
- Strategy Colombian Low Carbon Development (ECDBC)
- National Strategy for Reducing Emissions from Deforestation and Forest Degradation in developing countries; the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (ENREDD+).
- Strategy for Disaster Financial Protection.

References

• **Act 171 National Development Plan, 2014-2018** (Congreso de Colombia, 2015)

Chapter VI - Green Growth

"Article 171. Deforestation of natural forests. The Ministry of Environment, Housing and Territorial Development will develop a national policy to combat deforestation which contains an action plan aimed at ending the loss of natural forests by 2030. This policy will include provisions to substantively link to the sectors that act as drivers of deforestation, including the productive chains that use the forest and its derivatives".

• **Law 223 of 2015** (Congreso de Colombia, 2015) **(ZIDRES)[37], Why they are created and Areas of Interest Rural Development develop, Economic and Social, and Articles 31 and 52 of Law 160 of 1994 are added.**

CHAPTER I

Preliminary Provisions

Article 1. Object. Create Interest Areas Rural Economic Development Social (Zidres), as special areas of agricultural potential, located in the country, isolated from the most significant urban centers that demand adaptation high production costs. Have low population density and highpoverty, lack of basic infrastructure for transport and marketing of products, and their agrologic and climatic characteristics,

[37] *Law 223 / 2015, text was approved by Congress of Colombia and sanctioned by President of Republic of Colombia. It has not published on Official Gaceta of Senate*

are inappropriate for developing family production units to promote productive projects that benefit the landless farm workers and promote capital investment in agriculture.

Paragraph. The ZIDRES are considered of public utility and social interest.

Article 2. Objectives. The ZIDRES they are intended:

a) To promote the social inclusion of farm worker as a social agent productive;

b) To increase the sustainable productivity of the land;

c) To promote the social and economic development of the area;

d) To improve the agricultural conditions of the soil;

e) To encourage the conservation of the environment;

f) To promote access and regularization of land ownership to agricultural workers;

g) To promote rural employment and food security.

• **Law 1450 of June 16, 2011, by was issued the National Development Plan 2010-2014** (Congreso de Colombia, 2011)

Regarding biodiversity, the NDP in Chapter VI "Environmental sustainability and risk prevention", looked at the need to pursue actions to:

a. Strengthen the protection and restoration of biodiversity and eco systemic services.

b. Risk management for losing biodiversity and ecosystemic services.

c. Strengthen sustainable use of biodiversity for competitiveness and economic and social growth.

• **Document 3700 CONPES - National Council for Economic and Social Policy - Republic of Colombia - National Planning Department "Institutional Strategy for Policy Coordination and Action on Climate Change in Colombia".** (DNP, 2011)

"General objective: To facilitate and promote the formulation and implementation of policies, plans, programs, incentives, projects and methodologies on climate change, achieving the inclusion of as crucial to the design and planning of development projects climatic variables, by setting up a system of intersectoral coordination ".

• **REDD+ Preparation Proposal (R-PP) Version 8 - Government of Colombia** (MADS, 2013)

• **Document CONPES 3797 of 2014** (DNP, 2014)

Goals:

- *Create social and economic conditions for inclusive and sustainable development of Altillanura, based on the construction of a model region from:*
- *Equipping the region and social services infrastructure for development.*

- *Sort the territory of a harmonious and according to the vocation of the region way.*
- *Create conditions that encourage investment to exploit the agricultural and agro-industrial potential of the region*
- *The expansion of institutional capacities for managing regional development.*

• **National Strategy for Prevention, Monitoring, Control and Surveillance Forestry** (MAVDT, 2010)

Objective:

To establish and to implement an integrated set of guidelines, procedures and actions harmoniously articulate the preventive, legal, administrative, financial and operational processes for the prevention, monitoring, control and surveillance management and utilization, mobilization, processing and marketing of fores resourcest, timber and non-timber, based on the coordinated management of the environmental authorities and other relevant agencies of the state and the active participation of the various actors in the forest production chain, in other productive sectors related and civil society.

• **Biodiversity Action Plan Orinoco wather shed Colombia** (Correa, Ruiz, & Arévalo, 2005)

"Vision: In 10 years there will be greater awareness of biodiversity in the Orinoco and increased the processes of conservation and sustainable use; human groups are more aware of the biological and cultural wealth for the improvement of their living conditions ".

• **"Technical and Scientific Institutional Capacity to Support Reduce Emissions from Deforestation and Degradation Projects (REDD) in Colombia"** [38]

• **"Estimating the opportunity costs of REDD+"** (World Bank, 2011)

• **Annex 7. Legal Support contains a systematic summary of the legal bases in Colombia for a REDD+ project.**

Land tenure in the field of project execution

The Reservation is a collective, inalienable, and indefeasible property (Political Constitution of Colombia – 1991, Articles 63 and 329). The administration and management of these lands are subjected to uses and customs of the beneficiaries (Decree 1386 of 1994, Article 10; Decree 2164 of 1995, Article 22) [39].

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[38] *During 2002-2009 IDEAM, supported by the Gordon and Betty Moore Foundation, developed the project "Technical and Scientific Institutional Capacity to Support Reduce Emissions from Deforestation and Degradation Projects (REDD) in Colombia" with which the country is preparing to address the demands of REDD through historical knowledge of deforestation and the estimation of potential reserves of carbon stored in aboveground biomass in natural forests of Colombia.*

The RIU-SM is registered as property identified Folio No. 540-0005491 Property Registration Office of Public Instruments Registry of Puerto Carreno, Vichada (Annex 2.2.4) [40]. The Resolution was notarized by Deed No. 3798 of September 15, 2008, Notary 19 of Bogotá DC Circle (Annex 2.2.3) [41].

By Certification No. 263 of April 16, 2013 (Annex 2.2.6), issued by the Ministry of Interior - prior consultation, it confirms that the Resguardo Indígena Unificado – Selva de Matavén (RIU-SM) belongs to the ethnic groups of Sikuani, Piaroa, Puinave, Curripaco, Cubeo and Piapoco that inhabit the 17 sectors, as stipulated in Resolution 037 of July 2003 (INCORA, 2003) (Annex 2.2.1) [42].

Mataven Jungle is a common area of about 920,871 hectares, which is considered the "heart health", instead of founding myths, sacred sites and important reserves of natural resources. It is a space of religious significance.

Conucos spaces are male and female use and handling them equally members of the family (father, mother and children) in the work of production, although specific activities involved; the division of labor by gender is presented. The family is involved in shaping the conuco where foods like bananas, yuca, pineapple, sugarcane, yams and corn are grown.

The work to prepare the land are made by men, while planting, maintaining and harvesting crops and any kind of processing of products is a task preferably performed by women and children.

The woman is responsible for maintenance and breeding hens, which get eggs and meat for food.She is responsible for the preparation and cooking of food and, therefore, dosage and use thereof. It is also responsible for making crafts and food preparation for marketing them (cassava cakes).

Activities with more physical effort, such as construction of housing or entechada, are made by men; the fishing and hunting are distinctly masculine.

The participation of women is gaining ground in each and every one of the activities that are unique to men and win leadership in the development of community meetings, not only in attendance but also the participation and decision making.

1.12 Ownership and other programs

1.12.1 Right of use

As indicated above, the RIU-SM is registered as property identified Folio Real Estate Registration No. 540-0005491 of August 4, 2008 (Annex 2.2.4), issued by the Office of Public Records of Puerto Carreño, Vichada, based on the resolution 037 of July 22nd, 2003 issued by the INCORA (Annex 2.2.1), "by which is unified under the name of Indigenous Unified Reservation of Mataven, 16 indigenous communitties reuned on the right side of the Vichada river, left side of the Orinoco river, an arm of Amanaven and also

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[39] *Source: File "Decretos_pueblos_indigenas.pdf"*
[40] *Copy of this document may be found in "Oficina de Registro de Instrumentos Públicos" Carrera 6 # 18-81 Puerto Carreño - Vichada.*
[41] *Address Notary 19: Cra. 13 No. 60 – 53, Bogotà D.C.*
[42] *Copy of this document may be found in "Colombian Institute for Rural Development - INCODER -in liquidation" (formerly called INCORA), Calle 43 No. 57-41 Bogotá D.C.*

expands the Unified Reservation, located in the jurisdiction of the municipalities of Cumaribo and Puerto Inirida, Guainia and Vichada departments". Resolution 037/2003 was notarized by Deed No. 3798 of September 15, 2008, Notary 19 of Bogotá DC Circle (Annex 2.2.3).

By Certification No. 263 of April 16, 2013 (Annex 2.2.6), issued by the Ministry of Interior - prior consultation, it confirms that the Indigenous Unified Forest Reservation of Mataven belongs to the ethnic groups of Guahibo, Piaroa, Puinave, Curripaco, Cubeo and Piapoco, inhabiting the 17 sectors, as established in Resolution 037 of July, 2003 INCORA. The Reservation is collective, inalienable, and indefeasible (Articles 63 and 329 of the Constitution of Colombia) property. The administration and management of these lands are subjected to uses and customs of the beneficiaries and Decree 1386 of 1994, Article 10 and Decree 2164 of 1995, Article 22 [43].

This documentation satisfies the VCS Standard as rights of use "arising by virtue of a statutory, property or contractual right" (*VCS. 2012 VCS Standard. Version 3.3, 04 October 2012. Verified Carbon Standard, Washington, DC*) has been documented.

In annex 2 (ACATISEMA and RIU-SM information) this aspect can be detailed.

1.12.2 Emissions trading programs and other binding limits

No emission reductions generated by the Project Area (PA) part of an emissions trading program.

1.12.3 Other forms of environmental credit

The Project has not tried to create emission reductions with no program and has not had any form of environmental credits.

1.12.4 Participation under other GHG programs

The REDD+ RIU-SM Project has not been registered under another program.

1.12.5 Projects rejected by other GHG programs

The RIU REDD+ RIU-SM Project - SM has not been subjected to validation.

1.13 Additional information relevant to the Project

In the indicated annexes additional information is presented.

Annex 1. Process of socialization, training and consultation of ACATISEMA

[43] *Source: File "Decretos_pueblos_indigenas.pdf"*

Annex 2. Information and Indigenous Unified Reservation

Annex 3. Information of MEDIAMOS F & M S.A.S.

Annex 4. Management Plan for Sustainable Land and Forest

Annex 5. Family Agrifood Production Units System (FAPUS)

Annex 6. Process of deforestation for forming conucos

Annex 7. Legal support

Annex 17. Geographical information system of the REDD + RIU-SM Project

Annex 18. Statistical results of the socio-economic survey

Annex 21. Biodiversity potential impacts

Annex 22. Socio-economic potential impacts.

Eligibility Criteria

Project REDD+ Resguardo Indígena Unificado – Selva de Mataven is not a grouped project, so eligibility criteria for inclusion of new instances of each project activity is not applicable.

Leakage Management

Annex 4 describes the Management Plan of Forests and Lands and leakage mitigation measures, particularly through the Family Agrifood Production Units System (FAPUS) (Annex 5).

Commercially sensitive information

There is not commercially confidential information.

2 APPLICATION OF THE METHODOLOGY

2.1 Title and reference of methodology

Verified Carbon Standar (VCS) Program, version 3, 2015

In the following table the methodology and modules applied in the design and implementation of REDD+ project RIU-SM are presented.

It meets the requirements in VCS VM0007 REDD Methodology Framework (REDD-MF), Table 3 - Avoiding Unplanned Deforestation / Degradation. In the last column of the table below these requirements and their application in the REDD + RIU-SM Project are shown.

Justification and documentation is provided in the relevant sections of the PD and the respective annexes.

Table 30. Methodology and applied modules. REDD+ RIU SM Project

Title	Reference		Version	Date	Requirements (*)	Applicability RIU-SM	
						A	NA
Methodology							
REDD Methodology Modules	REDD-MF	VM0007	1.5	9 March 2015	M	X	
Carbon Pools							
Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools	CP-AB	VMD0001	1.1	11 October 2013	M	X	
Estimation of carbon stocks in the dead-wood pool	CP-D	VMD0002	1.0	11 October 2013	(m)[3]		X
Estimation of carbon stocks in the litter pool	CP-L	VMD0003	1.0	11 October 2013	O		X
Estimation of stocks in the soil organic carbon pool	CP-S	VMD0004	1.0	11 October 2013	O	X	
Estimation of carbon stocks in the long-term wood products pool	CP-W	VMD0005	1.1	20 November 2012	(m)[1]		X
Baseline							
Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation and planned degradation	BL-PL	VMD0006	1.2	3 May 2013	-		X
Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation	BL-UP	VMD0007	3.2	3 May 2013	M	X	
Estimation of baseline emissions from forest degradation caused by extraction of wood for fuel	BL-DFW	VMD0008	1.0	11 October 2013	-		X

Title	Reference		Version	Date	Requirements (*)	Applicability RIU-SM	
						A	NA
Estimation of baseline carbon stock changes and greenhouse gas emissions in ARR project activities on peat and mineral soil	BL-ARR	VMD0041	1.0	9 March 2015	-		X
Estimation of baseline soil carbon stock changes and greenhouse gas emissions in peatland rewetting and conservation project activities	BL-PEAT	VMD0042	1.0	9 March 2015	-		X
Leakage							
Estimation of emissions from activity shifting for avoided planned deforestation	LK-ASP	VMD0009	1.2	9 March 2015	-		X
Estimation of emissions from activity shifting for avoided unplanned deforestation	LK-ASU	VMD0010	1.1	9 March 2015	M	X	
Estimation of emissions from market-effects	LK-ME	VMD0011	1.1	9 March 2015	(m)[1]		X
Estimation of emissions from displacement of fuelwood extraction	LK-DFW	VMD0012	1.0	11 October 2013	-		X
Estimation of emissions from displacement of pre-project agricultural activities	LK-ARR	VMD0043	1.0	9 March 2015	-		X
Estimation of emissions from ecological leakage	LK-ECO	VMD0044	1.0	9 March 2015	-		X
Emissions							
Estimation of greenhouse gas emissions from biomass and peat burning	E-BPB	VMD0013	1.1	9 March 2015	M	X	
Estimation of emissions from fossil fuel combustion	E-FFC	VMD0014	1.0	11 October 2013	O		X
Rio revisarEstimation of direct N2O emissions from nitrogen application	E-NA		1.0	3 October 2013	(m)[4]		X
Monitoring							
Methods for monitoring of greenhouse gas emissions and removals	M-MON	VMD0015	2.1	20 November 2012	M	X	
Methods for monitoring greenhouse gas emissions and removals in ARR project activities on peat and mineral soil	M-ARR	VMD0045	1.0	9 March 2015	-		X
Methods for monitoring of soil carbon stock changes and greenhouse gas emissions and removals in peatland rewetting and conservation project activities	M-PEAT	VMD0046	1.0	9 March 2015	-		X

Title	Reference		Version	Date	Requirements (*)	Applicability RIU-SM	
						A	NA
Miscellaneous							
Methods for stratification of the Project area	X-STR	VMD0016	1.1	9 March 2015	M	X	
Estimation of uncertainty for REDD Project activities	X-UNC	VMD0017	2.1	9 March 2015	M	X	
Tools							
Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities	T-ADD	VT0001	3.0	1 February 2012	M	X	
Tool for testing significance of GHG emissions in A/R CDM Project activities	T-SIG		2	19 October 2007	M	X	
VCS AFOLU Non-Permanence Risk Tool	T-BAR		3.2	4 October 2012	M	X	

Conventions:

(*) Avoiding Unplanned Deforestation/ Degradation

M: Modules marked with an M are fully mandatory: the indicated modules and tools must be used

O: Modules marked with an O are fully optional: the indicated pools and sources can be included or excluded as decided by the Project but if included in the baseline they must also be in the Project scenario.

(m)[1] Mandatory where the process of deforestation involves timber harvesting for commercial markets

(m)[3] Mandatory if this carbon pool is greater in baseline (post-deforestation/degradation) than project scenario and significant; otherwise can be conservatively omitted.

(m)[4] Mandatory where leakage prevention activities include increases in the use of fertilizers

Source: Verified Carbon Standar (VCS) Program, version 3, 2015
Source: VCS VM0007 REDD+ Methodology Framework (REDD-MF), Version 1.5, Table 3

2.2 Applicability of methodology

REDD-MF (VM0007): Applicability conditions

The Project comply with the Applicability Conditions and Justifications for the **REDD Methodology Framework Module (VM0007)**, applied modules and tools, listed in the following table. In the third column of the table indicates the Section in the PD and annexes the technical support and documentation and reference source is presented

Table 31. Methodology and applied modules. REDD+ Project RIU SM

1. REDD-MF, REDD Methodology Framework –VM0007

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
General:		
All land areas registered under the CDM or under any other GHG program (both voluntary and compliance-oriented) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other GHG program must be monitored over time and reported in the monitoring reports.	• The Project is not registered in any carbon trading scheme or program. Once the Project Area (PA) is approved by the VCS, carbon credits will be traded. • In the Project Area are not registered by any other project under CDM, VCS, CBB or other lands.	Section 1.12.4 "Participation under other GHG programs". Annex 9. REDD-MF, REDD Methodology Framework –VM0007 Annex 2.1.11, clause 8 "*ACATISEMA declares that it is not in force, at the moment of the signing of this agreement, another contract, arrangement, pact or alliance with the same objective of this agreement or that it impedes and hinders it* [REDD+ project]."
REDD - All REDD Activity Types		
Land in the Project Area has qualified as forest (following the definition used by VCS: *Land with woody vegetation that meets an internationally accepted definition (eg, UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests*) at least 10 years before the Project start date.	• The Project Area (PA) complies with this condition with complete forest cover demonstrated for the years 2001 and 2011, period (hrp).	Section 2.3 "Project boundary" and Annex 10. "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007": in HRP, Project Area has only forest[44] land with more of 10 years old, the spatial images has a resolution of 30 X 30 meters, also, the minimum mapping unit is 1 ha. (aprox. 11 pixels), polygons smaller than 1 ha. are absorbed by other category around it. So, each forest area meets the size.
If land within the project area is peatland and emissions from the soil carbon pool are deemed significant, the relevant WRC modules (see Table 1) must be applied alongside other relevant modules.	• No organic soils (peatlands) exist within the Project Area (PA). • This condition does not apply	Section 3.1 "Baseline emissions" Annex 14. "CP-S. Estimation of carbon stock un the soli organic carbon pool – VMD0004" and Annex 10. "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007". Annex 17: acording to cartographic analysis of land cover, no peatland areas are evident.
Baseline deforestation and baseline forest degradation in the Project Area fall within one or more of the following categories: - Unplanned deforestation (VCS category AUDD); - Planned Deforestation (VCS category	• Baseline deforestation in the Project Area (PA) falls within the Unplanned Deforestation category (AUDD), as the agents of deforestation are small scale farmers.	Section 1.2 "Sectoral scope and Project type"

[44] Forest: minimum area of land of 1.0 hectares (ha) with tree crown cover (or equivalent stocking level) of more than 30% and with trees that can reach a height of 5 meters (m) at their maturity in situ (Ministry of Environment, Housing and Territorial Development. Definition of forest for land use projects, change of use soil and forestry for the first commitment period -COLOMBIA-) (Yepes, et al., 2011) "ANEXO 12. Definiciones importantes en el contexto de proyectos REDD." (page 153).

Applicability Condition	**Justification**	Section in the PD and annexes the technical support and documentation and reference source
APD); - Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD).		
Leakage avoidance activities must not include: - Agricultural lands that are flooded to increase production (eg, paddy rice); - Intensifying livestock production through use of feed-lots and/or manure lagoons.	• Leakage avoidance activities do not include flooding agricultural land or creating feed lots or manure lagoons. • Agricultural activities that develop the natives are not made in indundables lands. It is not a common practice indundables select to set conucos soils and produce food. • In the area of influence of the project does not have manure lagoons.	Section 3.1 "Baseline emissions" Annex 12. "LK-ASU. Estimation of emissions from shifting activity for unplanned avoided deforestation – VMD0010" Annex 4. "Plan of sustainable management of land and forests". Annex 5. "Family Agrifood Production Units System - FAPUS". Annex 17: according to cartographic analysis of land cover, there are not large areas of agricultural lands, grassland nor manure lagoons to production.
REDD - Unplanned Deforestation		
Baseline agents of deforestation must: (i) clear the land for settlements, crop production (agriculturalist) or ranching, where such clearing for crop production or ranching does not amount to large scale industrial agriculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) be either residents in the Reference Region for Deforestation (RRD) or immigrants. Under any other condition this methodology must not be used.	• Baseline agents of deforestation are small scale farmers. • The Project baseline agents of deforestation are: small-scale farmers and livestock producers; they are residents or migrants from the Reference Region. The average size of deforestation agents allows classifying them as small-scale. • The baseline agents of deforestation are indigenous peoples and in some cases immigrant actors looking for land to convert for agricultural uses, small scale livestock, *praderización*, legal and illegal mining and illegal crops. The *praderización* is the conversion of native forests into grassland in order to increase the value of the land. • They do not have Reforestation Programs, what happens in these deforested areas is the natural succession of vegetation, process described in the establishment of *conucos*. • The immigrants actors have not legal right to deforest the land, as well as indigenous that leave their reservation to deforest other lands. They have not management plans formalized with of ambiental authorities. • The RIU-SM habitants use the forest in their territory according their uses and customs, without considering any law or legal document (see applicability condition of BL-UP -	Section 1.10 "Conditions prior to Project initiation" Section 2.4 "Baseline scenario" Annex 10. "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007" Annex 2.2.1 Resolution 037/2003 INCORA, explains the existence of indigenous and, even, some colonists in the territory, than are baseline agents of deforestation.

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
	VMD0007 below)	
If, in the baseline scenario of avoiding unplanned deforestation project activities, post-deforestation land use constitutes reforestation, this methodology may not be used.	• Within the Project Area (PA), the post-deforestation land use constitutes cropland (AAH-*conucos*) agriculture and grassland. Reforestation does not constitute a post-deforestation land use of the Project; reforestation is not a common practice.	Section 1.10 "Conditions prior to Project initiation" Section 2.4 "Baseline scenario" Annex 10. "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007"

2. **BL-UP, Estimation of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Unplanned Deforestation - VMD0007**

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Baseline agents of deforestation shall: (i) clear the land for settlements, crop production (agriculturalist) or ranching, where such clearing for crop production or ranching does not amount to large scale industrial agriculture activities; (ii) have no documented and uncontested legal right to deforest the land for these purposes; and (iii) are either resident in the reference region or immigrants.	• "The agents of deforestation in the project baseline are: farmers and livestock producers in small scale who are residents or immigrants from the reference region. The average size of the deforestation caused by agents can be classified as small scale. • The agents of deforestation in the baseline are indigenous and immigrant in search for land to convert to agriculture, small-scale livestock, pastures (praderización), legal and illegal mining and illegal crops. The "praderización" is the conversion of natural forests into pasture in order to increase the value of the land. • They have no reforestation programs, what happens in these deforested areas is the natural succession of vegetation, process described in establishing conucos (Appendix 6). • Immigrants have no legal right to deforest the land, as well as Indians who leave their shelter to deforest other lands. They have no formalized management plans with environmental authorities".	Section 1.10 "Conditions prior to Project initiation" Section 2.4 "Baseline scenario" Annex 10. "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned - VMD0007" Annex 12 LK-ASU, Estimation of emissions from activity shifting for avoided unplanned deforestation - *VMD0010* Annex 2.2.1 Resolution 037/2003 INCORA, explains the existence of indigenous and, even, some colonists in the territory, than are baseline agents of deforestation.
Where, pre-Project, unsustainable fuelwood collection is occurring within the Project boundaries modules BL-DFW and LK-DFW shall be used to determine potential leakage. (Where a project claims no fuelwood collection was occurring this shall be evidenced through a PRA process)	• No fuelwood collection occurs within the Project boundaries as evidenced from participatory rural appraisals (PRA) conducted (Meetings in Cumaribo, Zonel Meeting; delegates of ACATISEMA in meeting in Cali) and a follow-up PRA, which fuelwood collection and use practices. • Further, a local forester familiar with the property states "The community uses fuelwood originating from dead wood, usually in areas cleared for agriculture (conucos). Rarely are trees cut down for fuelwood" (pers comm).	Annex 1. "Socialization process, training and consultation" the evidence presented socialization meetings, consultation (PRA) Annex 6 Characterisation of process of the deforestation for forming conucos 1.10 "Conditions prior to Project initiation"

3. LK-ASU, Estimation of emissions from activity shifting for avoided unplanned deforestation - VMD0010

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
The module is applicable for estimating carbon stock changes and greenhouse gas emissions related to the displacement of activities that cause deforestation of lands outside the project area due to the avoided unplanned deforestation in the project area.	• It is used to estimate CO_2 emissions from deforestation unplanned moved from the Project Area to the leakage belt due to project activities.	Section 3.3 "Leakage emissions" Annex 12. LK-ASU, Estimation of emissions from activity shifting for avoided unplanned deforestation - *VMD0010* The kind of deforestation that ocurrs in RIU-SM is unplanned (Annex 10 BL-UP)
Activities subject to potential displacement are: - conversion of forest land to grazing lands, - crop lands, and - other land uses.	• Leakage avoidance activities do not include agricultural lands flooded to increase production and intensifying grassland production. Leakage activities, as listed in VCS-PD, do not include any kind of flooded crops or livestock production. • The project activities to avoid deforestation may displace land uses like cropland (AAH-conucos) agriculture and grassland outside the Project Area.	Annex 4. "Plan of sustainable management of land and forests Annex 5. "Family Agrifood Production Units System - FAPUS". Also see information in file "transition_changes.xlsx" folder "calculation_tables" about changes in land uses.
The module is mandatory if BL-UP has been used to define the baseline and the applicability criteria in BL-UP must be complied with in full.	• Applies as far as BL-UP is used, and this BL-UP module is applied completely	Module BL-UP was applied: Annex 10. "Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned - VMD0007"

4. M-MON, Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Strata as defined in the relevant baseline modules are fixed and may not be changed without baseline revision	• The ex-ante stratification is fixed for this baseline and will not be changed.	Section 2.3 "Project boundary - Estratificación" is presented related to the strata (biomes) Annex 11. M-MON, Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015 Section 3.1 "Baseline emissions" Annex 15 X-SRT presents the strata defined for REDD+ Project. Strata are biomes with features that do not tend to change
Emissions from logging may be omitted if it can be demonstrated the emissions are *de minimis* using T-SIG.	• Logging emissions have been omitted as no commercial timber harvest occurs in the baseline or with Project case.	Section 2.4 "Baseline scenario" Annex 20. "Tool for texting significance of GHG Emissions in / A R CDM project activities (T-SIG)"
If emissions from logging are not omitted as *de minimis*, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when the selective logging occurs.	• This condition is not applicable.	Annex 11. "M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015"

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary.	• This condition is not applicable.	Annex 11. “M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015”
All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm.	• This condition is not applicable.	Annex 11. “M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015”
During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area.	• This condition is not applicable.	Annex 11. “M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015”
The logging practices cannot include the piling and/or burning of logging slash	• This condition is not applicable.	Annex 11. “M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015”
Volume of timber harvested must be measured and monitored.	• This condition is not applicable.	Annex 11. “M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015”

5. CP-AB, Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools - VMD0001

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
This module is applicable to all forest types and age classes.	• Module CP-AB has been applied in Project.	Section 2.3 “Project boundary” Annex 13. “CP-AB. Estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools - VMD0001”
Inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory as per the framework module REDD-MF.	• Aboveground tree biomass pool has been accounted as can be seen in the results from field inventories	Section 2.3 “Project boundary” Annex 13. “CP-AB. Estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools - VMD0001”, Step 3 Results of study of aboveground tree biomass are presented in file "plot_study_fustales.xlsm" folder "calculation_tables"
Non-tree aboveground biomass must be included as part of the project boundary if the following applicability criteria are met: - Stocks of non-tree aboveground biomass are greater in the baseline than in the project scenario, and - Non-tree aboveground biomass is determined to be significant (using the T-SIG module).	• Non-tree aboveground biomass pool has been excluded as it was not significant	Section 2.3 “Project boundary” Annex 20. “Tool for testing significance of GHG Emissions in A / R CDM project activities (T-SIG)”
Belowground (tree and non-tree) biomass are not required for inclusion in the project boundary because omission is conservative.	• Belowground tree biomass pool is being accounted. As can be seen, standard factor (0.24) has been used to account this pool • Non-tree belowground biomas pool has been excluded	Section 2.3 “Project boundary” Annex 20. “Tool for testing significance of GHG Emissions in A / R CDM project activities (T-SIG)”. Decisions of inclusion and exclusion are explained Results of study of belowground tree biomass are presented in file "plot_study_fustales.xlsm", sheet “BRG_parcelas”, folder "calculation_tables"

6. CP-S, Estimation of stocks in the soil organic carbon pool - VMD0004

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Soil organic carbon shall be included if stocks are greater, or are increasing at a greater rate, in the baseline than in the project scenario. Ex ante determination that stocks are greater in the baseline than in the project scenario can be made on the basis of IPCC 2006GL Relative Stock Change Factors (FLU, FMG, and FI) – if the average combined stock change factor for the baseline (area-weighted by post conversion land use) is greater than or equal to 1, then soil organic carbon must be included, otherwise it can be conservatively omitted, and	• An inventory of field, laboratory analysis and estimation of reservoir of organic carbon in the soil were made. • The significance of the pool of organic soil without considering natural regeneration is 23.1%, and considering the natural regeneration is 21.9% in estimates of carbon in pre-deforestation strata. In the post-deforestation estimates the significance of organic soil reservoir is 61.2%. For this reason it is considered as a reservoir of importance in the baseline scenario and the scenario "with Project"	Section 3.1 “Baseline emissions” Annex 20. “Tool for testing significance of GHG Emissions in A / R CDM project activities (T-SIG)”. Decisions of inclusion and exclusion are explained. Annex 14. “CP-S. Estimation of stocks in the soil organic carbon pool - *VMD0004”* Results of study of soil organic carbon stock are presented in file "soil_analysis.xlsx", folder "calculation_tables"
Soil organic carbon shall be included if determined to be significant (using T-SIG)	• Soil organic tree biomass pool has been included considering T-SIG	

7. X-STR, Methods for stratification of the Project Area - VMD0016

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Any module referencing strata i must be used in combination with this module.	• Modules that references strata use this module	Section 3.1 “Baseline emissions” Annex 15. “X-STR. Methods for stratification of the Project area - VMD0016”
In case of REDD, above-ground biomass stratification is only used for pre-deforestation forest classes, and strata are the same in the baseline and the project scenario.	• Stratification of pre-deforestation forest classes was made using official IGAC information.	Section 2.3 “Project boundary” Annex 15. “X-STR. Methods for stratification of the Project area - VMD0016”. Stratification described
Post-deforestation land uses are not stratified. Instead, average post-deforestation stock values (eg, simple or historical area-weighted approaches are used, as per module BL-UP).	• Estimating densities deforestation post-carbon were performed considering the land uses.	Section 3.1 “Baseline emissions” Annex 13. “CP-AB. Estimation of carbon stocks in the domed and belowground biomass in live tree and non-tree pools - VMD0001”
For peatland rewetting and conservation project activities this module must be used to delineate non-peat versus peat and to stratify the peat according to peat depth and soil emission characteristics, unless it can be demonstrated that the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is *de minimis*,	• No organic soils (peatlands) exist within the Project Area (PA).	Section 3.1 “Baseline emissions” Annex 14. “CP-S. Estimation of stocks in the soil organic carbon pool - VMD0004”
In the case of peatland rewetting and conservation project activities, the project boundary must be designed such that the negative effect of drainage activities that occur outside the project area on the project GHG benefits are minimized.	• No organic soils (peatlands) exist within the Project Area (PA).	Section 3.1 “Baseline emissions” Annex 14. “CP-S. Estimation of stocks in the soil organic carbon pool - VMD0004”

8. X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017

Applicability Condition	**Justification**	Section in the PD and annexes the technical support and documentation and reference source
This module is mandatory when using methodology REDD-MF.	• A precision target of a 95% confidence interval equal or less than 15% of the recorded value has been used to determinate the number of plots. • Modules that references strata use this módule	Section 3.6 "Uncertainty analysis" Annex 16. "X-UNC. Estimation of uncertainty for REDD Project activities - VMD0017"
It is applicable for estimating the uncertainty of estimates of emissions and removals of CO_2-e generated from REDD and WRC project activities.	• Emission estimates are based on sample processes involving uncertainty and measurement errors. Statistical methods let to estimate this uncertainty	Section 3.6 "Uncertainty analysis" Annex 16. "X-UNC. Estimation of uncertainty for REDD Project activities - VMD0017"
The module focuses on the following sources of uncertainty:		
• Determination of rates of deforestation and degradation	• Deforestation rates were calculated for two periods, considering the total area of the reference region and the total deforested area, ie no sampling methods used for its calculation. The regression equation for estimating the annual deforestation rate that was tested was not significant, ie, it did not meet the established rates R2 and hence no confidence intervals or probability levels are mentioned.	Section 1.10 "Conditions prior to Project initiation" Annex 10 "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007" Annex 16. "X-UNC. Estimation of uncertainty for REDD Project activities - VMD0017"
• Uncertainty associated with estimation of stocks in carbon pools and changes in carbon stocks	• A precision target of a 95% confidence interval equal or less than 15% of the recorded value has been used to determinate the number of plots. • Emission estimates are based on sample processes involving uncertainty and measurement errors. Statistical methods let to estimate this uncertainty	Section 1.10 "Conditions prior to Project initiation" Section 3.1 "Baseline emissions" Annex 13. "CP-AB. Estimation of carbon stocks in the domed and belowground biomass in live tree and non-tree pools - VMD0001" Annex 14. "CP-S. Estimation of stocks in the soil organic carbon pool - VMD0004" Annex 16. "X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017"
• Uncertainty associated with estimation of peat emissions	• This condition does not apply.	Annex 14. "CP-S. Estimation of stocks in the soil organic carbon pool - VMD0004" Annex 16. "X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017"
• Uncertainty in assessment of project emissions	• This condition does not apply.	Section 3.2 "Project emissions" Annex 11. "M-MON. Methods for Monitoring of Greenhouse Gas Emissions and Removals - VMD0015" Annex 16. "X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017"
Where an uncertainty value is not known or cannot be simply calculated, a project must justify that it is using an indisputably conservative number and an uncertainty of 0% may be used for this component.	• This condition does not apply.	Section 3.6 "Uncertainty analysis" Annex 16. "X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017"

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
Guidance on uncertainty – a precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value must be targeted. This is especially important in terms of project planning for measurement of carbon stocks; sufficient measurement plots should be included to achieve this precision level across the measured stocks.	• Stratified random sampling model is applied, and using IDEAM Protocol (Yepes, et al., 2011) ensures compliance with these requirements	Section 3.1 "Baseline emissions" Section 3.6 "Uncertainty analysis" Annex 10 "BL-UP. Estimaction of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Deforestation Unplanned – VMD0007" Annex 16. "X-UNC, Estimation of uncertainty for REDD Project activities - VMD0017"

9. T-ADD, Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities – VT0001

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
AFOLU activities the same or similar to the proposed project activity (In the context of this tool, activities the same or similar to the proposed project activity are used for the identification of possible land use scenarios that are allowable AFOLU activities under VCS document AFOLU Requirements) on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;	• Indispensable for the validity of the project. It applies in full.	Section 1.10 "Conditions prior to Project initiation" Section 1.11 "Compliance with laws, statutes and other regulatory frameworks" Section 2.4. "Baseline scenario" and Section 2.5. "Additionality"
The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario (Please refer to the most recent version of the VCS document AFOLU Requirements, available on the VCS website). Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	• Indispensable for the validity of the project. It applies in full. • New methodologies are not proposed for baseline	Section 1.10 "Conditions prior to Project initiation" Section 1.11 "Compliance with laws, statutes and other regulatory frameworks" Section 2.4. "Baseline scenario" Section 2.5. "Additionality"

10. T-SIG, Tool for testing significance of GHG emissions in A/R CDM Project activities

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
The tool shall be used in the application of an A/R CDM approved methodology to an A/R CDM project activity:		
To determine which decreases in carbon pools, and increases in emissions of the greenhouse gases measured in CO2 equivalents that result from the implementation of the A/R project activity, are insignificant and can be neglected.	• It applies in full.	Section 2.3 "Project boundary" Annex 20. "Tool for testing significance of GHG Emissions in A / R CDM project activities (T-SIG)".
To ensure that it is valid to neglect decreases in carbon pools and increases in GHG emissions by sources stated as being insignificant in the applicability conditions of an A/R CDM methodology.	It applies in full.	Section 2.3 "Project boundary" Annex 20. "Tool for testing significance of GHG Emissions in A / R CDM project activities (T-SIG)".

11. VCS TOOL T-BAR: AFOLU Non-Permanence Risk

Applicability Condition	Justification	Section in the PD and annexes the technical support and documentation and reference source
This tool provides the procedures for conducting the not permanence risk analysis and buffer determination required for Agriculture Forestry and Other Land Use (AFOLU) projects. The tool sets out the requirements for project proponents, implementing parthers and validation/verification bodies to assess risk and determine the appropriate risk rathing.	It applies in full.	Annex 23. “Impermanence risks for REDD + RIU-SM - T-BAR Project” Procedures are presented in file "Annex23_T-BAR_table.xlsx", folder "Annex 23. T-BAR"

2.3 Project boundary

a. Spatial and geographical boundaries

In the REDD+ SM-RIU Project defined as spatial limits the following:

1. **Project Area (PA):** It is within the RIU-SM and is completely under the legal and territorial control of the Indigenous who inhabit the reservation. It is a forest area (in 2011) which is under threat of deforestation (VMD0007).

   Project implementers develop activities to mitigate this threat.

2. **Leakage Belt (LB):** It borders the Project Area (PA) and it is located in the most accessible and likely to be deforested areas. It is a forest area (in 2011) that surrounds or is in the immediate vicinity of the Project Area (PA) to face "the leakage" related to the displacement caused by the activities of the REDD Project. Meets the requirements of similarity (VMD0007).

3. **Reference Region for Projecting Deforestation Rate (RRD):** In is whole is part of Cumaribo municipality and covers the north and west of the RIU-SM. Its biophysical features as its accesability and legal characteristics meets the requirements of similarity defined in BL-UP (VMD0007) module. It is a forest area in 2001.

4. **Reference Region for Projecting Location of Deforestation (RRL):** It is required for localization forecasts deforestation in the baseline. It is a continuous area that contains forested and non-forested areas; the RRL Region contains the Project Area (PA) and LB. Meets the requirements defined in the module similarity BL-UP (VMD0007).

   Geographic information and spatial limits of these are presented below in the Annex 15 (module VMD0016 X-STR Stratification methods).

Table 32. Spatial limits areas

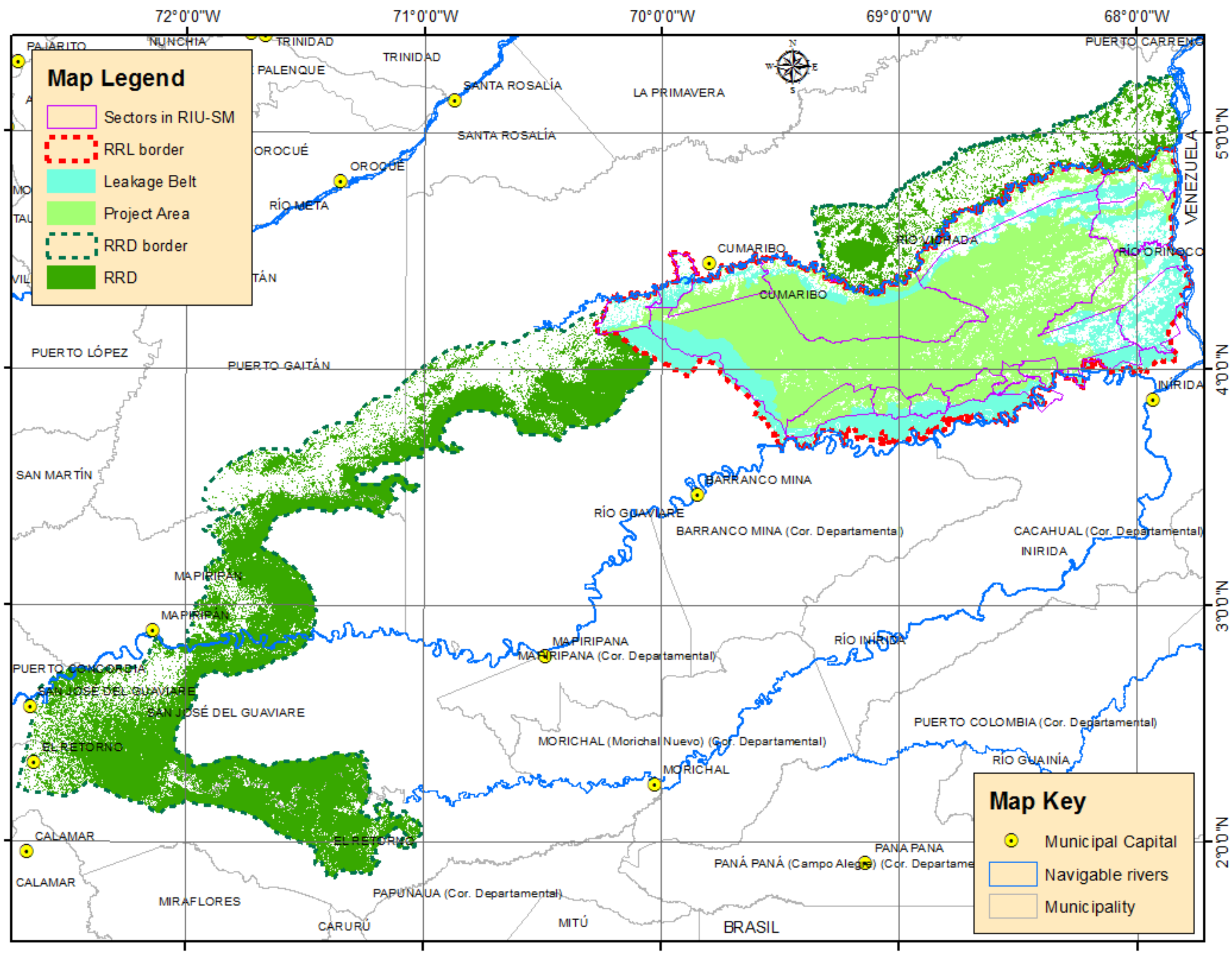
Limit	Area (ha)
Project Area (PA)	1,150,212
Leakage belt	486,211
RRD	1,444,805
RRL	2,028,439

Source: REDD+ project RIU-SM GIS. VMD0007, Part 1 Definition of boundaries, 1.1 Definition of the spatial boundaries of the analytical domain (based on stratification Annex 15 VMD0016)

The sectors of the RIU-SM and human settlements in them are the basis for activities of monitoring and control of the forests, the governance of ACATISEMA Association, and the establishing and developing of "Family Agrifood Production Units System" (FAPUS), mainly.

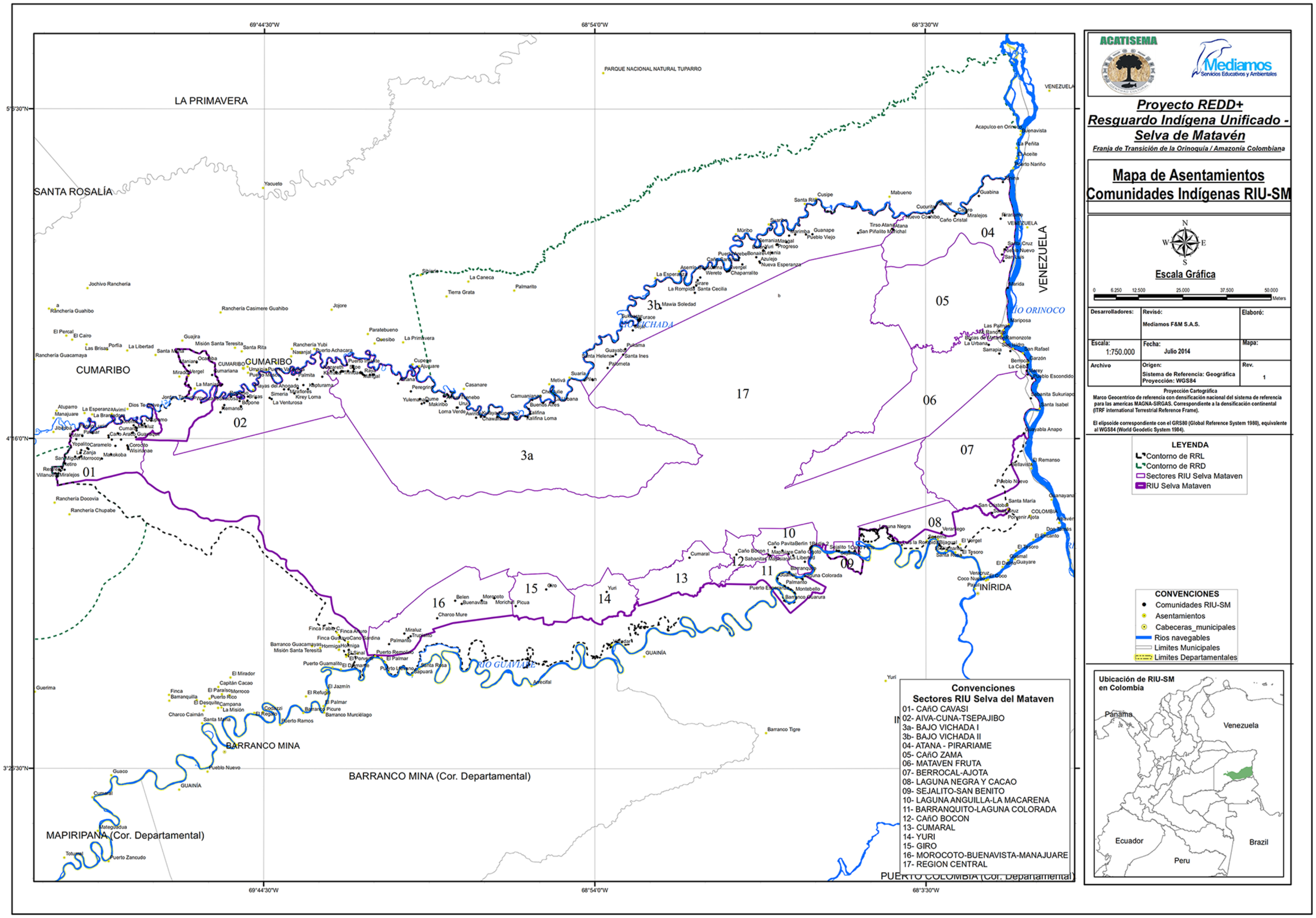
The following maps shows: the spatial boundaries of the REDD+ project RIU-SM, sectors of RIU-SM and the location of settlements in the Indigenous Reservation.

Map 8. Project spatial boundaries REDD+ RIU-SM



Source: REDD+ project RIU-SM, GIS

Map 9. Settlements in the Indigenous Reservation



Source: REDD+ project RIU-SM, GIS

The following tables show the areas of the intersections of each of the defined spatial limits, with the areas of the subregions of the Orinoco.

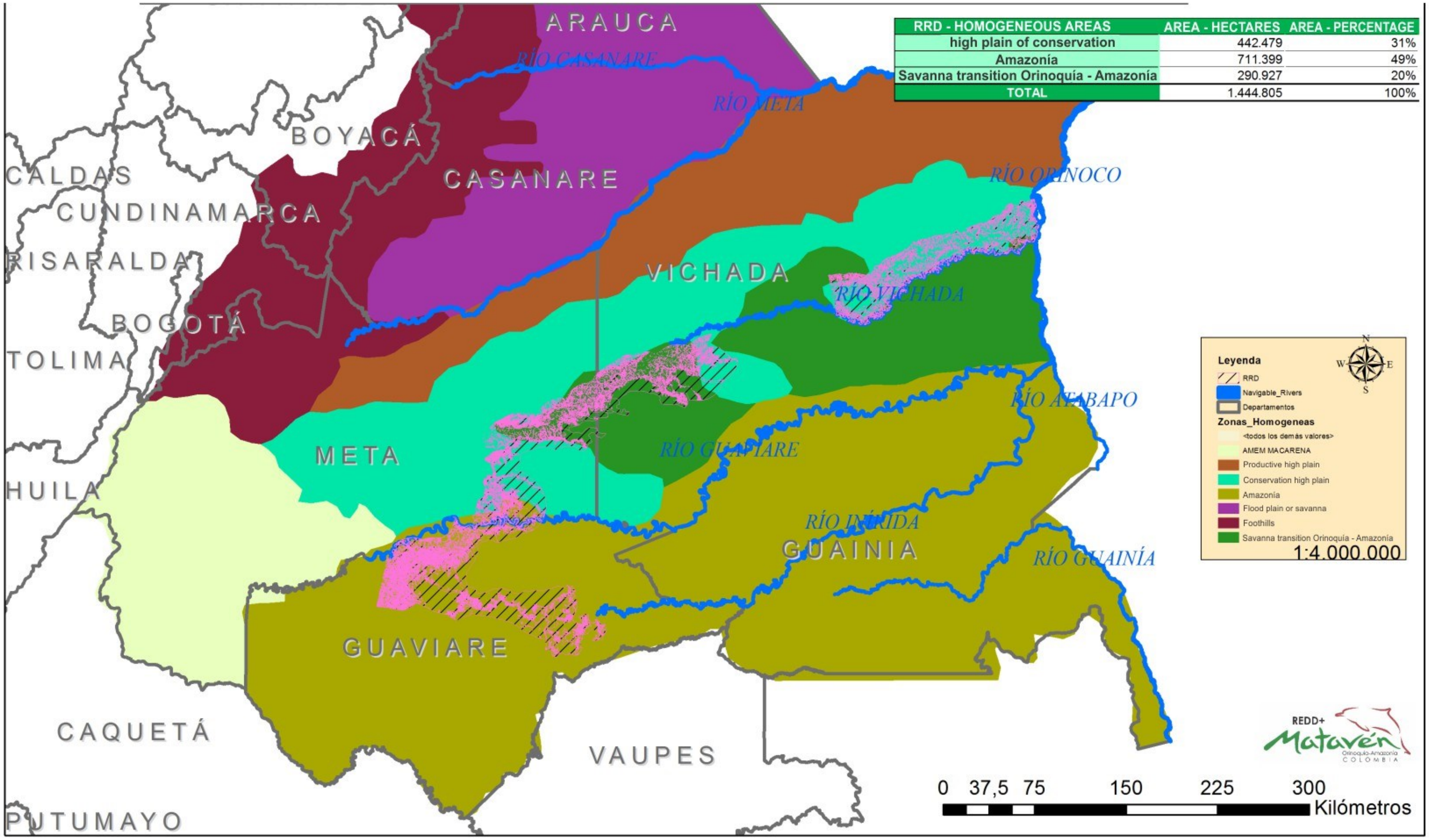
Table 33. Distribution areas of the intersections in Orinoco subregions with the spatial boundaries of the Project (RRL, RRD, PA, LB)

Orinoco subregions	RRL		RRD		PA		LB	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Amazon Orinoco savannah Transition	1,776,519	88%	290,927	20%	1,088,285	95%	323,019	66%
Amazon	200,332	10%	711,399	49%	51,713	4%	132,832	27%
High plain of conservation	51,589	3%	442,479	31%	10,201	1%	30,348	6%
Totals	**2,028,439**	**100%**	**1,444,805**	**100%**	**1,150,199**	**100%**	**486,199**	**100%**

Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

The following maps and tables show the distribution of intersecting areas in Orinoco subregions with the stratum, the spatial boundaries of the Project and Departments.

Map 10. Orinoco subregions and the Project Reference Region (RRD)



RRD - HOMOGENEOUS AREAS	AREA - HECTARES	AREA - PERCENTAGE
high plain of conservation	442.479	31%
Amazonía	711.399	49%
Savanna transition Orinoquía - Amazonía	290.927	20%
TOTAL	1.444.805	100%

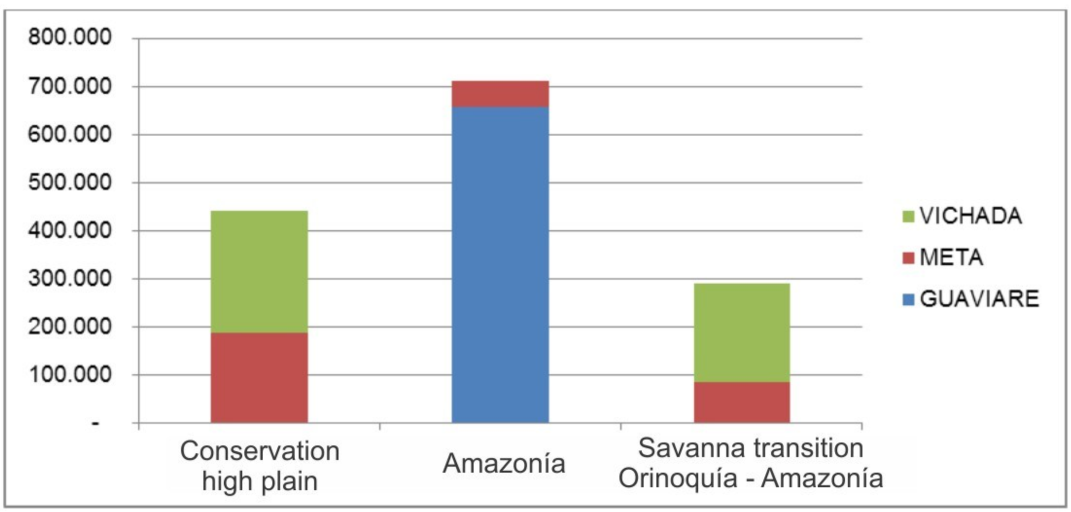
Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Table 34. Distribution of the intersections of the areas in Orinoco subregions and the Departments with the Project Reference Region (RRD)

	Subregiones de la Orinoquía – RRD			
Departments	**High plain of conservation**	**Amazon**	**Transition Savanna Orinoco - Amazon**	**Grand Total**
Guaviare	94	656,204		**656,298**
Meta	187,309	55,195	84,617	**327,122**
Vichada	255,062		206,310	**461,372**
Grand Total	**442,466**	**711,399**	**290,927**	**1,444,792**

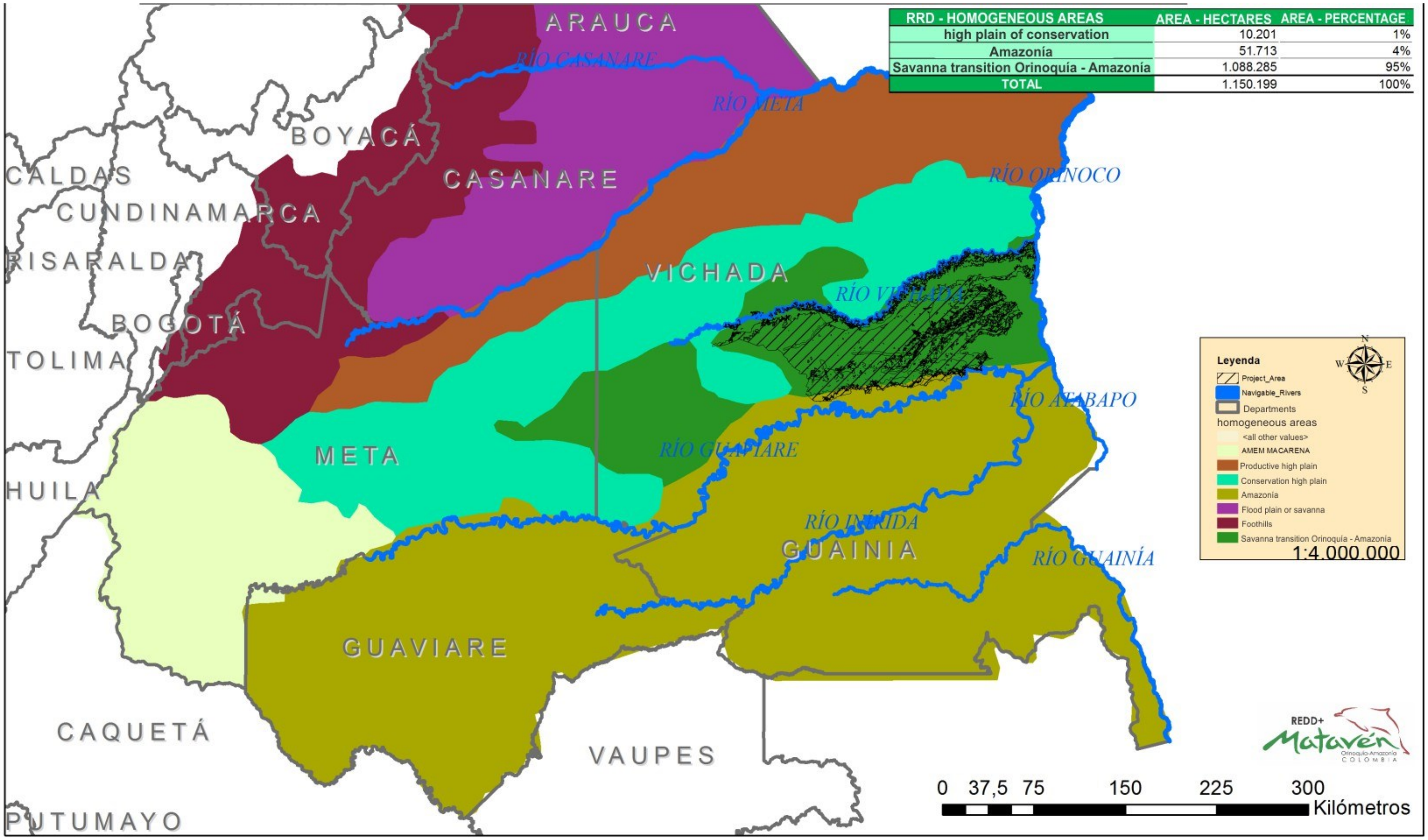
Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Illustration 29. Graph of the Orinoco and subregions of the Project Reference Region (RRD)



Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Map 11. Subregions of the Orinoco and the Project Area (PA)



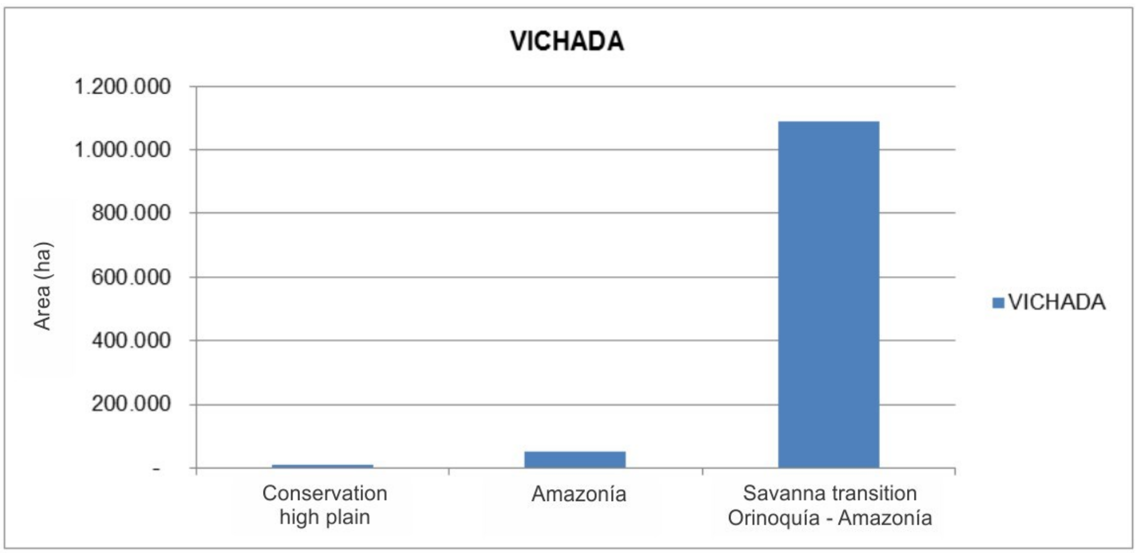
Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Table 35. Distribution of the intersections of the areas in Orinoco subregions with the Project Area (PA)

	Orinoco subregions – PA			
Departments	**High plain of conservation**	**Amazon**	**Transition Savanna Orinoco - Amazon**	**Grand Total**
Vichada	10,201	51,713	1,088,289	**1,150,203**
Grand Total	**10,201**	**51,713**	**1,088,289**	**1,150,203**

Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Illustration 30. Graphical distribution of the intersections of the areas in Orinoco subregions with the Project Area (PA)



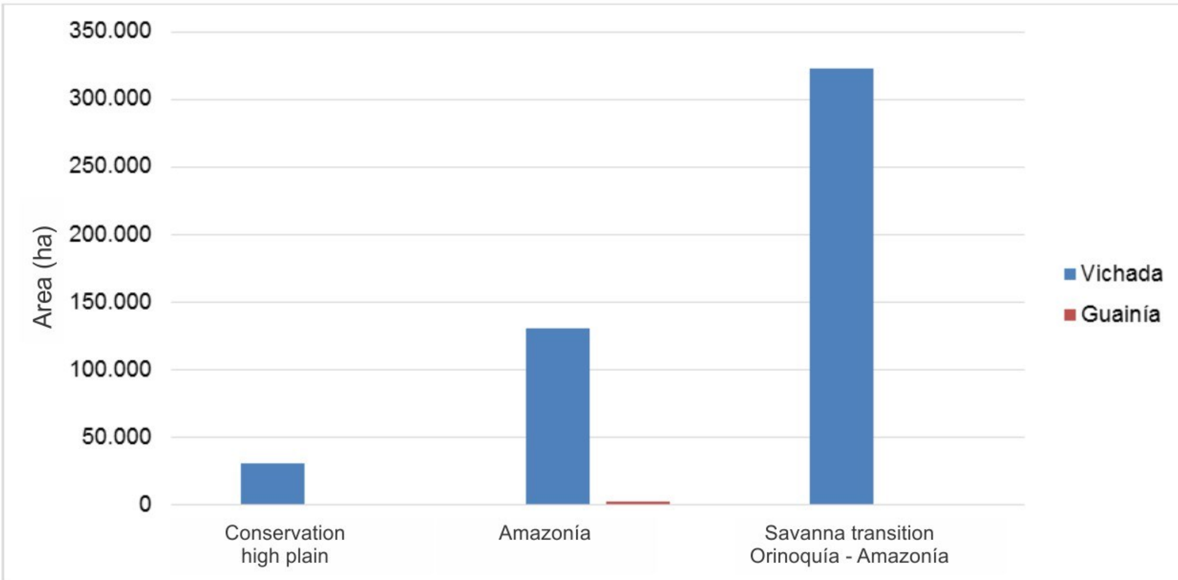
Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Table 36. Distribution of the intersections of the areas in Orinoco subregions with Leakage belt (LB)

	Orinoco Subregiones - LB			
department	**High plain of conservation**	**Amazon**	**Transition Savanna Orinoco - Amazon**	**Grand Total**
Vichada	30,348	130,374	322,383	483,105
Guainía		2,458		2,458
Grand Total	**30,348**	**132,832**	**322,383**	**485,563**

Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Illustration 31. Graph of the distribution of the intersections of the areas of the subregions of the Orinoco leakage belt (LB)



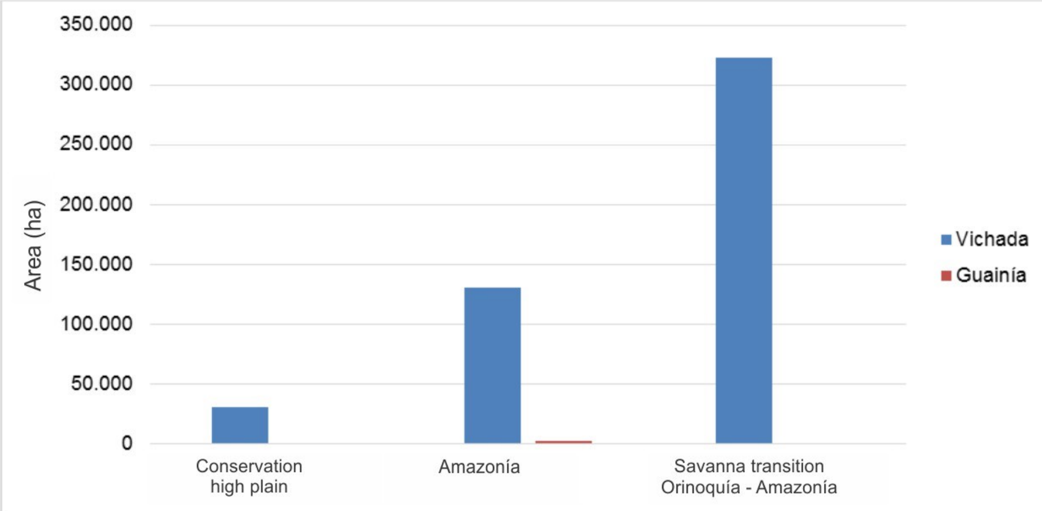
Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Table 37. Distribution of the intersections of the areas in Orinoco subregions with the RRL

	Orinoco subregions – RRL			
Department	**High plain of conservation**	**Amazon**	**Transition Savanna Orinoco - Amazon**	**Grand Total**
Vichada	51,589	197,030	1,775,803	2,024,422
Guainía		3,302		3,302
Grand Total	**51,589**	**200,332**	**1,775,803**	**2,027,724**

Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

Illustration 32. Distribution of the intersections of the areas in Orinoco subregions with RRL



Source: REDD+ project RIU-SM. Based on (Congreso de Colombia, 2015) Plan Nacional de Desarrollo 2014-2018

b. Carbon pool

In the baseline scenario, the following carbon pools have been considered: aboveground biomass, belowground tree biomass and soil organic carbon.

In the Project scenario it has been considered that there would be no change in carbon stocks from deforestation or degradation within the Project Area (PA). Activities aiming at protecting the Project Area (PA) from deforestation agents and avoiding leakage are established.

Table 38. Carbon pools included in the REDD Project

Carbon pools	Included / Excluded	Justification
Aboveground biomass	Included	Carbon in aboveground biomass and palms was estimated in strata of the Project Area (PA) within the REDD+ RIU-SM Project and in strata of the Project Area (PA) in a pre-deforestation scenario. Carbon stock in biomass post-deforestation was estimated. Non-tree woody biomass (e.g. shrubs, pasture and cropland) than the Project case (forest) and is conservatively excluded.
Belowground biomass	Included	Significant in tropical forests. Included and treated together with aboveground biomass for completeness to include whole tree (aboveground and belowground) biomass.
Soil organic carbon	Included	Significant in tropical forests.

Source: Annex 9 - VM0007, 5. Project boundary, 5.4 Sources of GHG emissions, 5.4.2 REDD: GHG Sources Included In or Excluded from the REDD Project Boundary

c. Relevant GHG sources, sinks and reservoirs for the Project and Baseline scenarios

The following sources of GHG emissions: Biomass burning, Combustion of fossil fuels and Use o fertilizers, are excluded from the REDD+ RIU-SM Project boundary.

Table 39. GHG Sources included in or excluded from the REDD Project Boundary

Sources		Gas	Included	Justification / Explanation
Baseline and Project	Biomass burning	CO_2	Excluded	However, carbon stock decreases due to burning are accounted as a carbon stock change
		CH_4	Excluded	Non-CO_2 gases emitted from woody biomass burning - it is conservative to exclude in the baseline but must be included in the project case if fire occurs.
		N_2O	Excluded	
	Combustion of fossil fuels	CO_2	Excluded	Can be neglected if excluded from baseline accounting.
		CH_4	Excluded	Potential emissions are negligible
		N_2O	Excluded	Potential emissions are negligible
	Use of fertilizers	CO_2	Excluded	Potential emissions are negligible
		CH_4	Excluded	Potential emissions are negligible
		N_2O	Excluded	Can be excluded if excluded from baseline accounting except in the situation where fertilizer use is enhanced as a leakage avoidance mechanism.

Source: Annex 9 - VM0007, 5. Project boundary, 5.4 Sources of GHG emissions, 5.4.2 REDD: GHG Sources Included in or Excluded from the REDD Project Boundary

Acording to Annex 20 (T-SIG), table of "Relative contribution of each source *i to the sum* of project and Leakage GHG emissions" – post – deforestation. It is completely insignificant the carbon content and greenhouse gas emissions from biomass burning (0.36 t C / ha for biomass burning. IPCC good practice guidance for land use, changing land use and forestry. 2003. 3.3.2.1.1.2 Choice of Emission/Removal Factor: 0, 2 t d.m / ha)

No use of chemical fertilizers in the project activities and emissions from fossil fuel combution were excluded from the baseline.

d. Leakage

The application of the LK-ASU Module of the approved VCS VM0007 REDD Methodology Modules was considered in the VMD0010 Module; leakage due to displacement of unplanned deforestation [45].

[45] *Annex 12. LK-ASU, Estimation of emissions from activity shifting for avoided unplanned deforestation - VMD0010.*

2.4 Baseline Scenario

2.4.1 Baseline Identification and Justification

The identification and selection of alternative land use scenarios for determination of the baseline and assessment of additional was conducted in accordance with the VT0001 Tool for the Demonstration and Assessment of Additional in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, Version 3, and VM0007 methodology module BL-UP "VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation", version 3.0.

The project meets the applicability requirements of VT0001 as follows:

- The proposed project activities do not violate any applicable law whether it is or is not enforced. Additional details regarding relevant laws are provided in Section 1.11.
- The project is not proposing a new baseline methodology but is using VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP), Version 3.0, which includes a detailed step by step approach for development of the baseline.

2.4.2 Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity (VT0001)

2.4.2.1 Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

The following alternative land use scenarios were identified for the project:

Scenario 1: Continuation of the pre-project land use;

Scenario 2: What are the conditions of scenario 1 (pre-project land use) plus arising from the implementation of the National Development Plan (Congreso de Colombia, 2015) specifically what corresponds to the political and economic definition in CONPES 3797 of 2014 (DNP, 2014) which aims to create social and economic conditions for inclusive and sustainable development of Mountain Plateau based on the construction of a model region and the Law 223 of 2015 (Congreso de Colombia, 2015) (ZIDRES) by which areas of interest in regional economic and social development are established (*See section 1.11 "Compliance with laws, statutes and other regulatory frameworks"*).

Scenario 3: Project activities occurring without being registered as a VCS Project.

The three alternatives will be considered below. Scenario 2 was selected as the baseline scenario.

Scenario 1: The conditions for this scenario (pre-project land use) were discussed in section 1.10, which include deforestation for subsistence agriculture and small livestock.

The trend of deforestation continue growing in the 4 types of biomes in the way described in section 1.10 with results greater deforested areas and therefore with a progressive decline and degradation of environmental assets lost forest habitats and their benefits for the sustainability of the territories, local communities, climate and biodiversity. The key problem subsist through the lack of an integrated management system to achieve its sustainability and mitigate threats to their conservation, highly related with the factors That determine the fragility of the social and culture conditions being experienced by Communities, in terms of the loss of values and traditions linked to ethnic identity, situation That limits the Ability of participation, management and monitoring of the territory by the Communities, affecting the conditions of governance and security in the zone.

Scenario 2. What are the conditions of the stage in the context of the implementation of two laws (Law on the National Development Plan (DNP, 2014) and ZIDRES Act (Congreso de Colombia, 2015)) and CONPES 3797 of 2014 (DNP, 2014). This legal framework has special reference and application in the Orinoco where it is located the Indian Unified - Forest Mataven; the Law on the National Development Plan seeks to make in the expansion of the agricultural frontier, mining and oil in Colombia, old aspiration of different national governments and is now embodied in law, accompanied by Law 223 of 2015 (ZIDRES) and CONPES 3797 of 2014, also reinforce the purpose of converting this region into a zone of interest for Economic and Social Development Regional.

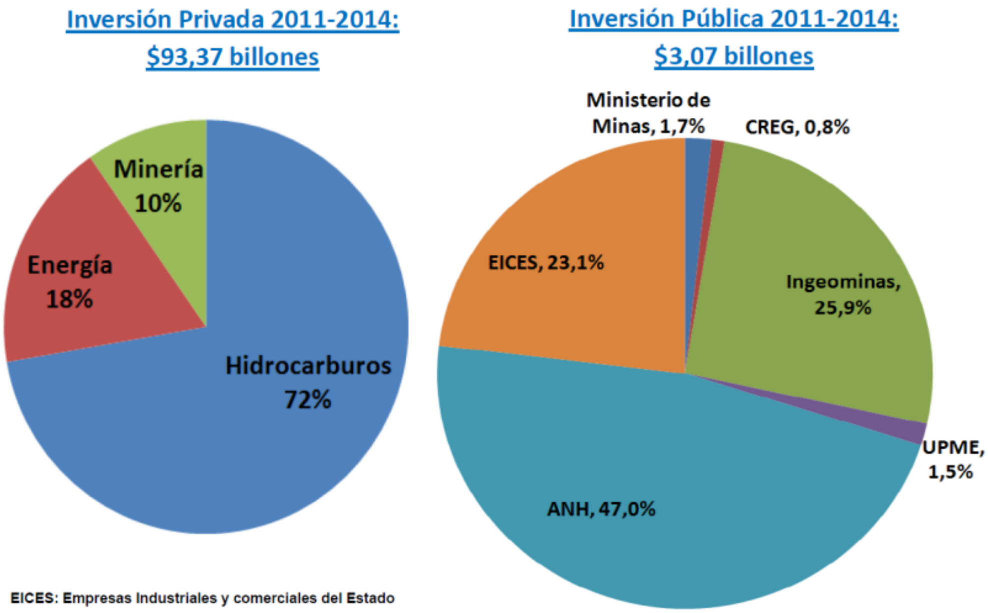
Amazon strip is part of the Colombian Amazon natural region comprising the entire territories of the departments of Amazonas, Caquetá, Guainía, Guaviare, Putumayo and Vaupés, and part of the territories of Vichada, Meta, Cauca and Nariño. As environmental unit, eco-systemic and social-cultural should be construed as a whole and in the understanding of the relationships and roles between soils, climate, vegetation and general socio-eco-systems.

The National Development Plan believes that Vichada is a privileged area of Colombia, with great potential for agricultural expansion, which owns 33% of water resources of the country; six rivers pass through it parallel: Meta, Vita, Tomo, Vichada, Orinoco and Guaviare; It constitutes 75% of the national territory Mountain Plateau the only arable savannah Colombia. (UNIANDES, s.f.)

Also the National Development Plan highlights the mining and energy sector, calling it one of the engines of national development, which is apparent from the analysis of their participation in the GDP rose from 9.7% in 2006-2009 to 11.2% in the period 2010-2013. It should be noted that within the mining and energy sector, the oil subsector is the main impulse of GDP, with a share of 52.3% of the total contribution of the sector in the years 2010-2013.

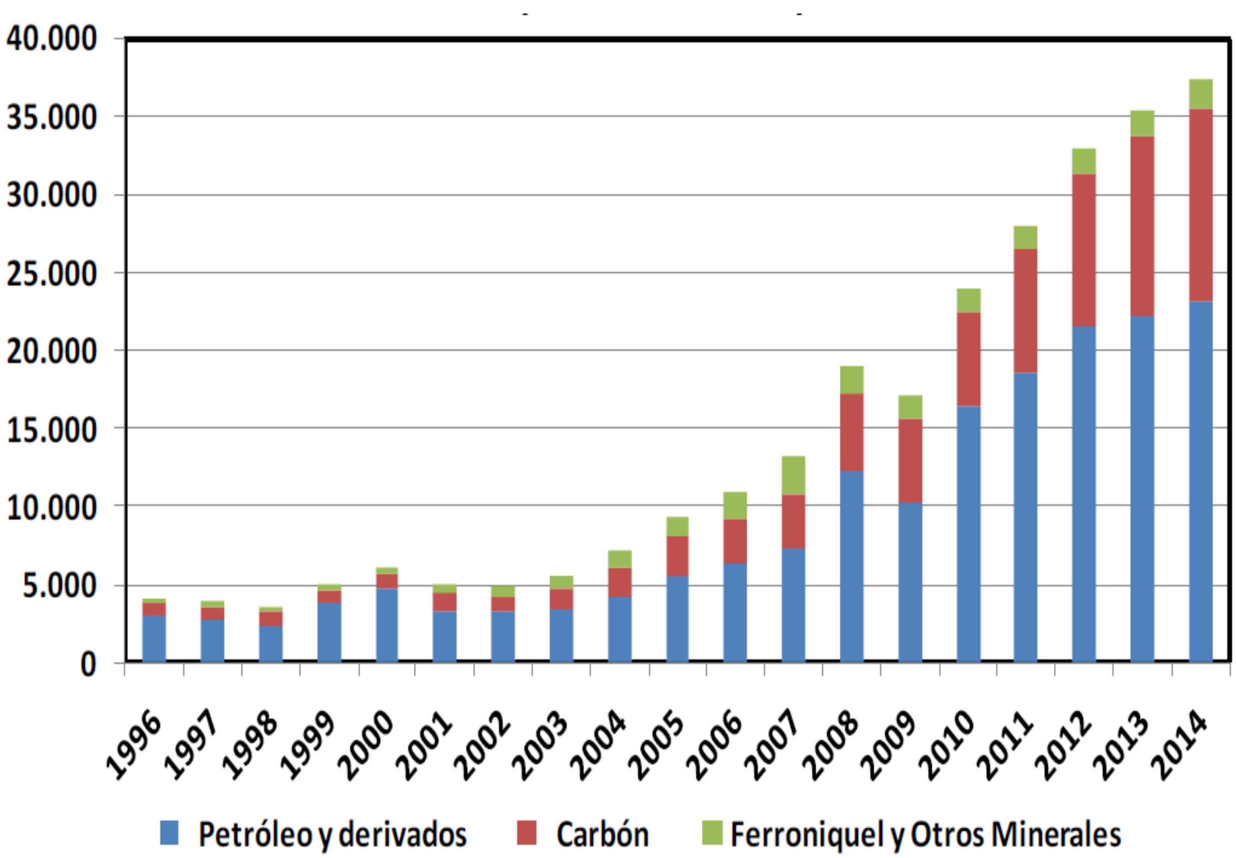
The growth of the mining and energy sector in the four years 2010-2014 due largely to increased Foreign Direct Investment -FDI, which rose from US $ 4,961 million in 2010 to US $ 8,281,000 in 2013, with a growth rate annual average of 46% (Illustration 33). This has demanded the internationalization of the sector, which is reflected in the figures for exports (Illustration 34), (DNP, 2011).

Illustration 33. Private investment and public investment in the sector of Mines and energy (2011 to 2014)



Source: (DNP, 2011) "Presentation of the National Development Plan 2010-2014, challenges and targets for the Mining-Energy sector"

Illustration 34. Total exports mines and energy sector (US $ million)



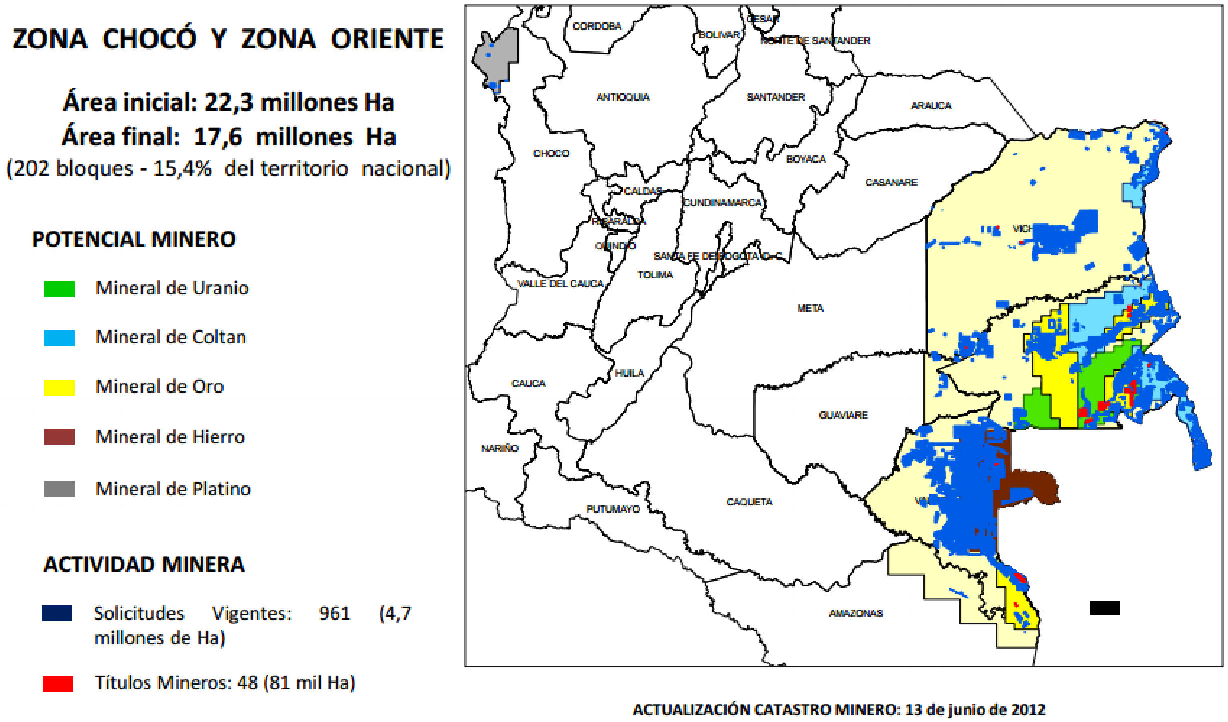
Source: (DNP, 2011) "Presentation of the National Development Plan 2010-2014, challenges and targets for the Mining-Energy sector"

In 2012 President Santos said 17.6 million hectares of the country as "Strategic Reserve Mining" in the departments of Chocó, Amazonas, Guaviare, Guainía, Vaupés and Vichada with great potential for the extraction of strategic minerals and desirable such as uranium, coltan, gold, iron and platinum. This new reserve area is added to the 2.9 million hectares that had been declared as mining reserve by the Government in early 2012, which includes parts of the departments of the coast and the Midwest.

Maps 12 exhibits the strategic mining areas according to their mineral potential and the Map 13 shows the applications and mining rights. [46]

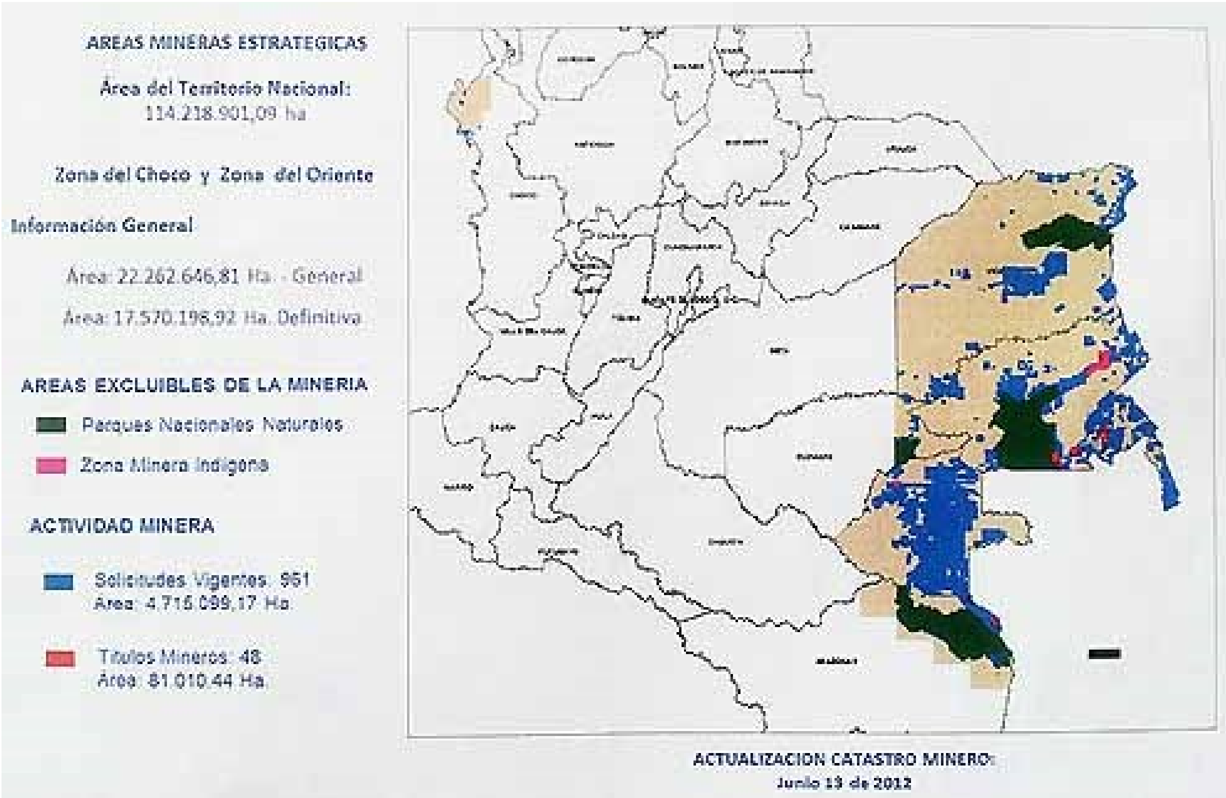
[46] *Lobo-Guerrero, C. '[Presidente] Santos declara 17,6 millones de hectáreas del país como "reserva estratégica minera" ' Revista Semana. http://www.semana.com/nacion/articulo/santos-declara-176-millones-hectareas-del-pais-como-reserva-estrategica-minera/259867-3*

Map 12. Classification of strategic mining areas according to their mineral potential



Source: Strategic mining áreas. Agencia Nacional de Minería, July 2012.

Map 13. Mining in 2012



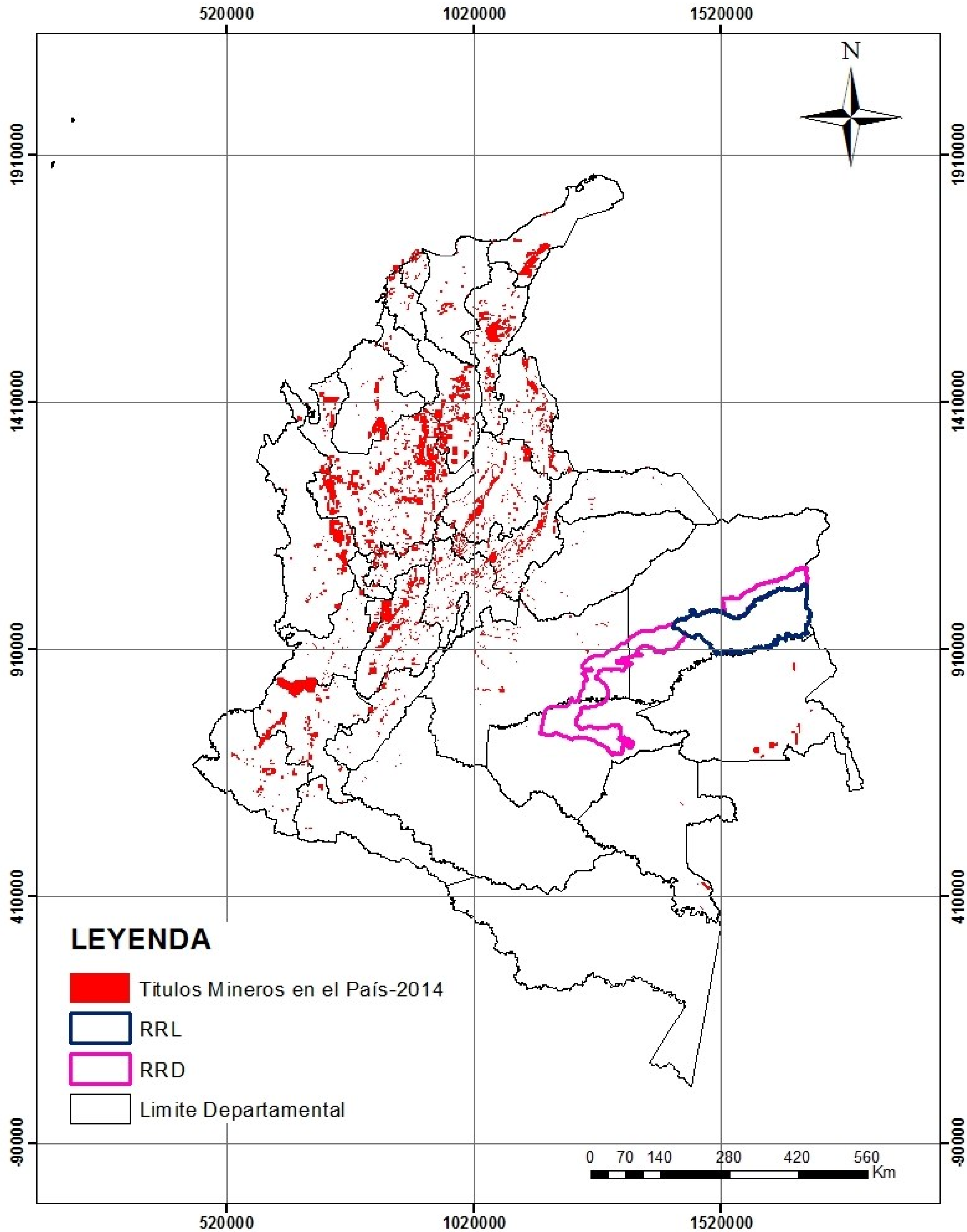
Source: Mining Cadastre, 2012

The Vice-President has a goal during the term of the National Development Plan to promote a technological leap in sectors such as telecommunications, agriculture, disaster prevention, mining, intelligent transport systems, including navigation and aerial surveillance, security and defense, environmental monitoring and infrastructure management, protection and management of ocean resources, urban planning, mapping, and location-based services. Moreover, it emphasizes that the mining and energy sector will play a key role in ensuring compliance with this goal and sustained economic development and inclusive role.

Map 14 shows the distribution of mining rights in the country in 2014, the Map 15 shows the mining rights granted in RRD region, these empower the extraction of construction materials and other concessible, meanwhile the Map 16 teaches granted mining rights within the RRL region is that this title allows the extraction of titanium. (ANN, 2012) [47]

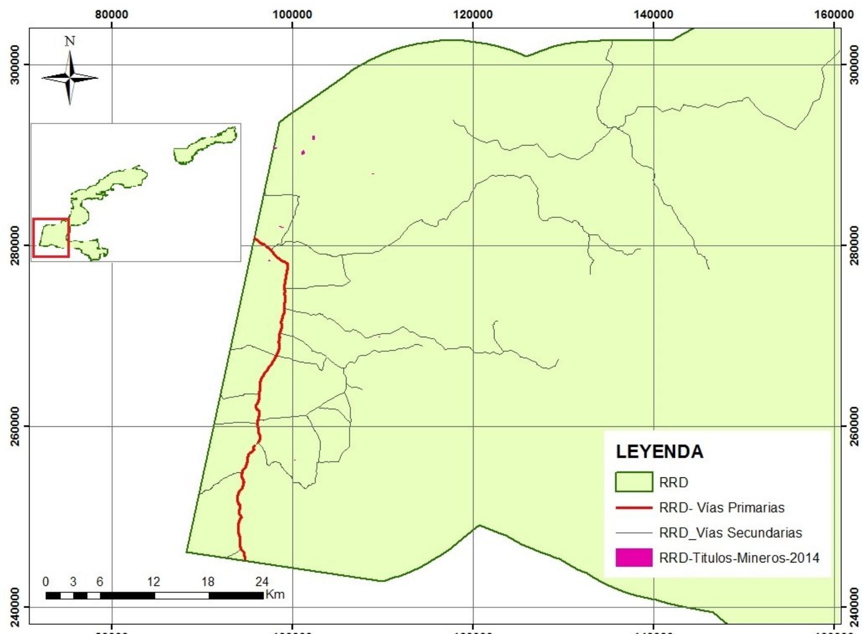
[47] *Agencia Nacional de Minería (ANN), 2012. Resolución 0045 de 2012 "Por la cual se declaran y delimitan unas Áreas Estratégicas Mineras y se adoptan otras determinaciones".*

Map 14. Mining rights granted in the country by 2014



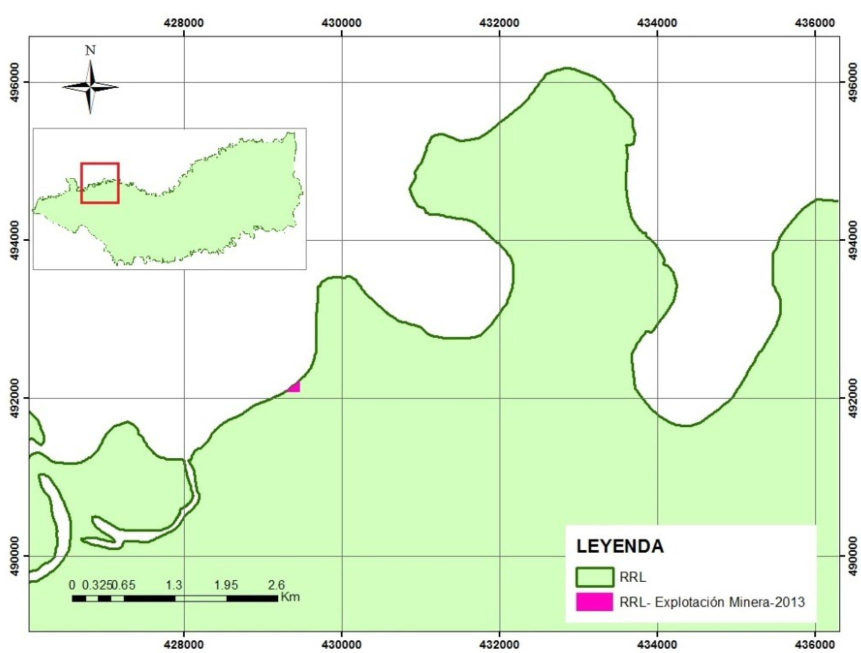
Source: SIGOT (online). Instituto Colombiano de Geología y Minería-INGEOMINAS, 2014

Map 15. Mining rights granted RRD 2014



Source: REDD+ project RIU-SM. Based on SIGOT (online). Instituto Colombiano de Geología y Minería-INGEOMINAS, 2014

Map 16. RRL mining rights granted in 2014



Source: REDD+ project RIU-SM. Based on SIGOT (online). Instituto Colombiano de Geología y Minería-INGEOMINAS, 2014

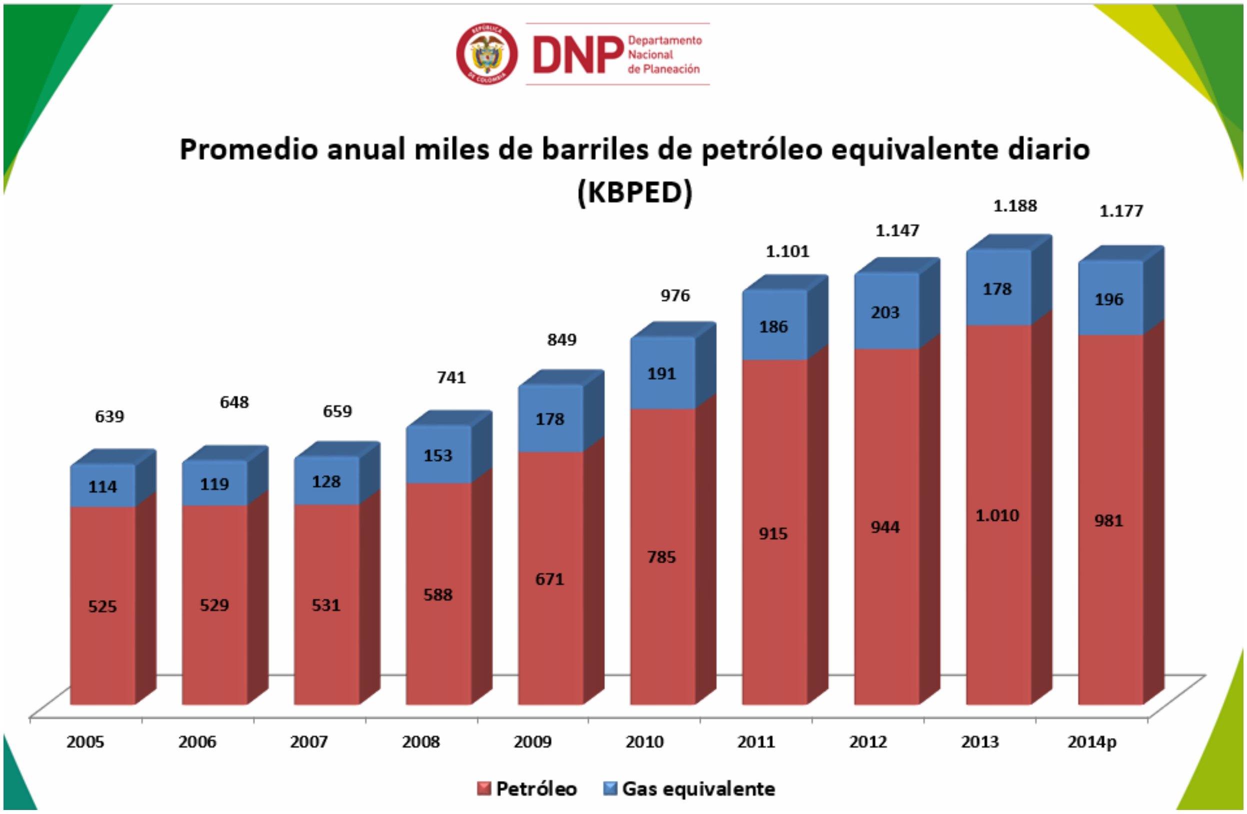
Given the reconfiguration of the international oil market, international prices for them and the development of new technologies, in Colombia efforts have been made in the hydrocarbons subsector to promote investment in exploration and production. One of the measures was to encourage private investment in these activities, which has resulted in an increase in production levels in recent years. Finally it possible to achieve a record production of 1,007 KPBD (thousands of barrels a day) in 2013 and maintain an average production of 984 KPBD during 2014. Similarly, investments in exploration by the industry led to the increase in levels of oil reserves, in 2013 the highest level of the past fifteen years he, with a total of 2,445 million barrels, with a level of self-sufficiency (reserves / production) of 6.6 years (DNP, 2015) [48].

It is noteworthy, according to figures from the Ministry of Mines and Energy, in the region composed of the departments of Casanare, Vichada, Meta and Arauca, extracted an average of 751,373 barrels of daily crude (March, 2013), representing 74.5% of domestic production. Production in the department of Meta continues to reach new records, while in Vichada an exploratory campaign that could lead to the discovery of new deposits of heavy oil coming forward[49].

According to the National Hydrocarbons Agency between 2005 and 2014 production of hydrocarbons (oil and gas) increased by 84%, reaching 1,177 KPBD. Illustration 35. Shows the average annual oil production, which highlights it's Steady growth from 2005 to 2014. (Zaninovich, 2014)[50]

[48] *(DNP, 2015). Bases del Plan Nacional de Desarrollo 2014-2018*
[49] *http://www.colombiaenergia.com/featured-article/meta-y-vichada-presente-y-futuro-del-sector-petrolero*
[50] *"Infraestructura para la Industria Petrolera". Expositor: Dimitri Zaninovich. Expo Oil and Gas, 2014*

Illustration 35. Annual average thousand barrels of oil equivalent daily (MBOED)



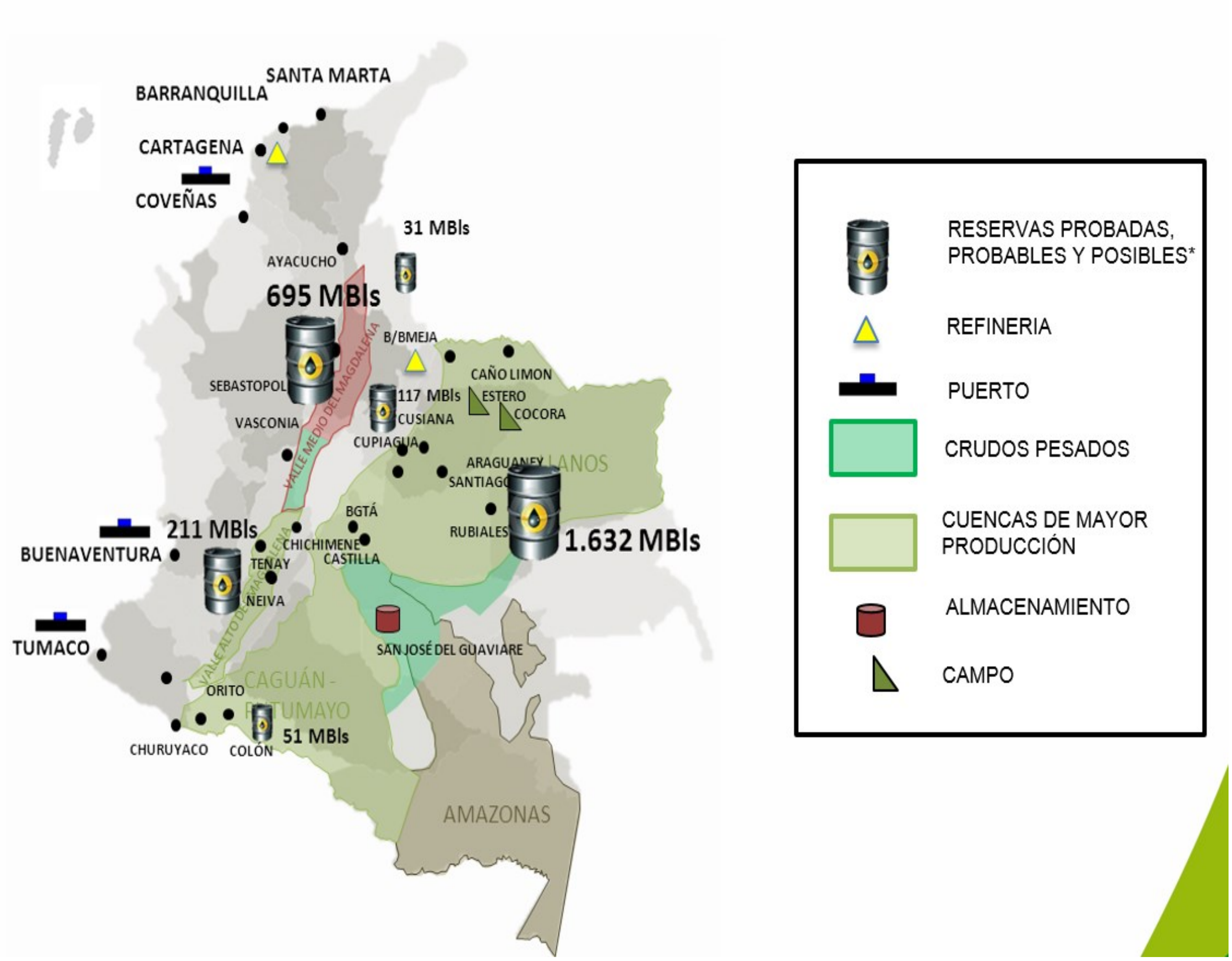
Source: (Zaninovich, 2014)

Map 17 presents the current situation of the location of hydrocarbons; It emphasized that RRD and RRL regions are part of the basins classified as higher hydrocarbon production area is made.

In more detail the National Hydrocarbons Agency (ANH) provides the spatial distribution of areas for exploration and exploitation of hydrocarbons in the country. In 2006, there were only two areas of oil production, which occupied part of RRD region, while in the region RRL any dynamic is not localized in the Map 18 is shown and described further localized areas of direct impact by the activity of the RRL and adjacent regions RRD hydrocarbons. [51]

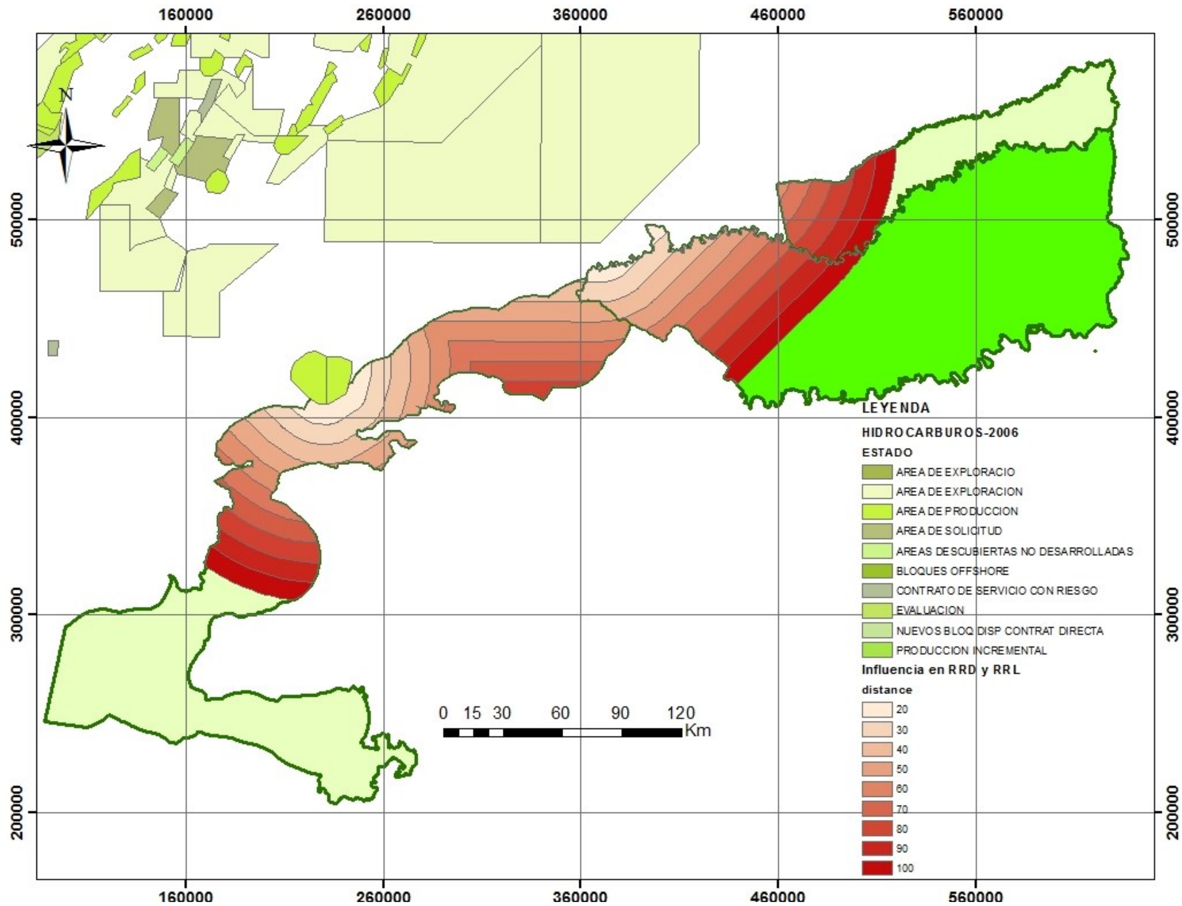
[51] *The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013*

Map 17. Panorama current location of hydrocarbons



Source: (Zaninovich, 2014)

Map 18. Hydrocarbon subsector activity for 2006 in RRD and RRL



Source: The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013

In 2013, the exploration and mining increased compared to the year 2006, the Map 19 shows the national context, while the Map 20 and the Map 21 have the same dynamics in RRD and RRL region respectively. RRD in the region can be found different states of hydrocarbon activities, from exploration (larger area) through the technical evaluation (TEA for its acronym in English) to the output (lower area). At the same time, the region RRL hydrocarbon activity is in technical evaluation by three operators namely: ECOPETROL S.A., BHP Billiton, TALISMAN COLOMBIA OIL & GAS LTD.[52]

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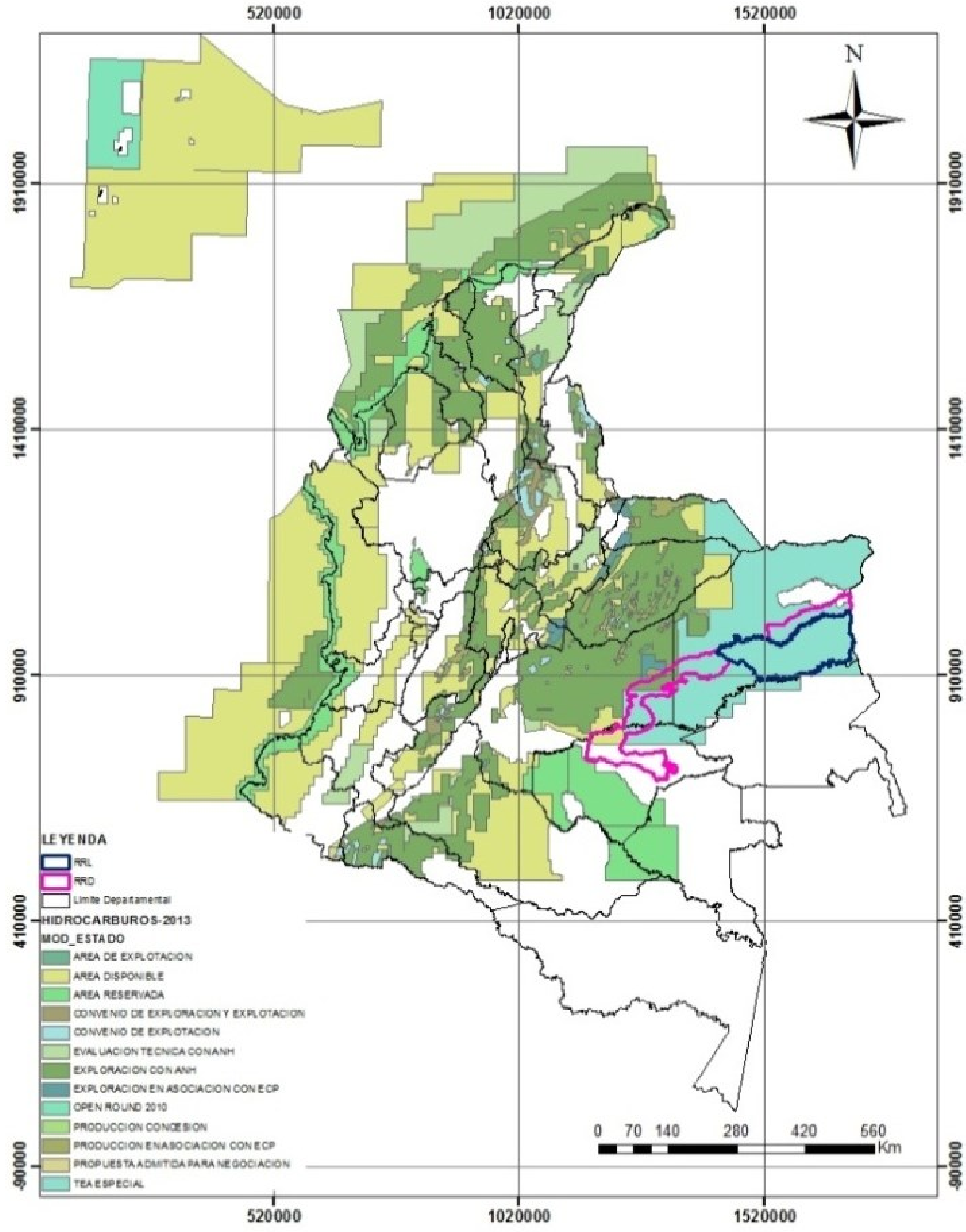
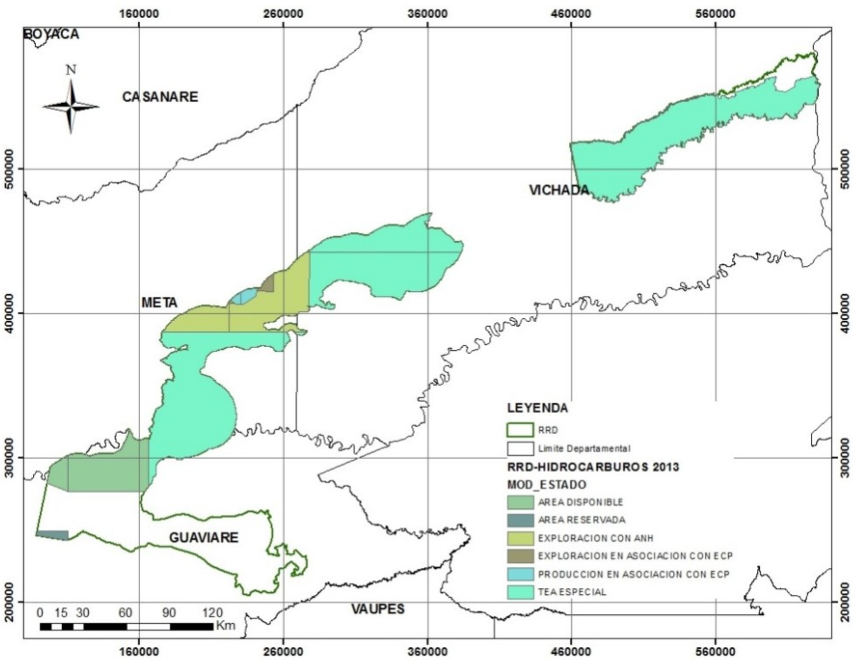
[52] *The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013*

Map 19. Activity hydrocarbon subsector 2013 in Colombia



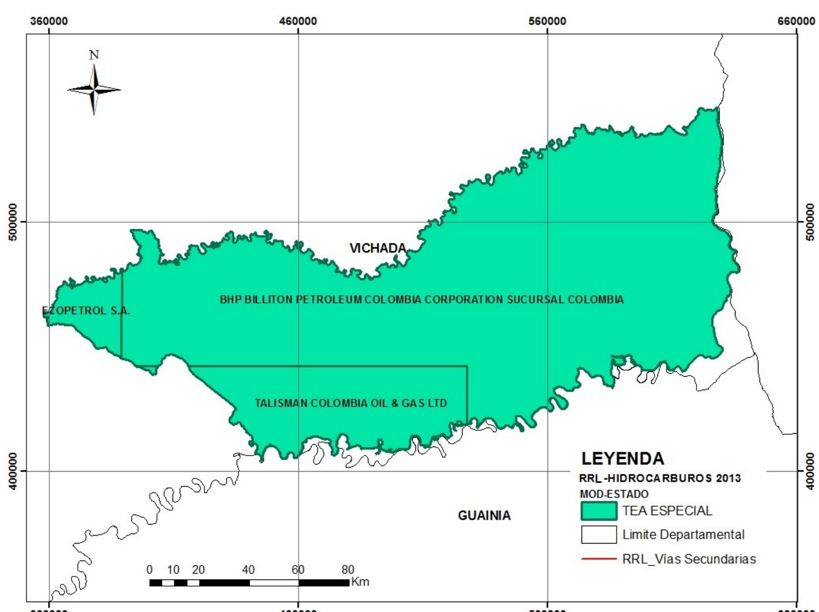
Source: The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013

Map 20. Activity hydrocarbon subsector 2013 RRD



Source: The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013

Map 21. Activity hydrocarbon subsector 2013 in RRL



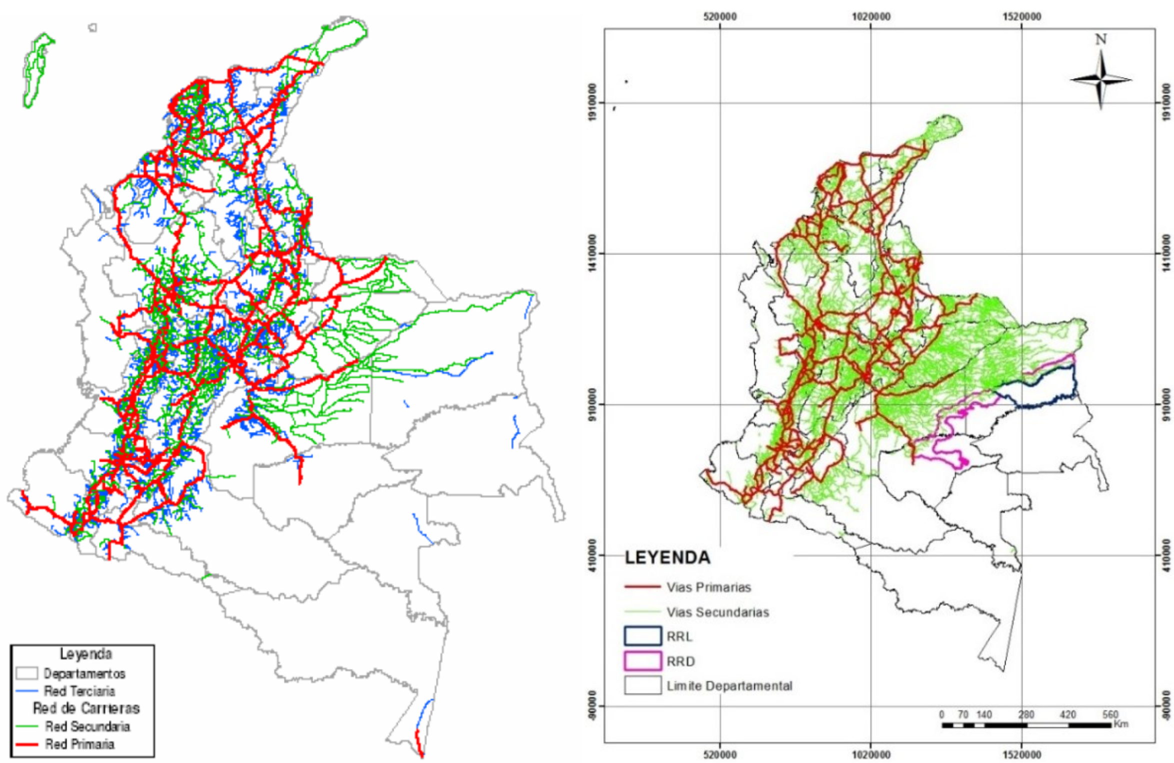
Source: The layer (SHP) used to maps was downloaded from the SIGOT. Energy Mining Planning Unit, years 2006 and 2013

Regarding the construction of the road network, historically investments in the transportation sector had been relatively low. On average, during the first decade of the century, investment in transport infrastructure was below 1% of GDP, insufficient number compared to international standards, especially considering the topographical complexities of land and road density that characterizes Colombia. According to the Global Competitiveness Report 2014 - 2015 of the OECD, the transport infrastructure Colombia is under developed countries, emerging Asia and some Latin American countries.

For these reasons in recent years efforts were undertaken to increase the pace of investment in the sector, focusing on triple the resources of the national budget dedicated to infrastructure and attracting resources from the private sector under the Public Private Partnership scheme. The efforts of the Government to increase investment in the Transport Sector resulted during the four years 2010 - 2014 a significant increase infrastructure investment. The GDP of the construction sector has shown a positive trend between 2011-2013 going from a growth of 6.0% in 2012 to 9.8% in 2013, establishing itself as the sector that boosted investment and domestic growth during 2013.

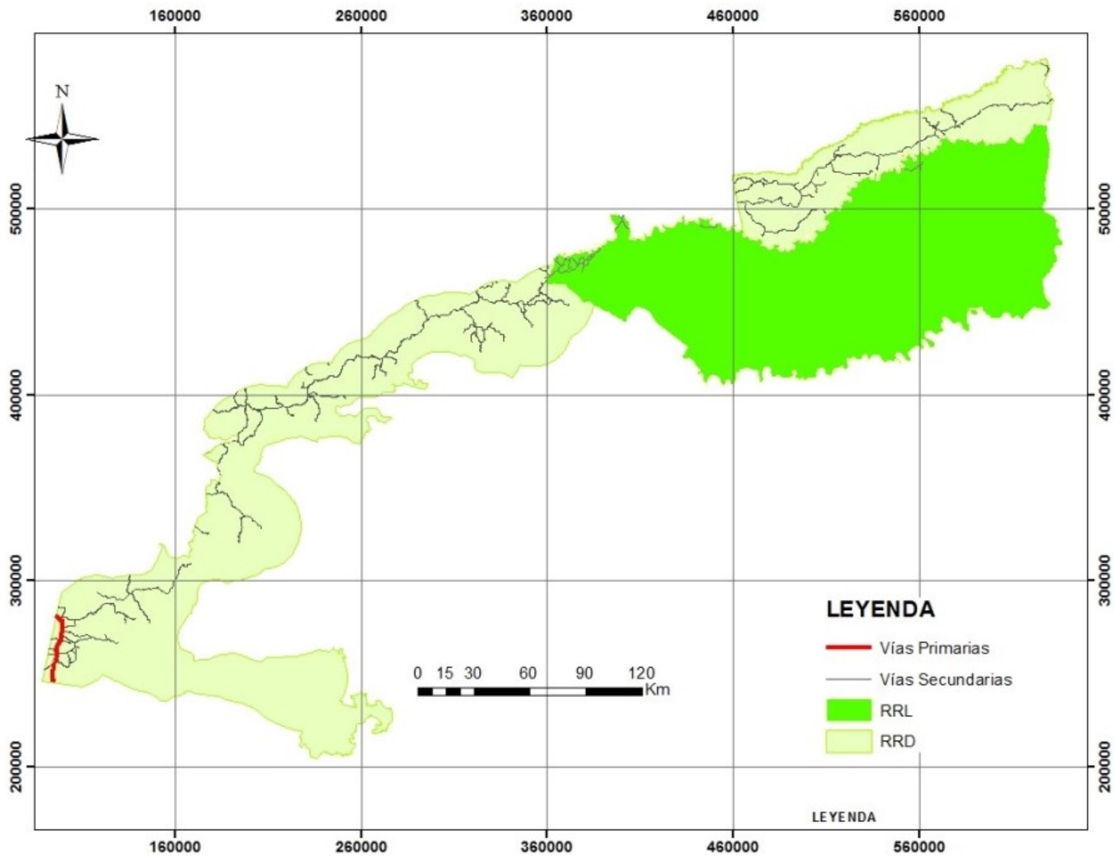
Map 22 shows the road infrastructure of the country had in 2006 (left) and today (right). In the Map 23, primary and secondary roads in RRD and RRL Region is presented. [53]

Map 22. Road infrastructure in 2006 (left) Vs Current Infrastructure Investment (right)



[53] The layers (shapes) were downloaded from SIGOT. Ministry of Transportation, year: 2006

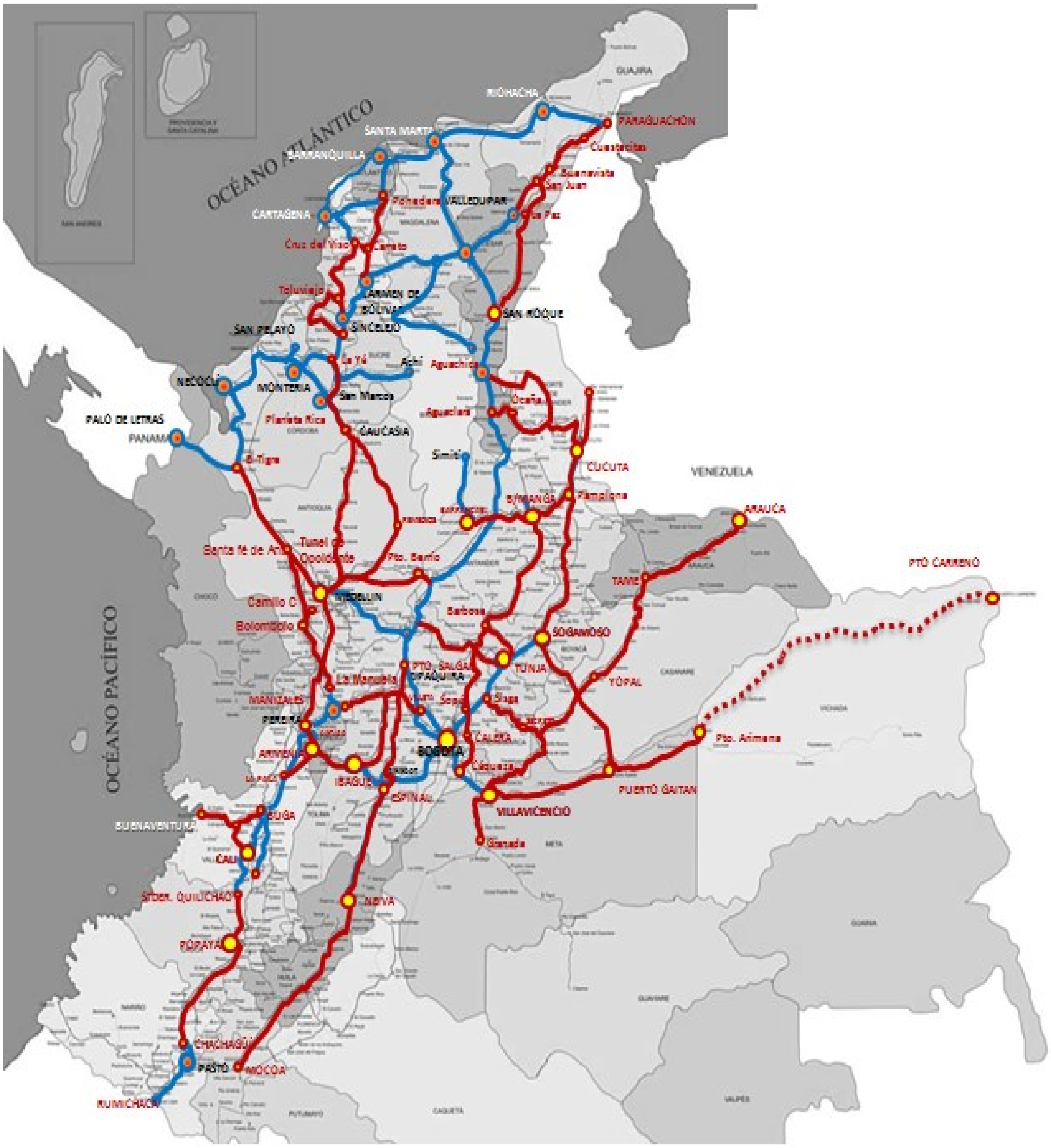
Map 23. Primary and secondary roads in RRD and RRL



Source: The layers (shapes) were downloaded from SIGOT. Ministry of Transportation, year: 2006

Finally on the Map 24 current and future road projects being worked on are presented, the emphasis is on the "Via Puerto Carreno" project, but does not cross or RRL region or RRL region whether it will have a direct impact on them.

Map 24. Road infrastructure projects recently completed, ongoing, future



Source: (Congreso de Colombia, 2015)

The Act of National Development Plan defines, in conclusion, to establish the pattern of holding responsible for strategic minerals in the geographical areas of Mountain Plateau Conservation Zone transition Orinoco and Amazon Indigenous Mining Zones, whereas Areas strategic Mining, particularly in the departments of Vaupés, Guainía and Vichada, correspond to areas with potential for exploitation of strategic minerals such as niobium, tantalum and black sands and these areas conducting objective selection process will be prioritized, with special concession contracts in which economic considerations be set minimum other than those royalties, which stakeholders should offer.

The allocation of the special concessions, will be based on reliable geological and quality. For which the Colombian Geological Service-SGC-, prioritize its exploration program for these areas, advancing the appropriate geophysical survey and geological and geochemical exploration scale greater detail.

Also the Law on the National Development Plan define Order the prospectively territory according to their environmental, agricultural, mining and energy and cultural vocation by increasing Institutional capacities in the region still need to strengthen the capacities of their territories, either whether municipalities, departments or ETIS, to which foster appropriate land use and land use planning that meets the productive potential and the needs of the people of the region. For this it is proposed (a) build a model of development and prospective land use planning from the environmental importance of its natural resources, particularly water, agro-ecological potential and ecosystems of the Orinoco and the Amazon; (B) strengthening institutions in the Special Management Area of La Macarena, by territorial association with long-term vision; (C) administrative and implement a development model for areas not municipalized in Guaviare, Vichada, Guainía and Vaupés that transitions indigenous territories Indigenous Territorial - ETI.

Paradoxically these three elements of the National Development Plan (mining and hydrocarbon exploitation, the construction of the road network and the expansion of the agricultural frontier) applied to the area of the RIU-SM (with their regions RRD and RRL) constitute serious threats for the protection and conservation of natural resources especially forests. These developments have increased pressure for new land for farming activities that taken in the pre-start of the project conditions, increase effective demand (including units with title) and the main reason for the change in land use will remain stronger and installation of crops and pastures.

The construction of the road network not only facilitates access to forests by reducing the cost of transporting agricultural products to larger markets, but also improves the feasibility of activities such as mining.

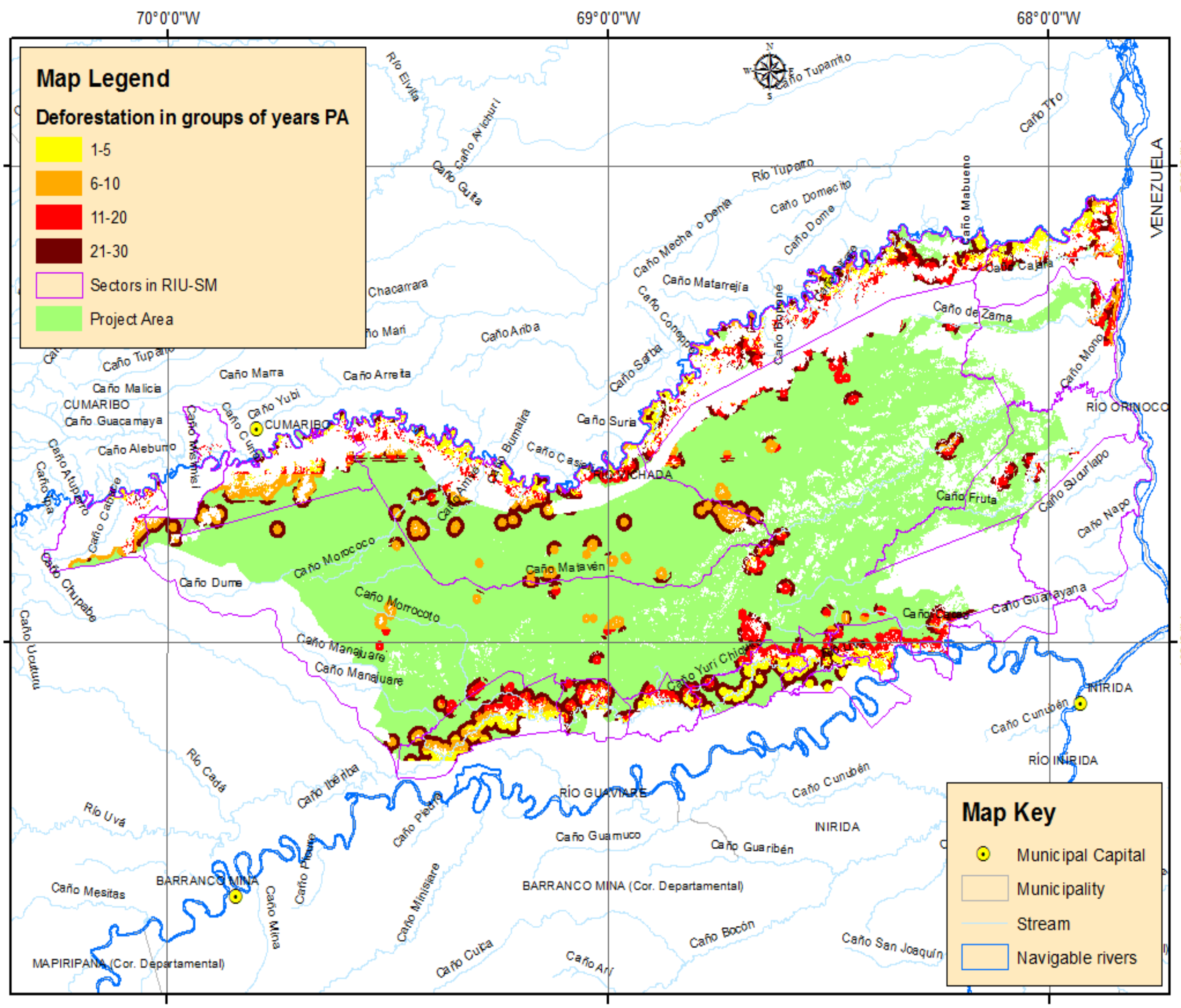
Another consequence of this road network is that it facilitates the interaction between regional markets and border markets of Venezuela and Brazil; many investors will explore the possibilities of installing crops with high export potential. It is expected that this increased flow of these markets also facilitate the entry of agents of deforestation in the neighboring countries of Venezuela and Brazil.

As a result, the areas near the road network will contribute significantly in meeting the demand of the population in the Mountain Plateau and surroundings, making it necessary to install new areas of crops and pastures to meet the growing demand for food, since it exceed the productive capacity of existing areas. So that the threat of deforestation will be greater over the area of the proposed project.

The scenario expected to 2042 shows deforestation by changing land use due to agriculture and animal husbandry practiced by agents of deforestation, mainly migrant settlers and will be given by the direct relationship with the increasing profitability of agriculture and livestock (Map 25 and Map 26).

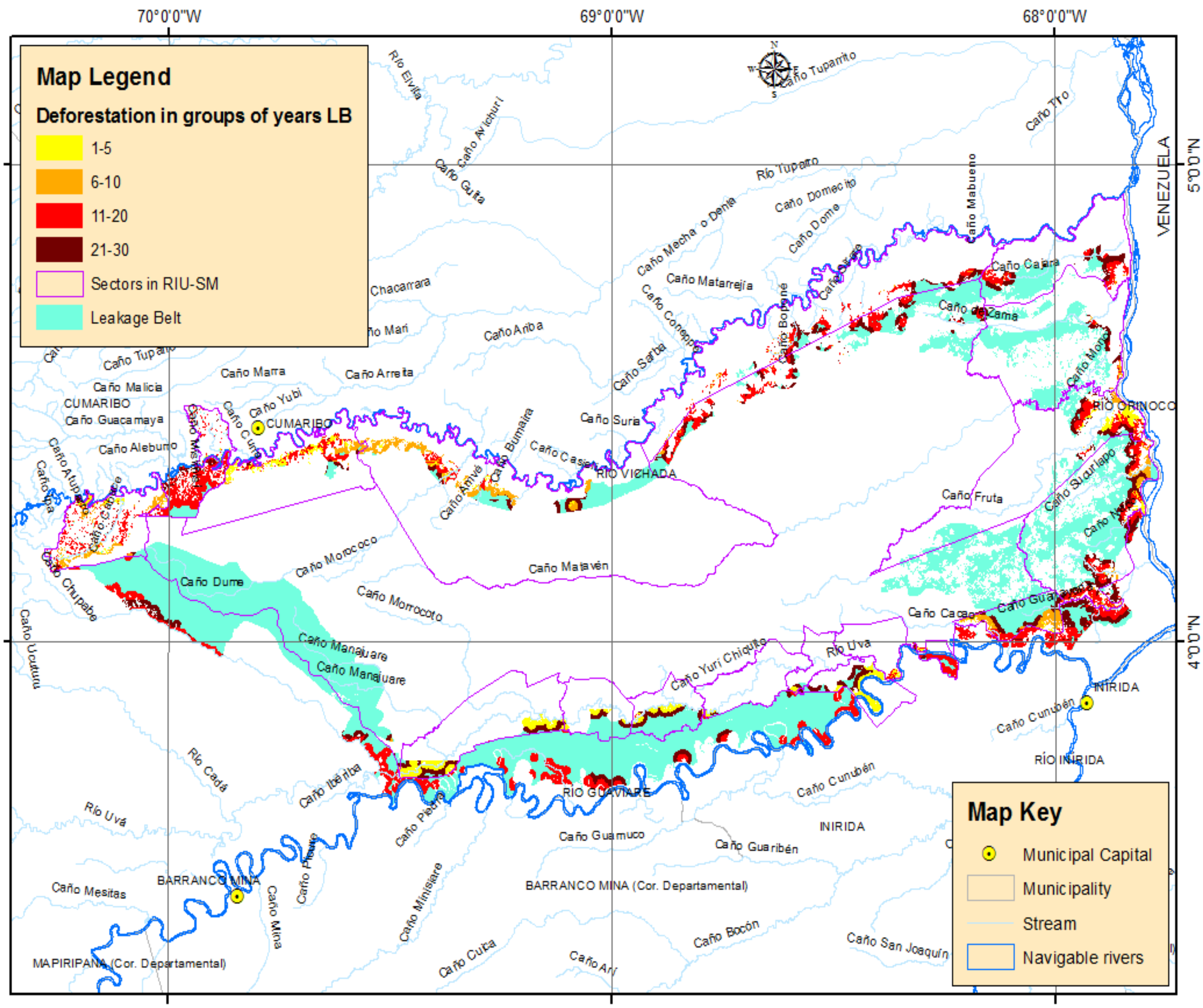
So that the outcome will be the deforestation of forest **298,410**has in the Project Area and **169,828**has in the leakage belt for the year 2042 it is the year in which the project proposes ending the crediting period. (Congreso de Colombia, 2015)

Map 25. Prediction map of scenario of Baseline of projected deforestation until year 2042 in PA



Source: REDD+ project RIU-SM; Date: GIS 2013; Scale: 1:1.250.000

Map 26. Prediction map of scenario of Baseline of projected deforestation until year 2042 in LB



Source: REDD+ project RIU-SM. Fieldwork and field methods; GIS; Date: 2013; Scale: 1:1.250.000

Complementary and complete justification of this baseline shown in Annex 10 (BL UP-VMD007).

The three scenarios are possible (realistic and credible) to the project area considering both historical conditions, as the uses of the land, practices and economic tendencies and laws and national and sectorial policies, such as project activities designed as the key issue described in section 1.10 and compliance with laws, statutes and other regulatory frameworks presented in section 1.11.

2.4.2.2 Sub-step 1b. Consistency of credible land use scenarios with enforced applicable laws and regulations.

The proposed alternative scenarios described above could occur under current historical circumstances.

The road development and the implementation of the National Development Plan 2014 – 2018 (Congreso de Colombia, 2015) have been carried out with the government consent and the alternative scenarios considering the consequences and risks involved in this fact. The land-use changes is a reality that is occurring in the country and the conversion from forest to non-forest areas has been occurring as a result of poor governance and deficient management of natural resources by the national, regional and local government. Although this does not happen by the lack of laws, they do not develop enough actions that contribute to the implementation of these laws (incentives, trainings, alternative projects, etc.). This weakness in governance is a reality at a national, regional and local level that governments are seeking to combat.

Scenario 1: Includes the deforestation for subsistence agriculture, ranching and logging that was occurring for many years. Information gathered and discussions with communities indicate that these activities were widespread in the project zone (RRD y RRL). Therefore, either these activities were considered legal or the laws were not being enforced. It is assumed that the activities would have been allowed to continue in the region, so this scenario remains plausible.

Scenario 2. Baseline Scenario. It is also a plausible scenario given that constitute the conditions of stage 1 on which and its plausibility was justified, and the legal and regulatory context of the National Development Plan (Law 1753 of 2015) (Congreso de Colombia, 2015) and ZIDRES Act (Act 223 of 2015) (Congreso de Colombia, 2015) described in Sub-step 1a.

Scenario 3. Includes all project activities without being registered as a VCS project. Section 1.11 was presented as all project activities are in accordance with all applicable laws and regulations.

2.4.2.3 Sub-step 1c Selection of the baseline scenario

The first proposed alternative scenario is likely, even more considering that the administration and management of regional governments and authorities responsible for safeguarding forest areas have not a history of success in this regard, within the Colombian rainforest, deforestation is increasing and deforested areas and illegal logging activities occurs rapidly in forest areas, without giving the indigenous peoples the opportunity to protect their forests, which are their source of investment and labor.

The second scenario is the most likely scenario, which has been occurring throughout the Colombian rainforest where the implementation of roads generates the immigration of people, some of them perform harvesting and burning forests for agricultural and livestock activities on a small scale. Governments do not employ their resources in meeting the requirements of environmental standards, given its limited budget, significant levels of corruption, operational inefficiencies, and scenarios evidenced through different documents (national magazines and newspapers).

The third scenario is also likely since the actions of local governments before the advancement of shifting agriculture has always been minimal. The government has no resources to implement activities or actions that train people in the proper management of forest resources or alternative land-uses to compensate for their basic needs in harmony with the sustainable use of natural resources. The indigenous peoples could join the safeguard, but surely and with the advance of deforestation, they will be looking for safeguarding their forest areas and refugee, that are essential for the daily subsistence of the community.

In addition, the analysis of investment in Section 2.5.1 In addition, shows that Scenario 3 is much less attractive financially than scenario 2.

According to the abovementioned, the alternative scenario 2 is the Baseline scenario; it is related to the regional history in terms of land-use change and continues with the actual legislation.

Thus, the STEP 1 “Identification of alternative land use scenarios to the project activity” of VT0001 to demonstration and assessment of additionality has been met

In the next section (2.5) the following three steps of VT0001 will be analyze, which allow, in STEP 2, demonstrate additionality. The STEP 3 "Barriers analysis" does not apply. In the STEP 4 "Common practice analysis" the demonstration and assessment of additionality will be completed.

2.5 Additionallity

The project applied the steps outlined in the VCS Tool, VT0001*,* “Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities” to demonstrate the additionality of the project. The baseline scenarios discussed are presented more fully in Section 2.4.

2.5.1 Step 2 Investment analysis (VT0001)

2.5.1.1 Sub-step 2a Determine appropriate analysis method

Simple Cost Analysis: as the Project proponents of this VCS AFOLU Project generate no financial or economic benefits other than VCS related income through the Project activity, a simple cost analysis is justified. This analysis focuses solely on revenues generated by the project that can be used for project activities.

2.5.1.2 Sub-step 2b – Option I. Apply simple cost analysis

The activities made over RIU-SM produce no revenue. The Project Area (PA) will be managed for conservation purposes, no for livestock or crop production. Costs associated with Project activities implemented, Project development and VCS Project validation are significant. Additionally, while the Project will incur in ongoing costs (related to management and implementation of Project activities including forest patrols, social programs, and payments for environmental services), it will not generate future financial benefits other than VCU related income. The Project Proponents do not obtain financial benefits by develop other activities different than conservation, and therefore the outcome of a simple cost comparison shows significant Project expenditure without financial return by VCS-related income, thus this REDD+ Project will not be viable in the absence of carbon compensation.

Cash Flow of the REDD+ Project RIU-SM

A cumulative cash flow is presented with the incomes with which the activities in 2013, 2014, 2015, 2016 and 2017 were executed, and with a projection of the availability of cash by sales of VCUs, where “cash flow in” exceeds “cash flow out”, establishing the breakeven point and from then it stays positive. This breakeven point can be achieved in the fifth year (2017).

A first conservative sale of 1,000,000 VCUs are set in 2017. The Project breakeven point is found in the fifth year and, likewise, with these revenues the invested economic resources accumulated since the project start can be recovered in this year, in particular, the respective payments for capital contribution of work done by the professionals of MEDIAMOS and the members of ACATISEMA will be made.

The Proponents shall ensure compliance of the proposed activities, as it has happened since of Project start (2013), assuming the respective costs of the year 2016 and 2017 (presented in Table 41 in the "Value per activity / No sales of VCUs" column), for which already the necessary resources are secured.

Steps taken to find the breakeven point

To find the breakeven point of the Project is the result of analysis of the cumulative costs incurred during the development of the different activities from the Project start, which is also represented as the investments made by the Project developer. After the approximate cost to develop each of the activities is set for both, the current year (2016) and for the following years, then a conservative estimate of VCUs sales in 2017 and subsequent years will be done, thus finding the breakeven point, which is when the sales revenue of VCUs fully covers the costs of the Project activities since 2013 (including capital contribution of work made by the Proponents).

1. Quantification of costs incurred from January 1st, 2013 until March 31st, 2016

Corresponding to all necessary activities for Project design, PDD development and implementation.

- ✓ **Conducting management meetings and Project socialization** at regional and national level, on the desirability of the implementation of REDD+ Project in the Resguardo Indígena Unificado – Selva de Matavén (RIU-SM).
- ✓ **Conducting training workshops** with the different RIU-SM representatives (Coordinating Committee members, councils, Captains, leaders, youth, women, pastors and members of the community in general) on issues of governance, climate change, REDD+ Projects, monitoring and control of deforestation, and self-sustainable food production.
- ✓ **Conducting zonal meetings** with leaders of indigenous communities in decision-making related to design and implementation of REDD + Project RIU-SM.
- ✓ **Conducting fieldwork on carbon stocks** (aboveground biomass and soil analysis in 131 plots) developed by members of indigenous communities who were trained by MEDIAMOS professionals; verification of geo-referencing points in the Reservation; implementation of socio-economic survey of the 250 indigenous communities in the Reservation.
- ✓ **Preparation and execution of the audit for the validation and verification of REDD+ Project SM RIU** with the respective work meetings, both in Cali and in the Reservation, and field work activities to verify the plots.

Cost valuation of activities REDD+ Project RIU-SM

Until VCUs sales are made, the costs of implementing the Project will be funded by the Proponents, applying two strategies that have enabled sustainability during these 3 years, through:

a) cash investments for the development of Project activities and

b) significant capital contribution of work done by professionals of MEDIAMOS in the processes of design, preparation and development of Project activities (carbon inventory, Geographic Information Systems-GIS, filing and systematize the socio-economic surveys, soil studies, etc.) and members of ACATISEMA (Captains, Councils, Indigenous Guard, Coordinating Committee) who contribute in their knowledge in Project Co-Direction, zonal Coordination, implementation of FAPUS and monitoring activities in the Indigenous Reserve. These capital contributions of work allow the cost of the operation to be manageable and do not generate high financial commitments.

Within the cash flow, values that represent contributions to finance some activities are included. These resources were provided by the "Ministerio de Ambiente y Desarrollo Sostenible" (MADS), "Fondo Acción", and "Fundación Natura" as part of the support to the REDD+ initiative to develop in the RIU-SM (Annex 1.9.4.2: Convention 310, 2015, between "Ministerio de Ambiente y Desarrollo Sostenible" (MADS) and ACATISEMA; Annex 1.9.3.5: Convention 843 between MEDIAMOS – "Fondo Acción"; Annex 1.10.2.4: Terms of Reference of Consulting "Review of Document PDD Project REDD+ RIU-SM design, conducted between 04/01/2015 and 07/30/2015 – "Fundación Natura" - IDB).

Origin of resources

As it can be seen in the following table, both ACATISEMA and MEDIAMOS have been strategic allies in the presentation and implementation of this project and are also the biggest contributors of it.

The capital contribution of work will be paid during the first two years after the Project has income from sales of VCUs and has reached breakeven point.

Table 40. Origin of resources (values in thousands of dollars)

	Resources in cash		**Capital contribution of work**		**Total contribution**	
	USD	**% contribution**	**USD**	**% contribution**	**USD**	**% contribution**
MEDIAMOS F&M S.A.S	318.3	55%	468.0	57%	786.3	56%
ACATISEMA	0	0%	358.5	43%	358.5	26%
Private investor	166.7	29%	0	0%	166.7	12%
Ministerio de Ambiente	70.8	12%	0	0%	70.8	5%
Fondo Acción	12.0	2%	0	0%	12.0	1%
Fundación Natura	6.7	1%	0	0%	6.7	0.5%
Total cash resources	**574.4**	**100%**	**826.4**	**100%**	**1,400.9**	**100%**

Source: REDD+ project RIU-SM

2. Estimation of costs to develop activities in 2016 and following years

Below is a table of the costs associated with the implementation of the Project activities. in which there are differences against the value of some activities between the columns "Value per activity / No sales of VCUs" and "Value per activity / With sales of VCUs" because:

- ✓ Capital contribution of unpaid work if no sales; if sales are presented, in activities the value of this working capital is included.
- ✓ In the Activity A1.3 is contemplated a contribution to the financing of zonal meetings and the General Assembly ACATISEMA (which is held every 3 years), only in the case of sales revenues.
- ✓ In the Activity A2.3 design tasks and training have been completed, but its implementation requires a significant investment (due to the size of the territory and number of communities in RIU-SM) that can only be done with sales resources of VCUs.
- ✓ The Activities A2.1 and A2.2 have been implemented since the Project start; with the resources of sales of VCUs a strengthening of investment is planned to potentiate their results.

Table 41. Cost estimation for products and activities (with sales of VCUs and without sales VCUs) (in thousands of dollars) for 2016 and consequent years

		Value per activity / No sales of VCUs	Value per activity / With sales of VCUs	Performing activity
Prod. 1	**Measures to reduce the vulnerability of the RIU-SM generated by external factors, designed and implemented**			
A1.1	To monitor and to control the conservation and recovery of forests and lands of the RIU-SM.	44.8	46.7	They do not depend on VCUs sales
A1.2	To develop and to implement a communication and information system at the RIU-SM.	1.9	1.9	
A1.3	To design and to establish a system of governance for development and sustainability of ACATISEMA Association.	6.0	43.7	A contribution to the financing of zonal meetings and the General Assembly will be made in the case of sales of VCUs
Prod. 2	**Implemented auto-sustainable production system.**			
A2.1	To establish and to develop a Family Agrifood Production Units System - FAPUS.	9.8	85.0	An increase in the funding of these activities will be made with the revenues from the sales of VCUs
A2.2	To design and to develop a training and education program plan for the administration and management of natural resources RIU-SM.	6.9	58.2	
A2.3	To manage resources for project design and establishment of production chains.	4.3	137.6	
Prod. 3	**A mechanism for valuation and compensation for environmental services generated in the RIU-SM, validated and verified.**			
A3.1	To validate a REDD+ Project with international standards.	30.8	31.7	They do not depend on VCUs sales
A3.2	To verify the project and to record the units of forest compensation for avoided deforestation.	15.8	16.3	
	TOTAL	**120.3**	**421.2**	

- *According to the calculation of the costs of the Project activities without selling of VCUs in 2016, the Proponents would have to incur costs of USD 120,340, but the Activity A3.1 is already paid by USD 30,820.*
- *Validation costs are covered only once during the Project and the verification will be conducted every two years.*
- *While submitting the PDD some other activities in different proportions were also funded, leaving in 2016 approximately USD 65,000 to be covered.*

According to VCUs sales revenues budgetary additions will be made to increase investment for the implementation of Project activities, achieving greater net positive impact on the communities represented in the development and welfare within them.

Cost of Registration of VCUs

According to the document "VCS Program Fee Schedule" values that are taken into account within the respective sales costs are set to perform. These are:

- USD 0.10 per VCU for the first million registered VCUs
- USD 0.09 per VCU for an additional 1 million registered VCUs
- USD 0.08 per VCU for the 2 million registered subsequent to VCUs
- USD 0.06 per VCU issued after 4 million registered VCUs

These costs will be caused once validation and verification have been obtained.

3. Projections and sales of VCUs certified

It is consistent with the AFOLU Non-Permanence Risk Tool VCS Version 3, Procedural Document, 4 October 2012, v3.2, Internal Risks in 2.2, 2.2.2 Financial viability (FV) says "*Cash flow in may include commercial revenue streams associated with the project, secured revenue* ***and conservatively projected revenues from the sale of GHG credits****, page 6*", a conservative estimate of 2,600,000 VCUs is made to certify the Project every year, starting from 2013, which is considered to remain constant, at least, during the project cycle, although the trend is to increase it with protectionist measures and conservation. This approach applies to both cash flow scenarios listed above.

A price is also managed with a conservative approach of USD2.5 by VCU, considering that in the carbon market selling price has fluctuated between USD4.5 and USD8.5 in the period November 2015 to May 2016, excluding peaks of more than USD25 in 2006 and 2008.

Behavior of the value of carbon credits (November 2015 to May 2016)

Source: http://www.investing.com/commodities/carbon-emissions; Currency in EUR.

Behavior of the value of carbon credits (January 2006 to January 2016)

Source: http://www.investing.com/commodities/carbon-emissions; Currency in EUR.

Years of VCUs sales

An analysis is considered projecting that the first VCUs sales can be made in 2017.

The sales projection in cash flow is represented for Project cycle, where bi-annual certifications will be held in 2016, 2018, 2020, 2022, 2024, etc.

The following table show sales projections of VCUs per year, according to the bi-annual certifications (certification of 2.6 million of VCUs / year)

These sales will strengthen the financing of various project activities, increasing its impact and technical improvement in the performance of each and every one of them.

Table 42. Values of projected sales

PROJECTIONS OF SALES OF VCUs / YEAR

					BP										
Years of the Project cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
PROJECTIONS OF SALES OF VCUs / YEAR															
Certification periods															
2013-2014-2015					1,000	2,000	2,400								
2016-2017						1,000	2,100	2,100							
2018-2019								1,000	2,100	2,100					
2020-2021										1,000	2,100	2,100			
2022-2023												1,000	2,100	2,100	
2024-2025														1,000	2,100
2026-2027															
2028-2029															
2030-2031															
2032-2033															
2034-2035															
2036-2037															
2038-2039															
Total sales of VCUs / year					**1,000**	**3,000**	**4,500**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**
Values projected sales / year (thousand USD)					**2,500**	**7,500**	**11,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**

BP: Breakeven point

Source: REDD+ project RIU-SM

Table 42. Values of projected sales *(continuation)*

PROJECTIONS OF SALES OF VCUs / YEAR

Years of the Project cycle	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
PROJECTIONS OF SALES OF VCUs / YEAR															
Certification periods															
2013-2014-2015															
2016-2017															
2018-2019															
2020-2021															
2022-2023															
2024-2025	2,100														
2026-2027	1,000	2,100	2,100												
2028-2029			1,000	2,100	2,100										
2030-2031					1,000	2,100	2,100								
2032-2033							1,000	2,100	2,100						
2034-2035									1,000	2,100	2,100				
2036-2037											1,000	2,100	2,100		
2038-2039													1,000	2,100	2,100
Total sales of VCUs / year	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**3,100**	**2,100**	**2,100**
Values projected sales / year (thousand USD)	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**5,250**

Source: REDD+ Project RIU-SM

Ability to fund the cost of the activities, to ensure that the Project will reach the breakeven point

The Project Proponents have the financial capacity and strategic partners for the performance of the activities until certification and VCUs sales, even until 2017, with which deforestation is avoided in the Project Area; it is important to take into account that the project necessarily depends on VCUs sales to make it sustainable.

To finance the Project during the years 2016 and 2017, a private investor was brought in through a Participation Account Agreement worth COP1,200,000,000 (USD 400,000) (Annex 3.17: Participation Account Agreement).

At present MEDIAMOS, according to its purpose as an entity that provides educational and environmental services, develop contracts with COOMEVA (Annex 3.4: Institutional Adequacy Annex 3.4a: Certificate of contracts made with COOMEVA between 2013 to 2015 ; Annex 3.4b: Certificate of current contracts with COOMEVA in 2016); it also has an experience in contracting with various environmental and educational institutions nationwide (Annex 3.4: Institutional Adequacy; Annex 3.4c: service delivery contract in the formulation and implementation of a plan of establishment and forest management (PEMF) in the basin of Mulalo River, mine La Calera, Municipality of Yumbo, Valle del Cauca. H & M Agroforestal SAS -. MEDIAMOS F&M SAS).

MEDIAMOS and its partners shareholders are linked with various financial institutions and with management possibilities of various products such as credit card and revolving credits for free investment that enable rapid availability of financial resources to develop the activities of REDD+ Project RIU-SM when required.

The strategic partners have been supporting important processes of forest governance (Activity A1.3), as well as support in covering some administrative costs of the project, such as Fundación Natura (Annex 1.10.2.4: Terms of Reference of Consulting "Review of Document PDD Project REDD+ RIU-SM design, conducted between 04/01/2015 and 07/30/2015 – in alliance with IDB), Fondo Acción (Annex 1.9.3.5: Convention 843), Ministerio de Ambiente y Desarrollo Sostenible (Annex 1.9.4.2: Convention 310, 2015, between “Ministerio de Ambiente y Desarrollo Sostenible” (MADS) and ACATISEMA), and private investors.

The Project proponents have secured USD134,000 for the development of activities in 2016 and 2017, this ratio of funds versus the needs gives a percentage of approximately 55.8% taking into account that the respective payments have already been made due to the process of audit.

With costs and revenues from the sale of VCUs, cash flow of REDD+ Project RIU-SM is performed, as it is shown below.

Cash flow

A projected cash flow is presented, taking into account its condition.

The cash flow consists of four main items:

1. Projected revenues by sales of VCUs / year (step 3 to find the breakeven point)

2. Incomes for execution of Project Activities

3. Executed and projected expenditures / year (steps 1 and 2 to find the breakeven point)

4. Net and cumulative balances / year

In the item "2. Incomes for execution of Project Activities" are considered incomes by investments for develop the Project Activities before the breakeven point is reached.

In the item "3. Executed and projected expenditures / year" are considered costs by "Registering VCUs ".

In any case the projected costs were estimated in increments determined by the Consumer Price Index (CPI).

In the item "4. Net and cumulative balances / year", a "Net Balance" is presented, which refers to the difference between the "Projected revenues by sales VCUs / year" and "Executed and projected expenses / year" (activities, capital contribution of work, VCUs registration payment).

The table contents an " Cumulative Balance" that identifies the year in which the breakeven point of the Project is reached (values change from negatives to positives).

Table 43. Projected Cash flow of REDD+ Project RIU-SM (since year 1 until year 15)

BREAKEVEN POINT IN 2017 (VALUES IN THOUSANDS OF USD)

Years of the project cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sales of VCUs	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1. PROJECTED INCOMES BY SALES OF VCUs / YEAR															
Periods of certification	Sales values of VCUs														
2013-2014-2015					2,500	5,000	6,000	6,000							
2016-2017						2,500	5,250	5,250							
2018-2019								2,500	5,250	5,250					
2020-2021										2,500	5,250	5,250			
2022-2023												2,500	5,250	5,250	
2024-2025														2,500	5,250
2026-2027															
2028-2029															
2030-2031															
2032-2033															
2034-2035															
2036-2037															
2038-2039															
Total sales values (USD) / year	**0**	**0**	**0**	**0**	**2,500**	**7,500**	**11,250**	**13,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**
2. INCOMES FOR EXECUTION OF PROJECT ACTIVITIES															
Investments before breakeven point	**236,2**	**124,0**	**143,4**	**120,3**											
3. EXECUTED AND PROJECTED EXPENDITURES / YEAR															
Cost of activities															
Activity A1.1	127.6	45.9	37.3	44.8	46.7	46.7	46.7	46.7	46.7	46.8	46.8	46.8	46.8	46.8	46.9
Activity A1.2		19.8	21.5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Activity A1.3	35.0	31.0	0.0	6.0	43.7	43.7	43.8	43.8	43.8	43.8	43.8	43.8	43.9	43.9	43.9
Activity A2.1		27.3	25.8	9.8	85.0	85.1	85.1	85.1	85.2	85.2	85.3	85.3	85.3	85.4	85.4
Activity A2.2	73.6			6.9	58.2	58.2	58.3	58.3	58.3	58.3	58.4	58.4	58.4	58.4	58.5
Activity A2.3				4.3	137.6	137.7	137.7	137.8	137.9	137.9	138.0	138.0	138.1	138.1	138.2
Activity A3.1			45.9	30.8											
Activity A3.2			12.9	15.8	16.3	16.3	16.3	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Subtotal of cost of activities	**236.23**	**124.03**	**143.39**	**120.3**	**433.2**	**433.4**	**433.6**	**433.7**	**433.9**	**434.1**	**434.3**	**434.4**	**434.6**	**434.8**	**435.0**
Other contributions and registration of VCUs															
Institutional contributions			89.5												
Registration of VCUs					100.0	960.0		422.0		422.0		422.0		422.0	
Subtotal			**89.5**		**100.0**	**960.0**		**422.0**		**422.0**		**422.0**		**422.0**	
Capital contribution of work															
MEDIAMOS professionals	169.9	144.5	123.9	29.7											
ACATISEMA Assistance	105.7	99.3	110.9	42.5											
Subtotal capital of work	**275.5**	**243.8**	**234.8**	**72.3**											
Total expenses (USD) / year	**511.7**	**367.9**	**467.7**	**192.6**	**533.2**	**1,393.4**	**433.6**	**855.7**	**433.9**	**856.1**	**434.3**	**856.4**	**434.6**	**856.8**	**435.0**
4. NET AND CUMULATIVE BALANCES / YEAR															
Net balance	-511.7	-367.9	-467.7	-192.6	1,966.8	6,106.6	10,816.4	12,894.3	4,816.1	6,893.9	4,815.7	6,893.6	4,815.4	6,893.2	4,815.0
Cumulative balance	**-511.7**	**-879.6**	**-1,347.3**	**-1,539.9**	**426.9**	**6,533.5**	**17,349.9**	**30,244.2**	**35,060.3**	**41,954.2**	**46,769.9**	**53,663.5**	**58,478.8**	**65,372.1**	**70,187.1**

Table 44. Projected Cash flow of REDD+ Project RIU-SM (since year 16 until year 30)

SCENARIO 2: BREAKEVEN POINT IN 2017 (VALUES IN THOUSANDS OF USD)

Years of the project cycle	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Sales of VCUs	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
1. PROJECTED INCOMES BY SALES OF VCUs / YEAR															
Periods of certification	Sales values of VCUs														
2013-2014-2015															
2016-2017															
2018-2019															
2020-2021															
2022-2023															
2024-2025	5,250														
2026-2027	2,500	5,250	5,250												
2028-2029			2,500	5,250	5,250										
2030-2031					2,500	5,250	5,250								
2032-2033							2,500	5,250	5,250						
2034-2035									2,500	5,250	5,250				
2036-2037											2,500	5,250	5,250		
2038-2039													2,500	5,250	5,250
Total sales values (USD) / year	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**7,750**	**5,250**	**5,250**
2. EXECUTED AND PROJECTED EXPENDITURES / YEAR															
Cost of activities															
Activity A1.1	46.9	46.9	46.9	46.9	46.9	47.0	47.0	47.0	47.0	47.0	47.1	47.1	47.1	47.1	47.1
Activity A1.2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Activity A1.3	43.9	43.9	43.9	44.0	44.0	44.0	44.0	44.0	44.1	44.1	44.1	44.1	44.1	44.1	44.2
Activity A2.1	85.4	85.5	85.5	85.5	85.6	85.6	85.6	85.7	85.7	85.7	85.8	85.8	85.8	85.9	85.9
Activity A2.2	58.5	58.5	58.5	58.5	58.6	58.6	58.6	58.6	58.7	58.7	58.7	58.7	58.8	58.8	58.8
Activity A2.3	138.2	138.3	138.3	138.4	138.5	138.5	138.6	138.6	138.7	138.7	138.8	138.8	138.9	139.0	139.0
Activity A3.1															
Activity A3.2	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Subtotal of cost of activities	**435.1**	**435.3**	**435.5**	**435.7**	**435.8**	**436.0**	**436.2**	**436.4**	**436.5**	**436.7**	**436.9**	**437.1**	**437.2**	**437.4**	**437.6**
Other contributions and registration of VCUs															
Institutional contributions															
Registration of VCUs	422.0		422.0		422.0		422.0		422.0		422.0		422.0		
Subtotal	**422.0**		**422.0**		**422.0**		**422.0**		**422.0**		**422.0**	**0.0**	**422.0**		
Capital contribution of work															
MEDIAMOS professionals															
ACATISEMA Assistance															
Subtotal capital of work															
Total expenses (USD) / year	**857.1**	**435.3**	**857.5**	**435.7**	**857.8**	**436.0**	**858.2**	**436.4**	**858.5**	**436.7**	**858.9**	**437.1**	**859.2**	**437.4**	**437.6**
3. NET AND CUMULATIVE BALANCES / YEAR															
Net balance	6,892.9	4,814.7	6,892.5	4,814.3	6,892.2	4,814.0	6,891.8	4,813.6	6,891.5	4,813.3	6,891.1	4,812.9	6,890.8	4,812.6	4,812.4
Cumulative balance	**77,080.0**	**81,894.7**	**88,787.2**	**93,601.5**	**100,493.7**	**105,307.7**	**112,199.5**	**117,013.1**	**123,904.6**	**128,717.9**	**135,609.0**	**140,422.0**	**147,312.7**	**152,125.3**	**156,937.8**

Source: REDD+ Project RIU-SM

Distribution of incomes by sales of VCUs

The flow of investment and project resources is based on the "Strategic Alliance Agreement for the Protection, Conservation and Recovery of Natural Forest of Unified Indigenous Reservation - Forest Mataven" presented in Annex 2.1.11, in which they left established as a code for good governance, criteria, principles, objectives, scope, stages, ethnic safeguards and environmental obligations of each party to the Project Proponents, management, administration and functions; also and particularly the financial contribution of the project in terms of the participation of the parties to the costs and expenses of design, development, validation, verification, registration, marketing and project implementation and the distribution of reserves and profits. Similarly, let the procedure established for VCUs marketing.

Table 45. Distribution of income for the project implementation and utilities and reservations

		YEARS OF IMPLEMENTATION OF THE PROJECT											
		1 to 5		6 to 10		11 to 15		16 to 20		21 to 25		26 to 30	
		% For implementation of activities	% for bookings and utilities	for implementation of activities	% for bookings and utilities	% for implementation of activities	% for bookings and utilities	% for implementation of activities	% for bookings and utilities	% for implementation of activities	% for bookings and utilities	% for implementation of activities	% for bookings and utilities
(1)	% of total revenue	80%	20%	75%	25%	70%	30%	70%	30%	70%	30%	70%	30%
(2)	ACATISEMA	40%	10%	50%	12.5%	60%	20%	65%	20%	70%	22.5%	70%	22.5%
(3)	MEDIAMOS	40%	10%	25%	12.5%	10%	10%	5%	10%	0%	7.5%	0%	7.5%

Source: Annex 2.1.11 Strategic Alliance Agreement for the Protection, Conservation and Recovery of Natural Forest of the Unified Indigenous Reservation of the Mataven Jungle between ACATISEMA y MEDIAMOS F&M S.A.S (ACATISEMA, MEDIAMOS, 2013), page 6.

2.5.2 Step 4 Common practice analysis (VT0001)

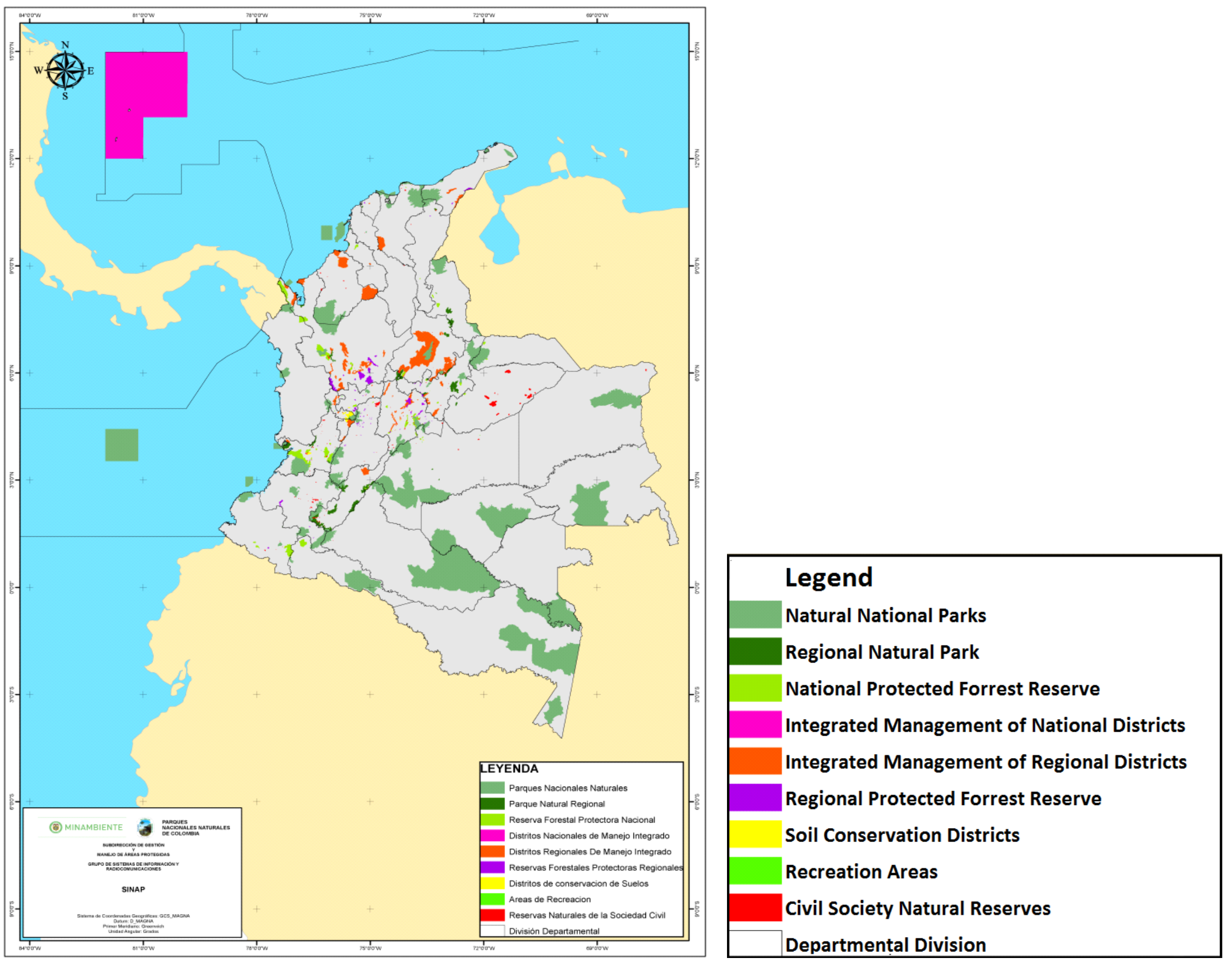
The definition and existence of protected areas in Colombia can be seen as a common practice. The country has set up the National System of Protected Areas (SINAP) that unifies protected areas, social actors and strategies and management tools that together contribute as a whole to fulfill the conservation objectives of the country. It includes all protected areas of public, private or community governance, and the scope of national, regional or local management. The national purpose of SINAP is to conserve the biosphere and it can be reached through various strategies that contribute to their achievement. The actions that can guarantee to accomplish these specific objectives constitute a national priority and a joint task that must be met from their own areas of competence or action, for the State and particular. A decisive factor in shaping them are the various management categories of protected areas that integrate the SINAP.

According to the Single National Register of Protected Areas (RUNAP) there are 723 units of protected areas with an area of 23,618,408 hectares, from which 116 units (16%) have 60.4% of the total area corresponding to National Protected Areas, 218 units (30.2%) have 9.2% of the total area corresponding to Regional Protected Areas and 389 units (53.8%) have only 0.3% of the total area corresponding to

Private Protected Areas; distribution that can be seen on the map 27 (Source: National Register of Protected Areas - RUNAP, December 10, 2015). In Vichada, Cumaribo, there is just one unit, the "Tuparro National Natural Park" (Resolution 264 September 1980)[54].

In the municipality of Cumaribo, in addition to the National Park, there is also another strategic ecosystem that is the Mataven Forest that includes the area of the Unified Indigenous Reservation, which does not belong to SINAP; these two ecosystems are the only area that exists in the municipality known as "Soil of Protection". For their genetic, biological and cultural wealth they are part of the strategic ecosystems of national importance.

Map 27. National Protected Areas



Source: National Register of Protected Areas - RUNAP

54 https://www.parquesnacionales.gov.co/PNN/portel/libreria/php/decide.php?patron=01.04

Independently of the purposes of the owners of protected areas, SINAP areas remain under pressure from deforestation, as shown by different studies (SINCHI and Environmental Ministry: “Monitoring of forests and other coverage of the Colombian Amazon, to scale 1:100000. Data of period 2012 "; IDEAM: Estimate of carbon dioxide emissions generated by deforestation over 2005 – 2010 period).

In this sense, there have been efforts for the conservation of these forests, both public funding in some State lands as private funds including local areas, but these resources are not enough. Moreover, in the region there are no projects financed with the objective of stopping deforestation. In the Orinoco region of the 13 projects of the 2012-2015 Corporinoquia Action Plan, only 3 have to do with environmental sustainability but none has as its specific purpose stopping deforestation[55].

The same applies to the Development Plan of the Municipality of Cumaribo for the 2012 – 2015 term (Agreement No. 006 of May 31, 2012) which only has a program called Challenge II: "Environmental Sustainability and Risk Management”, whose outcome goals, none correspond to stopping deforestation. In this Development Plan are considered other projects such as the development of agricultural and livestock sectors but also, they are not goals for deforestation carefully specified. Similar situation to the Development Plan for the municipality of Cumaribo occurs with the Strategic Plan of the Department of Vichada 2012 - 2022 (Source: Research Group, Institute of Biotechnology, National University of Colombia Strategic Plan for Science, Technology and Innovation 2012-2022 Vichada Governor, Administrative Department of Science, Technology and Innovation October 2012).

Moreover, there is a national work on the establishment of a National REDD + Strategy and has a REDD Desk, but these mechanisms that aim to develop in a future REDD Projects with specific targets to avoid deforestation, are still in initial stages. Check below:

The Colombian government, as part of preparatory work for REDD + (including participation in a future system of financial incentives), develops the proposal by defining it as a "roadmap" which states what activities can be done, how they can be performed and what financial resources will be needed. The preparation phase is estimated to last still two or three years.

In relation to the expected time for implementation it has been estimated to require 4 years[56].

The Colombian REDD Desk is a space created by a group of NGOs working in Colombia, which are interested in the development of strategies, policies, plans and REDD projects in the country, in accordance with the rights of indigenous, afro-Colombians and local communities, equity generation and distribution of benefits and sustainable forest management. One of the purposes of this REDD Desk is to promote the development of experiences and pilot projects to reduce emissions from deforestation and degradation.

Despite these efforts, in Colombia, currently there are just two projects and both in the Colombian Pacific Region:

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[55] http://l.corporinoquia.gov.co/index.php/inicio/planeacion-estrategica/59-proyectos/1214-programa-y-proyectos-del-plan-de-accion-2012-2015

[56] https://www.minambiente.gov.co/index.php/component/content/article?id=439:plantilla-bosques-biodiversidad-y-servicios-ecosistematicos-32

Project Name	Project Proponent
The Choco-Darien Conservation Corridor REDD Project	Anthrotect S.A.S.
Bajo Calima y Bahia Malaga (BC-BM) REDD+ Project	Consejo Comunitario de Bajo Calima, Consejo Comunitario de La Plata-Bahía Málaga

*Source: http://www.vcsprojectdatabase.org/#/projects/st_/c_CO/ss_14/so_/di_/np_*

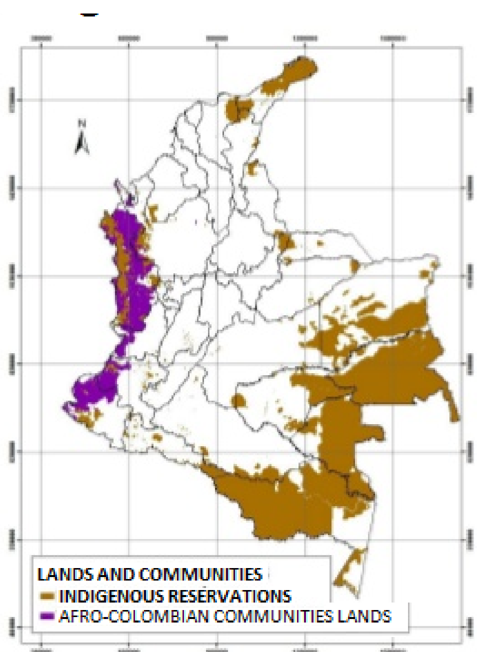
In this region, although USAID has financed productive activities and employment, there is no similar activities to the two mentioned projects.

There are other projects BioREDD + in process design and implementation (http://bioredd.org/). BIOREDD + has its scope in the Colombian Pacific which focuses its efforts.

Also the Agriculture Ministry of Colombia and INCODER have implemented programs to subsidize sustainable products such as cocoa and fishing, but these programs do not contain policies that encourage the reduction of deforestation. Currently the Ministry of Agriculture develops the "Siembra Colombia" Program, but also the investment of 1.6 billion pesos that aims to expand the cultivated area throughout the country has no goals in terms of stopping deforestation.

About the regions of the Orinoco and the Colombian Amazon, it should be noted that they are composed by a large majority of titled lands in the indigenous reservations as shown in the following illustration:

Illustration 36. Indigenous Reservations and Collective Territories



Mapa de Resguardos Indígenas y Comunidades Negras		
Description	Area (ha)	% National Area
Indigenous Reservations	30.554.254	27%
Afro Communities	5.182.489	5%
Total	35.736.743	31%

- Almost 70% of indigenous reservations and 71% of the afro- Colombian communities collective titles are in forest reserve area.
- In the Pacific Forest Reserve there is an agreement between the lands of ethnic groups, which has generated a new source of conflict

Source: INCODER, Indigenous Reservations legally constituted, 2010 and DANE, population projections in Indigenous Reservations in June 30th, 2010

Vichada department has 32 reservations with an estimated of 30,063 people (Source: INCODER, Indigenous Reservations legally constituted, 2010 and DANE, population projections in Indigenous Reservations in June 30th, 2010).

A common practice in these regions is reforesting to dedicate the land to heterogeneous agricultural crops, meadows and pastures. In the study of the historical reference period for REDD+ RIU Project - SM (2001-2011) shows the change in land use of forests: (138,565 hectares) 15.4% changed to heterogeneous agricultural crops, 43.1% to pastures and 48.8% became regenerating vegetation (stubble). Deforestation is then made to convert the land use from natural forests mainly in heterogeneous agricultural crops and pasture (livestock) and to expand the possession of the land (pastures).

Indigenous Reservations do not have the financial capacity to implement REDD+ projects, so due to lack of government and community resources there are no similar projects or initiatives to reduce deforestation and forest degradation in the Orinoco region.

For these reasons, efforts to reduce deforestation and degradation of forests RIU-SM through support to monitoring and control, local governance, planning and implementation of land use, value-added products, access to markets and local training, is not a common practice in the region. In particular, the Management Model resulting from the Agreement of the Strategic Partnership between the Association of Councils and Indigenous Authorities Traditional Jungle Mataven (ACATISEMA) and a small Colombian private company (MEDIAMOS) to develop the project in accordance with international standards VCS is currently unique in the country and the region.

In synthesis, there are some state actions in forest conservation through SINAP and projects, primarily designed to boost agricultural and livestock activity, but not enough resources are dedicated to stop deforestation. There is the National REDD+ Policy but it is in early stages but without definitions still on the financing of specific projects and there are only two REDD+ certified projects in Colombia, both in the Pacific Region.

Therefore, the REDD+ project RIU-SM is not a common practice in the region, which based on a strategic alliance ACATISEMA - MEDIAMOS seeks to stop deforestation in the Reservation and to achieve payments for environmental services, with which the project activities take place while allowing a better welfare of communities, conserving and protecting the forest and its biodiversity.

In summary:

- The REDD+ RIU SM Project is not the only credible alternative land use
- The REDD+ RIU-SM Project is not a financially viable land use without the AFOLU VCS Project revenues.
- The REDD+ RIU-SM Project activities are NOT common practice.

The Project activity, without revenue from carbon credits, is unlikely to occur and is not a common practice in the region. The Project is therefore additional

2.6 Methodology deviations

There are no methodology deviations in the application of the approved VCS REDD Methodology Modules.

3 ESTIMATED OF GHG EMISSION REDUCTIONS AND REMOVALS

To carry out the process and quantification of Baseline Emissions, indications set forth in modules BL-UP (Annex 10), X-STR (Annex 15), CP-AB (Annex 13), were followed. Baseline emissions were determined considering the deforestation rate calculated for RRD and the deforestation model that located the deforestation every year. Following is a summary of the main processes and equations; details are presented on each module developed for the project.

3.1 Baseline Emissions

3.1.1 Stratification

Stratification for carbon stocks consist in grouping forest areas in homogeneous groups in terms of carbon stocks, using stratification factors (such as type of forest/vegetation, type of soil/geology, management) that could affect carbon stocks, so that less sample parcels would be required to reach certain level of precision.

Stratification applied to all areas of space limits are based on official information of IGAC (Instituto Geográfico Agustín Codazzi), IDEAM (Instituto de Hidrología, Meteorología y Estudios Ambientales) attached to Ministerio de Ambiente y Desarrollo Sostenible (MADS), official institutions authorized to provide official information on this subject.

A biome is defined as a set of ecosystems characterized by species and a variety of plants with characteristic conditions of climate and land. They are usually defined by the structure of the vegetation and climate. The biome is also defined by geographic components (latitude and altitude) and local names are used for designation, for example: Valle del Cauca Biome.

Stratification is defined in 4 types of biomes.

The map of biomes in Colombia was prepared from synthesis units established by superposition of three key thematic layers: land cover, climate and geopedologi (INVEMAR, et al., 2007).

In RIU-SM these biomes (strata) are:

Table 46. Biomes (strata) of RIU-SM

Biome		Description	Landscape characteristics
1	Helobiome	Floodplain forest without understory	Flood prone forest in the low plane of the Caño Mataven
2	Litobiome	Foodplain forest with understory	Flood prone forest in the high plane of Caño Mataven
3	Peinobiome	Rocky hill forest	Rocky hill forest of residual granite in the Guayanes Shield
4	Zonobiome	Forest land	Plateau forest of moderately dissected ancient sedimentary plains

Source: Annex 15 X-STR – Module VMD0016, Methods for stratification of the project area

The savannas on sandy plains (white sand) slightly dissected are not characterized as stratum in RIU-SM, for the purposes of the Project.

Stratification of above ground biomass in REDD project activities

Pre-stratification (prior to inventory) of the project area is not required, however, prestratification may serve to avoid requirements for post measurement stratification later (below). It is not expected that the project proponent will begin with high resolution, spatially explicit, biomass measurement information for the project area and leakage belt. Thus, it is acceptable practice to base strata on ancillary data that can serve as a proxy for potential biomass classes (eg, vegetation class maps, interpretation of aerial photographs or high resolution satellite imagery; see module *BL-UP*). The areas of strata delineated prior to allocation of inventory plots using stratified sampling are known exactly and require no accuracy assessment.

Stratification of above-ground biomass using remote sensing

When using remote sensing, data must be georeferenced into a common geodetic system, for example using the UTM system using best-practice methods in remote sensing ~~(~~*Biomes Map 2007 made by IGAC in year 2007* (CGIAR CSI, s.f.)[57]. Semi-automated image classification approaches may be applied. Strata must be validated by reference data collected in the field, other oficial documentation or from recent independent higher resolution remote sensing imagery.

Table 47. Biomes in the Project Area (PA), Leakage Belt (LB), Reference Region (RRD) and Reference region for projecting location of deforestation (RRL 2011)

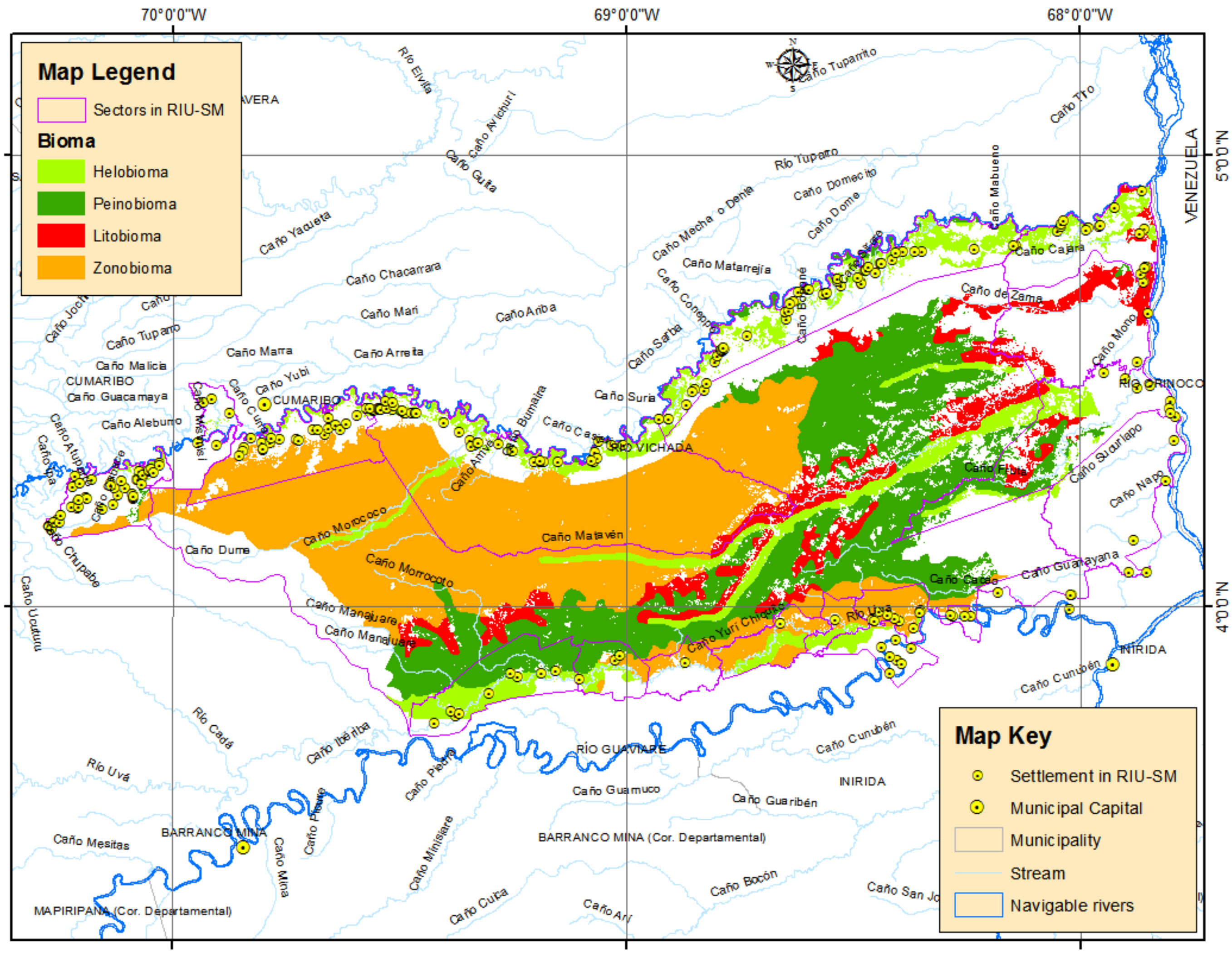
Stratum (biomes)	Areas and percentage of coverage									
	PA		LB		RRD		RRL forests		RRL	
	$A_{BSL,i}$ or A_i Area (ha)	%	$A_{BSL,i}$ or A_i Area (ha)	%	$A_{BSL,i}$ or A_i Area (ha)	%	Area (ha)	%	$A_{BSL,i}$ or A_i Area (ha)	%
Helobiome	174,516	15.2	105,905	21.8	230,435	15.9	280,422	17.1	391,909	19.3
Peinobiome	326,058	28.3	112,079	23.1	333,195	23.1	438,138	26.8	579,288	28.6
Litobiome	116,099	10.1	73,625	15.1	158,752	11.0	189,724	11.6	293,615	14.5
Zonobiome	533,538	46.4	194,602	40.0	722,424	50.0	728,140	44.5	763,627	37.6
Total	**1,150,212**	**100**	**486,211**	**100**	**1,444,805**	**100**	**1,636,423**	**100**	**2,028,439**	**100**

Source: Annex 15. X-STR – Module VMD0016, Methods for stratification of the project area, in its appendix characterization biomes, landscapes and soil types it is presented in the reference region. (CGIAR CSI, s.f.)

The following maps show the spatial distributions of strata (biomes) in the Project Area (PA), Leak Belt (LB) and Reference Region (RRD).

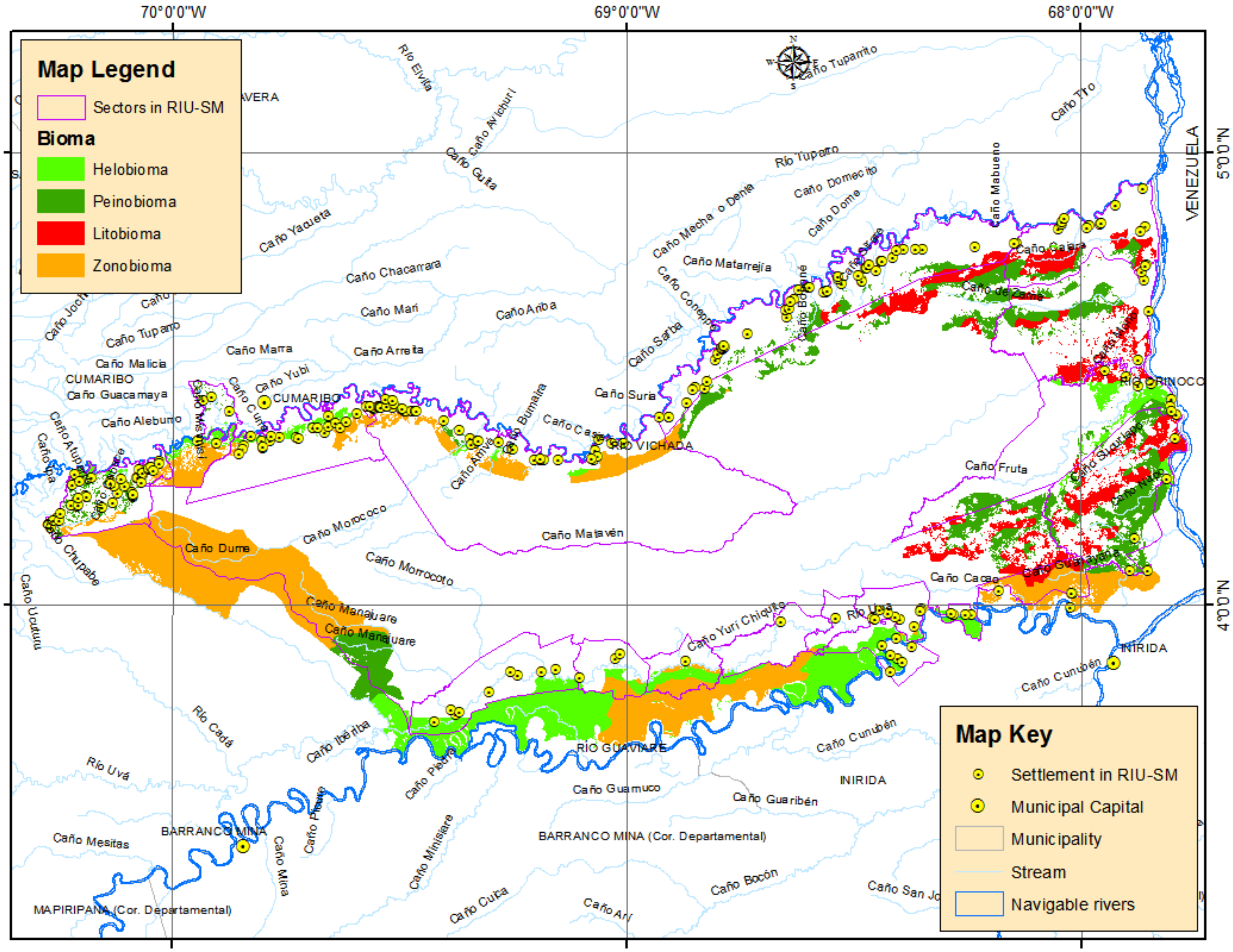
[57] *Project developed for the entire country of Colombia, about the elevation and slope from DEM, data STRM were used, downloadable portal CGIAR*

Map 28. Project Area (PA) forest stratification (strata: biomes)



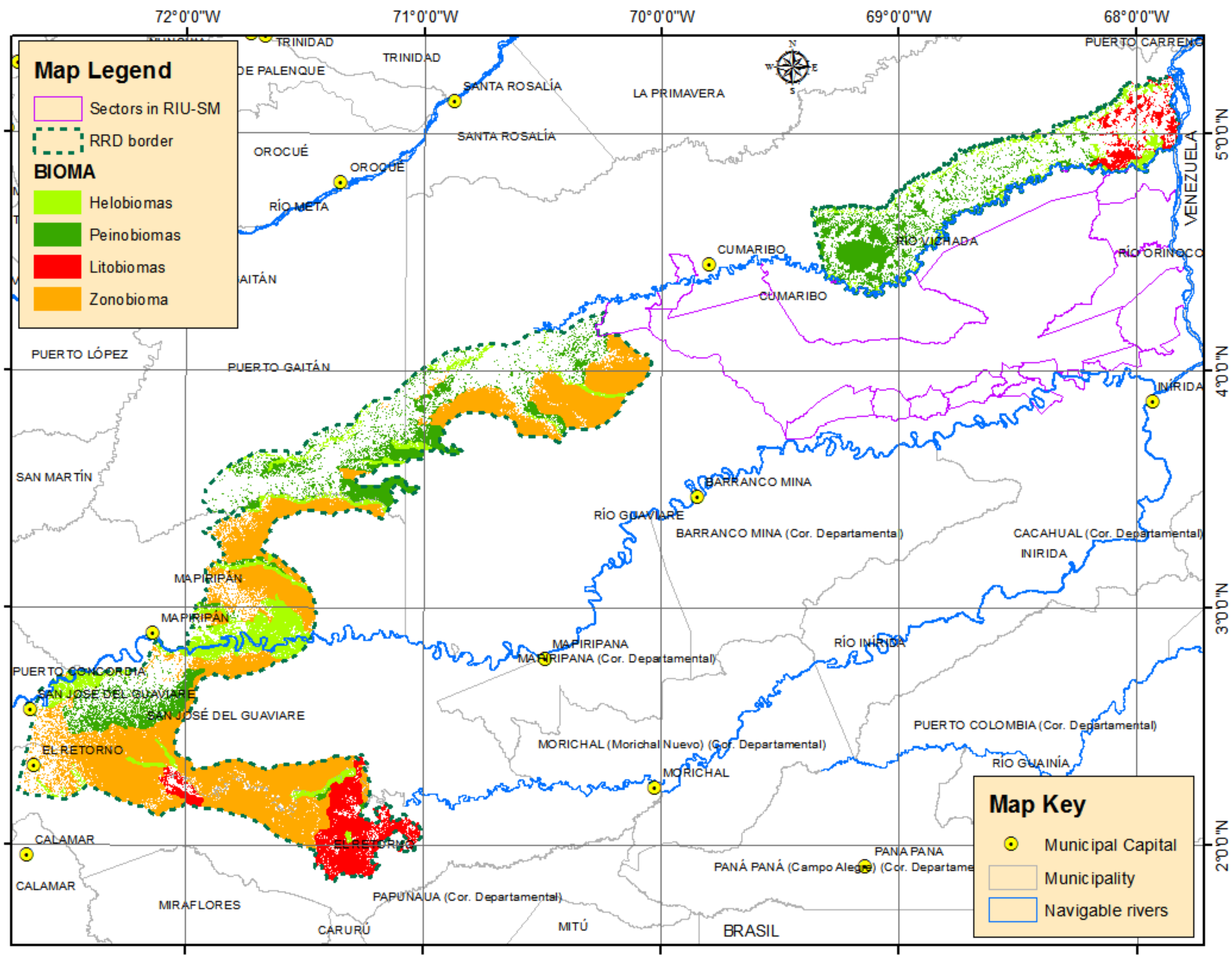
Source: REDD+ project RIU-SM, GIS

Map 29. Leakage Belt (LB) forest stratification (strata: biomes)



Source: REDD+ project RIU-SM, GIS

Map 30. RRD forest stratification (strata: biomes)



Source: REDD+ project RIU-SM, GIS

3.1.2 Estimation of Carbon Stocks before deforestation for stratum

Estimates of carbon stocks were based on field observations obtained from plots stratified random sampling, then allometric equations using properly validated. The calculations of the estimates are made using appropriate statistical developments in this type of sampling.

Fieldwork and calculations were made between January and May 2013.

3.1.2.1 Aboveground tree biomass ($C_{AB\_tree,i}$):

Step 1: Determination of tree dimensions and size and amount of field plots:

In each sample unit the following parameters are evaluated:

- In trees of 10 cm or more of DBH (diameter at breast height): specie name (common), C (circumference), HC (commercial height - tree trunk height-), HT (total height), and habit (A: tree ;) Q: Palm; L: liana; AR: Bush; H: tree fern), its state conventions (L: stem inclined; Q: broken above 1.3 m from the ground; I: irregular stem; B: with buttresses; M: multiple stems) and special observations.
- In the 4 central registry units (strata), all the trees of 10 cm or more of DBH are evaluated.
- Each plot was georeferenced using geographic coordinates.
- In some plots, vegetation measurements were taken with DBH <10 cm, to constitute the so-called study of "vegetation on regeneration" (understory) (Yepes et al., IDEAM, 2011, p. 41).
- The plots and the fustales are marked.

Some other aspects are also evaluated: types of vegetation, Forest Type (primary, secondary), forest condition (degree of intervention).

An instructive was elaborated to be applied in field work (Annex 13. CP - AB - VMD0001) to indicate the procedures location of plots and measurement of trees.

Size of field plots

The protocol established by the IDEAM was applied to determine the size and type of the plots (Protocol for the national and subnational estimates of biomass carbon in Colombia, 2011) (Yepes, et al., 2011), Chapter 1, pages 17 - 24. The size and type is determined by the table 4 (page 35), Step 1-3: selected plot size is 50 x 50 m (0.25 hectares) with a sampling error of 10%.

The plot size 50 x 50 m was considered the most suitable for this type of forest, taking into account the recommendation of studies “Keller et al. 2001”, “Chave et al. 2003”) (Yepes, et al., 2011), page 34:

> *“For the projects at sub-national scales (e.g. regional / subregional), it is recommended to use plots of 0.25 ha (50 mx 50 m) because it is the most appropriate size to achieve the required error in estimations of carbon (±10% with confidence of 95%) in forestry projects (Emmer 2007, Biocarbon Fund 2008, Rügnitz et al. 2009). This size allows to make estimations of average aboveground biomass and, therefore, of carbon, with very narrow confidence intervals, and very similar behaviors to*

those obtained when plots of 1.0 ha are used (…). Similar results were obtained in the Brazilian Amazon and Panama (Keller et al. 2001, Chave et al. 2003), where they concluded that plots of 0.25 ha were the ideal size to estimate the existing aboveground biomass in this forests type."

Amount of field plots

To calculate the number of plots (n) is necessary to specify the level of accuracy given by the maximum allowable sampling error ($E\%$) and the level of probability. The VCS VMD0017 standard - Module X-UNC states:

*"Guidance on uncertainty – a precision target of a **95% confidence interval half-width** equal to or less **than 15%** of the recorded value must be targeted. This is especially important in terms of project planning for measurement of carbon stocks; sufficient measurement plots should be included to achieve this precision level across the measured stocks." (VCS Module VMD0017 Estimation of uncertainty for REDD+ project activities (X-UNC), page 5)*

To calculate the sample size (n) for stratified random sampling (H strata) Equation 4 of IDEAM Protocol has been used. (Yepes, et al., 2011), page 26:

$$n = \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{E^2 + \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{N}} \qquad \textit{(Equation 4)}$$

Where:

n : number of sample plots

t : student t value for given probability

P_j : relative importance or proportion occupied by each stratum

S_j^2 : variance associated with the variable of interest in each stratum (biomass or carbon stored in vegetation)

E : sampling error

N : total number of plots that could be established in the area of interest.

The average of inventory ($\bar{X}$) is obtained using Equation 5 of the Protocol, page 26:

$$\bar{X} = \sum_{j=1}^{H} P_j * \bar{X}_j \qquad \textit{(Equation 5)}$$

Where:

$\bar{X}$: average of inventory

P_j : relative importance or proportion occupied by each stratum

$\bar{X}_j$: average of inventory in each stratum

For the distribution of the number of samples in strata (n_j) Equation 6 of the Protocol is used, page 26:

$n_j = n * P_j$ *(Equation 6)*

The confidence interval (CI) was calculated with Equation 8 of the Protocol, page 26:

$IC = \bar{X} \pm S_{ye} * Z^{(\alpha)}$ *(Equation 8)*

Where:

CI : average of confidence interval

$\bar{X}$: average of inventory

S_{ye} : standard error of the stratified average of inventory

$Z^{(\alpha)}$: 1.96 (for the 95% probability level)

$E = S_{ye} * Z^{(\alpha)}$

With Equation 9 the sampling error percentage is calculated

$E\% = \frac{S_{ye} * Z^{(\alpha)}}{\bar{X}} * 100$ *(Equation 9)*

$E\% = \frac{E}{\bar{X}} * 100$

Where:

$E\%$: sampling error (in percentage)

As shown, the value of $\boldsymbol{n}$ depends on the variance of the strata (S_j^2), which are unknown, and $E\%$ depends on the average $\bar{X}$ that is also unknown. Then the method to be used is an heuristic type, i.e. successive approximations previously using some existing related or approximate information and apply sampling pilots or pre-sampling to have some information about the variances and average, and based on them, to make a calculation of n and n_j of each stratum.

In our case to make pre-sampling and sampling pilots is very expensive, the high cost of travel to the selected parcels to go back, calculate and return back to the jungle. Therefore, as an initial guide information published by the IDEAM [Figure 6 of the Protocol to the IDEAM on page 36 it is used; or Table 3 on page 123, Annex 2 (Yepes, et al., 2011)], which indicates that for plot size of 50m x 50m, an

$E\%$ of 15% and a probability of 95%, in simple random sampling (in each stratum a simple random sample is selected independently) 11 plots would be required in each stratum, that is, with about 44 plots are conservatively approximate the size of stratified random sample.

Acting more conservatively and to ensure the accuracy levels required by the standard, if only 10%, there was a stratified random sample of 131 permanent plots, distributed proportionally in each stratum, as follows:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
	n_1	n_2	n_3	n_4
n_j	16	29	24	62

Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"

With independent simple random sampling in each stratum.

Application of equations

With the data of proportionality in each stratum with respect to the entire area of the Project Area, the P_j is obtained. With the data collected in each simple random sample from each stratum, estimate of S_j^2 in each stratum and the average of inventory were made:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
P_j	0.1517	0.2835	0.1009	0.4639
S_j^2	10,784.04	3,448.60	4,411.57	35,100.57

Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"

With these data Equation 4 was applied; for stratified random sampling with an $E\%$ of 15% and 95% probability:

$P_1 * S_1^2$	1,636.21
$P_2 * S_2^2$	977.60
$P_3 * S_3^2$	445.29
$P_4 * S_4^2$	16,281.77
$\sum_{i=1}^{H} P_j {S_j}^2$	19,340.87

t = 1.96

$t^2 \sum_{i=1}^{H} P_j {S_j}^2$ = 74,299.898

N = 4,600,850 (*Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

Sampling error (according to Equation 9)

$E\%$ = 15%

E = $E\% * \bar{X}$

E = 38.55

Finally, the number of plots in the 4 strata is calculated (Equation 4):

$$n = \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{E^2 + \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{N}} = 50$$

Equation 6 is applied to calculate the number of samples within each stratum (n_j), with n = 50:

$$n_j = n * P_j$$

	Strata i			
	Helobioma	Peinobioma	Litobioma	Zonobioma
P_j	0.1517	0.2835	0.1009	0.4639
n_j	8	14	5	23

Therefore, with sample sizes (# of plots) randomly selected independently in each stratum, compliance accuracy is guaranteed (all sample sizes in each stratum are higher than those required) to $E\%$ of 15% and probability level selected.

Applying Equation 4 to calculate $E\%$:

$$E^2 = t^2 \sum P_j S_j{}^2 \left(\frac{1}{n} - \frac{1}{N}\right)$$

$$E = 23.8$$

$E\% = \frac{E}{\bar{X}} * 100 = 9.3\%$, with a probability level of 95%, which meets conservatively with the level of accuracy established in the standard.

This sampling error value is equal to applying the equation presented in "*Sampling Techniques, Chapter 5 Stratified Random Sampling, page 92 (Cochran, 1997)* " to estimate the error of the mean of stratified inventory:

For stratified random sampling, the variance of the estimate $\bar{y}_{st}$ is:

$$V(\bar{y}_{st}) = \sum_{h=1}^{L} W_h{}^2 \frac{S_h{}^2}{n_h}(1 - f_h) \quad (5.6)$$

Where:

$V(\bar{y}_{st})$: variable of weighted sample mean

$\bar{y}_{st}$: weighted sample mean ($\bar{X}$) (estimator of the mean in stratified sampling)

W_h : stratum weight

S_h : true variable by stratum

n_h : numbers of plots by stratum

f_h : sampling fraction in the stratum (n_h/N_h)

h : stratum

The Standard Error of Mean is $\sqrt{V(\bar{y}_{st})}$ = (S_{ye}).

Average of inventory $\bar{X}$ (Equation 5):

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
P_j	0.1517	0.2835	0.1009	0.4639
$\bar{X}_j$	278.5	218.8	222.1	280.9
$P_j * \bar{X}_j$	42.25	62.04	22.41	130.29
$\sum_{j=1}^{H} P_j * \bar{X}_j$	256.99			

$\bar{X}$ = 256.99 (*Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

Stratified inventory standard error S_{ye}:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
${W_h}^2$	0.0230	0.0804	0.0102	0.2152
${S_h}^2$	10,784.04	3,448.60	4,411.57	35,100.57
n_h	16	29	24	62
f_h	0.00002	0.00002	0.00005	0.00003

$V(\bar{y}_{st})$ = 148.75

S_{ye} = 12.20

(Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables")

$E\% = \frac{S_{ye} * Z^{(\alpha)}}{\bar{X}} * 100$ = 9.3%

(*Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

The observations of field work are presented in formats that also takes into Annex 13.

Following are the results of the analysis of the sample (Annex 19, "Estimation of carbon in the above and belowground biomass in live trees").

Step 2: Selection of the allometric equation:

The following equation for trees (fustales) and other for palms are selected.

$$\ln(BA) = a + B1 \ln(D)$$

Where:

BA is the biomass of trees in kg

D is the average diameter measured at 1.3 m height from the ground from 10cm

a and **B1** are constant model

R^2 is the fit of the model

Independent variables: diameter (D). The values of the estimated parameters are:

Forest type	a	B1	R^2
bh-T	-1.544	2.37	0.932

Source: (Yepes, et al., 2011) Protocolo para la estimación nacional y subnacional de biomasa - carbono en Colombia, IDEAM 2011, page 49

This allometric equation was selected for comparison with 2 other offering the advantages of not requiring but the diameter at breast height, reducing risks of uncertaint7y and measurement errors by not needed other variables such as height and density.

Allometric equation to estimate the biomass of palms

$$BA = 6.666 + 12.826 * H^{0,5} * \ln(H)$$

Where:

Acronym	Description
BA	aboveground dry matter, kg / tree
H	height of the trunk, meters (for palms this is the main stem, excluding the fronds)

Source: (IPCC, 2003) Annex 4.A.2 (4.A.2 table, page 4.114 [513])

Step 3: Estimation carbon reservoir in biomass for each tree.

In the file "plot_study_fustales.xlsm" (folder "calculation_tables") are estimates, by applying the selected in the previous step allometric equation.

Step 4: Calculate the average carbon in biomass per plot in each stratum and its conversion to CO_2 e, 0.47 factor was used to transform carbon in biomass and CO_2 [58].

In the file "plot_study_fustales.xlsm" (folder "calculation_tables") are the calculations of the average carbon content in biomass per plot for each stratum, converted to CO_2 e.

Based on the results of fieldwork estimates of carbon densities by strata was made as shown in the table 48 (these data were considered for both PA and LB):

Table 48. Statistics of simple random sampling in each stratum (biome). Aboveground biomass (AB)

Aboveground biomass (AB) - "fustales" (trees with DBH>=10cm)

Stratum	Helobiome			Peinobiome			Litobiome			Zonobiome		
	AB	C and CO_2 equivalent		AB	C and CO_2 equivalent		AB	C and CO_2 equivalent		AB	C and CO_2 equivalent	
	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)
Number of plots in stratum sample	16	16	16	29	29	29	24	24	24	62	62	62
Minimum value	155.3	73.0	267.7	93.5	44.0	161.2	128.2	60.3	221.0	151.9	71.4	261.8
Maximum value	533.2	250.6	918.9	354.0	166.4	610.0	351.5	165.2	605.8	1,296.3	609.3	2,233.9
Average	278.5	130.9	479.9	218.8	102.9	377.1	222.1	104.4	382.7	280.9	132.0	484.1
Coefficient of variation of average	9.3%	9.3%	9.3%	5.1%	5.1%	5.1%	5.8%	5.8%	5.8%	8.5%	8.5%	8.5%
% Sampling error	19.9%	19.9%	19.9%	10.4%	10.4%	10.4%	12.0%	12.0%	12.0%	16.9%	16.9%	16.9%
Lower limit	223.1	104.9	384.5	196.2	92.2	338.0	195.5	91.9	336.9	233.5	109.8	402.5
Upper limit	333.8	156.9	575.3	241.5	113.5	416.2	248.6	116.8	428.4	328.2	154.3	565.7

Source: REDD+ project RIU-SM, file "plot_study_fustales.xlsm", sheets "estad H"-"BA vs. n Z" (folder "calculation_tables")

Table 49. Stratified sampling statistics and estimates for the biomass (ton dry matter / ha)

	PA		Average / Stratum		EE	EE%	Trust limits	
Biomes	**Área** (has)	**%**	**$\bar{y}_h$**	**$W_h * \bar{y}_h$**	**$t*S(\bar{y}_h)$**		**Lower Lim**	**Uper Lim**
Helobiomes	174,516	15.2%	278.5	42.3	55.34	19.9%	223.14	279.06
Peinobiomes	326,058	28.3%	218.8	62.0	22.37	10.2%	196.46	244.15
Litobiomes	116,099	10.1%	222.1	22.4	28.28	12.7%	193.77	239.38
Zonobiomes	533,538	46.4%	280.9	130.3	47.35	16.9%	233.53	297.27
Total	**1,150,212**	**100%**		257.0	**23.905**	**9.3%**	**233.09**	**280.90**

Source: REDD+ project RIU-SM, file "plot_study_fustales.xlsm", sheet "calculo Yst var PA (BA)" (folder "calculation_tables")

[58] *CF = carbon fraction of dry matter (default = 0.47), (ton C/tonne d.m.) (IPCC, 2006) INV GLs AFOLU Chapter 4 Table 4.3)*

Table 50. Estimation of aboveground biomass (AB) and carbon equivalent – Sampling Error

Weighted averages	
256.99	AB (t dm / ha)
442.88	CO_2 e / ha

Source: REDD+ project RIU-SM, file "plot_study_fustales.xlsm", sheet "calculo Yst var PA (BA)" (folder "calculation_tables")

It meets the requirements of sampling error and reliability level:

Sampling error: **9.3%** less than or equal to **15%**

Level of reliability: **95%** probability

Also presented in this Annex 19 the study of the number of fruit trees per plot and per hectare (trees with D>=10cm)

3.1.2.2 Belowground tree biomass ($C_{BB\_tree,i}$):

The content of carbon in below-ground tree biomass of each tree were obtained by multiplying the results of part 1, step 3, for the value R = 0.24 (root - stem ratio)[59].

The following table presents this transformation:

Table 51. Belowground tree biomass in each stratum (biome)

Stratum	Helobiome			Peinobiome			Litobiome			Zonobiome		
	AB	C and CO_2 equivalent		AB	C and CO_2 equivalent		AB	C and CO_2 equivalent		AB	C and CO_2 equivalent	
	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)	t d.m. / ha	C (t/ha)	CO_2 (t/ha)
Average aboveground biomass	278.5	130.9	479.9	218.8	102.9	377.1	222.1	104.4	382.7	280.9	132.0	484.1
Average belowground biomass	66.83	31.41	115.18	52.52	24.68	90.51	53.29	25.05	91.84	67.41	31.68	116.17

Source: based on REDD+ project RIU-SM, file "plot_study_fustales.xlsm", sheet "BRG_parcelas" (folder "calculation_tables")

Additional information is in Annex 13 CP-AB VMD0001, and specifically:

- Templates for data collection plots - upper-stem, regeneration and soils (folder "Anexo 13. CP-AB - VMD0001")
- Location data plots (file "plot_study_fustales.xlsm", sheet "Plots", folder "calculation_tables")
- Basic Statistics (code and location of the plot, biome, number of trees, diameter, total height) (file "plot_study_fustales.xlsm", sheets "estad H"-"BA vs. n gral", folder "calculation_tables")

[59] *AFOLU Guidelines (IPCC 2006, Chapter 4, page 4.49)*

- CO_2 content and / tree plot, ha (file "plot_study_fustales.xlsm", sheets "estad H"-"BA vs. n gral", folder "calculation_tables")

3.1.2.3 Estimation of soil organic carbon pool

Estimated content of soil organic carbon in the case of baseline (pre and post deforestation) and in the case of the project.

Similarly, the carbon stock in the organic soil was done using the protocol established by IDEAM (Yepes, et al., 2011). Results are presented in Annex 14. There are a instructive-document with indications how realize the workfield to collect the soil-samples through to make "calicatas" and a report about soil analysis make in laboratory.

Table 52. Statistics of simple random sampling in each stratum (biome) CO_2 in soil (Cumulative t/ ha) by soil depths (cm)

	CO_2 (Cumulative t/ ha) by soil depths (cm)									
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
HELOBIOME										
n	12	12	12	12	12	12	12	12	12	12
Minimum	16.2	34.1	59.6	73.4	86.8	95.6	104.3	111.0	112.3	113.6
Maximum	88.9	173.0	263.3	353.6	443.9	508.5	635.8	763.1	890.4	1,017.7
Average	55.5	87.6	123.5	159.4	195.3	222.1	249.0	275.9	302.8	329.7
Coefficient of variation of average	12.2%	12.8%	14.6%	16.3%	17.5%	19.1%	20.8%	22.4%	23.9%	25.2%
% Sampling error	26.9%	28.2%	32.2%	35.9%	38.5%	42.1%	45.9%	49.4%	52.6%	55.4%
LL	40.5	62.9	83.6	102.2	120.1	128.6	134.8	139.6	143.6	147.2
UL	70.4	112.2	163.3	216.5	270.5	315.6	363.3	412.2	462.0	512.2
PEINOBIOME										
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
n	20	20	20	20	20	20	20	20	20	20
Minimum	18.4	27.7	34.0	40.4	46.7	54.3	62.0	69.6	77.2	84.9
Maximum	320.0	449.7	499.1	548.4	597.8	647.9	697.9	748.0	798.1	848.1
Average	98.5	165.4	195.8	226.1	256.5	276.5	296.5	316.5	336.5	356.5
Coefficient of variation of average	17.9%	14.3%	12.9%	12.2%	11.8%	12.1%	12.4%	12.8%	13.1%	13.5%
% Sampling error	37.4%	30.0%	27.0%	25.5%	24.7%	25.3%	26.0%	26.7%	27.5%	28.2%
LL	61.6	115.8	142.9	168.6	193.2	206.7	219.5	231.9	244.0	255.8
UL	135.3	215.0	248.7	283.7	319.9	346.4	373.5	401.0	428.9	457.1
LITOBIOME										
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
n	9	9	9	9	9	9	9	9	9	9
Minimum	11.8	23.9	39.8	55.6	71.5	86.4	91.3	96.1	101.0	105.8
Maximum	253.9	660.2	809.5	958.7	1,108.0	1,178.3	1,248.7	1,319.0	1,389.3	1,459.7
Average	78.9	158.3	207.8	257.2	306.6	331.5	356.3	381.2	406.0	430.9
Coefficient of variation of average	31.0%	41.3%	37.9%	35.9%	34.8%	34.3%	34.1%	33.9%	33.7%	33.7%
% Sampling error	71.4%	95.3%	87.3%	82.9%	80.1%	79.2%	78.5%	78.1%	77.8%	77.6%
LL	22.6	7.5	26.4	44.0	60.9	68.9	76.4	83.5	90.1	96.5
UL	135.2	309.2	389.1	470.3	552.4	594.0	636.2	678.9	721.9	765.3
ZONOBIOME										
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
n	47	47	47	47	47	47	47	47	47	47

	CO$_2$ (Cumulative t/ ha) by soil depths (cm)									
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
Minimum	2.9	15.6	31.5	40.0	41.8	47.9	54.0	60.1	66.2	72.4
Maximum	701.5	931.3	1,446.3	1,961.2	2,476.1	2,603.2	2,730.3	2,857.3	2,984.4	3,111.5
Average	88.4	153.4	199.2	244.9	290.6	317.4	344.1	370.9	397.6	424.4
Coefficient of variation of average	21.4%	18.3%	19.7%	20.7%	21.6%	20.9%	20.4%	20.0%	19.7%	19.4%
% Sampling error	42.5%	36.5%	39.1%	41.3%	42.9%	41.7%	40.7%	39.8%	39.1%	38.5%
LL	50.8	97.4	121.2	143.8	165.8	185.1	204.2	223.2	242.1	260.8
UL	126.0	209.4	277.1	346.0	415.5	449.7	484.0	518.5	553.2	587.9
GENERAL										
	0-10	**0-20**	**0-30**	**0-40**	**0-50**	**0-60**	**0-70**	**0-80**	**0-90**	**0-100**
n	88	88	88	88	88	88	88	88	88	88
Minimum	2.9	15.6	31.5	40.0	41.8	47.9	54.0	60.1	66.2	72.4
Maximum	701.5	931.3	1,446.3	1,961.2	2,476.1	2,603.2	2,730.3	2,857.3	2,984.4	3,111.5
Average	85.2	147.6	188.9	230.2	271.5	296.6	321.6	346.6	371.7	396.7
Coefficient of variation of average	13.1%	11.7%	12.3%	12.8%	13.3%	12.9%	12.7%	12.5%	12.3%	12.2%
% Sampling error	25.9%	23.2%	24.3%	25.3%	26.3%	25.6%	25.1%	24.7%	24.4%	24.2%
LL	63.2	113.3	143.1	171.9	200.2	220.7	240.9	260.9	280.8	300.6
UL	107.3	182.0	234.8	288.6	342.8	372.5	402.3	432.3	462.5	492.8

Source: REDD+ project RIU-SM, Annex 14; file "soil_analysis.xlsx", sheet "CO2 ac biom" (folder "calculation_tables")

With previous results presented in Table 52, carbon densities were estimated.

3.1.2.4 Forest carbon stock pre-deforestation

From tables 48, 51 and 52 we have the following table:

Table 53. Estimation of carbon stocks (t CO$_2$/ha) before deforestation for stratum

Pool	Acronym	Helobiome	Peinobiome	Litobiome	Zonobiome
Aboveground tree biomass	$C_{ABtree\text{-}bsl,i}$	479.9	377.1	382.7	484.1
Aboveground non-tree biomass	$C_{ABnon\text{-}tree\text{-}bsl,i}$	0	0	0	0
Belowground tree biomass	$C_{BBtree\text{-}bsl,i}$	115.2	90.5	91.8	116.2
Belowground non-tree biomass	$C_{BBnon\text{-}tree\text{-}bsl,i}$	0	0	0	0
Dead wood	$C_{DW,bsl,i}$	0	0	0	0
Litter	$C_{LI,bsl,i}$	0	0	0	0
Organic soil	$C_{SOC,bsl,i}$	123.5	195.8	207.8	199.2
Subtotal		**718.5**	**663.4**	**682.3**	**799.4**

Source: Annex 10- VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.1 Forest carbon stocks; file "VMD0007.xlsx", sheet "P4 Step4.2.1 forest C stock" (folder "calculation_tables")

The differences between these carbon densities can be considered significant, justifying the stratification.

3.1.2.5 Calculation of the historical deforestation rate

To obtain the projections of the deforested area, a model for the forecast of deforestation needs to be constructed (Annex 10 VMD0007, Part 3 Location and quantification of threat of unplanned deforestation), which requires estimating the historical rate of deforestation and its trend (Annex 10 VMD0007, Step 2.1.3 Calculation of the historical deforestation rate).

Deforestation during historical reference period (hrp)

Table 54. Remaining Forest and Deforested Areas in the RRD

Year	Deforested	Remaining Forest
2001	-	1,444,805
2005	43,237	1,401,568
2011	95,328	1,306,212
	138,565	

Deforestation (hrp) / RRD = %

138,565 (ha hrp) / 1,444,805 (ha) = 9.59%

13,857 (ha hrp/year) / 1,444,805 (ha) = 0.96% average / year

Source: REDD+ project RIU-SM. Annex 10 VMD0007, Section 5 - Step 2.1.3

Deforestation for each interval of the historical reference period (hrp)

Table 55. Deforestation in phr in each one of the biomes

	2001		Deforestation Period 1 (2001-2005)		Deforestation Period 2 (2005-2011)	
Biomes	**Área** (has)	**%**	**D** (has / año)	**t** (% año)	**D** (has / año)	**t** (% año)
Helobiome	230,435	15.95%	1,602	0.6950%	2,744	1.2247%
Peinobiome	333,195	23.06%	3,663	1.0993%	5,490	1.7235%
Litobiome	158,752	10.99%	86	0.0543%	445	0.2812%
Zonobiome	722,424	50.00%	5,459	0.7556%	7,209	1.0289%
Total	**1,444,805**	**100%**	**10,809**	**0.7481%**	**15,888**	**1.1336%**

D: deforestation rate

Source: REDD+ project RIU-SM. Folder "calculation_tables", file "transition_changes.xlsx", Sheets "Transit Helob", "Transit Peinob", "Transit Litob" and "Transit Zonob"

Table 56. Deforestation trends in phr

	Deforestation Period (2001-2011)			Increm. D (has/year) per 2 vs. per 1
Biomes	**D** (has / año)	**t** (% año)	**Tend**	
Helobiome	2,287	0.9924%	growing	1,142
Peinobiome	4,759	1.4284%	growing	1,827
Litobiome	302	0.1901%	growing	359
Zonobiome	6,509	0.9009%	growing	1,750
Total	**13,857**	**0.9591%**	**growing**	5,079

- D: deforestation rate
- Increment in D (has/año): Period 2 vs. Period 1

Source: REDD+ project RIU-SM. Changes in coverage and land use (Folder "calculation_tables", File "transition_changes.xlsx", Sheet "trends general")

As can be seen the trend of deforestation in all biomes is growing and also for the entire RRD. This information is inferred from the transition tables for RRD studied. The rate of deforestation is **13,857 ha/ year** with a relative annual rate of **0.9597%.** The comparison with official data for the Orinoco and other Colombian regions (Yepes, et al., 2011) show the threat level of increasing deforestation for the Project Area (PA) and the RIU-SM.

Tables 58, 59 and 60 show changes in land uses in RRD in each of the periods and for the entire historical period and in particular deforestation, information needed to calculate "*Estimation of carbon stocks after deforestation for stratum*" (section 3.1.2.7 below)

Changes in the forest have been Vegetation Regeneration (VR) Heterogeneous Agricultural Areas (AAH) and Grassland (GL), yielding the following rates of deforestation:

Table 57. Summary of changes from forest to others land uses in HRP

Forest to:	2001 -2005 (has)	2005-2011 (has)	2001-2011 (has)
Vegetation Regeneration (VR)	17,569	50,156	67,677
Heterogeneous agricultural area (HAA)	7,851	14,054	21,350
Grassland (G)	17,806	31,100	49,502

Source: REDD+ project RIU-SM. Based on Changes in coverage and land use (Folder "calculation_tables", File "transition_changes.xlsx", Sheet "Transition biomes")

Table 58. Transition matrix of categories of coverage and use of CT/UT land in RRD - (2001-2005)

Classes	Area (ha) 2005	%	Forest	VR	S	SI	AAH	G	H	CR	SD	Subt class/ cobert 2005	Loss - change 2011	%	Loss - change / year	% / year
Forest	**1,444,805**	**100%**	**1,401,568**	**17,569**	0	0	**7,851**	**17,806**	0	0	**11**	**1,444,805**	**43,237**	**2.99%**	**10,809**	**0.75%**
VR: Vegetation regeneration	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
S: sheets	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
Yes: Seasonally flooded savannas	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
AAH: Areas Agric. Heterogeneous.	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
G: grassland	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
H: wetlands	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
CR: Rocky Mountains	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
SD: Bare soil	0	0,0%	0	0	0	0	0	0	0	0	0	0	0		0	
Area in 2005	**1,444,805**	**100%**	**1,401,568**	**17,569**	**0**	**0**	**7,851**	**17,806**	**0**	**0**	**11**	**1,444,805**				
% Área en 2005			**97.0%**	**1.2%**	**0.0%**	**0.0%**	**0.5%**	**1.2%**	**0.000%**	**0.0%**	**0.00%**					
Gain - change 2015			0	17,569	0	0	7,851	17,806	0	0	11	**43,237**				
%			0.00%									**0.00%**		**D:**	**10,809**	has/year
Earnings - changes / year			0	4,392	0	0	1,963	4,452	0	0	3	**10,809**				
% / year			0.00%									**0.00%**				
Net change			-43,237	17,569	0	0	7,851	17,806	0	0	11	**0**				
Net change / year			-10,809	4,392	0	0	1,963	4,452	0	0	3	**0**				
% NET			-2.99%									**-2.99%**				
% NET / year			-0.75%									**-0.75%**				

Source: REDD+ project RIU-SM. Changes in coverage and land use (Folder “calculation_tables”, File “transition_changes.xlsx”,Sheet “Transition biomes”)

Table 59. Transition matrix of categories of coverage and use of CT/UT land in RRD - (2005-2011)

Classes	Area (ha) 2005	%	Forest	VR	S	SI	AAH	G	H	CR	SD	Subt class/ cobert 2005	Loss - change 2011	%	Loss - change / year	% / year
Forest	**1,401,568**	**97%**	**1,306,212**	**50,156**	**0**	**0**	**14,054**	**31,100**	**28**	**0**	**18**	**1,401,568**	**95,328**	**6.80%**	**15,888**	**1.13%**
VR: Vegetation regeneration	17,569	1.2%	0	10,832	0	0	2,334	4,403	0	0	0	**17,569**	17,569	100%	2,928	16.67%
S: sheets	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	
Yes: Seasonally flooded savannas	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	
AAH: Areas Agric, Heterogeneous,	7,851	0.5%	0	2,893	0	0	4,957	0	0	0	0	**7,851**	7,851	100%	1,308	16.67%
G: grassland	17,806	1.2%	0	3,793	0	0	3	14,010	0	0	0	**17,806**	17,806	100%	2,968	16.67%
H: wetlands	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	
CR: Rocky Mountains	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	
SD: Bare soil	11	0.0%	0	2	0	0	0	0	0	0	9	**11**	11	100%	2	16.67%
Area in 2011	**1,444,805**	**100%**	**1,306,212**	**67,677**	**0**	**0**	**21,350**	**49,512**	**28**	**0**	**27**	**1,444,805**				
% Area in 2011			**90.4%**	**4.7%**	**0.0%**	**0.0%**	**1.5%**	**3.4%**	**0.002%**	**0.0%**	**0.00%**					
Gain - change 2011			0	56,845	0	0	16,392	35,503	28	0	18	**108,785**				
%			0.00%	323.55%			208.80%	199.39%			161.54%	**893.28%**		**D:**	**15,888**	has/year
Earnings - changes / year			0	9,474	0	0	2,732	5,917	5	0	3	**18,131**				
% / year			0.00%	53.93%			34.80%	33.23%			26.92%	**148.88%**				
Net change			-95,328	39,276	0	0	8,541	17,697	28	0	7	**-29,780**				
Net change / year			-15,888	6,546	0	0	1,424	2,949	5	0	1	**-4,963**				
% NET			-6.80%	223.55%			108.80%	99.39%			61.54%	**486.48%**				
% NET / year			-1.13%	37.26%			18.13%	16.56%			10.26%	**121.62%**				

Source: REDD+ project RIU-SM. Changes in coverage and land use (Folder “calculation_tables”, File “transition_changes.xlsx”,Sheet “Transition biomes”)

Table 60. Categories transition matrix of coverage and land use CT/UT en RRD - (2001-2011)

Classes	Area (ha) 2005	%	Forest	VR	S	SI	AAH	G	H	CR	SD	Subt class/ cobert 2001	Loss - change 2011	%	Loss - change / year	% / year
Forest	**1,444,805**	**100%**	**1,306,212**	**67,677**	**0**	**0**	**21,350**	**49,512**	**28**	**0**	**27**	**1,444,805**	**138,565**	**9.59%**	**13,857**	**0.96%**
VR: Vegetation regeneration	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
S: sheets	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
Yes: Seasonally flooded savannas	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
AAH: Areas Agric, Heterogeneous,	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
G: grassland	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
H: wetlands	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
CR: Rocky Mountains	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
SD: Bare soil	0	0.0%	0	0	0	0	0	0	0	0	0	0	0		0	0.00%
Area in 2011	**1,444,805**	**100%**	**1,306,212**	**67,677**	**0**	**0**	**21,350**	**49,512**	**28**	**0**	**27**	**1,444,805**				
% Area in 2011			**90.4%**	**4.7%**	**0.0%**	**0.0%**	**1.5%**	**3.4%**	**0.002%**	**0.0%**	**0.00%**					
Gain - change 2011			0	67,677	0	0	21,350	49,512	28	0	27	**138,593**				
%			0.00%									**0.00%**		**D:**	**13,857**	has/year
Earnings - changes / year			0	6,768	0	0	2,135	4,951	3	0	3	**13,859**				
% / year			0.00%									**0.00%**				
Net change			-138,565	67,677	0	0	21,350	49,512	28	0	27	**28**				
Net change / year			-13,857	6,768	0	0	2,135	4,951	3	0	3	**3**				
% NET			-9.59%									**-9.59%**				
% NET / year			-0.96%									**-2.40%**				

Source: REDD+ project RIU-SM. Changes in coverage and land use (Folder "calculation_tables", File "transition_changes.xlsx",Sheet "Transition biomes")

3.1.2.6 Projected deforested areas

For the projection of deforested area, both the PA to the LB, was applied the Deforestation Model developed in the Annex 10 VMD0007, Part 3 Location and quantification of threat of unplanned deforestation, STEP 3.4 Mapping of the locations of future deforestation, 3.4.2 Where location analysis (Steps 2.1, 2.2, 2.3) has been conducted, Annual areas deforested in each forest class within the Project Area.

Estimation of the annual areas of unplanned baseline deforestation in the RRD

(Annex 10 VMD0007, Step 2.2)

Equation 3 of Annex 10 VMD0007 (page 17) was used to calculate the historical rate for RRD:

$$A_{BSL,RRD,unplanned,t} = A_{RRD,unplanned,hrp} \,/\, T_{hrp}$$

Where:

$A_{BSL,RRD,unplanned,t}$: *Projected area of unplanned baseline deforestation in the RRD / year* (ha)

$A_{RRD,unplanned,hrp}$: *Total deforested area during the historical reference period in the RRD* (ha)

T_{hrp}: *Duration of the historical reference period in years* (year)

$A_{BSL,RRD,unplanned,t}$ = 138,565 / 10 = **13,857 ha / year**

Estimation of the annual areas of unplanned baseline deforestation in the project area

(Annex 10 VMD0007, Step 2.3)

Equation 4 of Annex 10 VMD0007 (page 17) was used to calculate Projected area of unplanned baseline deforestation in the reference region for location (RRL) / year:

$$A_{BSL,RR,unplanned,t} = A_{BSL,RRD,unplanned,t} \; * P_{RRL}$$

Where:

$A_{BSL,RR,unplanned,t}$: *Projected area of unplanned baseline deforestation in the reference region for location (RRL) / year* (ha)

$A_{BSL,RRD,unplanned,t}$: *Projected area of unplanned baseline deforestation in RRD / year* (ha)

P_{RRL}: *Ratio of forest area in the RRL at the start of the baseline period to the total area of the RRD*

$A_{BSL,RR,unplanned,t}$ = 13,857 * 1,636,423 / 1,444,805

$A_{BSL,RR,unplanned,t}$ = 13,857 * 1.133 = **15,694 ha / year**

Equation 5 of Annex 10 VMD0007 (page 18) was used to calculate Projected area of unplanned baseline deforestation in the project area / year:

$$A_{BSL,PA,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{PA}$$

Where:

$A_{BSL,PA,unplanned,t}$: *Projected area of unplanned baseline deforestation in the project area / year* (ha)

$A_{BSL,RRD,unplanned,t}$: *Projected area of unplanned baseline deforestation in RRD / year* (ha)

P_{PA}: *Ratio of the project area to the total area of RRD*

$A_{BSL,PA,unplanned,t}$ = 13,857 * 1,150,212 / 1,444,805

$A_{BSL,PA,unplanned,t}$ = 13,857 * 0.796 = **11,031 ha / year**

Equation 6 of Annex 10 VMD0007 (page 18) was used to calculate Projected area of unplanned baseline deforestation in the leakage belt area / year:

$$A_{BSL,LK,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{LK}$$

Where:

$A_{BSL,LK,unplanned,t}$: *Projected area of unplanned baseline deforestation in the leakage belt area / year* (ha)

$A_{BSL,RRD,unplanned,t}$: *Projected area of unplanned baseline deforestation in RRD / year* (ha)

P_{LK}: *Ratio of the area of the leakage belt to the total area of RRD*

$A_{BSL,LK,unplanned,t}$ = 13,857 * 486,211 / 1,444,805

$A_{BSL,LK,unplanned,t}$ = 13,857 * 0.337 = **4,663 ha / year**

Equation 7 of Annex 10 VMD0007 (page 18) was used to calculate the sum of Total area of unplanned baseline deforestation in the project area

$$A_{BSL,PA,unplanned} = \Sigma_{t=1}^{t*} A_{BSL,PA,unplanned,t}$$

Where:

$A_{BSL,PA,unplanned}$: *Total area of unplanned baseline deforestation in the project area* (ha)

$A_{BSL,PA,unplanned,t}$: *Projected area of unplanned baseline deforestation in the project area / year* (ha)

Equation 8 of Annex 10 VMD0007 (page 18) was used to calculate the sum of Total area of unplanned baseline deforestation in the leakage belt

$$A_{BSL,LK,unplanned} = \Sigma_{t=1}^{t*} A_{BSL,LK,unplanned,t}$$

Where:

$A_{BSL,LK,unplanned}$: *Total area of unplanned baseline deforestation in the leakage belt* (ha)

$A_{BSL,LK,unplanned,t}$: *Projected area of unplanned baseline deforestation in the leakage belt / year* (ha)

With the previous results and applying the procedures of the spatial model (Annex 10 VMD0007, Part 3, section "3.4.2 Where location analysis"), annual projected area of unplanned baseline deforestation in the project area was estimated. The results are presented in Tables 61 and 62 and the corresponding locations are shown on Map 31. A total of **298,410** deforested have estimated the project area and **169,828** hectares in the leakage belt.

Table 61. Results of deforestation model in Project Area for stratum / year

t	Helobiome	Peinobiome	Litobiome	Zonobiome	Subtotal $\sum_i A_{BSL,PA,unplanned,t}$
2013	402	2	0	11,872	12,276
2014	11,337	6	0	2	11,345
2015	12,879	10	5	10	12,904
2016	12,597	10	1	4	12,611
2017	4,755	4,074	0	1	8,831
2018	19	2,576	4,152	3,821	10,568
2019	3	2	0	13,903	13,909
2020	4	0	0	11,897	11,901
2021	8	4	0	9,386	9,398
2022	5	3	0	14,488	14,496
Subtotal year 1-10	**42,008**	**6,687**	**4,159**	**65,385**	**118,239**
2023	11,229	0	0	2,125	13,356
2024	10,310	2	4	11	10,326
2025	4,290	1,909	3	8	6,209
2026	7	6,917	2	4	6,930
2027	7	7,516	3,445	4	10,973
2028	2	6	4,050	2	4,060
2029	3	0	0	9	11
2030	0	0	0	17	17
2031	19	4,129	1,466	5,341	10,955
2032	11,993	4	901	3	12,902
Subtotal year 10-20	**37,860**	**20,484**	**9,871**	**7,524**	**75,739**
2033	9,018	4	0	6	9,028
2034	1,293	5	0	12,554	13,853
2035	7	3,956	6	2,869	6,838
2036	1	8,162	723	2	8,888
2037	4,893	6	3,945	1	8,845
2038	4,664	2	3	9,408	14,077
2039	1	2	0	14,562	14,565
2040	7	2	0	13,736	13,745
2041	2	8	1	12,013	12,024
2042	6	2,560	1	4	2,570
Subtotal year 20-30	**19,893**	**14,706**	**4,679**	**65,154**	**104,433**
Total years 1-30	**99,762**	**41,877**	**18,710**	**138,062**	**298,410**

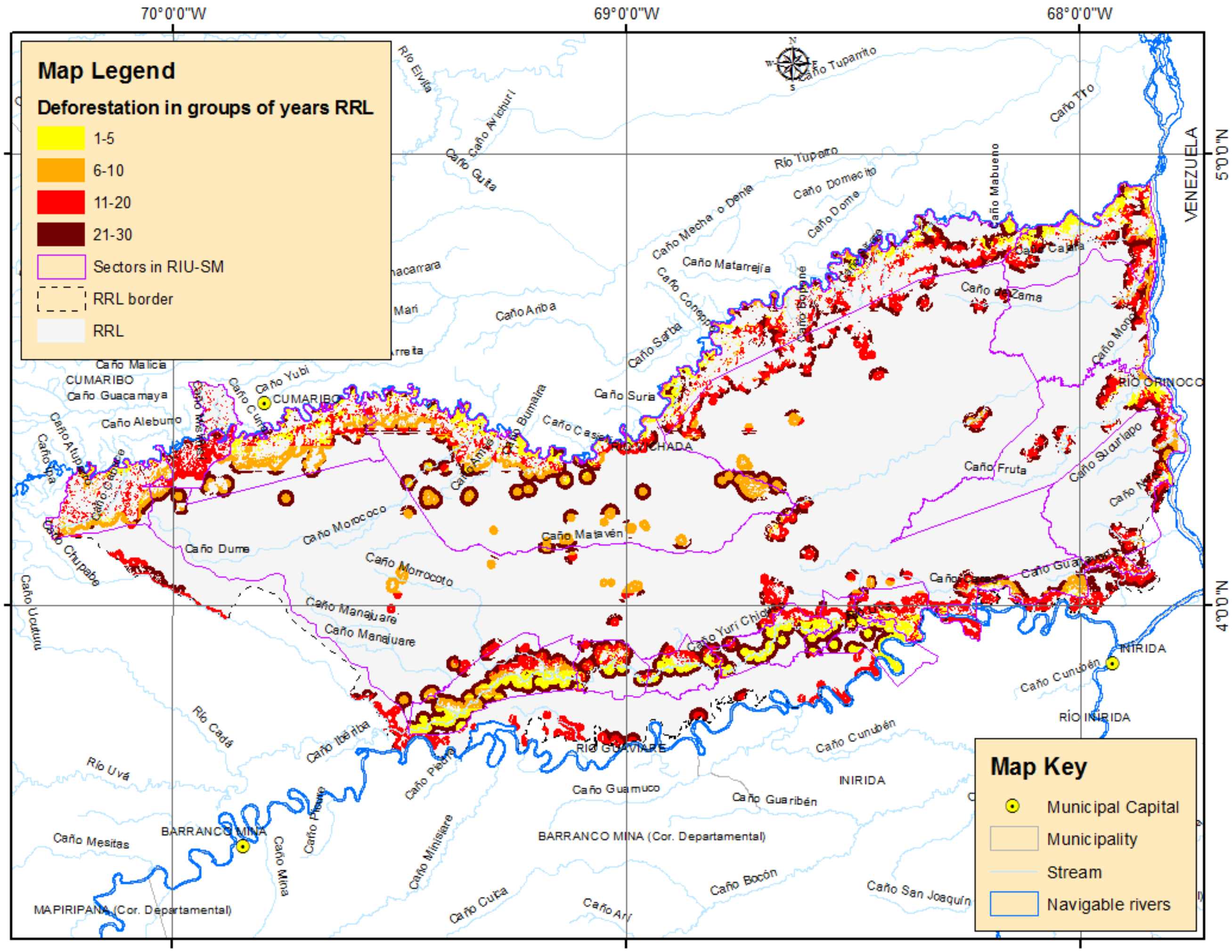
Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 3 Location and quantification of threat of unplanned deforestation, STEP 3.4 Mapping of the locations of future deforestation, 3.4.2 Where location analysis (Steps 2.1, 2.2, 2.3) has been conducted, Annual areas deforested in each forest class within the Project Area; file "spatial_model_results.xlsx", sheet "P4" (folder "calculation_tables")

Table 62. Results of deforestation model in Leakage Belt for stratum / year

t	Helobiome	Peinobiome	Litobiome	Zonobiome	Subtotal $\sum_i A_{BSL,LK,unplanned,t}$
2013	293	3	0	2,969	3,265
2014	4,198	2	1	2	4,203
2015	2,600	3	0	2	2,606
2016	2,959	0	0	5	2,965
2017	4,976	1,753	1	1	6,730
2018	3	1,161	2,580	1,247	4,990
2019	1	2	0	1,685	1,687
2020	2	5	0	3,699	3,705
2021	3	2	0	6,189	6,194
2022	2	1	0	1,111	1,115
Subtotal year 1-10	**15,037**	**2,931**	**2,582**	**16,910**	**37,460**
2023	2,185	6	3	0	2,195
2024	5,150	6	3	10	5,169
2025	882	8,353	3	9	9,248
2026	1	8,645	6	4	8,656
2027	0	6	4,665	0	4,671
2028	1,405	1,105	1,863	7,181	11,554
2029	13,628	2	0	1,971	15,601
2030	4	1,631	0	13,949	15,584
2031	1,169	1,453	1,095	952	4,669
2032	2,185	1	526	1	2,713
Subtotal year 10-20	**26,609**	**21,209**	**8,164**	**24,077**	**80,059**
2033	6,631	0	0	5	6,636
2034	56	1	0	1,773	1,830
2035	2	7,664	12	1,143	8,821
2036	2	1,930	789	4,069	6,788
2037	161	1,028	5,620	1	6,811
2038	1,210	2	0	364	1,576
2039	0	2	0	1,128	1,129
2040	0	0	0	1,949	1,949
2041	2,880	1	0	788	3,669
2042	12,378	719	0	1	13,099
Subtotal year 20-30	**23,319**	**11,349**	**6,421**	**11,220**	**52,309**
Total years 1-30	**64,965**	**35,488**	**17,168**	**52,207**	**169,828**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 3 Location and quantification of threat of unplanned deforestation, STEP 3.4 Mapping of the locations of future deforestation, 3.4.2 Where location analysis (Steps 2.1, 2.2, 2.3) has been conducted, Annual areas deforested in each forest class within the Leakage Belt; file "spatial_model_results.xlsx", sheet "P4" (folder "calculation_tables")

Map 31. Prediction Map of Scenario of Baseline of projected deforestation until year 2042 in RRL



Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 3 Location and quantification of threat of unplanned deforestation, STEP 3.4 Mapping of the locations of future deforestation, 3.4.2 Where location analysis (Steps 2.1, 2.2, 2.3) has been conducted.

3.1.2.7 Forest carbon stock post-deforestation

Estimation of carbon stocks after deforestation for stratum

An estimate of the density of carbon by stratum post-deforestation are made (table 68), based on weightings obtained in the transition tables of the historical reference period (2001-2011) (table 63), and on estimations of carbon stocks according to land uses in each stratum (tables 64 to 67). The methods used are presented in the Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 and 4.2.3 Estimation of post-deforestation carbon stocks. Annex 10 - VMD0007.

Table 63. Weightings by classes of land uses post-deforestation (2001-2011)

Classes use of post-deforestation land, u	*Strata*			
	1: Helobiome	*2: Peinobiome*	*3: Litobiome*	*4: Zonobiome*
u1 = VR	*47.0%*	*40.9%*	*18.6%*	*54.8%*
u2 = HAA	*24.2%*	*23.4%*	*12.5%*	*8.3%*
u3 = G	*28.7%*	*35.7%*	*68.8%*	*37.0%*
u4 = W	*0.1%*	*0.0%*	*0.0%*	*0.0%*
u5 = BS	*0.1%*	*0.0%*	*0.1%*	*0.0%*
Totales	*100.0%*	*100.0%*	*100.0%*	*100.0%*

Source: REDD+ Project RIU-SM Folfer "calculation_tables", file "land-uses_weights.xlsx", Sheet "pond_pt2_alt2".

Table 64. Estimation of carbon stocks after deforestation for land use - Helobiome

Carbon pool	1. Regenerating vegetation (VR)	2. Crops (HAA)	3. Grassland (G)	4. Wetland	5. Bare soil	6. Settlement
1. $C_{ABtree\text{-}post,i}$	110.0	0	0	0	0	0
2. $C_{ABnon\text{-}tree\text{-}post,i}$	0	113.7	11.4	0	0	0
3. $C_{BBtree\text{-}post,i}$	26.4	0	0	0	0	0
4. $C_{BBnon\text{-}tree\text{-}post,i}$	0	27.3	18.2	0	0	0
7. $C_{SOC,post,i}$	121.8	62.7	119.8	0	0	0
Subtotal	**258.2**	**203.6**	**149.3**	**0**	**0**	**0**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 Estimation of post-deforestation carbon stocks - Estimation of Carbon Stocks after deforestation for land use; file "VMD0007.xlsx", sheet "P4 Step4.2.2 postdef C stock" (folder "calculation_tables")

Table 65. Estimation of carbon stocks after deforestation for land use - Peinobiome

Carbon pool	1. Regenerating vegetation (VR)	2. Crops (HAA)	3. Grassland (G)	4. Wetland	5. Bare soil	6. Settlement
1. $C_{ABtree\text{-}post,i}$	110.0	0	0	0	0	0
2. $C_{ABnon\text{-}tree\text{-}post,i}$	0	113.7	11.4	0	0	0
3. $C_{BBtree\text{-}post,i}$	26.4	0	0	0	0	0

Carbon pool	1. Regenerating vegetation (VR)	2. Crops (HAA)	3. Grassland (G)	4. Wetland	5. Bare soil	6. Settlement
4. $C_{BBnon\text{-}tree\text{-}post,i}$	0	27.3	18.2	0	0	0
7. $C_{SOC,post,i}$	193.2	99.4	189.9	0	0	0
Subtotal	**329.6**	**240.4**	**219.4**	**0**	**0**	**0**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 Estimation of post-deforestation carbon stocks - Estimation of Carbon Stocks after deforestation for land use; file "VMD0007.xlsx", sheet "P4 Step4.2.2 postdef C stock" (folder "calculation_tables")

Table 66. Estimation of carbon stocks after deforestation for land use - Litobiome

Carbon pool	1. Regenerating vegetation (VR)	2. Crops (HAA)	3. Grassland (G)	4. Wetland	5. Bare soil	6. Settlement
1. $C_{ABtree\text{-}post,i}$	110.0	0	0	0	0	0
2. $C_{ABnon\text{-}tree\text{-}post,i}$	0	113.7	11.4	0	0	0
3. $C_{BBtree\text{-}post,i}$	26.4	0	0	0	0	0
4. $C_{BBnon\text{-}tree\text{-}post,i}$	0	27.3	18.2	0	0	0
7. $C_{SOC,post,i}$	205.1	105.5	201.5	0	0	0
Subtotal	**341.5**	**246.5**	**231.1**	**0**	**0**	**0**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 Estimation of post-deforestation carbon stocks - Estimation of Carbon Stocks after deforestation for land use; file "VMD0007.xlsx", sheet "P4 Step4.2.2 postdef C stock" (folder "calculation_tables")

Table 67. Estimation of carbon stocks after deforestation for land use - Zonobiome

Carbon pool	1. Regenerating vegetation (VR)	2. Crops (HAA)	3. Grassland (G)	4. Wetland	5. Bare soil	6. Settlement
1. $C_{ABtree\text{-}post,i}$	110.0	0	0	0	0	0
2. $C_{ABnon\text{-}tree\text{-}post,i}$	0	113.7	11.4	0	0	0
3. $C_{BBtree\text{-}post,i}$	26.4	0	0	0	0	0
4. $C_{BBnon\text{-}tree\text{-}post,i}$	0	27.3	18.2	0	0	0
7. $C_{SOC,post,i}$	196.6	101.1	193.2	0	0	0
Subtotal	**333.0**	**242.1**	**222.7**	**0**	**0**	**0**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 Estimation of post-deforestation carbon stocks - Estimation of Carbon Stocks after deforestation for land use; file "VMD0007.xlsx", sheet "P4 Step4.2.2 postdef C stock" (folder "calculation_tables")

Table 68. Estimation of carbon stocks after deforestation for stratum

Carbon pool		Helobiome	Peinobiome	Litobiome	Zonobiome
Aboveground tree biomass	$C_{ABtree\text{-}post,i}$	51.7	44.9	20.4	60.2
Aboveground non-tree biomass	$C_{ABnon\text{-}tree\text{-}post,i}$	30.7	30.7	22.1	13.6
Belowground tree biomass	$C_{BBtree\text{-}post,i}$	12.4	10.8	4.9	14.5
Belowground non-tree biomass	$C_{BBnon\text{-}tree\text{-}post,i}$	11.8	12.9	15.9	9.0
Dead wood	$C_{DW,post,i}$	0	0	0	0
Litter	$C_{LI,post,i}$	0	0	0	0
Organic soil	$C_{SOC,post,i}$	106.7	170.0	190.0	187.4
Subtotal		**213.3**	**269.3**	**253.3**	**284.7**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.2 Estimation of post-deforestation carbon stocks; file "VMD0007.xlsx", sheet "P4 Step4.2.2 postdef C stock" (folder "calculation_tables")

3.1.2.8 Forest carbon stock changes

Equations 16 to 22 of VCS Module VMD0007 BL-UP were used to calculate Baseline carbon stock change in different pools. In general, Equations 16 to 22 follow the following structure for respective pool:

$$Baseline\ Carbon\ Stock\ change_{pool} = BSL\ Carbon\ stock_{pool} - Post\text{-}deforestation\ carbon\ stock_{pool}$$

That is, results of table 53 minus results of table 68 (table 69):

Table 69. Estimation of changes of carbon stocks for stratum

Carbon pool		Helobiome	Peinobiome	Litobiome	Zonobiome
Aboveground tree biomass	$\Delta C_{ABtree,i}$	428.2	332.2	362.2	423.8
Aboveground non-tree biomass	$\Delta C_{ABnon\text{-}tree,i}$	-30.7	-30.7	-22.1	-13.6
Belowground tree biomass	$\Delta C_{BBtree,i}$	102.8	79.7	86.9	101.7
Belowground non-tree biomass	$\Delta C_{BBnon\text{-}tree,i}$	-11.8	-12.9	-15.9	-9.0
Dead wood	$\Delta C_{DW,i}$	0	0	0	0
Litter	$\Delta C_{LI,i}$	0	0	0	0
Organic soil	$\Delta C_{SOC,i}$	16.7	25.7	17.8	11.7
Subtotal		**505.2**	**394.1**	**429.0**	**514.7**

Source: Annex 10 - VMD0007, 5. PROCEDURES, Part 4 Estimation of carbon stock changes and greenhouse gas emissions, STEP 4.2 Estimation of carbon stocks and carbon stock changes per stratum, 4.2.3 Estimation of carbon stock changes per stratum; file "VMD0007.xlsx", sheet "P4 Step4.2.3 Eq16-22 C st-ch,i" (folder "calculation_tables")

3.1.2.9 Calculation of the sum of baseline carbon stock changes

Equation 24 of Annex 10 VMD0007 was used to calculate the baseline carbon stock change in each pool / stratum ***i*** / year, in Project area and Leakage belt:

$$\Delta C_{BSL,i,t} = A_{unplanned,i,t} * (\Delta C_{ABtree,i} + \Delta C_{ABnon\text{-}tree,i} + \Delta C_{LI,i})$$
$$+ (\sum_{t-10}^{t} A_{unplanned,i,t}) * (\Delta C_{BBtree,i} + \Delta C_{BBnon\text{-}tree,i} + \Delta C_{DW,i}) * (1/10)$$
$$+ (\sum_{t-20}^{t} A_{unplanned,i,t}) * (C_{WP100,i} + \Delta C_{SOC,i}) * (1/20)$$

Table 70. Total Baseline Forest Carbon stock change in areas deforested in Project Area ($\Delta C_{BSL,i,t}(PA)$)

Year	*i*=1 Helobiome	*i*=2 Peinobiome	*i*=3 Litobiome	*i*=4 Zonobiome	Subtotal
	$t\ CO_2$-e / ha	$t\ CO_2$-e / ha	$t\ CO_2$-e / ha	$t\ CO_2$-e / ha	
2013	163,835	533	0	4,987,314	5,151,681
2014	4,623,071	1,743	138	118,030	4,742,981
2015	5,364,083	3,003	1,828	121,288	5,490,203
2016	5,377,201	3,118	268	118,796	5,499,384
2017	2,306,981	1,261,177	204	117,731	3,686,093
2018	424,633	829,979	1,445,687	1,722,286	4,422,586
2019	418,308	53,947	33,235	5,995,321	6,500,811
2020	418,640	53,380	33,235	5,289,568	5,794,823
2021	420,369	54,637	33,235	4,351,920	4,860,161
2022	419,059	54,302	33,235	6,588,006	7,094,602
2023	4,988,934	53,421	33,391	1,427,464	6,503,210
2024	4,622,630	53,838	34,513	560,036	5,271,017
2025	2,155,011	644,051	34,112	558,761	3,391,935
2026	337,935	2,209,055	34,063	557,307	3,138,361
2027	294,913	2,422,556	1,232,732	557,517	4,507,718
2028	292,983	140,731	1,441,335	521,294	2,396,343
2029	293,070	138,997	63,671	394,951	890,689
2030	291,967	139,115	63,671	288,092	782,845
2031	299,797	1,416,823	574,135	2,437,646	4,728,400
2032	5,178,662	173,081	389,224	113,899	5,854,866
2033	3,982,921	173,251	82,588	88,270	4,327,030
2034	822,021	173,428	82,659	5,359,379	6,437,487
2035	260,989	1,383,384	84,715	1,414,713	3,143,802
2036	248,092	2,670,363	334,190	238,762	3,491,406
2037	2,237,179	155,912	1,437,589	238,080	4,068,761
2038	2,192,360	151,455	63,966	4,187,703	6,595,483
2039	338,804	151,417	62,984	6,437,045	6,990,250
2040	341,361	151,249	63,050	6,226,531	6,782,190
2041	339,194	125,529	52,787	5,583,261	6,100,771
2042	231,514	915,354	46,506	648,500	1,841,874
Subtotals	**49,686,515**	**15,758,830**	**7,792,946**	**67,249,471**	**140,487,762**

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0007.xlsx", Sheet "P4 Step4.3 Eq24(PA) C stck chng"

Table 71. Total Baseline Forest Carbon stock change in areas deforested in Leakage Belt ($\Delta C_{BSL,i,t}(LB)$)

Year	*i*=1 Helobiome	*i*=2 Peinobiome	*i*=3 Litobiome	*i*=4 Zonobiome	Subtotal
	$t\ CO_2\text{-}e / ha$	$t\ CO_2\text{-}e / ha$	$t\ CO_2\text{-}e / ha$	$t\ CO_2\text{-}e / ha$	
2013	119,531	837	0	1,247,094	1,367,463
2014	1,713,439	491	419	30,094	1,744,443
2015	1,103,989	1,099	128	30,124	1,135,340
2016	1,276,116	122	98	31,403	1,307,740
2017	2,127,151	542,663	228	29,769	2,699,811
2018	150,274	373,269	898,167	553,106	1,974,816
2019	149,536	23,786	20,634	749,584	943,540
2020	149,971	24,733	20,634	1,612,046	1,807,384
2021	150,552	24,075	20,634	2,694,551	2,889,812
2022	150,331	23,622	20,634	622,622	817,209
2023	1,037,128	25,233	21,682	139,208	1,223,251
2024	2,228,449	25,343	21,557	143,473	2,418,821
2025	517,222	2,608,645	21,794	142,979	3,290,640
2026	139,774	2,765,551	22,919	140,956	3,069,200
2027	94,310	149,186	1,644,873	139,345	2,027,714
2028	666,820	481,455	688,406	3,144,199	4,980,880
2029	5,660,965	148,773	54,589	1,011,045	6,875,373
2030	245,359	653,045	54,589	6,027,620	6,980,612
2031	719,726	611,053	435,835	648,110	2,414,724
2032	1,145,310	173,035	246,493	247,924	1,812,762
2033	2,958,369	172,941	67,552	247,746	3,446,608
2034	295,045	173,211	67,504	990,161	1,525,921
2035	263,236	2,488,928	71,690	743,043	3,566,897
2036	260,791	717,438	342,073	1,983,320	3,303,622
2037	321,758	451,579	1,997,349	314,722	3,085,408
2038	737,854	133,261	70,244	399,831	1,341,189
2039	132,865	133,189	70,095	704,935	1,041,084
2040	132,843	121,797	70,188	929,572	1,254,401
2041	1,295,687	112,270	62,321	448,646	1,918,924
2042	5,174,074	334,694	58,633	125,368	5,692,769
Subtotals	**31,118,475**	**13,495,322**	**7,071,964**	**26,272,596**	**77,958,356**

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0007.xlsx", Sheet "P4 Step4.3 Eq24(LK) C stck chng"

3.2 Project emissions

Under the REDD+ project RIU-SM an estimate "ex-ante" of "Net greenhouse gas emissions within the project area under the project scenario" (ΔCp) is performed, considering that it will achieve 85% of project effectiveness, that is, it is expected that 15% of deforestation (15% non-effectiveness) occurs.

This estimation "ex-ante" of ΔC_p is performed as follows:

1°. 15% of deforested projected area for the baseline in the Project Area (data in table 61) is calculated, which is forecast through the application of spatial model (VMD0007, step 3, point 3.4.2 $A_{BSL,unplanned,i,t}$ (PA)). These results are expressed by year (t=1 to t=30):

Table 72. Projected Deforested Area for Baseline in PA ($A_{BSL,unplanned,i,t}$ *(PA) * 15%*)

85% Effectiveness; 15%No Effectiveness

t (year)	*i = 1 Helobiome*	*i = 2 Peinobiome*	*i = 3 Litobiome*	*i = 4 Zonobiome*	*Subtotal*
2013	*60*	*0*	*0*	*1,781*	***1,841***
2014	*1,701*	*1*	*0*	*0*	***1,702***
2015	*1,932*	*1*	*1*	*1*	***1,936***
2016	*1,890*	*1*	*0*	*1*	***1,892***
2017	*713*	*611*	*0*	*0*	***1,325***
2018	*3*	*386*	*623*	*573*	***1,585***
2019	*0*	*0*	*0*	*2,085*	***2,086***
2020	*1*	*0*	*0*	*1,785*	***1,785***
2021	*1*	*1*	*0*	*1,408*	***1,410***
2022	*1*	*0*	*0*	*2,173*	***2,174***
Subtotal year 1-10	***6,301***	***1,003***	***624***	***9,808***	***17,736***
2023	*1,684*	*0*	*0*	*319*	***2,003***
2024	*1,546*	*0*	*1*	*2*	***1,549***
2025	*643*	*286*	*0*	*1*	***931***
2026	*1*	*1,038*	*0*	*1*	***1,039***
2027	*1*	*1,127*	*517*	*1*	***1,646***
2028	*0*	*1*	*607*	*0*	***609***
2029	*0*	*0*	*0*	*1*	***2***
2030	*0*	*0*	*0*	*2*	***3***
2031	*3*	*619*	*220*	*801*	***1,643***
2032	*1,799*	*1*	*135*	*0*	***1,935***
Subtotal year 10-20	***5,679***	***3,073***	***1,481***	***1,129***	***11,361***
2033	*1,353*	*1*	*0*	*1*	***1,354***
2034	*194*	*1*	*0*	*1,883*	***2,078***
2035	*1*	*593*	*1*	*430*	***1,026***
2036	*0*	*1,224*	*108*	*0*	***1,333***
2037	*734*	*1*	*592*	*0*	***1,327***
2038	*700*	*0*	*0*	*1,411*	***2,112***
2039	*0*	*0*	*0*	*2,184*	***2,185***
2040	*1*	*0*	*0*	*2,060*	***2,062***
2041	*0*	*1*	*0*	*1,802*	***1,804***
2042	*1*	*384*	*0*	*1*	***386***
Subtotal year 20-30	***2,984***	***2,206***	***702***	***9,773***	***15,665***
Total years 1-30	***14,964***	***6,282***	***2,806***	***20,709***	***44,762***

*Source: folder "calculation_tables", file "VMD0015.xlsx", sheet "Modelo Cp,t Ex ante", table "**ABSL,unplanned,i,t (PA) * 15%**".*

(In that table detailed information of Projected Deforested Area for Baseline in PA by strata (4 biomes i) can be found)

2°. Results of the changes in carbon stocks per stratum (4 biomes i) previously estimated due to changes in land use (u) (carbon content in pre-deforestation – carbon content in post-deforestation).

Equation 6 of VCS Module VMD0015: Carbon stock in all pools in post-deforestation land use $\boldsymbol{u}$ in stratum $\boldsymbol{i}$, is applied:

$$C_{post,u,i} = C_{AB\_tree,i} + C_{BB\_tree,i} + C_{AB\_non\text{-}tree,i} + C_{BB\_non\text{-}tree,i} + C_{DW,i} + C_{LI,i} + C_{SOC,PD\text{-}BSL,i}$$

Where:

Acronym:	Unit:	Description:	Source
$C_{P,post,u,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in all pools in post-deforestation land use u in stratum i*	
$C_{AB\_tree,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in aboveground tree biomass in stratum i*	BL-UP (VMD0007) P4 Step 4.2.2 postdef C stock
$C_{AB\_non\text{-}tree,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in aboveground non-tree vegetation in stratum i*	
$C_{BB\_tree,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in belowground tree biomass in stratum i*	
$C_{BB\_non.tree,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in belowground non-tree vegetation in stratum i*	
$C_{DW,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in dead wood in stratum i*	
$C_{LI,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in litter in stratum i*	
$C_{SOC,PD\text{-}BSL,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Mean post-deforestation stock in soil organic carbon in the post deforestation stratum i*	

Table 73. Estimations of carbon stocks according to post-deforestation land uses in each stratum ($C_{P,post,u,i}$) (subtotals from tables 64 to 67)

Post-deforestation land use u	*i = 1 Helobiome*	*i = 2 Peinobiome*	*i = 3 Litobiome*	*i = 4 Zonobiome*
u=1 veg. reg.(VR)	*258.2*	*329.6*	*341.5*	*333.0*
u=2 cropland (HAA)	*203.6*	*240.4*	*246.5*	*242.1*
u = 3 grassland (G)	*149.3*	*219.4*	*231.1*	*222.7*
u=4 wetland (W)	*0.0*	*0.0*	*0.0*	*0.0*
u=5 bare soil (BS)	*0.0*	*0.0*	*0.0*	*0.0*

Source: Folder "calculation_tables", file "VMD0015.xlsx", sheet "Eq6 CP,post,u,i,t"

Equation 5 of VCS Module VMD0015: Net carbon stock changes in all pools as a result of deforestation in the project case in land use $\boldsymbol{u}$ in stratum $\boldsymbol{i}$ at time $\boldsymbol{t}$, is applied:

$$\Delta C_{pools,Def,u,i,t} = C_{BSL,i} - C_{P,post,u,i} - C_{WP,i}$$

Where:

Acronym:	Unit:	Description:
$\Delta C_{pools,Def,u,i,t}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t*
$C_{BSL,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in all pools in the baseline case in stratum i (table 53)*
$C_{P,post,u,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock in all pools in post-deforestation land use u in stratum i /(table 73)*
$C_{WP,i}$	$t\ CO_2\text{-}e\ ha^{-1}$	*Carbon stock sequestered in wood products from harvests in stratum i*

$C_{WP,i}$ is considering = 0

$C_{BSL,i}$ corresponds to subtotals on table 53

	Helobiome	Peinobiome	Litobiome	Zonobiome
$C_{BSL,i}$	718.5	663.4	682.3	799.4

According subtotals of data in table 53 and data in table 73 Equation 5 is applied. Results are:

Table 74. Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t ($\Delta C_{pools,Def,u,i,t}$)

Post-deforestation land use u	*i = 1 Helobiome*	*i = 2 Peinobiome*	*i = 3 Litobiome*	*i = 4 Zonobiome*
u=1 veg. reg.(VR)	460.3	333.8	340.8	466.4
u=2 cropland (HAA)	514.9	423.0	435.8	557.3
u = 3 grassland (G)	569.2	444.0	451.2	576.6
u=4 wetland (W)	0.0	0.0	0.0	0.0
u=5 bare soil (BS)	0.0	0.0	0.0	0.0

Source: Folder "calculation_tables", file "VMD0015.xlsx", sheet "Eq5 Cpools,Def,i,t"

3°. Carbon Stock Changes are result of "*Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t*" (Table 74) weighted according to "*Weightings by classes of land uses post-deforestation (2001-2011)*" (Table 63). Results are:

Table 75. Carbon Stock Changes

	i = 1 Helobiome	*i = 2 Peinobiome*	*i = 3 Litobiome*	*i = 4 Zonobiome*
u=1 veg. reg.(VR)	216.16	136.37	63.32	255.39
u=2 cropland (HAA)	124.43	99.04	54.61	46.13
u = 3 grassland (G)	163.33	158.53	310.38	213.17

	i = 1 Helobiome	i = 2 Peinobiome	i = 3 Litobiome	i = 4 Zonobiome
u=4 wetland (W)	0.00	0.00	0.00	0.00
u=5 bare soil (BS)	0.00	0.00	0.00	0.00
$\Delta C_{pools,Def,i,t}$ ***(tCO_2/ha)***	***503.91***	***393.94***	***428.31***	***514.69***

*Source: folder "calculation_tables", file "VMD0015.xlsx", sheet "Modelo Cp,t Ex ante", table "**Change in land use by strata (u,i) * ΔCpools,Def,u,i,t (tCO_2/ha)**".*

(In that table detailed information of Carbon Stock Changes by Carbon pools ($\Delta Cpools$) and Land Use changes (u) can be found).

These results can be applied for each of the years "t":

4°. The procedures defined in the VCS REDD-MF VM0007, Section 8 Quantification of GHG Emission Reductions and Removals, sub-section 8.2 Project emissions, sub-sub-section 8.2.2 REDD (Annex 9) are applied, which are based on the procedures defined in the VCS Module M-REDD VMD0015, section 5 Procedures: Calculation of ΔC_p: "Net greenhouse gas emissions within the project area under the project scenario" (Annex 11).

- Changes in Carbon Stocks due to deforestation of 15% ("% non-effectiveness") in the Project Area for the project scenario are calculated, using the Equation 3 of the VCS Module M-REDD VMD0015. These results are expressed per year (t=1 to t=30):

Equation 3 of VCS Module M-REDD VMD0015 $\Delta C_{P,DefPA,i,t}$ (Ex-ante)

$$\Delta C_{P,DefPA,i,t} = \Sigma_{u=1}^{U}(A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t})$$

Which can be expressed as follows:

Equation 3 of VCS Module M-REDD VMD0015 $\Delta C_{P,DefPA,i,t}$ (Ex-ante)

$$\Delta C_{P,DefPA,i,t} = A_{DefPA,i,t} * \Delta C_{pools,P,Def,i,t}$$

Where:

Acronym	Value	Unit	Description
$\Delta C_{P,DefPA,i,t}$	Table 76	t CO_2-e	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t
$A_{DefPA,i,t}$	Table 72	Ha	Area of recorded deforestation in the project area stratum was converted at time
$\Delta C_{pools,P,Def,i,t}$	Table 75	t CO_2-e ha^{-1}	Net carbon stock changes in all pools in the project case in stratum at time

Source: VCS VMD0015- Methods for monitoring of GHG emissions and removals (M-MON) Equation 3, page 8

Table 76. Net Carbon Stock changes by deforestation in the project case in the PA ($\Delta C_{P,DefPA,i,t}$)

	$\Delta C_{P,DefPA,i,t}$ by Forest strata i				Subtotal	ΔC_p
t	**Helobiome**	**Peinobiome**	**Litobiome**	**Zonobiome**	$\Delta C_{p,t}$	**Cummulative**
t = 1 : 2013	30,394	102	0	916,595	**947,090**	**947,090**
t = 2 : 2014	856,911	330	25	176	**857,443**	**1,804,534**
t = 3 : 2015	973,491	562	337	771	**975,161**	**2,779,695**
t = 4 : 2016	952,193	570	41	295	**953,098**	**3,732,793**
t = 5 : 2017	359,406	240,758	28	92	**600,284**	**4,333,077**
t = 6 : 2018	1,439	152,227	266,755	294,984	**715,406**	**5,048,483**
t = 7 : 2019	231	138	0	1,073,380	**1,073,749**	**6,122,231**
t = 8 : 2020	286	26	0	918,477	**918,790**	**7,041,021**
t = 9 : 2021	600	266	0	724,591	**725,457**	**7,766,478**
t = 10 : 2022	343	195	0	1,118,542	**1,119,079**	**8,885,558**
Subtotal year 1-10	**3,175,293**	**395,173**	**267,187**	**5,047,904**	**8,885,558**	
t = 11 : 2023	848,796	24	29	164,090	**1,012,938**	**9,898,496**
t = 12 : 2024	779,281	110	236	821	**780,448**	**10,678,944**
t = 13 : 2025	324,236	112,809	163	585	**437,793**	**11,116,736**
t = 14 : 2026	494	408,724	151	310	**409,679**	**11,526,416**
t = 15 : 2027	525	444,160	221,333	344	**666,362**	**12,192,777**
t = 16 : 2028	186	337	260,185	190	**260,899**	**12,453,676**
t = 17 : 2029	203	0	0	662	**865**	**12,454,542**
t = 18 : 2030	0	23	0	1,284	**1,307**	**12,455,849**
t = 19 : 2031	1,466	243,982	94,193	412,306	**751,948**	**13,207,797**
t = 20 : 2032	906,544	234	57,911	251	**964,939**	**14,172,736**
Subtotal year 10-20	**2,861,732**	**1,210,402**	**634,200**	**580,843**	**5,287,178**	
t = 21 : 2033	681,628	261	0	438	**682,327**	**14,855,063**
t = 22 : 2034	97,771	292	18	969,198	**1,067,279**	**15,922,343**
t = 23 : 2035	544	233,741	401	221,490	**456,177**	**16,378,520**
t = 24 : 2036	103	482,275	46,430	176	**528,984**	**16,907,503**
t = 25 : 2037	369,857	361	253,483	54	**623,755**	**17,531,258**
t = 26 : 2038	352,533	141	185	726,352	**1,079,211**	**18,610,468**
t = 27 : 2039	80	131	0	1,124,212	**1,124,422**	**19,734,891**
t = 28 : 2040	553	96	12	1,060,445	**1,061,106**	**20,795,997**
t = 29 : 2041	171	453	39	927,444	**928,108**	**21,724,104**
t = 30 : 2042	431	151,249	60	306	**152,047**	**21,876,151**
Subtotal year 20-30	**1,503,672**	**869,000**	**300,629**	**5,030,114**	**7,703,415**	
Total years 1-30	**7,540,697**	**2,474,575**	**1,202,016**	**10,658,862**	**21,876,151**	

Source: Annex 9 - VM0007, 8. Quantification of GHG Emission Reductions and Removals, 8.2 Project emissions, 8.2.2 REDD, in turn based on Annex 11 - VMD0015 M-REDD, 5. PROCEDURES, Calculation of ΔC_P: Net Greenhouse Gas Emissions within the Project Area under the Project Scenario (Ex ante estimation) (Equation 1 ΔC_{Pt}); file “VMD0015.xlsx”, sheet “Eq1 Cp PA Exante” (folder “calculation_tables”).

- In the case of REDD+ project RIU-SM, in the project scenario, changes in carbon due to degradation are not considered, taking into account the principle of conservatism in the estimates.
  - In this way $\Delta C_{P,Deg,i,t}$ = 0 (Equation 7 of the VCS Módule M-REDD VMD0015)

The same situation is happening with the natural alterations in Project Area and the growth of forests:

- In this way $\Delta C_{P,DistPA,i,t}$ = 0 (Equation 20 of the VCS Módule M-REDD VMD0015)
- In this way $\Delta C_{P,Enh,i,t}$ = 0 (Equation 25 of the VCS Módule M-REDD VMD0015)

It is considered that there are not significant greenhouse gases emissions different to CO_2.

- In this way $GHG_{P,E,i,t}$ = 0 (Equation 30 of the VCS Módule M-REDD VMD0015)

- Net greenhouse gas emissions within the project area under the project scenario are calculated, applying Equation 1 of VCS Module VMD0015. These results are expressed per year (t=1 to t=30):

Equation 1 of VCS Module M-REDD VMD0015 ΔC_P (Ex-ante)

$\Delta C_P = \Sigma_{t=1}^{t*} \Sigma_{i=1}^{M} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t})$

Which can be expressed as follows:

Equation 1 of VCS Module M-REDD VMD0015 ΔC_P (Ex-ante)

$\Delta C_P = \Sigma_{t=1}^{t*} \Sigma_{i=1}^{M} (\Delta C_{P,DefPA,i,t} + 0 + 0 + 0 - 0)$
$\Delta C_P = \Sigma_{t=1}^{t*} \Sigma_{i=1}^{M} \Delta C_{P,DefPA,i,t}$

Namely, they are the same values of the table 76, now in total

ΔC_P = 21,876,151 t CO_2e

This estimate of ΔCp is defined as "ex-ante" since it corresponds to calculations of greenhouse gases emissions in the Project Area in the case where the project is implemented, i.e., it is an estimation before project implementation.

3.3 Leakage emissions

$\Delta C_{LK-AS,unplanned} = \Delta C_{LK-ASU-LB} + \Delta C_{LK-ASU-OLB} + GHG_{LK,E}$

Source: VCS Module VMD0010 LK-ASU Estimation of emissions from activity shifting for avoiding unplanned deforestation, Equation 16 $\Delta C_{LK-AS,unplanned}$

Where:

Acronym	*Value*	*Unit*	*Description*
$\Delta C_{LK-AS,unplanned}$	Table 79	t CO_2e	Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation Net CO_2 emissions

Acronym	*Value*	*Unit*	*Description*
$\Delta C_{LK\text{-}ASU\text{-}OLB}$	Table 78	t CO_2e	Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt
$\Delta C_{LK\text{-}ASU\text{-}LB}$	Table 77	t CO_2e	Net CO_2 emissions due to unplanned deforestation displaced from the project area to the Leakage Belt
$GHG_{LK,E}$	0	t CO_2e	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities

Source: Annex 12 VMD0015, Equation 16

To obtain "*Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation Net CO_2 emissions ($\Delta C_{LK\text{-}AS,unplanned}$)*" following steps were filled:

1º Equation 1 of VCS Module VMD0010 LK-ASU was applied to calculate "*Net CO_2 emissions due to unplanned deforestation displaced from the project area to the Leakage Belt ($\Delta C_{LK\text{-}ASU\text{-}LB}$)*". In Folder "*calculation_tables*", file "*VMD0010.xlsx*", sheet "*S3 Exante Eq1 CLK-ASU,LB*" is the calculation of $\Delta C_{LK\text{-}ASU\text{-}LB}$.

$$\Delta C_{LK\text{-}ASU\text{-}LB} = \Delta C_{P,LB} - \Delta C_{BSL,LK,unplanned}$$

Where:

$\Delta C_{LK\text{-}ASU\text{-}LB}$	t CO_2-e	*Net CO_2 emissions due to unplanned deforestation displaced from the project area to the Leakage Belt*
$\Delta C_{P,LB}$	t CO_2-e	*Net greenhouse gas emissions within the leakage belt in the project case*
$\Delta C_{BSL,LK,unplanned}$	t CO_2-e	*Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt*

$\Delta C_{P,LB}$ is estimated adding to "*Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt ($\Delta C_{BSL,LK,unplanned,i,t}$)*" (table 71) a proportion of 6,45% of "*Net CO_2 emissions in the baseline from unplanned deforestation in the Project Area ($\Delta C_{BSL,PA,unplanned,i,t}$)*" (table 70).

$$\Delta C_{P,LB} = \Delta C_{BSL,LK,unplanned,i,t} + (\Delta C_{BSL,PA,unplanned,i,t} * 0.0645)$$

Following table shows the results of $\Delta C_{LK\text{-}ASU\text{-}LB}$:

Table 77. *Net CO_2 emissions due to unplanned deforestation displaced from the project area to the Leakage Belt ($\Delta C_{LK\text{-}ASU\text{-}LB}$)*

	i = 1 Helobioma	*i = 2 Peinobioma*	*i = 3 Litobioma*	*i = 4 Zonobioma*	$\Delta C_{LK\text{-}ASU\text{-}LB}$
t = 1 : 2013	*10,559*	*34*	*0*	*321,434*	***332,028***
t = 2 : 2014	*297,959*	*112*	*9*	*7,607*	***305,687***
t = 3 : 2015	*345,717*	*194*	*118*	*7,817*	***353,846***
t = 4 : 2016	*346,563*	*201*	*17*	*7,656*	***354,437***

	i = 1 Helobioma	i = 2 Peinobioma	i = 3 Litobioma	i = 4 Zonobioma	$\Delta C_{LK\text{-}ASU\text{-}LB}$
t = 5 : 2017	148,686	81,283	13	7,588	**237,570**
t = 6 : 2018	27,368	53,492	93,175	111,002	**285,037**
t = 7 : 2019	26,960	3,477	2,142	386,401	**418,980**
t = 8 : 2020	26,981	3,440	2,142	340,915	**373,479**
t = 9 : 2021	27,093	3,521	2,142	280,483	**313,239**
t = 10 : 2022	27,009	3,500	2,142	424,599	**457,250**
t = 11 : 2023	321,539	3,443	2,152	92,001	**419,134**
t = 12 : 2024	297,930	3,470	2,224	36,095	**339,719**
t = 13 : 2025	138,891	41,509	2,199	36,012	**218,611**
t = 14 : 2026	21,780	142,374	2,195	35,919	**202,269**
t = 15 : 2027	19,007	156,135	79,450	35,932	**290,524**
t = 16 : 2028	18,883	9,070	92,895	33,598	**154,445**
t = 17 : 2029	18,888	8,958	4,104	25,455	**57,405**
t = 18 : 2030	18,817	8,966	4,104	18,568	**50,455**
t = 19 : 2031	19,322	91,315	37,003	157,107	**304,747**
t = 20 : 2032	333,767	11,155	25,086	7,341	**377,348**
t = 21 : 2033	256,701	11,166	5,323	5,689	**278,879**
t = 22 : 2034	52,980	11,178	5,327	345,414	**414,898**
t = 23 : 2035	16,821	89,160	5,460	91,179	**202,619**
t = 24 : 2036	15,990	172,106	21,539	15,388	**225,022**
t = 25 : 2037	144,187	10,049	92,653	15,344	**262,233**
t = 26 : 2038	141,298	9,761	4,123	269,899	**425,081**
t = 27 : 2039	21,836	9,759	4,059	414,870	**450,524**
t = 28 : 2040	22,001	9,748	4,064	401,302	**437,115**
t = 29 : 2041	21,861	8,090	3,402	359,843	**393,197**
t = 30 : 2042	14,921	58,995	2,997	41,796	**118,709**

Source: REDD+ Project RIU-SM, Folder "calculation_tables", file "VMD0010.xlsx", sheet "S3 Exante Eq1 CLK-ASU,LB"

2º Equation 6 of VCS Module VMD0010 LK-ASU was applied to calculate "*Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt* ($\Delta C_{LK\text{-}ASU\text{-}OLB}$)". In Folder "*calculation_tables*", file "*VMD0010.xlsx*", sheet "*S4 Eq6 CLK-ASU,OLB*" is the calculation of $\Delta C_{LK\text{-}ASU\text{-}OLB}$.

$$\Delta C_{LK\text{-}ASU,OLB} = (\Delta C_{BSL,LK,unplanned} - \Delta C_{P,LB}) * LK_{PROP}$$

Where:

Acronym:	Unit:	Description:
$\Delta C_{LK\text{-}ASU,OLB}$	t CO_2-e	Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt
$\Delta C_{BSL,LK,unplanned}$	t CO_2-e	Net CO_2 equivalent emissions in the baseline from unplanned deforestation in the leakage belt
$\Delta C_{P,LB}$	t CO_2-e	Net CO_2 equivalent emissions within the leakage belt in the project case

LK_{PROP}	*proportion*	*Proportional leakage for areas with immigrating populations*

$\Delta C_{BSL,LK,unplanned,i,t}$ is from table 71.

$\Delta C_{P,LB}$ is estimated adding to "*Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt* ($\Delta C_{BSL,LK,unplanned,i,t}$)" (table 71) a proportion of 6,45% of "*Net CO_2 emissions in the baseline from unplanned deforestation in the Project Area* ($\Delta C_{BSL,PA,unplanned,i,t}$)" (table 70).

$$\Delta C_{P,LB} = \Delta C_{BSL,LK,unplanned,i,t} + (\Delta C_{BSL,PA,unplanned,i,t} * 0.0645)$$

LK_{PROP} : Proportional leakage for areas with immigrating populations according Equation 5 of VCS Module VMD0010:

$$LK_{PROP} = PROP_{IMM} * (1 - PROP_{LB}) * PROP_{CS}$$

Where:

Acronym:	*Value:*	*Description:*
LK_{PROP}	0,0979	*Proportional leakage for areas with immigrating populations*
$PROP_{IMM}$	0,0976	*Estimated proportion of baseline deforestation caused by immigrating population*
$PROP_{LB}$	0,0824	*Area of forest available in the Leakage Belt for unplanned deforestation as a proportion of the total national forest area available for unplanned deforestation*
$PROP_{CS}$	1,0930	*The proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside the Leakage Belt*

Source: REDD+ Project RIU-SM, Folder "calculation_tables", file "VMD0010.xlsx", sheet "S4 Eq5 LKPROP"

Table 78. Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt ($\Delta C_{LK\text{-}ASU,OLB}$) (taken as absolute values)

	i = 1 Helobioma	*i = 2 Peinobioma*	*i = 3 Litobioma*	*i = 4 Zonobioma*	$\Delta C_{LK\text{-}ASU\text{-}OLB}$
t = 1 : 2013	1,034	3	0	31,473	**32,510**
t = 2 : 2014	29,174	11	1	745	**29,931**
t = 3 : 2015	33,851	19	12	765	**34,646**
t = 4 : 2016	33,933	20	2	750	**34,704**
t = 5 : 2017	14,558	7,959	1	743	**23,261**
t = 6 : 2018	2,680	5,238	9,123	10,869	**27,909**
t = 7 : 2019	2,640	340	210	37,834	**41,024**
t = 8 : 2020	2,642	337	210	33,380	**36,569**
t = 9 : 2021	2,653	345	210	27,463	**30,670**
t = 10 : 2022	2,645	343	210	41,574	**44,771**
t = 11 : 2023	31,483	337	211	9,008	**41,039**
t = 12 : 2024	29,171	340	218	3,534	**33,263**
t = 13 : 2025	13,599	4,064	215	3,526	**21,405**
t = 14 : 2026	2,133	13,940	215	3,517	**19,805**
t = 15 : 2027	1,861	15,288	7,779	3,518	**28,446**
t = 16 : 2028	1,849	888	9,096	3,290	**15,122**

	i = 1 Helobioma	*i = 2 Peinobioma*	*i = 3 Litobioma*	*i = 4 Zonobioma*	$\Delta C_{LK\text{-}ASU\text{-}OLB}$
t = 17 : 2029	*1,849*	*877*	*402*	*2,492*	***5,621***
t = 18 : 2030	*1,842*	*878*	*402*	*1,818*	***4,940***
t = 19 : 2031	*1,892*	*8,941*	*3,623*	*15,383*	***29,839***
t = 20 : 2032	*32,680*	*1,092*	*2,456*	*719*	***36,948***
t = 21 : 2033	*25,135*	*1,093*	*521*	*557*	***27,306***
t = 22 : 2034	*5,187*	*1,094*	*522*	*33,821*	***40,624***
t = 23 : 2035	*1,647*	*8,730*	*535*	*8,928*	***19,839***
t = 24 : 2036	*1,566*	*16,852*	*2,109*	*1,507*	***22,033***
t = 25 : 2037	*14,118*	*984*	*9,072*	*1,502*	***25,676***
t = 26 : 2038	*13,835*	*956*	*404*	*26,427*	***41,621***
t = 27 : 2039	*2,138*	*956*	*397*	*40,622*	***44,113***
t = 28 : 2040	*2,154*	*954*	*398*	*39,293*	***42,800***
t = 29 : 2041	*2,141*	*792*	*333*	*35,234*	***38,499***
t = 30 : 2042	*1,461*	*5,776*	*293*	*4,092*	***11,623***

Now, equation 16 of VCS Module VMD0010 LK-ASU (presented above), is applied. Results are:

Table 79. Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation Net CO_2 emissions ($\Delta C_{LK\text{-}AS,unplanned}$)

	Forest strata				Subtotal	
t	**Helobiome**	**Peinobiome**	**Litobiome**	**Zonobiome**	$\Delta C_{LK\text{-}AS,unp}$	**Cummulative**
t = 1 : 2013	11,593	38	0	352,907	364,538	**364,538**
t = 2 : 2014	327,133	123	10	8,352	335,618	**700,156**
t = 3 : 2015	379,568	212	129	8,582	388,492	**1,088,648**
t = 4 : 2016	380,496	221	19	8,406	389,142	**1,477,790**
t = 5 : 2017	163,244	89,242	14	8,331	260,831	**1,738,621**
t = 6 : 2018	30,047	58,730	102,298	121,871	312,946	**2,051,567**
t = 7 : 2019	29,600	3,817	2,352	424,235	460,004	**2,511,571**
t = 8 : 2020	29,623	3,777	2,352	374,295	410,047	**2,921,618**
t = 9 : 2021	29,746	3,866	2,352	307,946	343,910	**3,265,528**
t = 10 : 2022	29,653	3,842	2,352	466,174	502,021	**3,767,549**
Subtotal year 1-10	**1,410,703**	**163,870**	**111,878**	**2,081,098**	**3,767,549**	
t = 11 : 2023	353,022	3,780	2,363	101,009	460,173	**4,227,722**
t = 12 : 2024	327,102	3,810	2,442	39,629	372,982	**4,600,705**
t = 13 : 2025	152,491	45,574	2,414	39,538	240,017	**4,840,721**
t = 14 : 2026	23,913	156,315	2,410	39,436	222,073	**5,062,794**
t = 15 : 2027	20,868	171,422	87,229	39,450	318,970	**5,381,765**
t = 16 : 2028	20,732	9,958	101,990	36,887	169,568	**5,551,332**
t = 17 : 2029	20,738	9,836	4,505	27,947	63,026	**5,614,358**
t = 18 : 2030	20,660	9,844	4,505	20,386	55,395	**5,669,753**
t = 19 : 2031	21,214	100,256	40,626	172,490	334,586	**6,004,339**
t = 20 : 2032	366,447	12,247	27,542	8,060	414,296	**6,418,635**
Subtotal year 10-20	**1,327,186**	**523,042**	**276,028**	**524,832**	**2,651,086**	
t = 21 : 2033	281,835	12,259	5,844	6,246	306,185	**6,724,820**
t = 22 : 2034	58,167	12,272	5,849	379,235	455,523	**7,180,343**
t = 23 : 2035	18,468	97,890	5,995	100,106	222,458	**7,402,801**
t = 24 : 2036	17,555	188,957	23,648	16,895	247,055	**7,649,857**
t = 25 : 2037	158,305	11,032	101,725	16,847	287,909	**7,937,766**

	Forest strata				Subtotal	
t	Helobiome	Peinobiome	Litobiome	Zonobiome	$\Delta C_{LK\text{-}AS,unp}$	Cummulative
t = 26 : 2038	155,133	10,717	4,526	296,326	466,703	**8,404,469**
t = 27 : 2039	23,974	10,714	4,457	455,491	494,637	**8,899,106**
t = 28 : 2040	24,155	10,702	4,462	440,595	479,914	**9,379,020**
t = 29 : 2041	24,002	8,883	3,735	395,077	431,696	**9,810,716**
t = 30 : 2042	16,382	64,771	3,291	45,888	130,333	**9,941,049**
Subtotal year 20-30	**777,977**	**428,199**	**163,531**	**2,152,707**	**3,522,414**	
Total years 1-30	**3,515,866**	**1,115,110**	**551,436**	**4,758,637**	**9,941,049**	

Source: Annex 9 - VM0007, 8. Quantification of GHG Emission Reductions and Removals, 8.3 Leakage, in turn based on Annex 12 - VMD0010, 5. PROCEDURES, 5.7 Step 7: Estimation of total leakage due to the displacement of unplanned deforestation (Equation 16 Exante $\Delta C_{LK\text{-}AS,unplanned}$); file "VMD0010.xlsx", sheet "S7 Eq16 CLK-AS,unp Exante" (folder "calculation_tables")

9,941,049 tons of CO_2 of total leakage due to the displacement of unplanned deforestation (Equation. 16 Exante $\Delta C_{LK\text{-}AS,unplanned}$) are estimated under the project scenario.

3.4 Estimated GHG emission reductions and removals

For this estimattion, the presented methods in Annex 9 - VM0007, 8.4 Summary of GHG emission reduction and/or removals, 8.4.2 REDD was used (Equation 1 results equivalent to Equation 2 results NER_{REDD}).

Equation 1 VCS VM0007 REDD-MF

$$NER_{REDD+} = NER_{REDD} + NGR_{ARR} + NER_{WRC}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 1 NER_{REDD+}

Where:

Acronym	*Value*	*Unit*	*Description*
NER_{REDD+}	Table 80	t CO_2-e	*Total net GHG emission reductions of the REDD+ project activity up to year t**
NER_{REDD}	Table 80	t CO_2-e	*Total net GHG emission reductions of the REDD project activity up to year t**
NGR_{ARR}	*0*	t CO_2-e	*Total net GHG removals of the ARR project activity up to year t**
NER_{WRC}	*0*	t CO_2-e	*Total net GHG emission reductions of the WRC project activity up to year t**

Source: Annex 9 VM0007, Equation 1

Equation 1 VCS VM0007 REDD-MF is equivalent to:

$$NER_{REDD+} = NER_{REDD}$$

Equation 2 VCS VM0007 REDD-MF

$$NER_{REDD} = \Delta C_{BSL\text{-}REDD} - \Delta C_{WPS\text{-}REDD} - \Delta C_{LK\text{-}REDD}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 2 NER_{REDD}

Where:

Acronym	Value	Unit	Description
NER_{REDD}	Table 80	$t\ CO_2\text{-}e$	Total net GHG emission reductions of the REDD project activity up to year t*
$\Delta C_{BSL\text{-}REDD}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions in the REDD baseline scenario up to year t*
$\Delta C_{WPS\text{-}REDD}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions in the REDD project scenario up to year t*
$\Delta C_{LK\text{-}REDD}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions due to leakage from the REDD project activity up to year t*

Source: Annex 9 VM0007- Equation 2

Equation 3 VCS VM0007 REDD-MF

$$\Delta C_{BSL\text{-}REDD} = \Delta C_{BSL,planned} + \Delta C_{BSL,unplanned} + \Delta C_{BSL,degrad\text{-}FW/C}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 3 $\Delta C_{BSL\text{-}REDD}$

Where:

Acronym	Value	Unit	Description
$\Delta C_{BSL\text{-}REDD}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions under the REDD baseline scenario up to year t*
$\Delta C_{BSL,planned}$	0	$t\ CO_2\text{-}e$	Net GHG emissions in the baseline scenario from planned deforestation up to year t*
$\Delta C_{BSL,unplanned}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions in the baseline scenario from unplanned deforestation up to year t
$\Delta C_{BSL,degrad\text{-}FW/C}$	0	$t\ CO_2\text{-}e$	Net GHG emissions in the baseline scenario from degradation caused by fuelwood collection and charcoal making up to year t*

Source: Annex 9 VM0007- Equation 3

Equation 4 VCS VM0007 REDD-MF

$$\Delta C_{LK\text{-}REDD} = \Delta C_{LK\text{-}AS,planned} + \Delta C_{LK\text{-}AS,unplanned} + \Delta C_{LK\text{-}AS,degrad\text{-}FW/C} + \Delta C_{LK\text{-}ME}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 4 $\Delta C_{LK\text{-}REDD}$

Where:

Acronym	Value	Unit	Description
$\Delta C_{LK\text{-}REDD}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions due to leakage from the REDD project activity up to year t*
$\Delta C_{LK\text{-}AS\ planned}$	0	$t\ CO_2\text{-}e$	Net GHG emissions due to activity shifting leakage for projects preventing planned deforestation up to year t*
$\Delta C_{LK\text{-}AS\ unplanned}$	Table 80	$t\ CO_2\text{-}e$	Net GHG emissions due to activity shifting leakage for projects preventing unplanned deforestation up to year t*
$\Delta C_{LK\text{-}AS,degrad\text{-}FW/C}$	0	$t\ CO_2\text{-}e$	Net GHG emissions due to activity shifting leakage for degradation caused by extraction of wood for fuel up to year t*

Acronym	Value	Unit	Description
ΔC_{LK-ME}	0	t CO_2-e	Net GHG emissions due to market-effects leakage up to year t*

Source: Annex 9 VM0007- Equation 4

Table 80. Total net GHG emission reductions of the REDD project activity up to year t* (NER_{REDD+})

	*Total net GHG emission reductions of the REDD project activity up to year t**	*Net GHG emissions in the REDD baseline scenario up to year t**	*Net GHG emissions in the REDD project scenario up to year t**	*Net GHG emissions due to leakage from the REDD project activity up to year t**
t	NER_{REDD+}	$\Delta C_{BSL-REDD}$	$\Delta C_{WPS-REDD}$	$\Delta C_{LK-REDD}$
t = 1 : 2013	3,840,053	5,151,681	947,090	364,538
t = 2 : 2014	3,549,920	4,742,981	857,443	335,618
t = 3 : 2015	4,126,550	5,490,203	975,161	388,492
t = 4 : 2016	4,157,144	5,499,384	953,098	389,142
t = 5 : 2017	2,824,977	3,686,093	600,284	260,831
t = 6 : 2018	3,394,234	4,422,586	715,406	312,946
t = 7 : 2019	4,967,059	6,500,811	1,073,749	460,004
t = 8 : 2020	4,465,986	5,794,823	918,790	410,047
t = 9 : 2021	3,790,794	4,860,161	725,457	343,910
t = 10 : 2022	5,473,502	7,094,602	1,119,079	502,021
Subtotal year 1-10	**40,590,219**	**53,243,326**	**8,885,558**	**3,767,549**
t = 11 : 2023	5,030,098	6,503,210	1,012,938	460,173
t = 12 : 2024	4,117,587	5,271,017	780,448	372,982
t = 13 : 2025	2,714,125	3,391,935	437,793	240,017
t = 14 : 2026	2,506,608	3,138,361	409,679	222,073
t = 15 : 2027	3,522,386	4,507,718	666,362	318,970
t = 16 : 2028	1,965,876	2,396,343	260,899	169,568
t = 17 : 2029	826,797	890,689	865	63,026
t = 18 : 2030	726,143	782,845	1,307	55,395
t = 19 : 2031	3,641,866	4,728,400	751,948	334,586
t = 20 : 2032	4,475,631	5,854,866	964,939	414,296
Subtotal year 10-20	**29,527,118**	**37,465,383**	**5,287,178**	**2,651,086**
t = 21 : 2033	3,338,518	4,327,030	682,327	306,185
t = 22 : 2034	4,914,685	6,437,487	1,067,279	455,523
t = 23 : 2035	2,465,166	3,143,802	456,177	222,458
t = 24 : 2036	2,715,367	3,491,406	528,984	247,055
t = 25 : 2037	3,157,097	4,068,761	623,755	287,909
t = 26 : 2038	5,049,569	6,595,483	1,079,211	466,703
t = 27 : 2039	5,371,191	6,990,250	1,124,422	494,637
t = 28 : 2040	5,241,170	6,782,190	1,061,106	479,914
t = 29 : 2041	4,740,967	6,100,771	928,108	431,696
t = 30 : 2042	1,559,494	1,841,874	152,047	130,333
Subtotal year 20-30	**38,553,224**	**49,779,053**	**7,703,415**	**3,522,414**
Total years 1-30	**108,670,562**	**140,487,762**	**21,876,151**	**9,941,049**

Source: Annex 9 - VM0007, 8.4 Summary of GHG emission reduction and/or removals, 8.4.2 REDD (Equation 1 results equivalent to Equation 2 results ***NER_{REDD}****) ; file "VM0007.xlsx", sheet "Eq2 NER REDD" (folder "calculation_tables")*

Thus we have **108,670,562 tons of CO2** total net GHG emission reductions of the REDD project activity.

3.5 Uncertainty analysis

Project use module X-UNC (Annex 16) to combine uncertainty information and conservative estimates and produce an overall uncertainty estimate of the total net GHG emission reductions. The estimated cumulative net anthropogenic GHG emission reductions must be adjusted at each point in time to account for uncertainty as indicated in module X-UNC *(The allowable uncertainty under this methodology is +/- 15% of NER_{REDD+} at the 95% confidence level. Where this precision level is met then no deduction should result for uncertainty. Where uncertainty exceeds 15% of NER_{REDD+} at the 95% confidence level then the deduction must be equal to the amount that the uncertainty exceeds the allowable level)*. X-UNC calculates an adjusted value for NERREDD+ for any point in time. This adjusted $Adjusted\_NER_{REDD+}$ must be the basis of calculations at each point in time in equation 13. (Annex 16 X-UNC - VMD0017).

$$Uncertainty_{REDD\_BSL,t*} = \sqrt{[Uncertainty_{BSL,RATE,t*}^2 + Uncertainty_{REDD\_BSL,SS}^2]}$$

Source: VCS (2015) VMD0017 Estimation of uncertainty for REDD+ project activities (X-UNC), Equation 6 $Uncertainty_{REDD\_BSL,t}$

$$Uncertainty_{REDD\_BSL,t*} = 8,36\%$$

Source: folder "calculation_tables" file "VMD0017.xlsx", Sheet "RIU-SM soils"

As the uncertainty does not exceed 15% of NER_{REDD+} at the 95% confidence level, then no deduction should result for uncertainty.

$$Adjusted\_C_{REDD,t} = NER_{REDD+,t}$$

Source: Annex 16, based don Equation 16; folder "calculation_tables" file "VMD0017.xlsx", Sheet "Eq16 Adjusted-CREDD,t"

3.6 Calculation of VCS buffer

Equation 7 VCS VM0007 REDD-MF

$$Buffer_{TOTAL} = Buffer_{Planned} + Buffer_{Unplanned} + Buffer_{Degrad-FW/C} + Buffer_{WRC} + Buffer_{ARR}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 7 $Buffer_{TOTAL}$

Where:

Acronym	*Value*	*Unit*	*Description*
$Buffer_{TOTAL}$	*Table 81*	*t CO_2-e*	*Total permanence risk buffer withholding*
$Buffer_{Planned}$	*0*	*t CO_2-e*	*Buffer withholding for avoiding planned deforestation project activities*
$Buffer_{Unplanned}$	*Table 81*	*t CO_2-e*	*Buffer withholding for avoiding unplanned deforestation project activities*
$Buffer_{Degrad-FW/C}$	*0*	*t CO_2-e*	*Buffer withholding for avoiding degradation through extraction of fuelwood project areas*
$Buffer_{WRC}$	*0*	*t CO_2-e*	*Buffer withholding for ARR project activities*

Acronym	Value	Unit	Description
$Buffer_{ARR}$	0	t CO_2-e	Buffer withholding for WRC project activities

Source: Annex 9 VM0007- Equation 7

Equation 9 VCS VM0007 REDD-MF

$$Buffer_{Unplanned} = \left\{ \begin{array}{l} (\Delta C_{BSL,unplanned} - \underbrace{\Sigma_{t=1}^{t^*} \Sigma_{i=1}^{M}}_{Baseline\ \ Unplanned} (E_{FC,i,t} + N_2O_{direct,i,t})) - \\ (\Delta C_{P,Unplanned} - \underbrace{\Sigma_{t=1}^{t^*} \Sigma_{i=1}^{M}}_{Project\ \ Unplanned} (E_{FC,i,t} + N_2O_{direct,i,t})) \end{array} \right\} *Buffer\%$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 9 $Buffer_{Unplanned}$

Where:

Acronym	Value	Unit	Description	Source
$Buffer_{Unplanned}$	Table 81	t CO_2-e	Buffer withholding for avoiding unplanned deforestation project activities	VM0007 Eq. 9
$\Delta C_{BSL,unplanned}$	Table 81	t CO_2-e	Net GHG emissions in the baseline from unplanned deforestation	Table 70; VMD0007 Eq. 24
$E_{FC,i,t}$	0	t CO_2-e	Emission from fossil fuel combustion in stratum i in year t	---
$N_2O_{direct,i,t}$	0	t CO_2-e	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum i in year t	---
ΔC_P	Table 81	t CO_2-e	Net GHG emissions within the project area under the project scenario (The project emissions must be divided between the emissions arising from the respective project areas for planned and unplanned deforestation and degradation through fuelwood extraction/charcoal production.)	Table 76; VMD0015 ΔC_p Ex ante estimation
Buffer%	17%	t CO_2-e	Buffer withholding percentage (Buffer withholding percentages are based on the project's overall risk classification, the percentage of carbon credits generated by the approved project activity that must be deposited into the AFOLU pooled buffer account to cover non-permanence related project risks. Buffer withholding percentage must be calculated using T-BAR. Different percentages will likely be calculated for each of the baseline types as relevant.)	Risk Report Calculation Tool
i	1, 2, 3, 4	dimensionless	1, 2, 3, …M (4) strata	VMD0016
t	1, 2, …, 30	year	1, 2, 3, … t* (30) years elapsed since the start of the REDD VCS project activity	Proponent

Source: Annex 9 VM0007- Equation 9

Table 81. Buffer withholding for avoiding unplanned deforestation project activities

t	$Buffer_{Unplaneed}$	$\Delta C_{BSL,unplanned}$	ΔC_P
t = 1 : 2013	714,780	5,151,681	947,090
t = 2 : 2014	660,541	4,742,981	857,443
t = 3 : 2015	767,557	5,490,203	975,161
t = 4 : 2016	772,869	5,499,384	953,098
t = 5 : 2017	524,587	3,686,093	600,284
t = 6 : 2018	630,221	4,422,586	715,406
t = 7 : 2019	922,601	6,500,811	1,073,749
t = 8 : 2020	828,926	5,794,823	918,790
t = 9 : 2021	702,900	4,860,161	725,457
t = 10 : 2022	1,015,839	7,094,602	1,119,079
t = 11 : 2023	933,346	6,503,210	1,012,938
t = 12 : 2024	763,397	5,271,017	780,448
t = 13 : 2025	502,204	3,391,935	437,793
t = 14 : 2026	463,876	3,138,361	409,679
t = 15 : 2027	653,031	4,507,718	666,362
t = 16 : 2028	363,025	2,396,343	260,899
t = 17 : 2029	151,270	890,689	865
t = 18 : 2030	132,861	782,845	1,307
t = 19 : 2031	675,997	4,728,400	751,948
t = 20 : 2032	831,288	5,854,866	964,939
t = 21 : 2033	619,599	4,327,030	682,327
t = 22 : 2034	912,935	6,437,487	1,067,279
t = 23 : 2035	456,896	3,143,802	456,177
t = 24 : 2036	503,612	3,491,406	528,984
t = 25 : 2037	585,651	4,068,761	623,755
t = 26 : 2038	937,766	6,595,483	1,079,211
t = 27 : 2039	997,191	6,990,250	1,124,422
t = 28 : 2040	972,584	6,782,190	1,061,106
t = 29 : 2041	879,353	6,100,771	928,108
t = 30 : 2042	287,271	1,841,874	152,047
TOTAL	**20,163,974**	**140,487,762**	**21,876,151**

Source: Annex 9 VM0007, Equation 9; folder "calculation_tables" file "VM0007.xlsx", Sheet "Eq9 Buffer unplan"

3.7 Calculation of Verified Carbon Units

Equation 13 VCS VM0007 REDD-MF

$$VCU_t = (Adjusted\_NER_{REDD+,t2} - Adjusted\_NER_{REDD+,t1}) - Buffer_{TOTAL}$$

Source: VCS (2015) VM0007 REDD+ Methodology Framework (REDD-MF), Equation 13 VCU_t

Where:

Acronym	*Value*	*Unit*	*Description*	*Source*
VCU_t	*Table 82*	*t CO_2-e*	*Number of Verified Carbon Units at time t = t2 - t1*	*VM0007 Eq. 13*
$Adjusted\_NER_{REDD,t2}$	*Table 82*	*t CO_2-e*	*Total net GHG emission reductions of the REDD+ project activity up to year t_2 adjusted to account for uncertainty (t CO_2e)*	*Table 80; VMD0017 Eq. 16*
$Adjusted\_NER_{REDD,t1}$	*Table 82*	*t CO_2-e*	*Total net GHG emission reductions of the REDD+ project activity up to year t_1 adjusted to account for uncertainty (t CO_2e)*	*Table 80; VMD0017 Eq. 16*
$Buffer_{TOTAL}$	*Table 82*	*t CO_2-e*	*Total permanence risk buffer withholding*	*Table 81; VM0007 Eq. 7*
t	*1, 2, …, 30*	*year*	*1, 2, 3, …t* time elapsed since the start of the REDD+ project activity*	*Proponent*

Source: Annex 9 VM0007- Equation 13

To achieve more conservative VCUs estimates, a discount for each year corresponding to "% efficiency" indicated in Table 82 is applied.

Table 82. Number of Verified Carbon Units at time t = t2 - t1

t	$Adjusted\_NER_{REDD,t}$	$Buffer_{TOTAL} = Buffer_{Unplaneed}$	% efficiency	VCU_t
t = 1 : 2013	3,840,053	714,780	10%	2,812,745
t = 2 : 2014	3,549,920	660,541	10%	2,600,441
t = 3 : 2015	4,126,550	767,557	8%	3,090,273
t = 4 : 2016	4,157,144	772,869	8%	3,113,533
t = 5 : 2017	2,824,977	524,587	5%	2,185,370
t = 6 : 2018	3,394,234	630,221	5%	2,625,812
t = 7 : 2019	4,967,059	922,601	5%	3,842,235
t = 8 : 2020	4,465,986	828,926	5%	3,455,208
t = 9 : 2021	3,790,794	702,900	5%	2,933,500
t = 10 : 2022	5,473,502	1,015,839	5%	4,234,780
t = 11 : 2023	5,030,098	933,346	5%	3,891,914
t = 12 : 2024	4,117,587	763,397	5%	3,186,481
t = 13 : 2025	2,714,125	502,204	5%	2,101,325
t = 14 : 2026	2,506,608	463,876	5%	1,940,595
t = 15 : 2027	3,522,386	653,031	5%	2,725,887
t = 16 : 2028	1,965,876	363,025	5%	1,522,708
t = 17 : 2029	826,797	151,270	5%	641,751
t = 18 : 2030	726,143	132,861	5%	563,617
t = 19 : 2031	3,641,866	675,997	5%	2,817,576
t = 20 : 2032	4,475,631	831,288	5%	3,462,126
t = 21 : 2033	3,338,518	619,599	5%	2,582,973
t = 22 : 2034	4,914,685	912,935	5%	3,801,662

t	$Adjusted\_NER_{REDD,t}$	$Buffer_{TOTAL} = Buffer_{Unplaneed}$	% efficiency	VCU_t
t = 23 : 2035	2,465,166	456,896	5%	1,907,857
t = 24 : 2036	2,715,367	503,612	5%	2,101,168
t = 25 : 2037	3,157,097	585,651	5%	2,442,873
t = 26 : 2038	5,049,569	937,766	5%	3,906,213
t = 27 : 2039	5,371,191	997,191	5%	4,155,300
t = 28 : 2040	5,241,170	972,584	5%	4,055,156
t = 29 : 2041	4,740,967	879,353	5%	3,668,534
t = 30 : 2042	1,559,494	287,271	5%	1,208,612
Total	**108,670,562**	**20,163,974**		**83,578,228**
Average/annual	**3,622,352**	**672,132**		**2,785,941**

Source: Annex 9 VM0007, Equation 13; folder "calculation_tables" file "VM0007.xlsx", Sheet "Eq13 VCUt"

This estimate shows, therefore, a total of 83,578,228 VCUs, with an annual average of 2,785,941 VCUs. For the first 10 years has an estimated average annual net 3,089,390 VCUs.

4 MONITORING

4.1 Data and Parameters Available at Validation

Table 83 Data and parameters available at validation

VM0007: METHODOLOGY FRAMEWORK (REDD-MF)

Data / Parameter	$\Delta C_{BSL,unplanned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions in the baseline from unplanned deforestation
Equations	3
Source of data	Module BL-UP
Value applied	Values applied: See Annex 9, Table 10. Net GHG emissions under the REDD baseline scenario up to year t*
Justification of choice of data or description of measurement methods and procedures applied	See module BL-UP
Purpose of Data	Calculation of baseline emissions
Comments	Without comment

VMD0001: Estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools (CP-AB)

Data / Parameter	CF
Data unit	t C t d.m.$^{-1}$
Description	Carbon fraction of dry matter
Equations	1, 3, 10, 11
Source of data	Values from the literature: *IPCC 2006, Volume 4 - AFOLU, Chapter 4 – Forest Land, Table 4.3 Carbon Fraction fo aboveground forest biomass (p. 4.48)*
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	The default value is 0.47 tonne of C per tonne of biomass (dry weight). This default value is more realistic for herbaceous biomass *(IPCC 2006, Volume 4 - AFOLU, page 6.9)*.
Purpose of Data	Transform biomass to carbon
Comments	Without comment

Data / Parameter	***R***
Data unit	t root d.m. t^{-1} shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area:aboveground biomass per unit area (not on a per stem basis)
Equations	5, Equation to calculate
Source of data	• Yepes A.P., Navarrete D.A., Duque A.J., Phillips J.F., Cabrera K.R., Álvarez, E., García, M.C., Ordoñez, M.F. 2011. Protocolo para la estimación nacional y subnacional de biomasa - carbono en Colombia. Instituto de Hidrología, Meteorología, y Estudios Ambientales-IDEAM-. Bogotá D.C., Colombia. 162 p. tabla 14, p. 86 • IPCC 2006, Chapter 4, page 4.49, Table 4.4 "Tropical moist deciduous forest / above-ground biomass >125 tonnes ha-1"
Value applied	R=0,24
Justification of choice of data or description of measurement methods and procedures applied	This is a recommended indirect method for estimating carbon in roots biomass, it is the result of review of more than 160 researchs in bosques nativos tropicales, templados y boreales (*Cairns et al, 1997)* in Yepes et al, 2011.
Purpose of Data	Estimating carbon in roots biomass according to aboveground biomass
Comments	Guidelines for Conservative Choice of Default Values: 2. Global value is selected from Table 4.4 of the AFOLU Guidelines (IPCC 2006), by choosing a climatic zone and forest type that most closely matches the project circumstances.

VMD0004: Estimation of stocks in the soil organic carbon pool (CP-S)

Data / Parameter	Dep_{sample}
Data unit	cm
Used in equations:	1
Description	Depth in cm to which soil sample is collected
Source of data	(Yepes, et al., 2011), page 93.
Measurement procedures (if any):	(Yepes, et al., 2011), section "*1.1.1 Muestreo en campo*", page 92.
Any comment:	Without comment

Data / Parameter	F_{LU}
Data unit	Dimensionless
Used in equations:	3
Description	Land use factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Measurement procedures (if any):	It was used according to source of data.
Any comment:	Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock.

	Stock Change Factors must be selected to reflect the circumstances most closely matching those of the project area and baseline scenario, especially regarding climate and post-conversion land-use, taking into account management practices and carbon inputs.

Data / Parameter	F_{MG}
Data unit	Dimensionless
Used in equations:	3
Description	Management factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Measurement procedures (if any):	I was used according to source of data.
Any comment:	Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock. Stock Change Factors must be selected to reflect the circumstances most closely matching those of the project area and baseline scenario, especially regarding climate and post-conversion land-use, taking into account management practices and carbon inputs.

Data / Parameter	F_I
Data unit	Dimensionless
Used in equations:	3
Description	Input factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Measurement procedures (if any):	I was used according to source of data.
Any comment:	Stock Change Factors as defined in IPCC 2006GL are equal to the carbon stock in the altered condition as a proportion of the reference carbon stock. Stock Change Factors must be selected to reflect the circumstances most closely matching those of the project area and baseline scenario, especially regarding climate and post-conversion land-use, taking into account management practices and carbon inputs.

VMD0007: Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP)

Data / Parameter	$A_{RRD, unplanned, hrp}$
Data unit	ha
Used in equations	3
Description	Total deforested area during the historical reference period (2001 a 2011) in the RRD
Module parameter originales in:	Value taken from the satellite images
Any comments	The Landsat images have the adequate resolution and they are a free and available tool to all public.

Data / Parameter:	$C_{AB\_tree,i}$
Data unit	t CO_2-e ha^{-1}
Used in equations	12, 13
Description	Carbon stock in aboveground biomass in trees in stratum i
Module parameter originales in:	CP-AB
Any comments	Whitout comment

Data / Parameter:	$C_{BB\_tree,i}$
Data unit	t CO_2-e ha^{-1}
Used in equations	12, 13
Description	Carbon stock in belowground biomass in trees in stratum i
Module parameter originales in:	CP-AB
Any comments	Whitout comment

Data / Parameter:	$C_{SOC,i}$
Data unit	t CO_2-e ha^{-1}
Used in equations	12
Description	Carbon stock in soil organic carbon in the baseline in stratum i
Module parameter originales in:	CP-S
Any comments	Whitout comment

Data / Parameter:	$C_{SOC,PD\text{-}BSL,i}$
Data unit	t CO_2-e ha^{-1}
Used in equations	13
Description	Mean post-deforestation stock in soil organic carbon in the post deforestation stratum i
Module parameter originales in:	CP-S
Any comments	Whitout comment

VMD0010: Estimation of emissions from activity shifting for avoided unplanned deforestation (LK-ASU)

Data / Parameter	$\Delta C_{BSL,LK,unplanned}$
Data unit	t CO_2e
Description	Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt
Ecuations	1, 6
Source of data	Module *BL-UP*
Value applied	Module *BL-UP "Annex 10 VMD0007 table 47"*

Justification of choice of data or description of measurement methods and procedures applied	See module BL-UP
Purpose of Data	Calculation of leakage emissions
Comments	Without Comment

Data / Parameter	C_{LB}
Data unit	t CO_2-e ha^{-1}
Description	Area weighted average aboveground tree carbon stock for forests available for unplanned deforestation inside the Leakage Belt
Ecuations	4
Source of data	field calculated: file: plot _study _fustales.xlsm, sheet "calculo Yst var Lk
Value applied	443.8 t CO2-e/ha
Justification of choice of data or description of measurement methods and procedures applied	Calculate from field measurements using Module CP-AB. As forests in the leakage belt are deforested, the area weighted average will be recalculated at each monitoring period.
Purpose of Data	Calculation of leakage emissions
Comments	Without Comment

Data / Parameter	C_{OLB}
Data unit	t CO_2-e ha^{-1}
Description	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation outside the Leakage Belt
Ecuations	4
Source of data	Literature: Average carbon dioxide –e- (tco2-e/ha) Philips J.F (2011) IDEAM estimaciones de carbon en Colombia Tabla 3.1 C B-ht:132.1 tC/ha
Value applied	484.37
Justification of choice of data or description of measurement methods and procedures applied	2. Use numbers derived from peer-reviewed literature that are nationally or at least regionally appropriate The available national forest area and *MANFOR* and *PROTFOR* will change over time. The area-weighted average will be recalculated at least every 5 years.
Purpose of Data	Calculation of leakage emissions
Comments	Without Comment

Data / Parameter	$A_{BSL,PA\text{-}unplanned,t}$
Data unit	ha
Description	Projected area of unplanned baseline deforestation in the project area at time t
Ecuations	7
Source of data	Module BL-UP
Value applied	Calculated value. Annex 10 Table 25
Justification of choice of data or description of measurement methods and procedures applied	See Module BL-UP
Purpose of Data	Calculation of leakage emissions
Comments	Without Comment

VMD0015: Methods for monitoring of GHG emissions and removals (M-MON)

Data / Parameter	***Regional Forest / Non-forest Cover Benchmark Map***
Data unit	ha
Description	Map showing the stratification and location of forest and non-forest areas in the Reference Region RRD at the beginning of the accreditation (*Map of spatial limits RRD 2011 – REDD+ project RIU-SM*)
Source of data	Landsat satellite images.
Justification of choice of data or description of measurement methods and procedures applied	"Landsat" images have adequate spatial resolution corresponding to 30 meters and an approximate scale of 1:70000, is a tool available to the public.
Any comments	Without Comment
Used in equations	3

Data / Parameter	***Project Forest Cover Benchmark Map***
Data unit	ha
Description	Map showing the stratification and location of forest areas in the Project area at the beginning of the accreditation (100% forested). (*Map of spatial limit PA 2011 – REDD+ project RIU-SM*)
Source of data	Landsat satellite images
Justification of choice of data or description of measurement	"Landsat" images have adequate spatial resolution corresponding to 30 meters and an approximate scale of 1:70000, is a tool available to the public.

methods and procedures applied	
Any comments	Without Comment
Used in equations	3, 8

Data / Parameter	***Leakage Belt Forest Cover Benchmark Map***
Data unit	ha
Description	Map that shows the stratification and location of forest in the Leakage belt at the beginning of the accreditation (100% forested). (*Map of spatial limit CF 2011 – REDD+ project RIU-SM*)
Source of data	Landsat satellite images.
Justification of choice of data or description of measurement methods and procedures applied	"Landsat" images have adequate spatial resolution corresponding to 30 meters and an approximate scale of 1:70000, is a tool available to the public.
Any comments	Without Comment
Used in equations	3

Data / Parameter	A_i
Data unit	ha
Description	Total area of each stratum *i*. (*Table spatial boundaries, similarity VMD0016.xlsx*)
Source of data	Landsat satellite images.
Justification of choice of data or description of measurement methods and procedures applied	Every time prior to baseline renewal (at a minimum every ten years)
Any comments	Ex-ante because it is assumed that strata area will remain constant.
Used in equations	19

Data / Parameter	$A_{RRD, unplanned, hrp}$
Data unit	ha
Description	Total deforested area during the term of reference (until 2011) in the RRD. (*deforestation for hrp -2001 to 2011- in RRD*)
Source of data	Value taken from the Landsat satellite images, used by the Deforestation Model
Justification of choice of data or description	"Landsat" images have adequate spatial resolution corresponding to 30 meters and an approximate scale of 1:70000, is a tool available to the public.

of measurement methods and procedures applied	
Any comments	Monitored for purpose of baseline revisions.
Used in equations	This parameter is not associated with any VCS equation; see Annex 10 section 2.1.3

Data / Parameter	***CF***
Data unit	t C t d.m.$^{-1}$
Description	Carbon fraction of dry matter
Source of data	Values from the literature: *IPCC 2006, Volume 4 - AFOLU, Chapter 4 – Forest Land, Table 4.3 Carbon Fraction fo aboveground forest biomass (p. 4.48)*
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	The default value is 0.47 tonne of C per tonne of biomass (dry weight). This default value is more realistic for herbaceous biomass *(IPCC 2006, Volume 4 - AFOLU, page 6.9)*.
Purpose of Data	Transform biomass to carbon
Comments	Without comment
Equations	19

Data / Parameter	***fj(X,Y)***
Data unit	t d.m. tree^{-1}
Description	Allometric equation for species j linking measured tree variable(s) to aboveground biomass of living trees, expressed as t d.m. tree^{-1}
Source of data	Protocol for the national and subnational estimates of biomass - carbon Colombia - IDEAM, 2011 (Yepes, et al., 2011), Equation 12.
Justification of choice of data or description of measurement methods and procedures applied	Equation with sufficient validation, R2 = 0.932, with national coverage data for the type of tropical rainforest.
Any Comments	It will be valued by the method “Limited Measurements”. Are selected trees at least 30 species of flora composition in the Project Area, with a minimum of 20 cm in diameter and a maximum diameter that represents the greatest present or potentially present trees in the future in the Project Area in the Leakage belt. • Measure DBH, and height to a 10 cm diameter top or to the first branch. • Calculate stem volume from measurements and multiplying by species-

	specific density to gain biomass of bole. • Apply a biomass expansion factor to estimate total aboveground biomass from stem biomass. For broadleaf tropical trees this factor shall be: – 1.38 for trees 20-40cm – 1.33 for trees 40-80cm – 1.25 for trees ≥ 80cm4 • Plot all the estimated biomass of all the measured trees along with the curve of biomass against diameter as predicted by the allometric equation. If the estimated biomass of the measured trees are distributed both above and below the curve (as predicted by the allometric equation) the equation may be used. The equation may also be used if the measured individuals have a biomass consistently higher than predicted by the equation. If plotting the biomass of the measured trees indicates a systematic bias to overestimation of biomass (>75% of the trees above the predicted curve) then destructive sampling must be undertaken, or another equation selected.
Used in equations	This parameter is associated with equation 35, but that equation does not apply.

Data / Parameter	*Change in the land use*
Data unit	%
Description	Percentages of the project area that will change the land use after deforestation.
Source of data	Landsat satellite images.
Justification of choice of data or description of measurement methods and procedures applied	To calculate the rate of deforestation
Comments	Without Comment
Used in equations	This does not apply

VMD0016: Module: Methods for stratification of the project area (X-STR)

Data / Parameter	$A_{BSL,i}$ or A_i
Data unit	ha
Description	Area of baseline stratum *i*
Equations	1, 6, 8, 12 or 7
Source of data	Own assessment
Value applied	Annex15 ; Annex 10 table 2
Justification of choice of data or description of measurement methods and	GIS coverages, ground survey data and/or remote imagery (satellite photographs) as outlined in Chapter 5.

procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Without Comment

VMD0017: Estimation of uncertainty for REDD+ project activities (X-UNC)

Data / Parameter	$A_{BSL,RRD,unplanned,t}$
Data unit	ha
Description	Projected area of unplanned baseline deforestation in the RRD in year t
Equations	1
Source of data	Module BL-UP
Value applied	13,857 ha/year
Justification of choice of data or description of measurement methods and procedures applied procedures (if any)	See module BL-UP
Purpose of Data	Calculation of uncertainty
Comments	Without Comment

Data / Parameter	$E_{REDD\_BSL\ SS,i,\ pool\#}$
Data unit	t CO_2e
Description	Carbon stock or GHG sources (eg, trees, dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the REDD baseline case
Equations	4
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions from baseline modules (*BL-DFW*, *BL-PL*, *BLUP*) used to calculate net emission reductions.
Value applied	Annex 10 part 4 step 4.2.1
Justification of choice of data or description of measurement methods and procedures applied procedures (if any)	See relevant modules
Purpose of Data	Calculation of uncertainty
Comments	Baseline stocks and sources are estimated *ex ante* for each baseline period

Data / Parameter	$U_{REDD\_BSL,SS,i,pool\#}$
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbón stocks and greenhouse

	gas sources in the REDD baseline case (1, 2, *n* represent different carbon pools and/or GHG sources)
Equations	4
Source of data	Calculations arising from field measurement data
Value applied	Annex 16 table 7
Justification of choice of data or description of measurement methods and procedures applied procedures (if any)	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the *t* value for the 95% confidence level For emission sources conservative parameters should be used sufficient to allow the uncertainty to be set as zero.
Purpose of Data	Calculation of uncertainty
Comments	Baseline stocks and sources are estimated *ex ante* for each baseline period

Data / Parameter	$E_{REDD,WPS,SS,i,\ Pool\#}$
Data unit	t CO_2e
Description	Carbon stock or GHG sources (eg, trees, soil organic carbon) in the project case
Equations	10
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions used in calculating net emission reductions, are from the following relevant modules: CP-AB, CP-S, BL-UP, LK-ASU.
Value applied	See annex 13 carbon stock en each stratum; file "VMD0017.xlsx" sheet "RIU-SM soils"
Justification of choice of data or description of measurement methods and procedures applied procedures (if any)	See relevant modules
Purpose of Data	Calculation of uncertainty
Comments	The *ex ante* estimation were derived directly from the estimations originating in the relevant modules: *CP-AB*, *CP-S*.

Data / Parameter	$U_{REDD,WPS,SS,i,pool\#}$
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the project case (1, 2, *n* represent different carbon pools and/or GHG sources)
Equations	10
Source of data	Calculations arising from field measurement data
Value applied	file "VMD0017.xlsx" sheet "RIU-SM soils"

Justification of choice of data or description of measurement methods and procedures applied procedures (if any)	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence leve. For emission sources conservative parameters should be used sufficient to allow the uncertainty to be set as zero.
Purpose of Data	Calculation of uncertainty
Comments	*Ex ante* the uncertainty in the project carbon stocks and sources shall be equal to the calculated baseline uncertainty

4.2 Data and Parameters Monitored

Table 84. Data and parameters at verification

VM0007: METHODOLOGY FRAMEWORK (REDD-MF)

Data / Parameter:	$\Delta C_{WPS\text{-}REDD}$
Data unit:	t CO_2e
Description:	Net GHG emissions in the REDD project scenario up to year t*
Equations	2
Source of data:	Module M-REDD
Description of measurement methods and procedures to be	See module M-REDD
Frequency of monitoring/recording:	See module M-REDD
QA/QC procedures to be applied:	See module M-REDD
Purpose of data:	Calculation of project emissions
Calculation method:	See module M-REDD
Comments:	Without comment

Data / Parameter	$\Delta C_{LK\text{-}AS,\ unplanned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity shifting for projects preventing unplanned deforestation
Equations	4
Source of data	Module LK-ASU
Value applied	Annex 12 table 16
Justification of choice of data or description of measurement methods and procedures applied	See module LK-ASU
Purpose of Data	Calculation of leakage
Comments	Without comment

VMD0001: Estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools (CP-AB)

Data / Parameter	A_{sp}
Data unit	ha
Description	Area of sample plots in ha
Equations	2, 6, 14
Source of data	(Yepes, et al., 2011)
Description of measurement methods and procedures to be applied	50 x 50 meters (0.25 ha) (Yepes et al. IDEAM, 2011. Protocol for national and sub-carbon biomass estimate in Colombia, table 9 page 52)
Frequency of monitoring/recording	Monitoring must occur at least every ten years for baseline renewal.
QA/QC procedures to be applied	Permanent consultation and supervicion
Purpose of data	Determination of size of plots to realize field work and then calculate aboveground and below biomass
Calculation method	Literature (Yepes et al. IDEAM, 2011)
Comments	This parameter was known ex-ante.

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points
Equations	4, 8
Source of data	(Yepes, et al., 2011)
Description of measurement methods and procedures to be applied	According to Yepes, 2011. (Protocol for national and sub-estimation of biomass carbon in Colombia, page 24)
Frequency of monitoring/recording	Monitoring must occur at least every ten years for baseline renewal.
QA/QC procedures to be applied	Permanent consultation and supervicion
Purpose of data	Determination of number of plots to realize field work and then calculate aboveground and below biomass
Comments	This parameter was known ex-ante.

Data / Parameter	***DBH***
Data unit	cm
Description	Diameter at breast height of a tree in cm
Equations	1, 3
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	Typically measured 1.3 m aboveground. Measure all trees above some minimum DBH in the sample plots. The minimum DBH is10 cm (for humid tropical forests 10 cm is commonly used). Minimum DBH employed in inventories is held constant for the duration of the project.
Frequency of monitoring/recordin g	Monitoring will occur every ten years for baseline renewal.
QA/QC procedures to be applied	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management will be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003
Purpose of data	To calculate the biomass of the tree
Calculation method	The circumference of the tree at the height of 1.30 cm is measured and then becomes the DBH. Minimum circumference is approx. 31 cm
Comments	This parameter was known ex-ante.

Data / Parameter	***H***
Data unit	m
Description	Total height of tree
Equations	1, 3
Source of data	Field measurements in sample plots
Description of measurement methods and procedures to be applied	The heights of the trees were taken, but this variable was not taken into account in the allometric equation
Frequency of monitoring/recordin g	Monitoring may occur at least every ten years for baseline renewal.
QA/QC procedures to be applied	This does not apply
Purpose of data	This does not apply
Calculation method	This does not apply
Comments	This parameter was known ex-ante.

VMD0004: Estimation of stocks in the soil organic carbon pool (CP-S)

Data / Parameter	$C_{SOCsample}$
Data unit	g C/100 g soil (fine fraction <2 mm)
Used in equations:	1
Description	Soil organic carbon of the sample in g C/100 g soil
Source of data	Field sampling and laboratory determination
Measurement procedures (if any):	For soil carbon determination, an aggregate sample is collected from within a sample plot in the field, thoroughly mixed and sieved through a 2 mm sieve. The prepared sample is analyzed for percent organic carbon using Walkley-Black method. (Annex 14-2)
Frequency of monitoring	Soil organic carbon is an included pool, monitoring will occur for baseline renewal.
QA/QC procedures:	Standard quality control / quality assurance (QA/QC) is determined by following procedures: field data collection is realized according Protocol of IDEAM (Yepes, et al., 2011) and the analysis is made according Walkley-Black method
Any comments:	This parameter was known ex-ante.

Data / Parameter	BD_{sample}
Data unit	g cm^{-3}
Used in equations:	1
Description	Bulk density of fine (< 2 mm) fraction of mineral soil per unit volume of sample in g cm^{-3}; bulk density equals the oven dry weight of the fine fraction (< 2 mm) of the soil core divided by the core volume
Source of data	Field sampling and laboratory determination
Measurement procedures (if any):	Procedure applied VMD0004
Frequency monitoring	Soil organic carbon is an included pool, monitoring will occur for baseline renewal.
QA/QC procedures:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management will be applied. Use or adaptation of QA/QCs already applied in national forest monitoring, or available from published handbooks, or form the IPCC GPG LULUCF 2003
Any comments	This parameter was known ex-ante.

VMD0007: Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP)

Data / Parameter:	***Any spatial feature included in the spatial model that is subject to changes over time (Factor Maps)***
Data unit	Depending on the spatial features selected
Used equations:	This does not apply
Description	Factor Maps
Source of data	According to field verification and geographic information systems (SIG)
Measurement procedures (if any)	Update of digital maps
Monitoring frequency:	It will be updated each time the baseline is revisited (every 10 years)
QA/QC procedures:	If secondary information, revision of reliable sources will be made; if primary information will be obtained according to IDEAM protocols.
Any comment:	Without comment

Data / Parameter:	***Risk Maps***
Data unit	ha
Used in equations	This does not apply
Description	This map shows, for each pixel, the risk for deforestation as a numerical scale (eg: 0 = 1 = minimal risk and the maximum risk)
Source of data	Maps derived factors.
Measurement procedures (if any)	By FOM confirmation process, testing various options (as specified in Section 3.2) to reach the best FOM.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	By FOM model validation.
Any Comments	Without comment

Data / Parameter:	***Baseline Deforestation Maps***
Data unit:	Depending on the spatial features selected
Used equations:	This does not apply
Description:	Maps showing the location of deforested hectares in each year of the baseline period
Source of data	Landsat satellite image.
Measurement procedures (if any)	Update of digital maps
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years)

QA/QC procedures:	Quality assessment using field GPS points taken in and confronted by the confusion matrix described in the PDD.
Any comment:	Without comment

Data / Parameter:	AA_U
Data unit	%
Used in equations	Part 2, Section 2.1.4
Description	Evaluation of the accuracy of unplanned deforestation rate (greater than or equal to 90%)
Source of data	Protocol digital image processing for quantitation of reforestation in Colombia, fine and gross national scale, IDEAM, chapter "Quality assessment Theme, p. 29 ". (Cabrera, Galindo, & Vargas, Protocolo de Procesamiento Digital de Imágenes para la Cuantificación de la Deforestación en Colombia, Nivel Nacional Escala Gruesa y Fina, 2011)
Measurement procedures (if any)	Meidinger model (2003) for the sampling design and model Bernal (2004) for assigning weights per stratum is used.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	The deforestation rate is calculated by the geographic information system therefore quality control is defined by the image processing control, following the rules of protocol (Cabrera et al. 2011) and field verification.
Any Comment:	Without comment

Data / Parameter:	***Correct***
Data unit	ha
Used in equations	15
Description	Area correct due to observed change predicted as change
Source of data	Spatial model of deforestation location
Measurement procedures (if any)	Area estimation through spatial intersection of the observed area and projected to start HRP area.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	By FOM model validation.
Any Comments	This is generated from the intersection of two facts: The first is the deforestation observed through the satellite in the 2005-2011 period. The second is the projected deforestation (modeled) from 2005 to 2011 in the IDRISI software.

Data / Parameter:	E_{rrA}
Data unit:	ha
Used in equations:	15
Description:	Area of error due to observed change predicted as persistence.
Source of data:	Spatial model of deforestation location
Measurement procedures (If any):	Estimating spatial intersection area by area as observed with the predicted change as persistent area.
Monitoring frequency:	It will be adjusted every 10 years in the evaluation of baseline.
QA/QC procedures:	By FOM model validation.
Any comment:	Without comment

Data / Parameter:	E_{rrB}
Data unit:	ha
Used in equations:	15
Description:	Area of error due to observed persistence predicted as change.
Source of data:	Spatial model of deforestation location
Measurement procedures (If any):	Area estimation through spatial intersection observed as persistent as the predicted change area.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	By FOM model validation.
Any comment:	Without comment

Data / Parameter:	FOM
Data unit:	Ha
Used in equations:	10
Description:	Figure of Merit
Source of data:	Remote sensing
Measurement procedures (If any):	Testing various options (as specified in Section 3.2) to reach the best FOM.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	By FOM model validation.
Any comment:	Without comment

Data / Parameter:	***LB***
Data unit:	ha
Used in equations:	6, to calculate P_{LK}
Description:	Leakage belt área. Map showing the location and stratification of forests within the leakage belt. (100% forest at the beginning of the project).
Source of data:	Landsat satellite images.
Measurement procedures (If any):	Methodology described in the PD. Following the instructions in the "Protocol of digital image processing to quantify deforestation in Colombia" IDEAM and supported by (GOFC-GOLD, 2013).
Quality Assurance / Quality Control	Where leakage belt boundaries have not been derived using GPS on-the-ground measurements quality control shall be carried out. A minimum of 30 locations on the leakage belt boundary, each separated by at least 1 km, shall be visited. If a systematic bias is detected in the original boundaries and/or if >10% of locations differ by >50 m then the entire boundary shall be re-surveyed. According to quality control employed by the "Protocol of digital image processing to quantify deforestation in Colombia" IDEAM.
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years).
QA/QC procedures:	Quality assessment using field points GPS taken in and confronted by the confusion matrix described in the PDD.
Any comment:	The stratification is based on the official map of Biomes IGAC (2008), available at the national SIGOT.

Data / Parameter:	***PA***
Data unit:	Ha
Used in equations:	1, 2
Description:	Unplanned deforestation project area. Map showing the location and stratification of forests within the project area (100% forest at the beginning of the project).
Source of data:	Landsat satellite images
Measurement procedures (If any):	Methodology described in the PD. Follow the guidelines of the "Protocol of digital image processing to quantify deforestation in Colombia" IDEAM and supported by GOFC-GOLD (2011).
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years)
Quality Assurance / Quality Control:	Quality assessment using GPS field points taken in and confronted by the confusion matrix described in the PDD.
Any comment:	The stratification is based on the official map of Biomes IGAC (2008), available at the national SDI SIG-OT.

Data / Parameter:	P_{LK}
Data unit	Dimensionless
Used in equations	6
Description	Ratio of the area of the leakage belt to the total area of RRD
Source of data	Landsat Satellite images.
Measurement procedures (if any)	Calculated from the result of remotely sensed data analysis
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years)
Quality Assurance / Quality Control	Through the accuracy assessment.
Any Comments	Monitored at least once every 10 years (when the baseline is revisited). It was estimated at time zero, this estimate was used for ex-ante purposes

Data / Parameter:	P_{PA}
Data unit	Dimensionless
Used in equations	5
Description	Ratio of the Project Area to the total area of *RRD*
Source of data	Landsat Satellite images.
Measurement procedures (if any)	Calculated from the result of remotely sensed data analysis
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years)
Quality Assurance / Quality Control	Through the accuracy assessment.
Any Comments	Monitored at least once every 10 years (when the baseline is revisited). It was estimated at time zero, this estimate was used for ex-ante purposes

Data / Parameter:	***RRD***
Data unit	ha
Used in equations	4 (to calculate P_{RRL}), 5 (to calculate P_{PA}), 6 (to calculate P_{LK})
Description	Geographical limit of the reference region to project the rate of deforestation.
Source of data	Landsat satellite images.
Measurement procedures (if any)	Methodology described in the PC. Follow the guidelines of the "Protocol of digital image processing to quantify deforestation in Colombia" IDEAM and supported by GOFC-GOLD (2011).
Monitoring frequency:	Annual monitoring shall be adapted every 10 years in the evaluation of the baseline.
Quality Assurance / Quality Control	Quality assessment using field GPS points taken in and confronted by the confusion matrix described in the PDD.
Any Comments	100% forest at the beginning of the historical reference period.

Data / Parameter:	***RRL***
Data unit	ha
Used in equations	This does not apply
Description	Geographical boundaries of the reference region to locate deforestation.
Source of data	Landsat satellite Images and existing digital maps
Measurement procedures (if any)	Limits generated from geoprocessing methods.
Monitoring frequency:	It will be updated each time the baseline is revisited (at least every 10 years)
Quality Assurance / Quality Control	Quality assessment using field GPS points taken in and confronted by the confusion matrix described in the PDD.
Any Comments	Without comment

Data / Parameter:	***Factor Maps***
Data unit:	ha
Used in equations:	This does not apply
Description:	13 maps used to calibrate the risk model.
Source of data:	Landsat satellite images, SIGOT and mapping updates during the project.
Measurement procedures (If any):	Limits generated from geoprocessing methods.
Monitoring frequency:	It will be adjusted every 10 years at baseline assessment.
QA/QC procedures:	IDEAM standards are used for primary information and data from reliable sources such as government and research institutes are used for secondary information.
Any comment:	Procedure described in section 3

Data / Parameter	***Project Forest Cover Monitoring Map***
Data unit	ha
Used in equations	3
Description	Map evidence stratification and location of the forest in the Project Area at the beginning of each verification period. It shows if there deforested areas within the project area.
Source of data:	Obtained from satellite images and field verification of deforested areas if any (GPS).
Measurement procedures (If any):	By using satellite images covering the Project Area it would be determined if there are any variations in the forest stratum identified in the Project Area. In case there are deforested areas it would be verified in field and confirmed by using GPS.
Monitoring frequency:	Every year with images. Verification of deforested areas will be permanent in field by the surveillance carried out by the monitoring equipment.

Quality Assurance / Quality Control	Permanent verification of the area of the project surfaces.
Any comments	Stratification is the same as the one used at the beginning of the term.

Data / Parameter	***Leakage Belt Forest Cover Monitoring Map***
Data unit	ha
Used in equations	3, 8
Description	Map evidencing the stratification and location of the forest in the Leakage Belt at the beginning of each verification period. It has to be evidenced if there are deforested areas.
Source of data	Satellite images and field verification of deforested areas if any (GPS).
Measurement procedures (If any):	By using satellite images covering the Leakage Belt it would be determined if there are any variations in the forest stratum identified in the Leakage Belt. In case there are deforested areas it would be verified in field and confirmed by using GPS.
Monitoring frequency:	Every year *with images.*
Quality Assurance / Quality Control	Permanent verification of the area of the project surfaces. Also, through the accuracy assessment.
Any comments	Stratification is the same as the one used at the beginning of the term.

VMD0010: Estimation of emissions from activity shifting for avoided unplanned deforestation (LK-ASU)

Data / Parameter	***MANFOR***
Data unit	ha
Description	Total area of forests under active management nationally
Equations	2
Source of data	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied	According to procedures applied by "*Registro Único de Áreas Protegidas – RUNAP (http://runap.parquesnacionales.gov.co/reportes) - Parques Nacionales Naturales de Colombia - Ministerio de Ambiente y Desarrollo Sostenible*"
Frecuency of Monitoring/ recording	It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
QA/QC procedures to be applied:	See Section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	It does not apply
Comments	Without comment

Data / Parameter	***PROTFOR***
Data unit	ha
Description	Total area of fully protected forests nationally
Equations	2
Source of data	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied:	A demonstration is required that areas will be protected against deforestation. Such a demonstration shall include either: 3. Evidence that the government has immediately acted to evict any and all illegal squatters Colombian laws to establish protected forest areas and surveillance Ex-ante, becuase it can be assumed that PROTFOR shall remain constant.
Frecuency of Monitoring/ recording	It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
QA/QC procedures to be applied:	See Section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	According to national data, consulted in the corresponding period of monitoring
Comments	Without comment

Data / Parameter	***TOTFOR***
Data unit	ha
Description	Total available national forest area
	2
Source of data	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied:	Limited to forest areas within 5km of roads and rivers suitable for conversion to agriculture / livestock According to procedures applied by *IDEAM - Ministerio de Ambiente y Desarrollo Sostenible*" to define total forests in Colombia.
Frecuency of Monitoring/ recording	It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
QA/QC procedures to be applied:	See Section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	According to national data, consulted in the corresponding period of monitoring
Comments	Without comment

Data / Parameter	$\Delta C_{P,LB}$
Data unit	t CO_2-e
Description	Net greenhouse gas emissions within the leakage belt in the project case

Equations	1,6
Sourse of data	Module M-REDD *(M-MON Annex 11 VMD0015)
Description of measurement methods and procedures to be applied:	It was calculated according to the method of the equation 2, Annex 11 See module M-MON (Annex 11 VMD0015)
Frecuency of Monitoring/ recording	See module M-REDD (M-MON Annex 11 VMD0015)
QA/QC procedures to be applied:	See chapter 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	Annex 11 ecuation 2
Comments	Without comment

Data / Parameter	$PROP_{IMM}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrating population
Equations	5, 7, 8
Source of data	The source of data was chosen with priority from higher to lower preference as follows: 1. Official data (government) (DANE 2005) 2. Peer-reviewed published sources 3. Other verifiable sources 4. PRA
Description of measurement methods and procedures to be applied:	Estimated as proportion of the area deforested according to the past census (2005) by population that migrated into the Leakage Belt and Project Area according to the past census (2005) (all areas within 2km of the boundaries of the project area and the leakage belt shall be considered here).
Frecuency of Monitoring/ recording	It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
QA/QC procedures to be applied:	See Section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	According to national data (DANE), consulted in the corresponding period of monitoring
Any comments	Without comment

Data / Parameter	$PROP_{RES}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by population that has been resident for ≥5 years
Equations	It does not apply
Source of data	The source of data was chosen with priority from higher to lower preference as

	follows: 1. Official data (government) (DANE 2005) 2. Peer-reviewed published sources 3. Other verifiable sources 4. PRA
Description of measurement methods and procedures to be applied:	Estimated as proportion of the area deforested in the past census (2005) by population resident in the Leakage Belt and Project Area for ≥5 years (all areas within 2km of the boundaries of the project area and the leakage belt shall be considered here).
Frecuency of Monitoring/ recording	It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
QA/QC procedures to be applied:	See Section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions.
Calculation method	According to national data (DANE), consulted in the corresponding period of monitoring
Any comments	Without comment

Data / Parameter	$A_{DefLB,i,t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in the project case in stratum *i* in year *t*
Equations	8
Source of data	Module *M-REDD (M-MON* Annex 11 VMD0015*)*
Description of measurement methods and procedures to be applied:	See Module M-REDD (M-MON Annex 11 VMD0015)
Frecuency of Monitoring/ recording	See Module M-REDD (M-MON Annex 11 VMD0015)
QA/QC procedures to be applied:	See section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	This data is given by GIS analysis.
Comments	Without comment

Data / Parameter	$A_{DefPA,i,t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in the project case in stratum *i* in year *t*
Equations	8
Source of data	Module *M-REDD (M-MON* Annex 11 VMD0015*)*
Description of measurement	See Module M-REDD (M-MON Annex 11 VMD0015)

methods and procedures to be applied:	
Frecuency of Monitoring/ recording	See Module M-REDD (M-MON Annex 11 VMD0015)
QA/QC procedures to be applied:	See section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	This data is given by GIS analysis.
Comments	Without comment

Data / Parameter	***Leakage Belt Forest Cover Benchmark Map***
Data unit	This does not apply
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period. Only applicable where leakage is to be monitored in a leakage belt.
Equations	3
Source of data	Module M-REDD (M-MON Annex 11 VMD0015)
Description of measurement methods and procedures to be applied:	See Module M-REDD (M-MON Annex 11 VMD0015)
Frecuency of Monitoring/ recording	See Module M-REDD (M-MON Annex 11 VMD0015)
QA/QC procedures to be applied:	See section 9.3 of REDD-MF (Annex 9 VM0007)
Purpose of data	Calculation of leakage emissions
Calculation method	This does not apply
Comments	Without comment

VMD0015: Methods for monitoring of GHG emissions and removals (M-MON)

Data / Parameter	***Project Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidencing the stratification and location of the forest in the Project area at the beginning of each verification period. It has to be evidenced if within the Project area there are deforested areas.
Source of data	Satellite images and field verification of deforested areas if any (GPS).
Justification of choice of data or description of measurement methods and procedures applied	By using satellite images covering the Project Area it would be determined if there are any variations in the forest stratum identified in the Project Area. In case there are deforested areas it would be verified in field and confirmed by using GPS. Frequency: It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event

Any comments	Without comment
Used in equations	3

Data / Parameter	***Leakage Belt Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidencing the stratification and location of the forest in the Leakage Belt at the beginning of each verification period. It has to be evidenced if there are deforested areas.
Source of data	Satellite images and field verification of deforested areas if any (GPS).
Justification of choice of data or description of measurement methods and procedures applied	By using satellite images covering the Leakage Belt it would be determined if there are any variations in the forest stratum identified in the Leakage Belt. In case there are deforested areas it would be verified in field and confirmed by using GPS. Frequency: It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
Any comments	Without comment
Used in equations	3, 8

Data / Parameter	$A_{DefPA, i,\underline{u},t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in stratum *i* converted to land use *u* at time *t*
Source of data	Remote sensing imagery
Justification of choice of data or description of measurement methods and procedures applied	Preprocessing of satellite images, satellite processing image digital and segmentation to determine the coverage change. According to the standards set by the IDEAM. Frequency: It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
Any comments	Ex-ante, estimation was made of deforestation in the with-project case.
Used in equations	3

Data / Parameter	$A_{DefLB, i,\underline{u},t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in stratum i converted to land use u at time t
Source of data	Remote sensing imagery
Justification of choice of data or description of measurement methods and procedures applied	Preprocessing of satellite images, satellite processing image digital and segmentation to determine the coverage change. According to the standards set by the IDEAM.

Comments	Ex-ante, estimation shall be made of deforestation in the leakage belt in the with-project case. The area of deforestation shall be made conservatively equal to: $(\sum_{t=1}^{t} (1 - PROP_{IMM}) * A_{BSL,LK,unplanned,t}) * (1 - PROP_{LPA})$ Where: $PROP_{IMM}$ Estimated proportion of baseline deforestation caused by immigrating population; proportion (Calculated in LK-ASU) $A_{BSL,LK,unplanned,t}$ Project rate of unplanned baseline deforestation in the Leakage Belt Area at year t; ha. yr^{-1} (Output parameter from BL-UP) $PROP_{LPA}$ Estimated proportion of baseline deforestation agents given the opportunity to participate in leakage prevention activities; proportion (proportion shall be conservatively estimated and justifiable. Leakage prevention activities must be planned to fully replace income, product generation and livelihood. Projects have the option ex-ante to conservatively set PROPLPA as equal to 1). *t* 1, 2, 3 …t years elapsed since the start of the project activity
Used in equations:	4

Data / Parameter	$A_{RRL, forest, t}$
Data unit	ha
Description	Remaining area of forest in RRL at time t
Source of data	Satellite images.
Justification of choice of data or description of measurement methods and procedures applied	The images used will be compatible with the ones already used in the estimations ex-ante in order to be compared. Frequency: It will be monitored when verification occurs (annual or bi-annual); examination must occur prior to any verification event
Any comments	There is no evidence of degraded areas or plots ex-ante within the project area.
Used in equations	This does not apply

Data / Parameter	F_{LU}
Data unit	Dimensionless
Description	Land use factor before or after conversion
Source of data	Stock Change Factors are provided in Tables 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Justification of choice of data or description of measurement	F_{LU} values for Tropical temperature and Moist/wet regime: A. For different activities to cropland Long term cultivated - 0.48

methods and procedures applied	Paddy rice - 1.10 Perennial/ Tree crop - 1.00 Set aside (<20 yrs.) - 0.82 B. For Land-use conversions to cropland Native forest (non-degraded) - 1 Shifting cultivation (Shortened fallow) - 0.64 Shifting cultivation (Mature fallow) - 0.8 C. For grassland management Default value - 1
Any comments	Without comment
Used in equations	16

Data / Parameter	F_{MG}
Data unit	Dimensionless
Description	Management factor before or after conversion.
Source of data	Stock Change Factors are provided in Table 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4.
Justification of choice of data or description of measurement methods and procedures applied	F_{MG} values for Tropical temperature and Moist/wet regime: A. For different activities to cropland Full tillage - 1.00 Reduced - 1.15 No-till - 1.22 B. For Land-use conversions to cropland Managed forest - 1.00 C. For grassland management Nominally manage (non-degraded) - 1 Moderately degraded grassland - 0.97 Severely degraded - 0.7 Improved grassland - 1.17
Any comments	Without comment
Used in equations	16

Data / Parameter	F_i
Data unit	Dimensionless
Description	Input factor before or after conversion
Source of data	Stock Change Factors are provided in Table 5.5, 5.10, and 6.2 of the IPCC 2006GL Volume 4
Justification of choice of data or description of measurement methods and procedures applied	F_i values for Tropical temperature and Moist/wet regime: A. For different activities to cropland Low - 0.92 Medium - 1.00 High without manure - 1.11 High with manure - 1.44 B. For Land-use conversions to cropland Managed forest - 1.00 C. For grassland management Medium (only to improved grassland) - 1 High (only to improved grassland) - 1.11

Any comments	Without comment
Used in equations	16

VMD0016: Module: Methods for stratification of the project area (X-STR)

Data / Parameter	$A_{WPS,i}$ or A_i
Data unit	ha
Description	Area of project stratum *i*
Equations	1, 6, 8, 12 or 7
Source of data	Own assessment
Description of measurement methods and procedures to be applied	GIS coverages and/or remote imagery (satellite photographs) as outlined in Chapter 5.
Frequency of monitoring/recording	At each monitoring event
QA/QC procedures to be applied	See Section 9.3 of *REDD-MF* (Annex 9 VM0007)
Purpose of data	Calculation of project emissions
Calculation method	This data is given by GIS analysis.
Comments	Without comment

4.3 Monitoring Plan

The primary purpose of the Monitoring Plan will be the collection of data to verify the level of deforestation and degradation within the Project Area and Leakage Belt over time, constantly updating estimates of emissions and the generation of sufficient and timely information to make adjustments to the strategies included in the project information.

In this sense the Monitoring Plan is based on the Matrix of Logic Structure (MLS) considered in section 1.8 of chapter 1 of PD.

4.3.1 Technical description of the tasks of monitoring

4.3.1.1 Data and parameters

The list of data and parameters that will be collected for the monitoring are the same data of the section 4.1 of PD and, in same way, the procedures to make estimates of carbon stocks, which were presented in Section 3 of PD. It should be noted that the plots installed are permanent and that the whole selected methodology is consistent with this feature.

Data Collection, Processing and Report

Data and parameters are defined in the Matrix of Logic Structure (MLS). The set of data collected, processed, reported and disseminated is the knowledge base and the Information System of REDD+ project RIU-SM (IS); this “IS” allows to identify trends in different variables and parameters that are useful to evaluate compliance with the objectives, results and indicators MLS.

Information System of REDD+ project RIU-SM follows the recognized stages of planning and monitoring, as indicated in this section 4.2 and whose collection, processing, analysis and interpretation of variables relation and parameters are presented in the chapters 2, 3, 4 and 5 of PD.

The information collected in field is systematized by professionals in charge of monitoring and evaluation, according to disciplinaries areas of project (section 4.2.3), who will present the monitoring report for the stage at the end of the period and will elaborate the Operative Plan of the following period, identifying additionally which manuals of instructions or protocols should be updated or adapted to the changes that occur.

Formats have been defined for the collection of the field data and for variables that are to be monitored. The collected data is systematically digitalized in spreadsheets designed according to the information requirements. The calculations are made in spreadsheets using the correspondent formulas and thereafter the required reports are delivered as a basis for the development of Monitoring Report.

All the field monitoring processes are documented. All the plots are georeferenced and systematized within the GIS.

The physical and digital files which store the data generated during the monitoring process will be accessible in the two modalities (physical files and digital files), being kept in the offices of REDD+ project RIU-SM.

4.3.1.2 Stages or processes of the information management

The information management comprises the following steps or processes:

Step 1: Selection and analysis of the source of land use change

a. For the monitoring period the following actions will be carried out:

- The collected and analyzed data should cover the entire Project Area and Leakage Belt. These data must be available for the year when verification occurs.
- To calculate each category of change of land use:
  - The area of each category within the project area and within the leakage belt will be calculated.
  - The forest cover maps of reference for the Project Area and Leakage Belt will be updated.
  - The remaining forest area within the project zone will be updated.

b. For the monitoring period of 10 years. Baseline review:

- Use of high resolution images (30 m x 30 m or less, if available) at the end of the period when the baseline will be renewed.
- The collected and analyzed data should:
  - To cover the entire reference region: data must be available for the year of baseline renewal or not more than a year earlier.
  - To be georeferenced for the processing of the land use change and geometrical corrections should be made as well as the detection of clouds and shadows.
- The area of each category within the reference region, Project Area and the Leakage Belt will be calculated.
- The forest cover maps for the reference area, Project Area and Leakage Belt will be updated.
- Deforested areas during the first 10 years are estimated in order to adjust the baseline and the deforestation rate, if necessary.

Step 2: Interpretation and analysis

This step comprises six sub-steps:

Sub-step 2.1 Monitoring of deforestation

✓ Deforested area within the Project Area (PA) per stratum.

✓ Deforested area within the Leakage Belt (LB) per stratum.

In both cases it must be specified the type of land use (LU) that have been changed to deforested areas. For the re-calculation of the baseline must be established or indicated if the percentage change of land use remain the same as in the initial baseline.

✓ Carbon stock in carbon pools:

- Carbon stock in each stratum defined in the baseline is maintained. It will be reassessed for the baseline review (in 10 years).
- Carbon stock of each land use is maintained. It will be reassessed for the baseline review (in 10 years).

✓ Deforested area within the Reference Region (for the baseline review).

Indications corresponding to the REDD Methodology Module be taken into account regarding the clouds for determining maps. A precise rate of 90% or more is wanted.

Sub-step 2.2 Monitoring of degradation

In this sense, it is expected that no degradation occurs by wood extraction due to illegal logging, firewood or coal production. If this happens, this degradation will be deducted.

A Participatory Rural Appraisal (PRA) will be conducted in order to determine whether degradation occurs. In this sense, these steps will be followed:

- ✓ Evaluate if degradation due to illegal logging occurs:
  - The PRA will be conducted every 2 years. If the results indicate that the Project Area has no pressure from this type of degradation, then it will be assumed that: $\Delta Cp,Deg,i,t = 0$.
- ✓ If the results of the PRA indicate that there is potential for degradation, then it must:
  - Obtain a “penetration distance” in the PRA (distance that the degradation agents can enter from the nearest access points).
  - Identify the most important access points to the vulnerable area.
  - From these points, draw distances and create a buffer zone with a width equal to the length of the penetration distance.
  - Transects will be established to evaluate the buffer zone. The assessed area should not be lesser than 1% of the buffer area.
  - If stumps are not found (harvested trees), then it is assumed that $\Delta Cp,Deg,i,t = 0$ and the assessment is repeated every 2 years.
  - If stumps are found, then a systematic assessment is carried out. For this, plots are distributed systematically, being the area to assess ≥ 3% of the buffer area.
  - Take into account the diameter of the stumps, which will be assumed as their DBH. If they are very large (e.g. due to buttresses), then the specie of stump is identified and standing trees of the same species are located. Afterwards, their DBH and stump diameter are measured and a ratio between DBH/stump diameters is calculated. With this ratio, the DBH from the stump diameter of the cleared individuals that were found is estimated.
  - With the DBH data, the carbon stock of the harvested trees is calculated, using the allometric equation that was used for the estimation of the tree carbon stocks in the baseline.
  - It will be assumed that all carbon stock of harvested trees will be emitted to the atmosphere.
  - This assessment must be repeated every 2 years.

Sub-step 2.3 Monitoring of emissions in the project scenario

For this monitoring, estimation of carbon stocks before and after deforestation are used and, consequently, the estimation of changes of these stocks.

i *Estimation of carbon stocks before deforestation*

- ➢ Carbon stock inventory

  The procedure for the implementation of the carbon stock inventory is indicated in section 3.1.2 of the PD in accordance with the protocol settled down by IDEAM.

Estimations of carbon stocks are based on field observations obtained from plots of stratified random sampling, then allometric equations properly validated are used. The calculations of estimations are made using appropriate statistical developments in this type of sampling, as it was done in the initial carbon inventory.

- Size of field plots

The protocol established by the IDEAM was applied to determine the size and type of the plots (Protocol for the national and subnational estimates of biomass carbon in Colombia, 2011) (Yepes, et al., 2011), Chapter 1, pages 17 - 24. The size and type is determined by the table 4 (page 35), Step 1-3: selected plot size is 50 x 50 m (0.25 hectares) with a sampling error of 10%.

The plot size 50 x 50 m was considered the most suitable for this type of forest, taking into account the recommendation of studies "Keller et al. 2001", "Chave et al. 2003") (Yepes, et al., 2011), page 34:

"For the projects at sub-national scales (e.g. regional / subregional), it is recommended to use plots of 0.25 ha (50 mx 50 m) because it is the most appropriate size to achieve the required error in estimations of carbon (±10% with confidence of 95%) in forestry projects (Emmer 2007, Biocarbon Fund 2008, Rügnitz et al. 2009). This size allows to make estimations of average aboveground biomass and, therefore, of carbon, with very narrow confidence intervals, and very similar behaviors to those obtained when plots of 1.0 ha are used (…). Similar results were obtained in the Brazilian Amazon and Panama (Keller et al. 2001, Chave et al. 2003), where they concluded that plots of 0.25 ha were the ideal size to estimate the existing aboveground biomass in this forests type."

- Amount of field plots

To calculate the number of plots (n) is necessary to specify the level of accuracy given by the maximum allowable sampling error ($E\%$) and the level of probability. The VCS VMD0017 standard - Module X-UNC states:

*"Guidance on uncertainty – a precision target of a **95% confidence interval half-width** equal to or less **than 15%** of the recorded value must be targeted. This is especially important in terms of project planning for measurement of carbon stocks; sufficient measurement plots should be included to achieve this precision level across the measured stocks." (VCS Module VMD0017 Estimation of uncertainty for REDD+ project activities (X-UNC), page 5)*

To calculate the sample size (n) for stratified random sampling (H strata) Equation 4 of IDEAM Protocol has been used. (Yepes, et al., 2011), page 26:

$$n = \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{E^2 + \frac{t^2 \sum_{i=1}^{H} P_j S_j{}^2}{N}} \qquad \textit{(Equation 4)}$$

Where:

n : number of sample plots

t : student t value for given probability

P_j : relative importance or proportion occupied by each stratum

S_j^2 : variance associated with the variable of interest in each stratum (biomass or carbon stored in vegetation)

E : sampling error

N : total number of plots that could be established in the area of interest.

The average of inventory ($\bar{X}$) is obtained using Equation 5 of the Protocol, page 26:

$$\bar{X} = \sum_{j=1}^{H} P_j * \bar{X}_j \qquad \textit{(Equation 5)}$$

Where:

$\bar{X}$: average of inventory

P_j : relative importance or proportion occupied by each stratum

$\bar{X}_j$: average of inventory in each stratum

For the distribution of the number of samples in strata (n_j) Equation 6 of the Protocol is used, page 26:

$$n_j = n * P_j \qquad \textit{(Equation 6)}$$

The confidence interval (CI) was calculated with Equation 8 of the Protocol, page 26:

$$IC = \bar{X} \pm S_{ye} * Z^{(\alpha)} \qquad \textit{(Equation 8)}$$

Where:

CI : average of confidence interval

$\bar{X}$: average of inventory

S_{ye} : standard error of the stratified average of inventory

$Z^{(\alpha)}$: 1,96 (for the 95% probability level)

$$E = S_{ye} * Z^{(\alpha)}$$

With Equation 9 the sampling error percentage is calculated

$$E\% = \frac{S_{ye} * Z(\alpha)}{\bar{X}} * 100 \text{ (Equation 9)}$$

$$E\% = \frac{E}{\bar{X}} * 100$$

Where:

$E\%$: sampling error (in percentage)

As shown, the value of $\boldsymbol{n}$ depends on the variance of the strata (S_j^2), which are unknown, and $E\%$ depends on the average $\bar{X}$ that is also unknown. Then the method to be used is an heuristic type, i.e. successive approximations previously using some existing related or approximate information and apply sampling pilots or pre-sampling to have some information about the variances and average, and based on them, to make a calculation of n and n_j of each stratum.

In our case to make pre-sampling and sampling pilots is very expensive, the high cost of travel to the selected parcels to go back, calculate and return back to the jungle. Therefore, as an initial guide information published by the IDEAM [Figure 6 of the Protocol to the IDEAM on page 36 it is used; or Table 3 on page 123, Annex 2 (Yepes, et al., 2011)], which indicates that for plot size of 50m x 50m, an $E\%$ of 15% and a probability of 95%, in simple random sampling (in each stratum a simple random sample is selected independently) 11 plots would be required in each stratum, that is, with about 44 plots are conservatively approximate the size of stratified random sample.

Acting more conservatively and to ensure the accuracy levels required by the standard, if only 10%, there was a stratified random sample of 131 permanent plots, distributed proportionally in each stratum, as follows:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
	n_1	n_2	n_3	n_4
n_j	16	29	24	62

Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"

With independent simple random sampling in each stratum.

Application of equations

With the data of proportionality in each stratum with respect to the entire area of the Project Area, the P_j is obtained. With the data collected in each simple random sample from each stratum, estimate of S_j^2 in each stratum and the average of inventory were made:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
P_j	0.1517	0.2835	0.1009	0.4639
S_j^2	10784.04	3448.60	4411.57	35100.57

Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"

With these data Equation 4 was applied; for stratified random sampling with an $E\%$ of 15% and 95% probability:

$P_1 * S_1^2$	1,636.21
$P_2 * S_2^2$	977.60
$P_3 * S_3^2$	445.29
$P_4 * S_4^2$	16,281.77
$\sum_{i=1}^{H} P_j S_j^2$	19,340.87

t = 1.96

$t^2 \sum_{i=1}^{H} P_j S_j^2$ = 74,299.898

N = 4,600,850 (*Source: file "plot_study_fustales.xls", sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

Sampling error (according to Equation 9)

$E\%$ = 15%

$E = E\% * \bar{X}$

E = 38.55

Finally, the number of plots in the 4 strata is calculated (Equation 4):

$$n = \frac{t^2 \sum_{i=1}^{H} P_j S_j^2}{E^2 + \frac{t^2 \sum_{i=1}^{H} P_j S_j^2}{N}} = 50$$

Equation 6 is applied to calculate the number of samples within each stratum (n_j), with n = 50:

$$n_j = n * P_j$$

	Strata i			
	Helobioma	Peinobioma	Litobioma	Zonobioma
P_j	0.1517	0.2835	0.1009	0.4639
n_j	8	14	5	23

Therefore, with sample sizes (# of plots) randomly selected independently in each stratum, compliance accuracy is guaranteed (all sample sizes in each stratum are higher than those required) to $E\%$ of 15% and probability level selected.

Applying Equation 4 to calculate $E\%$:

$$E^2 = t^2 \sum P_j S_j^{\,2} \left(\frac{1}{n} - \frac{1}{N}\right)$$

$E = 23.8$

$E\% = \frac{E}{\bar{X}} * 100 = 9.3\%$, with a probability level of 95%, which meets conservatively with the level of accuracy established in the standard.

This sampling error value is equal to applying the equation presented in "*Sampling Techniques, Chapter 5 Stratified Random Sampling, page 92 (Cochran, 1997)* " to estimate the error of the mean of stratified inventory:

For stratified random sampling, the variance of the estimate $\bar{y}_{st}$ is:

$$V(\bar{y}_{st}) = \sum_{h=1}^{L} W_h^{\,2} \frac{S_h^{\,2}}{n_h} (1 - f_h) \; \textit{(5.6)}$$

Where:

$V(\bar{y}_{st})$: variable of weighted sample mean

$\bar{y}_{st}$: weighted sample mean ($\bar{X}$) (estimator of the mean in stratified sampling)

W_h : stratum weight

S_h : true variable by stratum

n_h : numbers of plots by stratum

f_h : sampling fraction in the stratum (n_h/N_h)

h : stratum

The Standard Error of Mean is $\sqrt{V(\bar{y}_{st})}$ = (S_{ye}).

Average of inventory $\bar{X}$ (Equation 5):

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
P_j	0.1517	0.2835	0.1009	0.4639
$\bar{X}_j$	10784.04	3448.60	4411.57	35100.57
$P_j * \bar{X}_j$	42.25	62.04	22.41	130.29
$\sum_{j=1}^{H} P_j * \bar{X}_j$	256.99			

$\bar{X}$ = 256.99 (*Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

Stratified inventory standard error S_{ye}:

	Strata i			
	Helobiome	Peinobiome	Litobiome	Zonobiome
${W_h}^2$	0.0230	0.0804	0.0102	0.2152
${S_h}^2$	10784.04	3448.60	4411.57	35100.57
n_h	16	29	24	62
f_h	0.00002	0.00002	0.00005	0.00003

$V(\bar{y}_{st})$ = 148.75

S_{ye} = 12.20

(*Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

$$E\% = \frac{S_{ye} * Z^{(\alpha)}}{\bar{X}} * 100 = 9.3\%$$

(*Source: file "plot_study_fustales.xls" sheet "calculo Yst var PA (BA)" in folder "calculation_tables"*)

The observations of field work are presented in formats that also takes into Annex 13.

An instructive was elaborated to be applied in field work (Annex 13. CP - AB - VMD0001) indicating procedures for plots locating and trees measuring.

Following are the results of the analysis of the sample (Annex 19, "Estimation of carbon in the above and belowground biomass in live trees").

- Data processing

Following the corresponding steps for processing field data are presented

1. **Selection of the allometric equation:**

The following is the equation that is applied for trees (in spanish "fustales"). There is other equation for palms.

ln (BA) = a + B1 ln(D)

Where:

BA is the biomass of trees in kg

D is the average diameter measured at 1.3 m height from the ground for trees with DBH≥10cm

A and **B1** are model constants.

R^2 is the model adjustment.

Independent variable: diameter (D). The values of the estimated parameters are:

Forest type	a	B1	R^2
bh-T	-1.544	2.37	0.932

This allometric equation was selected by comparison with other equations. This equation offers the advantages of requiring only the diameter at breast height (DBH), reducing risks of uncertainty and measurement errors because other variables such as height and density are not required.

Allometric equation to estimate the biomass of palms

$$BA = 6.666 + 12.826 * H^{0,5} * \ln (H)$$

Where:

Acronym	Description
BA	Aboveground biomass, kg/tree
H	Height of the trunk, in meters. For palms this is the main stem, excluding the fronds

Source: (IPCC, 2003) Annex 4.A.2 (4.A.2 table, page 4.114 [513])

2. **Estimation of aboveground biomass of each tree**

   The estimation of biomass of each tree is obtained applying the allometric equation. See file "plot_study_fustales.xls" in folder "calculation_tables"

3. **Calculation of the average carbon in aboveground biomass per plot in each stratum**

   0.47 is the value of the factor that was used to transform biomass in carbon.[60]

[60] *CF = carbon fraction of dry matter (default = 0.47), (ton C/tonne d.m.) (IPCC, 2006) INV GLs AFOLU Chapter 4 Table 4.3)*

4. **Calculation of the belowground biomass per plot in each stratum**

   0.24 is the value of the "R factor" that was used to calculate the belowground biomass according to aboveground biomass[61].

5. **Estimation of soil organic carbon**

   See Annex 14.

6. **Estimation of carbon stocks before deforestation**

- Equipment used for measuring and monitoring the aboveground carbon stock

  According to "*Protocol for the national and subnational estimates of biomass - carbon Colombia*" - IDEAM, 2011 (Yepes, et al., 2011) and considering that project proponent made the decision to use the indirect method to measure and estimate the aboveground biomass, it must:

  - Have updated and detailed mapping, which allows to take the right decision on where to set the activities of carbon stock measure. REDD+ Project RIU-SM has a geographic information system (GIS) (Annex 17), supported with computer equipment and backup of information. A team of professionals is in charge of maintaining and processing of this information. For the GIS generation, determination of boundaries and calculation of areas Landsat satellite imagery are used and its calibration and correction process (pre-processing) is detailed in Annex 10, sub-section 2.1.2.
  - Have a set of devices to get the "Global Position System" (GPS) and to locate the plots by the fieldwork team. For REDD+ Project RIU-SM a set of 6 "*GPS Garmin ETREX 10*" were gotten.

    To calibrate these devices in futures dates of monitoring, when required, local distributor will be contacted to support.
  - Have a set of utensils to measure and mark plots: decameter, PVC tubes (or, alternatively, wood poles or stakes), rope or ribbon, scissors, paint of visible color and brushes. Also, tools to open way, as "machetes" (bowie knife). Whenever measurement and monitoring of this parameter are done, all the materials, utensils and tools described will be available.
  - Have a set of tools to measure tree dimensions and mark trees: flexible measuring tape to measure tree circumference, templates to register data, note-table to support templates, pens or pencils, aluminum plaques to mark each tree, permanent markers, copper wire of gauge 27 and galvanized nails of length 2-inch to set the aluminum plaques, hammers, quick-drying asphalt paint or reflective paint. Whenever measurement and monitoring of this parameter are done, all the materials, utensils and tools described will be available.

[61] *AFOLU Guidelines (IPCC 2006, Chapter 4, page 4.49)*

- Have a set of elements of protection for those running the fieldwork: gloves, proper shoes, caps and others. Photographs of the execution of the activity and the trees are taken, so cameras are included.
- Apply the adequate allometric equation to calculate the estimated biomass. This equation does not include the tree height, so this parameter is not applied and any tool is not necessary to be used.

In Annex 13 is the manual (instructive) that indicates procedures and tools to realize the fieldwork to obtain the data to measure the aboveground biomass and carbon stock.

In subsequent monitoring periods and review baseline, similar tasks will be performed to ensure the conservation of the sampling points and evaluate carbon stocks. Therefore, procedures and similar equipment will be executed and implemented to keep the information current and monitoring this parameter.

➢ Equipment used for measuring and monitoring the carbon stock in the soil organic

To measure and estimate the biomass in the soil organic carbon, indications of "Protocol for the national *and subnational estimates of biomass - carbon Colombia*" - IDEAM, 2011 (Yepes, et al., 2011) were followed. To do this the project proponent must:

- Locate the places to measure the soil organic carbón in the same place to measure the aboveground biomass.
- Dig a "calicata" (test pit) with a meter deep, for which tools are required such as: peaks, barretones, and shovels.
- Extract soil samples: two rings of metal (one with cutting edge), mallets, knives and "palines" (little shovels). Plastic bags are required to store the soil samples. Templates to register data, note-table to support templates and pens or pencils are required to fill the data about the soil sample. The plastic bags containing soil samples are saved in a container that protects them of hits and moisture.
- Estimate the organic carbon content and bulk density of soil samples: A laboratory for soil analysis was assembled by the project proponents, with the following equipment: electric oven (105° +/- 2°C), precision balance (100 gr +/- 0,0001gr), gram scale balance (6000 gr +/-0,1 gr), magnetic stirrers, glassware (pipettes, burettes, beakers, precipitate glasses, stir bar, watch glasses, Erlenmeyer, etc.), tools for handling samples (mortar, carvers, sieves, etc.), reagents (Potassium dichromate 1N , concentrated sulfuric acid, Ferrous Sulfate 1N, diphenylamine indicator, concentrated phosphoric acid), distilled water stock not less than 20 liters, trays, sink for washing instruments, storage area for samples and reagents, work-tables and computer.

  Responsibility to calibrate some of these tools and devices at moment of use them is in charge of the professionals contracted to realize the soil analysis.

In Annex 14 is the manual (instructive) that indicates procedures and tools to realize the fieldwork to obtain the soil samples to measure the soil organic biomass and carbon stock, the report of soil analysis (with information about the professionals contracted to do this) and the applied methods.

In subsequent review baseline, similar tasks will be performed to evaluate carbon stocks in soil organic biomass. Therefore, procedures and similar equipment will be executed and implemented to keep the information current and monitoring this parameter, and pertinent professionals will be contracted.

ii *Estimation of carbon stocks after deforestation*

Results in table 68 in this document.

iii *Estimation of carbon stocks changes*

Results in table 69 in this document.

iv *Estimation of project emissions (Project Area - PA and Leakage Belt - LB)*

Results in table 76 in this document.

Sub-step 2.4 Estimation ex-post of net reductions in emissions of greenhouse gases

Based on real deforestation of each period, according to Annex 10 VMD0007, sub-step 2.1

Sub-step 2.5 Calculation of VCS buffer

According to risk indicator as result of application of VCS Module T-BAR (Annex 23)

Sub-step 2.6 Calculation of VCUs

According to VCS Methodology VM0007 - REDD-MF, section 8.4.7.

4.3.1.3 Quality control

Quality control is established according to the stage of information processing and as it sets out in section 4.1 for each data or parameter:

- ✓ In the collection of field data: It has applied statistical methods of quality control based on Gauss or normal curve models. It can be applied to all parameters and variables established in the monitoring plan. The diameter of the trees is the variable that defines the biomass and the other parameters are derived from it. For palms also trunk height is required to define biomass.
- ✓ In the process of these data for storage and statistical analysis: It is applied the techniques of the computer processing, giving timely maintenance to the equipment and applications.

- ✓ In the analysis and interpretation of results that allow the comparison between periods in time to estimate ex post net changes in carbon stocks: also apply statistical methods of interpretation of results and inference.

All these quality controls have specialized and auxiliary personnel which allows lowering the level of risk of uncertainty and imprecision.

The process of data collection to statistics production is designing and it will be implemented in real time, saving time and manual processing steps to reduce error risks in the process.

In summary, the quality and control measures (QA/AC), standard operating procedures and methods of control and management of information collected are described as shown below:

CONTROL MEASURES	The following factors are considered: teams of collection and processing of information; trained staff; type of parameters and variables; statistical methods (samples, accuracy and level of reliability). The control elements are set for these factors according to established standards.
STANDARD OPERATING PROCEDURES	These procedures are defined and controlled according to the following phases: data collection, systematization, analysis, interpretation, inference and reporting of results.
METHODS OF CONTROL AND INFORMATION MANAGEMENT	The core of these methods focuses on security and storage thereof. In addition control measures and standard operating procedures are taken into account.

4.3.2 Duration of monitoring period and date of monitoring start

In section 1.6 was presented this information:

> ***"1.6 Project crediting period***
>
> ***REDD project crediting period***
>
> *Start: January 1st, 2013*
>
> *End: December 31st, 2042*
>
> *Total number of years: 30 years*
>
> ***Date at which the Project baseline will be revised***
>
> *Each 10 years*
>
> ***Duration of Monitoring Period***
>
> *The first period will be annual, and the following periods will be bi-annuals*

The first period annual: 2013

The second period bi-annual: 2014-2015

The third period bi-annual: 2016-2017

And so successively.

Monitoring start date: 1st January 2013"

4.3.3 Mitigation Measures and Monitoring actions

Based on the assumptions presented in the Matrix of Logic Structure (MLS, presented above) which is at the level of objectives and products, it proceeds to the assessment of risk associated with each respective assumption and the submission of appropriate mitigation measures. The methodology published by the International Tropical Timber Organization in its "Manual for Project Formulation" applies (OIMT, 2009), Part 3: Description of project interventions, Assumptions, Risks and Sustainability, pages 58-59.

According to this methodology, an assumption is a condition that must exist for the project can be successfully developed and it must be formulated with a positive statement of what is expected to happen. Risk is the probability that an assumption is not met.

Based on the project design for some risks identified, mitigation measures through project management were arranged; risk factors and mitigation measures presented in Annex 23 T-BAR are also included.

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
To objectives level				
Assumption 1: Governmental changes do not affect the development of the Project.	Very low risk.	✓Management the inclusion of Project in plans that are developed at the national, departmental and municipal levels, related to the protection of natural resources and indigenous communities.	✓Monitoring the management made by the administrative team of REDD+ Project RIU-SM relating to the identification of institutional plans led by the Government, its characteristics, its influence on the Project, its preparation and presentation of proposals for inclusion.	A1.2 A1.3
		✓Maintain direct relations with the Ministry of Environment and Sustainable Development, the governor of Vichada and the Mayor of Cumaribo permanently reporting on the nature of the project, its benefits and its developments.	✓Monitoring the development of the actions agreed in conjunction with the institutions with which relations have been established, determining the degree of compliance and the results achieved.	
		Documentary evidences: - Annex 1.5.4: Memories of meetings held by the Indigenous Co-Director of Project in the city of Puerto Carreño in: - Corporinoquia - Departmental Planning Office of Vichada - Offices of the Secretary of Education and Finance Department of Vichada. - SENA.		

62 In the monitoring tasks of Project activities related to each mitigation measure, formats, records, minutes and reports of monitoring actions for respective mitigation measure are managed. For example, for the first mitigation measure of assumption 1, in the tasks of monitoring of activities A1.2 and A1.3, formats, records, minutes and reports of monitoring actions of this mitigation measure are managed.

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		- Annex 1.9.4.2: Document of Convention No. 310 of 2015, signed between the Ministry of Environment and Sustainable Development and the Association ACATISEMA. - Annex 1.3.15a: Final report of Convention No. 310 of the 2015.d		
Assumption 2: The key development strategy of environmental sustainability projects in Colombia continues, as defined by the National Council for Economic and Social Policy (through document CONPES 3700 of 2011) and the National Planning Department (through the National Development Plan).	Very low risk.	✓Present in national, departmental and municipal events the project results, showing compliance with the goals of controlling deforestation and benefits to communities and biodiversity in the area where is located the Indigenous Reservation, achieved through the implementation of Project activities.	✓Monitoring the actions made to participate in events of interest to the Project, showing the progress and observing, collecting and putting into practice the lessons learned that can potentiate the development of Project.	A1.2 A1.3
		✓Strengthen the Project participation in national policies through the management of a second phase of Convention No. 310 of 2015 signed between the Ministry of Environment and ACATISEMA.	✓Monitoring the elaboration of the proposal to develop the second phase of the convention signed between the Ministry of Environment and Sustainable Development and ACATISEMA and submission to this Ministry.	
		✓Contribute at the level of the Project, with plans and commitments made by the Colombian State, measures and policies on climate change, particularly with those established by the Paris Agreement.	✓Measuring the impact that the development and the results of the Project are generating for national and international purpose of mitigating climate change, analyzing the importance that is being given to this initiative and observing whether it complies with the relevant legislation.	
		Documentary evidences: - Annex 1.5.6: Memory management meetings in different entities in Bogota to present the		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		project, its objectives and expected results, among others. - Annex 1.9.4.2: Document of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and the Association ACATISEMA. - Annex 1.2.1: Minutes of meeting held in the Indigenous Reservation to ratify the REDD + RIU-SM Project and socialize in front of a Senator of the Republic (which in turn was the Chairman of the Executive Committee GLOBE International, Chapter Colombia), delegates from the Ministries of Interior and Protection social and military and police officials who traveled to the Reservation to attend. - Reference document with the commitments of Colombia for COP21 (García Arbeláez, Barrera, Gómez, & Suárez Castaño, 2015).		
Assumption 3: The institutional and legal framework on indigenous communities and their autonomy are respected.	Very low risk.	✓Strictly comply with legal and institutional framework concerning indigenous communities, observing the legislation that exists about it in the country and respecting the provisions of the Statutes of ACATISEMA.	✓Monitoring the attitude adopted by indigenous communities and state control bodies regarding the effects involved in developing the Project activities and the objections that are generated, complying with the law and the ACATISEMA Statutes.	A1.2 A1.3
		✓Train and inform all members of ACATISEMA on the rights and duties of indigenous peoples established in the legal norms, through semiannual workshops in each area Indigenous	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, analyzing the degree of assimilation of the issues	

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		Reservation.	by the participants to the event.	
		✓Manage level ACATISEMA reform statutes for better compliance with the legal and institutional framework on indigenous and to better fulfill the goals and objectives of the project framework issues. Comment: A Zonal commission of representatives (Indigenous Zonal Coordinator of the Project) which will report to the General Assembly of 2016 was formed.	✓Monitoring the actions of support and proposals which seek to improve ACATISEMA Statutes, noting the interest that they can producing and the agreement that can be achieved between indigenous leaders.	
		Documentary evidences: - Annex 2.1.2: ACATISEMA Statutes. - Annexes 1.3.11, 1.3.12, 1.3.13 y 1.3.14: Minutes of meetings and workshops held in the framework of the implementation of Convention No. 310 of 2015, where indigenous communities were trained on governance and socialized Life Plan, regarding safeguards for REDD + (Annex 1.3.15a) and the contents of the Project primer (Annex 1.3.15b) and Project poster (Annex 1.3.15c).		
Assumption 4: Captains, Board of Cabildos, Coordination Committee and Zonal Coordinators undertake and participate in the	Low risk.	✓Maintain ongoing communication and information with communities about the development of the negotiations and implementation of project activities through newsletters, workshops and meetings of socialization.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and dissemination, by different means, of agreements, managements, activities and Project results.	A1.2
		✓Maintain and strengthen the efforts that allow	✓Monitoring the management that the	A1.2

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
development of the Project.		arriving in a timely manner, indigenous peoples, benefits in education, food, communication, production, health and housing generated by the project.	administrative staff of the Project makes to obtain the resources and support of partner institutions to properly develop activities, evaluating the magnitude of the impact generated in indigenous communities.	A1.3 A2.1 A2.2 A2.3
		✓Manage project resources, mainly financial, maintaining and respecting all mechanisms and measures necessary internal and external control.	✓Making a financial audit, disposing of reports on the dynamics of resource flow.	A1.3
		✓Strengthen education in ethical values and their application in project management, through zonal workshops.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made, understanding the characteristics of the Project and commitment to participate in a transparent administration.	A1.3 A2.2
		Documentary evidences: - Annex 1: Consultation Process, containing minutes of meetings and socialization training workshops on aspects of the implementation of REDD + Project activities (with results) and the activities of the Convention No. 310 signed between the Ministry of Environment and ACATISEMA. - Annex 3.17: Contract of accounts in participation (between private investor and MEDIAMOS). - Annex 1.9.6: Records of the National Learning Service - SENA which expressed support for the REDD+ Project through its education services		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		for the inhabitants of the RIU-SM.		
Assumption 5: National institutional support for the development of the Project is maintained.	Very low risk.	✓Strengthen ACATISEMA governance by managing a second phase of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and ACATISEMA.	✓Monitoring the elaboration of the proposal to develop the second phase of the convention signed between the Ministry of Environment and Sustainable Development and ACATISEMA and submission to this Ministry.	A1.2 A1.3
		✓Strengthen and expand institutional arrangements that have the Project and, in particular, the Action Plan agreed between ACATISEMA, MinAmbiente, Fondo Acción, Fundación Natura and MEDIAMOS.	✓Monitoring the development of the actions agreed in conjunction with the institutions with which relations have been established, determining the degree of compliance and the results achieved.	
		Documentary evidences: - Annex 1.9.4.2: Document of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and the Association ACATISEMA. - Annex 1.3.15a: Final report of Convention No. 310 of the 2015. - Annex 1.12: Minutes of Inter-institutional Alliance Ministry of Environment and Sustainable Development Inter, Fondo Acción, Fundación Natura, ACATISEMA MEDIAMOS (Plan of Action agreed). - Annex 1.9.3.3: Agreement of Understanding between Fondo Acción - ACATISEMA – MEDIAMOS. May 21, 2014.		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		- Annex 1.9.5.4: Mutual confidentiality agreement signed between the Alliance Strategic ACATISEMA- MEDIAMOS and Fundación Natura. February 1, 2015.		
Assumption 6: The team of Project human talent has experienced professionals in the skills needed to carry out the Project activities.	Very low risk.	✓Ensure the continued participation, in the team, of professionals with at least 5 years of experience in their field, in each subject area of the Project.	✓Monitoring the development of the Project activities, the participation and the degree of dedication of suitable professionals (according to their profile and resume) in charge of their respective area, reviewing periodic reports and products they generate.	A2.2
		✓Ensure the continued participation of indigenous in the Co-director team and the six zonal coordinators with at least 5 years of experience in knowledge and management of Indigenous Reservation.	✓Monitoring the development of the Project activities, the participation and the degree of dedication of indigenous people committed to lead their respective areas of influence, reviewing periodic reports and products they generate.	A1.2 A1.3 A2.2
		✓Maintain continuous and permanent manner, the training of indigenous zonal coordinators and Co-director, considering that this group of Indigenous people will taking increasing responsibility in management of project. Workshops and internships will be conducted in 2016 and 2017.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made, understanding the characteristics of the Project and commitment to participate in a transparent administration.	A1.2 A1.3 A2.2
		✓Maintain the strategy of the REDD+ project RIU-SM under which it is developed by an interdisciplinary team of professionals in MEDIAMOS with relevant experience in the development and implementation of forestry projects and with indigenous personal of ACATISEMA with great knowledge of the forest	✓Monitoring the development of the Project activities, the participation and the degree of dedication of suitable professionals and indigenous people that participate in Project, reviewing periodic reports and products they generate.	A1.2 A1.3 A2.2

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		and their communities. The alliance between ACATISEMA and MEDIAMOS is the main element in managing the project because they are groups that complement the technical and scientific part and knowledge of the territory.		
		✓Link in 2016 at least two other professionals with experience in the design and implementation of AFOLU projects and the quantification and carbon registry.	✓Monitoring the development of the Project activities, the linking, participation and the degree of dedication of two professionals with experience in this kind of projects, reviewing their contributions.	A2.2
		✓Keep the implementation of Adaptive Management Plan, based on the mitigation measures that have been defined and presented.	✓Monitoring compliance with mitigation measures as defined in this Adaptive Management Plan.	A1.2 A1.3 A2.2
		Documentary evidences: - Annex 24: Curriculum Vitae of MEDIAMOS F&M S.A.S. technical team and of indigenous Co-director of Project. - Illustration 3 of PDD “Organizational structure of the Strategic Alliance”. - Annex 1.2.2.2: Strategic Alliance Agreement signed between ACATISEMA and MEDIAMOS.		
Assumption 7: ACATISEMA has sufficient capacity, from the 5th year of the	Low risk.	✓Strengthen technical and administrative training for Project Co-Director, Zonal Coordinators and the Board of ACATISEMA, through workshops and internships in 2016 and 2017.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made, understanding the characteristics of the Project and commitment to	A2.2

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
Project, to take over the technical and administrative management of the Project.			participate in a transparent administration.	
		✓Keep management with the "Youth in Action" Program of the DPS and SENA to train young graduates, in order to start the implementation of academic programs from 2017.	✓Monitoring the management made to prepare the start of the programs of education and training, noting that training needs and the target population have been identified, and that agreements with relevant entities, logistics and resources necessary have been gotten.	A1.2 A2.2
		✓Make management with universities at regional and national level so that some Indigenous people can study, in accordance with defined training plan at project level.		
		Documentary evidences: - Annex 1: Socialization, training and consultation process - Annex 1.9.6: SENA's Documents in which manifested its support to REDD+ Project through its educational services to inhabitants of RIU-SM		
Assumption 8: The Project management team maintains a presence in the country and is located less than a day trip to the Project site, considering all the five zones of the Indigenous Reservation.	Very low risk.	✓Maintain the administrative and technical offices of the REDD+ project RIU-SM, which are located less than 3 hours traveling from the project area. ACATISEMA has two offices in the project zone, one in Inirida and other in Cumaribo. MEDIAMOS has its office in Cali. MEDIAMOS technical team continually travels to the Project Area. The Co-director and the zonal coordinators live in communities, in the project area.	✓Monitor the ongoing operation of headquarters provided for the development of the Project, with the presence of members of the management team, especially those offices of ACATISEMA in the cities of Cumaribo and Inírida, noting that they have the physical and technical resources and that preserve the conditions that facilitate travel to those places.	A1.2 A1.3

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		Office of MEDIAMOS: Alto del Rosario, Km 12 via El Otoño, La Buitrera – Cali. Branch offices of ACATISEMA: Cumaribo – Central zone Inirída, neighborhood La Esperanza. The indigenous Co-director lives in the community Pajuy and zonal coordinators live each in their indigenous communities (Bopone, Camuniana, Atana Piraniane, El Progreso, Berlin II y Cumaral).		
Assumption 9: Cash flow breakeven point of the Project is achieved in year 4.	Low risk.	✓Secure at least 40%-80% of needed funding to cover the total of required flow of expenses before the project reaches breakeven. Details are provided in a cash flow analysis which can be found in the PD of Project (section 2.5.1.2). Various agreements have been established to ensure the financing of the project before breakeven point. The financial documents, agreements and contracts are available for audit if required.	✓Monitoring the management that the administrative staff of the Project makes to obtain the resources and support of partner institutions to properly develop activities, noting cash flow and its sufficiency with respect to required funds.	A3.1 A3.2
		✓Extend the commitment to 5th year of the Project, both ACATISEMA as MEDIAMOS, so that the work of indigenous peoples in the project activities and their participation in the workshops are made without charges until revenues are taken for VCUs sale; the same with all the technical and administrative body of MEDIAMOS (PDD, section 2.5.1.2).	✓Monitoring the development of the Project activities, the participation and the degree of dedication of suitable professionals and indigenous people that participate in Project, reviewing periodic reports and products they generate, noting its willingness to continue until the balance point is achieved.	A3.1 A3.2
		✓Intensifying business strategy presales and sales of VCUs from 2016 through agreements with	✓Monitoring the actions taken with already contacted institutions and others that can be	A1.2

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		specialized agents.	made new alliances, to achieve marketing of VCUs, by reviewing agreements and contracts signed.	A3.1 A3.2
		✓Ensure that 80% of the compensation for VCUs income will be used for project activities during the first five years, the other 20% will go to the alliance organizations for social provisions, some of legal order; 75% in the period from sixth to tenth year, the other 25% to the alliance organizations for social provisions, some legal nature and 70% in the next twenty years, the other 30% to the alliance organizations for social provisions, some of a legal nature, according to Strategic Alliance Agreement ACATISEMA - MEDIAMOS. Revenues from VCUs sales are conservatively estimated. Financial documents are available for audit if required.	✓Making a financial audit, disposing of reports on the dynamics of resource flow, noting that the distribution of incomes contained in the Strategic Alliance Agreement signed between ACATISEMA and MEDIAMOS is fulfilled.	A3.1 A3.2
		Documentary evidences: - PDD Section 2.5.1.2 “Cash Flow of the REDD+ Project RIU-SM”. - Annex 8: Projected Cash Flow. - Annex 2.1.11: Strategic Alliance Agreement ACATISEMA - MEDIAMOS and Annex 1.9 Procedures and institutional arrangements.		
Assumption 10: Demand and prices of VCUs in the voluntary	Low risk	✓Forming a management team of voluntary carbon market with national and international relationships and agreements with companies	✓Monitoring the incorporating of specialized staff to achieve VCUs marketing, noting its experience in the voluntary carbon market by reviewing your	A1.2 A3.1

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
carbon market guarantee the sustainability of the Project after the breakeven point is achieved.		with experience, so that the presales and VCUs sales be promoted.	profile, resume and projects in which it have participated.	A3.2
		✓Intensify management VCUs presales and sales before the year Project breakeven point, taking into account that the Government has publicly announced that it has international resources for REDD+ Projects offsets. Estimate very conservatively sales of VCUs, as it is expected to sell al least half of verified VCUs.	✓Monitoring the actions taken with already contacted institutions and others that can be made new alliances, to achieve marketing of VCUs, by reviewing agreements and contracts signed.	A1.2 A3.1 A3.2
		Documentary evidences: - Paris Agreement. Draft decision - / COP21 (http://unfccc.int/resource/docs/2015/cop21/spa/l09s.pdf) "Green Fund" - Paris Agreement: Colombia would act of this way about climate change (http://cambioclimatico.minambiente.gov.co/images/ABC_B58_C41_baja.pdf) - Press news: "USD 300 million to stop deforestation in Amazonas" (El Tiempo http://www.eltiempo.com/multimedia/especiales/especial-cop21-300-millones-de-dolares-para-detener-deforestacion-en-la-amazonia/16445362) - Visión Amazonía: reducción de la deforestación en la selva amazónica para el año 2020 (https://www.minambiente.gov.co/images/Atenci		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		on_y_particpacion_al_ciudadano/consultas_publicas_2015/viceministerio/Resumen-VisionAmazonia-WEB.pdf)		
Assumption 11: With the resources and activities of the project the living conditions of the indigenous peoples of Indigenous Reservation (education, food, health, housing, transport, communication) are improved.	Very low risk	✓Keep and consolidate alliances and agreements with institutions that defined their support for the Project (MinAmbiente, Fondo Acción, Fundación Natura) and maintain the management to form new strategic alliances with national and regional institutions such as the DPS (“Youth in Action” Program, RESA) and SENA, among others.	✓Monitoring the development of the actions agreed in conjunction with the institutions with which relations have been established and others that can be made new alliances, determining the degree of compliance and the results achieved, determining the degree of compliance and the results achieved.	A1.2 A1.3
		✓Monitor improving social and economic conditions of indigenous peoples of the Indigenous Reservation.	✓Monitoring the impact that the activities are generating, evaluating whether defined and agreed benefits are reaching communities in the manner prescribed in the Project design. ✓Making a financial audit, disposing of reports on the dynamics of resource flow, noting that the distribution of incomes contained in the Strategic Alliance Agreement signed between ACATISEMA and MEDIAMOS is fulfilled.	A1.2
		✓Widely spread among communities about the benefits of the project, publishing a booklet and posters in which these benefits are illustrated.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and dissemination, by different means, of agreements, managements, activities and Project results (benefits).	A1.2
		Documentary evidences: - PDD, Section 1.8.1. Benefits and beneficiaries.		

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		- PDD, Section 5. Environmental and socio-economic impact. - Annex 4: Plan of sustainable management. - Annex 5: Family Agrifood Production Units System (FAPUS). - Annex 22: Socio-economic potential impacts.		
Assumption 12: The Agreement between ACATISEMA and MEDIAMOS is maintained by the 30-year cycle of the project.	✓Very low risk	✓Strictly observe and respect the Strategic Partnership Agreement between ACATISEMA and MEDIAMOS.	✓Monitoring the development of the Project, noting that the activities performed and the results obtained correspond with the agreed commitments.	A1.3
		✓Ratify in the Zonal Assemblies and each Ordinary General Assembly of ACATISEMA the Agreement between the Association and MEDIAMOS to develop the REDD+ Project RIU-SM.	✓Monitoring the actions and decisions that address in the Zonal Meetings and the General Assembly of the Association, noting that the leaders of the Indigenous Reserve continue to support the continuity of REDD+ Project RIU-SM and that they discuss a possible extension of activities protection beyond the project cycle.	A1.3
		✓Establish a Fiducia for project cycle that ensures proper routing and allocation of resources to the different communities of the Indigenous Reservation. With Fondo Acción respective management has been processed.	✓Monitoring the Fiducia with the Action Fund, noting that the distribution of incomes contained in the Strategic Alliance Agreement signed between ACATISEMA and MEDIAMOS is fulfilled.	A3.1 A3.2
		✓Maintain throughout the project cycle accompanying the Ministry of Environment and Sustainable Development, Ministry of Interior, Cumaribo “Personería” and the Ombudsman, on	✓Monitoring the attitude adopted by indigenous communities and state control bodies regarding the effects involved in developing the Project activities and the objections that are generated,	A1.2 A1.3

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		the implementation and compliance with the Agreement of the activities and goals of the Project, as ordered by the Court Supreme Court of Justice.	noting that the activities performed and the results obtained correspond with the agreed commitments and the set timetable.	
		✓Intensify the dissemination of the Agreement, so that all communities clearly aware of the points agreed between ACATISEMA and MEDIAMOS. New edition and publication of the Agreement and Articles of ACATISEMA be made.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and dissemination, by different means, of agreements, managements, activities and Project results.	A1.2
		✓Promoting the project is maintained and extended by ACATISEMA for at least another cycle of 30 years. An "Other If" will be established in the Agreement between ACATISEMA and MEDIAMOS formulating this point.	✓Monitoring the actions and decisions that address in the Zonal Meetings and the General Assembly of the Association, noting that the leaders of the Indigenous Reserve continue to support the continuity of REDD+ Project RIU-SM and that they discuss a possible extension of activities protection beyond the project cycle.	A1.2 A1.3
		Commentaries: - The Project is protected by a “legally binding commitment”: Agreement between ACATISEMA and MEDIAMOS which was ratified by Sentence of Tribunal of Villavicencio (Meta)” and by Decision of the Supreme Court of Justice, ensuring the continuity of management practices that protect carbon stocks credited to the entire length of the crediting period of the project (30 years). - Resguardo Indígena Unificado - Selva de		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		Matavén (RIU-SM) has resolution that guarantees land ownership indefinitely (Resolution 37/2003 INCORA), which was protocolización with Public Deed No. 3798/2008, Notaria 19 of the Bogota Circle. - ACATISEMA Association has public resolution that guarantees its operation indefinitely (Resolution 0177/2002 of the Ministry of Interior) and MEDIAMOS has also Public Deed of Constitution No.1555/1999, Sixth Notaria of Cali, registered at the Chamber of Commerce in May 26th, 1999 for an indefinite period.		
		Documentary evidences: - Annex 2.1.11 Strategic Alliance Agreement ACATISEMA-MEDIAMOS; - PD, Section 1.3 Project proponent; - Annex 1.11.8 Trib. Villavicencio; - Annex 1.11.10 Judgment of the Supreme Court; - Annex 2.2.1 Res. 037 /2003 INCORA; - Annex 2.2.3 Deed 3798 / 2008, Notaria 19, Bogotá; - Annex 2.1.1 Res. 0177/2002 MinInterior; - Annex 3.2 Statutes of ACATISEMA - Annex 3.1.1 Deed. No. 1555/1999 of		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		MEDIAMOS.		
Assumption 13: The Project Area remains protected by the constitutional and legal framework of the country, both in land ownership and use rights of resources.	Very low risk	✓Train and educate communities about their rights and duties on Indigenous Reservation in the constitutional and legal framework of the country, developing two workshops in each area during 2016 and 2017.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of governance, rights and duties as indigenous communities.	A1.2 A2.2
		✓Consolidate these rights and duties by applying ACATISEMA Statutes in the constitutional and legal framework.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of rights and duties as indigenous communities, organizational structure and application of the ACATISEMA Statutes.	A1.2 A1.3
		✓Keep ACATISEMA unit to preserve their rights, through consultations and dialogues in 2016 zonal workshops.	✓Monitoring the spaces where different government bodies of ACATISEMA actively involved, noting determinations about actions carried out by the Association in an attempt to fulfill its objective.	A1.2 A1.3
		✓Widely spread within communities the rights and duties of Indigenous Reservation against land ownership and use of their resources through a primer and two newsletters in 2016 and 2017.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and dissemination, by different means, of rights and duties of Indigenous communities respect to Reservation.	A1.2 A1.3
		Commentary: - The Project Area is legally protected by the Government of Colombia and its Constitution		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		(1991) and the Statutes of ACATISEMA.		
		Documentary evidences: - PD, Section 1.12 “Ownership and other programs”; - Annex 2.1.2 Statute of ACATISEMA; - Annex 2.2.1 Res. 037/2003 INCORA; - Annex 2.2.3 Deed No. 3798 / 2008, Notaria 19, Bogotá; - Annex 2.1.1 Res. 0177/2002 MinInterior.		
Assumption 14: The communities maintain their commitments to the Project.	Low risk	✓Permanently maintain communication and consultation with indigenous communities through the Zonal Coordinators, at least two workshops per year (one by semester) also be made, that allows interaction between the various indigenous communities.	✓Monitoring the work done by the Zonal Coordinators related to inform constantly in its area of influence on the degree of development of the Project. ✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made.	A1.2 A2.2
		✓Strengthen communication mechanisms by managing a radio-station and six digital kiosks, putting into operation agreement with the Ministry of TICs.	✓Monitoring the management made to organize some media in the Indigenous Reservation, consulting about the identified needs, approaches to entities that support these initiatives, agreements have been signed, logistics and resources.	A1.2
		✓Disseminate the positive impacts through the primer and posters produced in the Convention No. 310 of 2015 signed between ACATISEMA	✓Verification to the development of products / media and dissemination of information on the Project.	A1.2

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		and the Ministry of Environment.		
		✓Maintain surveillance and control of the territory against any threat of intrusion and violation of rights, particularly through of monthly patrols in each zone of the Indigenous Reservation.	✓Monitoring the routes of surveillance and control that the indigenous guard makes, noting they have the required logistics and resources, that documents prepared for this purpose are filled, that they communicate novelties and that corrective actions are taken.	A1.1
		✓Keep food production activities through FAPUS.	✓Monitoring the amount of food produced by indigenous people for self-consumption, noting how enough is and whether it meets the established plans.	A2.1
		✓Promote ACATISEMA commitment to keep Project activities indefinitely as their strategies and Statutes, becoming in the future the only organization with ownership and right to use their land and resources. An "Other If" will be established in the Agreement between ACATISEMA and MEDIAMOS formulating this point.	✓Monitoring the actions and decisions that address in the Zonal Meetings and the General Assembly of the Association, noting that the leaders of the Indigenous Reserve continue to support the continuity of REDD+ Project RIU-SM, that they discuss a possible extension of activities protection beyond the project cycle and that ACATISEMA is reaffirmed as the only association that has the property and rights to use the land and resources of the RIU-SM.	A1.3
		Documentary evidences: - PD, Section 1.8.1. Benefits and beneficiaries; - PD, Section 5. Environmental and socio-economic impact; - Annex 4 Plan of sustainable management;		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		- Annex 5 Family Agrifood Production Units System (FAPUS); - Annex 22 Socio-economic potential impacts.		
Assumption 15: The country maintains an adequate governance score according to the World Wide Governance Indicators.	Low risk	✓Participate in the National Strategy EN-REDD and Development Plan of the country, as it is for the low-carbon development, promoting the REDD+ Project RIU-SM will constitute a pilot plan to region and country in control and reducing deforestation and forest degradation.	✓Monitoring the management made by the administrative team of REDD+ Project RIU-SM relating to the identification of institutional plans led by the Government, its characteristics, its influence on the Project, its preparation and presentation of proposals for inclusion.	A1.2 A1.3
		✓Manage a Second phase of Convention No. 310 of 2015 signed between the MinAmbiente and ACATISEMA.	✓Monitoring the elaboration of the proposal to develop the second phase of the convention signed between the Ministry of Environment and Sustainable Development and ACATISEMA and submission to this Ministry.	A1.3
		✓Maintain the benefits of the project, which prevents corruption and violence, and contributes to law enforcement and political and social stability of the region and the country.	✓Monitoring the impact that the developed activities are generating, evaluating whether defined and agreed benefits are reaching communities in the manner prescribed in the Project design.	A1.2 A1.3 A2.1 A2.2 A2.3
		Commentaries: - Colombia is about to live a stage of post-conflict and peace, allowing the country to maintain its governance. - Colombia has an average score of -0.322 for the years 2011-2014, according to five		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		governance indicators scoring. The Colombian government is an active member of the UNFCCC REDD+ and within the framework of the same has established a National REDD Strategy (ENREDD). In addition Colombia has established a designated national authority, and has several projects registered under the Clean Development Mechanism and REDD+.		
		Documentary evidences: - Worldwide Governance Indicator (http://info.worldbank.org/ governance/wgi/ index.aspx#countryReports) - "WorldBank_2015_Gover_indicators.pdf" (folder "3_docs_references". - PD, Section 1.11. Compliance with laws, statutes and other regulatory frameworks of PD.		
Assumption 16: No high-impact forest fires in the Project Area are presented.	Low risk	✓Control and surveillance permanently through the indigenous reservation, according with the relevant plan in each sector and zone. ✓Have in account within the control system planned for the REDD+ Project RIU-SM, the monitoring of fires and burns.	✓Monitoring the routes of surveillance and control that the indigenous guard makes, noting they have the required logistics and resources, that documents prepared for this purpose are filled, that they communicate novelties and that corrective actions are taken.	A1.1
		✓Strengthen the community capacities in management of controlled burnings in the framework of the REDD+ project RIU-SM	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made, understanding and	

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		activities, as well as the implementation of awareness and environmental education programs in schools within the scope of the project. The organization at community level will be also essential to prevent the impacts of these burnings.	putting into practice the comprised issues.	
		✓Keeping track of early warnings issued by the IDEAM and Corporinoquia on areas that are susceptible to forest fires and act accordingly.	✓Monitoring the consultations that are made about the information that is available from the institutions, saving it in a database.	
		Documentary evidences: - IDEAM fires statistics: http://www.ideam.gov.co/web/ecosistemas/estadisticas-incendios - Early warnings: http://www.ideam.gov.co/web/pronosticos-y-alertas/informe-diario-de-incendios		
A product level				
Assumption 17: External actors involved in Project participate in the implementation through an appropriate institutional coordination.	Low risk	✓Coordinate and extend the Plan of Action with the Ministry of Environment, Fundación Natura y Fondo Acción, ACATISEMA and MEDIAMOS.	✓Monitoring the development of the actions agreed in conjunction with the institutions with which relations have been established, determining the degree of compliance and the results achieved.	A1.2 A1.3
		✓Expand the management and coordination to ensure the participation and support of other external actors.	✓Monitoring the new relationships and agreements established with other entities, noting that strengthen the development of the Project.	
		Commentaries: This issue is particularly important given the		

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		magnitude of the Project at the local, regional and national levels.		
		Documentary evidences: - Annex 1.9.4.2: Document of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and the Association ACATISEMA. - Annex 1.12: Minutes of Inter-institutional Agreement between Ministry of Environment, Fondo Acción, Fundación Natura, ACATISEMA and MEDIAMOS (agreed Action Plan). - Annex 1.9.3.3: Agreement of understanding between Fondo Acción – ACATISEMA – MEDIAMOS. May 21st, 2014. - Annex 1.9.5.4: Agreement of mutual confidentiality signed between the Strategic Alliance ACATISEMA-MEDIAMOS and Fundación Natura. February 1st, 2015.		
Assumption 18: External actors do not interfere with the stability of the ACATISEMA governance.	Very low risk.	✓Promote and ensure the participation of ACATISEMA in different official bodies and events for meeting and coordination of indigenous organizations in regional and national level, where the fundaments and organization of the Project are clarified, demonstrating their positive impacts on indigenous peoples of Indigenous Reservation and demanding respect for their autonomy as an	✓Monitoring the support provided to ACATISEMA to be linked to events concerning Indigenous Associations, verifying that their autonomy is recognized and that an importance to REDD + Project is given.	A1.2 A1.3

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
		organization not subsidiary to other organizations.		
		✓Strengthen ACATISEMA governance through unity and compliance with its Statutes.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of governance, rights and duties as indigenous communities, organizational structure and application of the ACATISEMA Statutes.	
		✓Manage a second phase of Convention No. 310 of 2015 signed between MinAmbiente and ACATISEMA.	✓Monitoring the elaboration of the proposal to develop the second phase of the convention signed between the Ministry of Environment and Sustainable Development and ACATISEMA and submission to this Ministry.	
		Documentary evidences: - Annex 1.9.4.2: Document of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and the Association ACATISEMA.		
Assumption 19: Carbon stocks in the Project Area, on which credits are issued, are protected against interference from external actors that can affect them.	Low risk.	✓Maintain forest patrols by the REDD+ project RIU-SM to prevent intrusions by outside actors into the project area. This activity is an ongoing enforcement and tends the protection of 100% of the carbon stock of the project area.	✓Monitoring the routes of surveillance and control that the indigenous guard makes, noting they have the required logistics and resources, that documents prepared for this purpose are filled, that they communicate novelties and that corrective actions are taken.	A1.1
		✓Maintain and strengthen the Indigenous Guard across all sectors and zones; they are responsible for making control patrols. It is an ancient practice	✓Monitoring the actions to improve the capacity of the indigenous guard of RIU-SM, noting that training is provided and that necessary tools are	

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		in the Indigenous Reservation.	provided to accomplish their work.	
		Commentary: - Indigenous communities are organized around RIU-SM, near and in the same line of rivers, which constitutes an advantage to control and surveillance tasks.		
		Documentary evidences: - PD, Illustration 4. Organizational structure of ACATISEMA.		
Assumption 20: Community leaders, by the statutory entities of the Association, resolve internal conflicts that hinder the development of the Project and maintain work disposition integrated and concerted.	Low risk.	✓Manage a second phase of Convention No. 310 of 2015 signed between the Ministry of Environment and ACATISEMA, for strengthening governance ACATISEMA.	✓Monitoring the elaboration of the proposal to develop the second phase of the convention signed between the Ministry of Environment and Sustainable Development and ACATISEMA and submission to this Ministry.	A1.2 A1.3
		✓Strengthen ACATISEMA governance through the implementation and respect the Statutes of the association.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of governance, rights and duties as indigenous communities, organizational structure and application of the ACATISEMA Statutes.	
		✓Keep training workshops on governance at the level of all communities, allowing aware of organizational importance and its operating mechanisms.		
		Documentary evidences: - Annex 1.9.4.2: Document of Convention No. 310 of 2015 signed between the Ministry of Environment and Sustainable Development and		

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		the Association ACATISEMA. - Annex 3.2 Statutes of ACATISEMA.		
Assumption 21: The unit of local communities and their willingness to work together maintains integrated and concerted.	Low risk.	✓Train captains, Cabildos Board, Board of ACATISEMA, Coordinating Committee and Zonal Coordinators on good governance practices and relationships, through regional workshops in 2016.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of governance, rights and duties as indigenous communities, organizational structure and application of the ACATISEMA Statutes.	A1.3
		✓Advice and support reform Statutes ACATISEMA to remedy failures or gaps in their participation and coordination mechanisms. A commission that will report to the General Assembly in 2016 was appointed.	✓Monitoring the actions of support and proposals which seek to improve ACATISEMA Statutes, noting the interest that they can producing and the agreement that can be achieved between indigenous leaders	
		✓Advice and support the collective construction of a Code of Good Governance that allows the preparation and training of the bodies of Management and Government ACATISEMA and strengthened to take autonomously and exclusive project implementation. A commission which reports to the General Assembly in 2016 was appointed.	✓Monitoring the proposals seeking construction of a serie of provisions for ethical administration of the Association, as well as training processes for ACATISEMA leaders	
		Documentary evidences: - Annex 3.2 Statutes of ACATISEMA.		
Assumption 22: Communities through	Very low risk.	✓Prioritize resources management and strengthening the FAPUS,	✓Monitoring the development of the Project, noting that the activities performed and the results	A2.1

Assumptions (risk factor)	**Risk**	**Mitigation Measures / Comments / Documentary evidences**	**Monitoring action**	**Act**[62]
FAPUS maintain the level of food production that contributes to its self-sustainability.			obtained correspond with the agreed commitments and schedule established.	
		✓Streamline management of resources for the establishment of sub-projects of productive chains already selected.	✓Monitoring the management that the administrative and marketing staff of the Project makes to obtain the resources, both investment returns by selling VCUS, and support of partner institutions to properly develop activities.	A2.3
		✓Mainly train captains and women on the management of production projects through regional workshops during 2016 and 2017.	✓Monitoring the actions of training and socialization carried out in the Indigenous Reservation, noting how often they are made and the degree of assimilation, by participants to events, of issues of food production for self-consumption and marketing.	A2.2
		Documentary evidences: - Annex 5: Family Agrifood Production Units System (FAPUS).		
Assumption 23: Strategic partnership between ACATISEMA and MEDIAMOS F & M S.A.S. is maintained and strengthened.	Low risk	✓Expedite the process and procedures of the validation, verification, registration and marketing of VCUs.	✓Monitoring the management to develop the processes with the DOE (Designated Operational Entity), so as to quantify the VCUs that can be marketed.	A3.1 A3.2
		✓Ensure the funds to support the development of the Project activities during the year when it plans to reach breakeven (2016) and even the resources to keep the project the following year (2017).	✓Monitoring the management that the administrative staff of the Project makes to obtain the resources and support of partner institutions to properly develop activities, noting cash flow and its sufficiency with respect to required funds.	A3.1 A3.2
		✓Expand and intensify the dissemination and	✓Monitoring the actions of training and socialization	A1.2

Assumptions (risk factor)	Risk	Mitigation Measures / Comments / Documentary evidences	Monitoring action	Act[62]
		socialization among communities on efforts made and progress through quarterly newsletters.	carried out in the Indigenous Reservation, noting how often they are made and dissemination, by different means, of agreements, managements, activities and Project results.	
		Documentary evidences: - PD, Section 2.5.1.2 "Cash Flow of the REDD+ Project RIU-SM"		

4.3.4 Monitoring and documentation of mitigation measures. Adaptive Management Plan

Mitigation measures presented in the previous section are specifically monitored, documenting learned lessons or corrections necessary and incorporating them in Project decisions on progressive monitoring periods. Notice how each Project activity has tasks involving the monitoring, evaluation of results, systematization of these results and, finally, its divulgation and socialization. Systematization and evaluation of results imply identify corrective measures gaps and obstacles that may be appearing in the execution of each activity and mitigation measures. In the monitoring tasks of Project activities related to each mitigation measure, formats, records, minutes and reports of monitoring actions for respective mitigation measure are managed. The set of mitigation measures and monitoring processes and documentation are the Adaptive Management Plan of Project.

Annually the POA (Annual Operational Plans) are developed, which collected progressively, year after year, the experiences and lessons in the implementation and operation of the Project activities and mitigations measures.

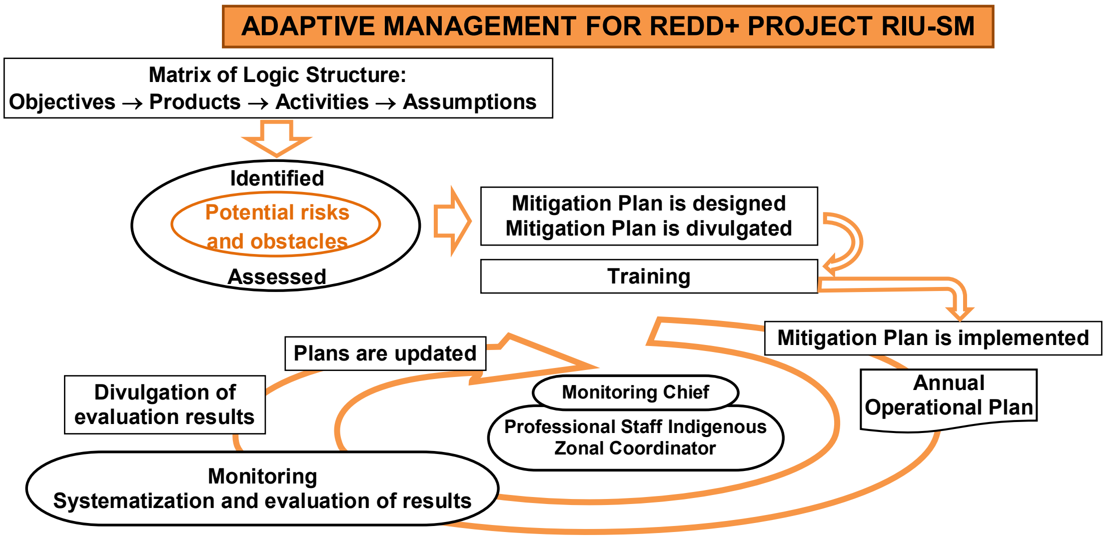
As explained above, it can be stated that Project is based in the premise of the “Adaptive Management”, in this sense every intervention on the territory is sustained in previous information collected in field as a knowledge basis. Based on this knowledge is that Operative Plans and the rest of the necessary instructions for the implementation of the project, the interventions on the territory and the treatment of the social component are defined.

This monitoring process of Project activities and mitigations measures leads to the identification of trends in the different variables and parameters, including those that are necessary and useful to assess compliance with the objectives of the Project and the Adaptive Management Plan; this knowledge, which is generated, leading to the adaptation of the system (plans and instructions).

The information collected in field by the technical staff and Indigenous Zonal Coordinator is systematized by the Monitoring and Evaluation Chief, who at the end of the year presents the Monitoring Report for the period to the specialists who together with other members of the project, will elaborate the Operative Plan of the following period, identifying additionally which manuals of instructions or protocols should be updated or adapted to the occurring changes.

Following, the information flow in the framework of the adaptive management of the project is presented:

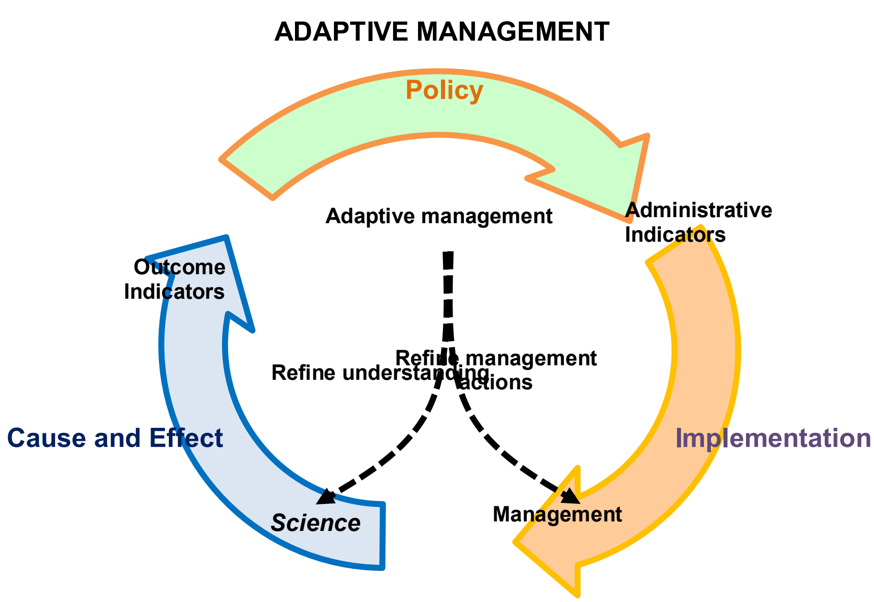
Illustration 37. Flow of Adaptive Management Plan



Source: REDD+ project RIU-SM

Adaptive management explicitly raised is experimental, ie, the integration of design with management and monitoring is sought in order to build knowledge through the development and testing of working hypotheses in order to adapt and learn. The following diagram illustrates this process.

Illustration 38. Integration of policy, implementation and cause-effect in AMP



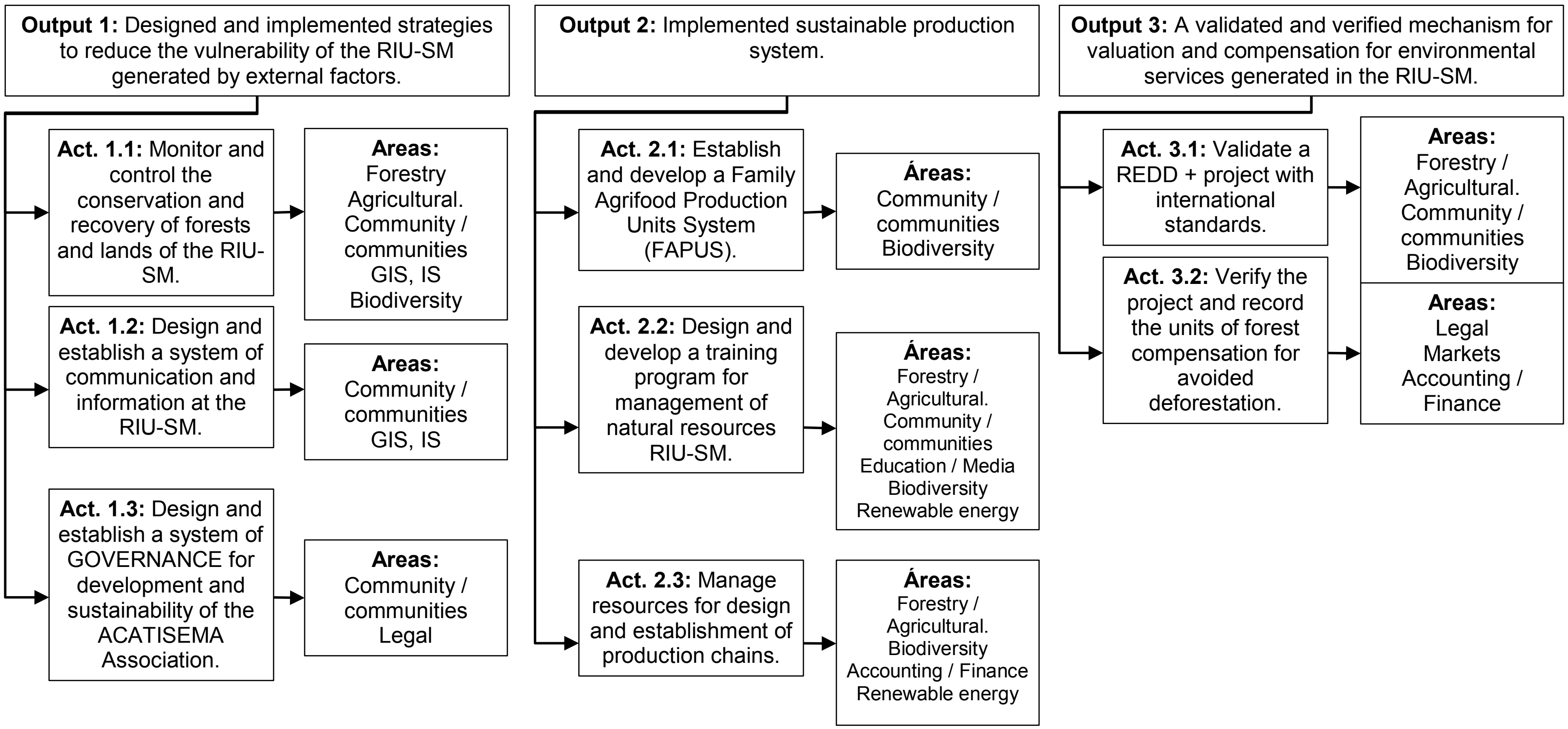
Source: Adaptive Management: A Tool for Conservation Practitioners by Nick Salafsky, Richard Margoluis, and Kent H. Redford. http://www.fosonline.org/Adaptive_Management1.cfm

4.3.5 Organizational structure

The REDD+ project RIU-SM has an experienced scientific and technical team for implementation and monitoring. The project has the support of institutions at the national level: Ministry of Environment and Sustainable Development, ACCION Fund and NATURA Foundation constituting with ACATISEMA and MEDIAMOS the strategic alliance for the support of REDD+ project RIU-SM. This alliance was formally established through agreements and meetings which minutes include the nature of this support. The Matrix of Action Plan developed in December 2014 systematized the corresponding activities (section 1.8).

The development of this monitoring plan is led by a multidisciplinary team of experts of following areas: socio-communal, forestry, food production, GIS, biodiversity and economic-financial of MEDIAMOS. These teams are responsible for assessing and monitoring the project together with ACATISEMA.

Illustration 39. Organizational structure for the implementation of project activities



Área	*Responsible*
Forestry / Agricultural	Francisco Quiroga, Freddy Martínez
Community / communities	Mónica Barragán, Juan Pablo Muriel
Geographic Information System *(GIS)*	Miguel Idrobo, Daniel Osorio
Information system *(IS)*	Salomé Quiroga, Eider Pérez, Paulo Barragán
Education / Media	Gaby Boshell, Claudia Muriel, Sandra Bravo, Gustavo Muriel, Sonia Guerrero
Renewable energy	Henry Soto – Emanuel Barriga

Área	*Responsible*
Legal	Esperanza Barragán
Biodiversity	Juan Carlos Silva
Markets	Mónica Barragán, Susan Quiroga, Sofia Barragán
Accounting / Finance	Waldo Amézquita, Consuelo Rivera

4.4 Internal Audit

The purpose of the internal audit is to minimize the risk of error, in such a way that it achieves the appropriate reliability of monitoring results. Its main stages are as follows:

1. Education and staff training

2. Quality control of collected and processed data.

3. Preparation, evaluation and publication of reports.

5 ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT

In Section 1.10.10 the problem analysis is presented with its corresponding "problem tree" and the environmental impact is presented in "Without REDD+ project" scenario.

In section 1.8 the description of project activities is presented with its own "objective tree" in "With REDD+ project" scenario and the environmental and socioeconomic impact of the project are presented; particularly sub-section 1.8.4 includes the project benefits.

5.1 Environmental impacts

In the Annex 21 potential positive and negative impacts on biodiversity are systematized in two scenarios: “With Project” and “Without Project”, identifying them in terms of flora, fauna, climate, air, landscape, soil and water. These impacts were analyzed according to the rating scale shown below depending on the intensity and scope of the impact,

Intensity and scope of impact	
Value	**Impact Level**
3	High positive
2	Half positive
1	Low positive
0	No impact
-1	Low negative
-2	Half negative
-3	High negative

The following results were obtained:

Table 85. Evaluation scores impacts on biodiversity

Scene	In the Project Area	Outside of the Project Area	Sub-totals
“With Project”	26	17	43
“Without project”	-26	-32.5	-58.5

Source: REDD+ project RIU-SM

Given these results, it shows that the project´s benefit for biodiversity is positive, while the impact in “Without project” scenario is negative; in a “With project” scenario the impact is not only positive, but the negative impacts in the “Without Project” scenario can be minimized or avoided through the its implementation.

Illustration 40. Scenarios "without project" and "with project"

Source: REDD+ project RIU-SM

Taking into account, these results can be seen that the net benefit of biodiversity project is positive with a punctuation of 13, compared with a punctuation "without project" of -32.5.

The main mitigation measures are focused on project activities presented in Section 1.8.

Some of the endangered species due to deforestation are on the IUCN Red List and CITES.

Table 86. Endangered Species in RIU-SM

CATEGORY GROUP	SPECIES	COMMON NAME	GLOBAL CATEGORY	NATIONAL CATEGORY
Plant	*Pachira quinata*	Ceiba Tolua	VU	EN
Plant	*Hirtella vesiculosa*		VU	
Plant	*Licania jaramilloi*			VU
Plant	*Eschweilera parvifolia*		LC	
Fish	*Pseudoplatystoma trigrinum* (Valenciennes, 1840)	Pintadillo tigre	VU	VU
Fish	*Potamotrygon motoro* (Müller & Henle, 1841)	Raya		VU
Birds	*Pipile pipile (Jacquin, 1784)*		CR	

CR: Critically Endangered, EN: Endangered, VU: Vulnerable, LC: Least Concern

Source: Based on (Villarreal Leal , et al., 2009), Characterization of the biodiversity of the Mataven rainforest; (UICN, 2008) Red book series of endangered species. Timber, fish, birds.

Measures to mitigate the impact of the biodiversity project is also presented in the Annex 21, according to the different components of flora, fauna, climate, air, landscape, soil and water.

5.2 Socio-economic impacts

One of the main objectives of REDD+ project RIU-SM aims to improve the living conditions of indigenous communities, especially children and youth in the region, who do not have the opportunities in the areas of education, health, employment and protection. Life plans developed by communities go hand in hand with the concepts that the REDD+ project handles and basically consist of:

- Community development, giving priority to the following areas: strengthening governance of the ACATISEMA Association, improving the quality of basic education (particularly of RIU-SM children); enabling access to courses of technical and production training for young people and above all future generating employment options for them.
- Environmental conservation strengthening- giving priority to the following areas: information strategies and environmental education, in order to sensitize local communities about the importance of protecting the environment; spread the REDD+ project RIU-SM for all communities to understand in depth of the project and the benefits it brings environmental protection; support local initiatives for environmental education; supporting of local initiatives on waste management.
- Establishment of information channels between communities that reveal the progress of the project and the various initiatives in community work, education, productive projects, etc.; the development of a system allowing a quick response to requests and proposals of community members; participation in various community activities, in order to hear their arguments and to respond to their concerns.

Mitigation measures:

Conflict management process: in the presence of internal conflicts within indigenous communities and the issues that arise within them, they must be resolved by the same authorities and indigenous communities in the context of its autonomy and in accordance with their own internal rules and go hand in hand with procedures staying within the dispute resolution, mechanisms that have been established in their domestic law and within the framework of their uses and customs.

ACATISEMA Association counts with approved statutes by the Assembly which regulates among others, internal conflicts as management and resolution mechanisms of these statutes.

Impacts on indigenous community in the "Without project" scenario.

The absence of the REDD+ project will produce a negative influence on the different sectors of the indigenous communities that are part of the RIU-SM; as it would not be possible to develop the proposed activities to benefit the community, due to lack of funding. The possible financing of those activities would be made through entry due to the commercialization of the carbon credits derived from a REDD+ project.

Illustration 41. Benefits are expected for the population

Source: REDD+ project RIU-SM

The impacts on the social components in "Without project" scenario:

- The offer opportunities to access information and mechanisms of education regarding with models of sustainable forest use will be smaller and limited considering that the presence of the Government and Non-Governmental Institutions in the area is uncertain and a very low coverage.
- There would be less opportunities to inform a population of over 13,000 people, including children and adults, who currently live in a situation of poberty and with very limited support of State entities. Communication with these communities wil help to enrich the dialogue orientated to cover topics as sustainable development, culture protection, sustainable management, etc.
- The lack of a strategy to promote and provide financial support to communities for the protection and care of their territory, is a factor that leads to the perpetuation of the informal management of production practices, such as mining, ranching and land invasion (colonization).
- Although State agencies have issued laws for protection, conservation, for the extensive territory and the riches it holds, there is no guarantee that this protection is effective; on the contrary it will continue the process of deforestation that is taking on an increasing scale.

Socioeconomic impacts on components in a "Without Project" scenario

• It will not be possible to generate new jobs and productive projects that improve the quality of life of people living in the RIU-SM.

• Lack of investment that would result from the implementation of REDD+ project RIU-SM. Given that this is a long term project, there would be no injection of a significant amount of financial resources that would have contributed to the sustainability and development of many indigenous communities.

• Alternative economic activities that will arise within communities as a strategy for improving farming practices, livestock and trade, would not be possible to perform and will continue the survival mechanisms with high aggressiveness towards the woods.

Impacts on indigenous community in REDD+ project in “With project” sceneario.

It is expected with the development of REDD+ project RIU-SM a series of community benefits and organizational will be unprecedented compared to other projects.

Impacts on social components are positive:

- The opportunity that indigenous communities have access to information and communication for the construction of a policy of forest conservation. Environmental management and generation of productive alternatives would be strengthened in communities.
- There will be a direct impact on strengthening the social capital of the ACATISEMA Association, in particular, in areas including local economic development and natural resources protection.
- With the development of sustainable production projects promoted by the REDD+ project RIU-SM, the viability of sustainable economic activities, will reduce pressure on forests, providing economic opportunities for residents and families who are natives of the area.
- A strategy will be defined to strengthen the Project with the support and the inclusion of government agencies such as the Ministry of Environment, Housing and Territorial Development, Ministry of Agriculture and Rural Development, Ministry of National Education, among others, and of private organizations which promote indigenous communities welfare and especially of children and women.
- The closest populations to the project area will be benefit for the extension and investment in basic services included in the REDD+ project RIU-SM. Project actions can be complemented with other public or private investment, since it is a sector that requires a lot of investment and unity of efforts and resources for the provision of basic services in areas of high geographic dispersion.

An extension of these impacts are considered in Annex 22: “Potential socioeconomic impacts”.

6 STAKEHOLDER COMMENTS

6.1 Features of Stakeholders

Below is a summary of stakeholder analysis of REDD + Project presents RIU-SM.

	Group of participants / beneficiaries	characteristics	Problems, interests, needs	Potential	Participation in the Project
			PRIMARY STAKEHOLDERS		
1	Communities of indigenous peoples of the RIU-SM	- See social, cultural, economic and environmental aspects (above).	- With unsatisfied basic needs. - Basic resources for livelihoods threatened. - With the increased interest in solving these problems.	- Rooted in the collective territory and ancestral knowledge of it. - Recognition of the impact that is being caused to its territory and subject to conditions to develop productive alternatives	- Primary and direct beneficiaries.
2	ACATISEMA	- It is the highest authority in the reservation.	- In need of organizational strengthening. - Its main objective is to foster the integral development, the conservation of the culture and society of indigenous communities as well as the consolidation of territory, self-government, defense, conservation, preservation of the environment and biodiversity of the Forest Mataven.	- Interested in developing their own managerial staff for the use and management of the natural resources; with authority, influence and decision power within their territory.	-Association direct beneficiary of the project. -They are prime participants in the planning and administration of the territory.
3	Teachers of primary and secondary basic education indigenous Reservation	- Responsible for providing education to the school population in the communities.	- With training needs in education in the sustainable management of natural resources.	- Once trained, they will be molding the future leaders of integrated management of the territory.	- They will be trained to improve the use and management of natural resources.

	Group of participants / beneficiaries	characteristics	Problems, interests, needs	Potential	Participation in the Project
4	Colonists	-Population (non-indigenous) in the area adjacent to the shelter. - Derive their income from agriculture, livestock, forest clearing and artisanal mining.	- Without any organization, many of them with basic needs unmet. - They are agents of the expansion of the agricultural frontier. - Some with land without official titles.	- With a few opportunities to participate in project activities and benefit from the results. - Their participation will be done by proper coordination and consultation with indigenous communities.	- With a few opportunities to participate in some activities and benefit from the results of the project.
5	**Mining Companies and individuals**	- Their income depends on mining.	- The current mining in the area is considered a threat to the conservation of the RIU-SM.	- Compete with the Project for the territory's resources.	- No current possibilities of direct participation.
			SECONDARY STAKEHOLDERS		
6	Ministerio de Ambiente y Desarrollo Sostenible	- Public entity at the national leadership in the management of the environment and renewable natural resources that promotes actions to regulate the environmental planning and defining national environmental policy and renewable natural resources.	- Its main interest is to achieve environmental planning, through the consolidation of a policy of sustainable development and strategic alliances with social and institutional participants in different sectoral and territorial scenarios.	- Institutional support.	- Direct participation by being the Environmental Authority.
7	Dirección de Asuntos Indígenas, ROM y Minorías - Ministerio del Interior	Public agency that advises the national level, prepares and proposes the formulation of public policy in favor of indigenous peoples within the framework of the defense, support, reinforcement and consolidation of ethnic and cultural rights.	- Its main interest is to promote recognition of the ethnic diversity and the exercise of their rights.	- Institutional support.	- Direct participation for being an institutional authority.
8	Corporinoquía	Regional environmental authority to ensure the proper use of natural resources in their area of jurisdiction.	- In need of resources to implement work plans with communities.	- Institutional support.	- Direct participation by being Environmental Authority.
9	Other government institutions: Governor ofice of Vichada, Mayor ofice Cumaribo	The Reservation for being part of the Cumaribo, Vichada, has territorial jurisdiction relations with the Governor's office and the Mayor's office.	- With institutional weaknesses and need of resources to implement work plans with communities.	- Institutional support.	- Direct participation for being territorial authorities.

Group of participants / beneficiaries		characteristics	Problems, interests, needs	Potential	Participation in the Project
10	Fundación NATURA	- Civil organization whose mission is the conservation, use and management of biodiversity to generate social, economic and environmental benefits in the context of sustainable human development.	- Its main interest is to contribute to the conservation and management of biodiversity Forest Mataven.	- Valuable experiences of community and environmental work.	- Direct participation in the fulfillment of its mission.
11	FONDO ACCIÓN To us, it is fundamental	- Colombian non-profit organization in the private scheme	His main interest is to encourage the participation of civil society and the private sector in the implementation of the country's public policies in two areas: - Conservation and sustainable development; and protection -development of children.	- Technical and managerial strengths that enable the design, selection, finance and administer programs and projects impact on two subject areas described above.	- Direct participation in the fulfillment of its mission.
12	SENA, Department of Social Prosperity (DPS), NGOs and private consultants	- Connected to the area - supporting the implementation of rural development activities.	- They obey their own interest mission and vision. - Its activities are carried out directly or through agreements with other institutions.	- Valuable experience working with communities.	- Direct or indirect participation through agreements and contracts for the implementation of some activities Participation.
THIRD LEVEL PARTICIPANTS					
13	Other indigenous communities neighboring RIU-SM	- Similar to the communities of indigenous peoples of the RIU-SM.	- Similar to the communities of indigenous peoples of the RIU-SM.	- Create similar projects in other reservations.	- Indirect beneficiaries of the project results.
14	Financial institutions	- They fund local development activities.	- Some with financing mechanisms for collaboration.	- Experience in financial development.	- They will be hired to explore their participation and achieve financial support.

6.2 Comments of the Stakeholders presented during the local consultations

The following table presents a summary of the events held in local consultations with its positive and negative feedbacks in different actors' categories. Here the PD Annex for each event, date and place is indicated:

1. ACATISEMA Board of Directors and Project Joint Commission.
2. ACATISEMA Coordinator Committee.
3. Board of Councils and ACATISEMA Coordinator Committee
4. Captains, councils and leaders of zones
5. ACATISEMA Zonal Meetings
6. ACATISEMA General Assembly
7. Discussion Table and Chieftains Summit
8. Public and private stakeholders.

The concerns and opinions were evaluated according to the following methodology:

- ✓ By recording the concerns and opinions and how often they were made.
- ✓ Classifying and prioritizing these comments.
- ✓ Widening explanations.
- ✓ Modifying or confirming the conclusions on the process to follow through signatures and fingerprints on the record or respective document memory.
- ✓ Making feedback at subsequent meetings, expanding and repeating the main concerns and opinions presented as many times as necessary.

Table 87. Meetings of ACATISEMA Board of Directors and Commission Joint REDD+ Project RIU-SM

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.4.1 Meeting of the ACATISEMA Board of Directors	July 6th, 2012	Bogotá	1 For the project design it must be taken into account the 5 zones in which the Reservation is divided and the leaders that make up the Association. 2 The project proposal should be socialized to the Coordinator Committee, the indigenous advisory and veedor fiscal. 3 Travel expenses, food and lodging for this socialization workshop in the city of Inírida will be assumed by MEDIAMOS; ACATISEMA will contribute with the active participation of his group of human talent. 4 ACATISEMA Representatives will provide official information related to the Association and the reservation.	1. Previous experiences with other institutions to design this kind of project have been disastrous
1.4.2.1 Meeting of the Board of directive of ACATISEMA	July 24th and 25th with 2012	Hotel Orinoco, Inírida – Guainía	1 The members of the Board of Directors, in the absence of the General Coordinator, decide to continue with the socialization process of the project proposal to the members of the Coordinating Committee. 2. In absence of any member of ACATISEMA Board was decided to form a Joint Commission to allow the proposed activities to continue. 3. It is proposed to perform some field trips to explore the Reservation area. 4. MEDIAMOS will cover of costs for tours.	
1.4.3.1 Meeting of the Joint Commission	September 25th 2012		1. Joint Commission with 4 ACATISEMA members and 2 MEDIAMOS representatives was created, in order to advance into the definition of work schedules, responsibilities and activities to follow. 2. It is required to inform and empower the Board of Councils on the progress of REDD+ project. 3. The process of participation in the project has given them greater discipline and responsibility in fulfilling tasks. 4. The table of distribution of responsibilities and resources of the project is accepted by both entities.	
1.4.4.1 Meeting of the Joint Commission for the project presentation at the "Bogota	November 22nd, 2012	Colombian Republic Congress, Bogotá	1. The REDD+ project RIU-SM was presented and welcomed by several Senators in the "Bogota Summit: cities and climate change. 2. A national and international guest's visit to Reservation was scheduled to Thursday December 6th, 2012 (Senator Mauricio Ospina, President of GLOBE International, Minister of Environment and Sustainable	

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
Climate Summit"			Development, Ambassador of France, other Senators). 3. It is proposed to register the REDD+ project RIU-SM in the database of the Ministry of Environment. 4. The project was submitted to the technical team of the Ministry of Environment and the IDEAM to manage support in the accompaniment of the project and is to be considered as a pilot project at the national level.	
1.4.5.1 Meeting of the Joint Commission to project presentation in the Senate of the Republic	November 23rd, 2012	Colombian Republic Congress, Bogotá	1. Several senators expressed the importance of the project for the country. The way that is was designed and developed, with the active participation of indigenous people is an invaluable value. 2. Senators interested are invited to meet the Reservation and their communities. 3. The Joint Commission considers invaluable the participation and support of Senator Mauricio Ospina, in both, the visit and the process that is being developed. The satisfaction for participation of Senator was manifested and agreed to express gratitude and the special invitation from ACATISEMA to him to know the territory and communities.	
1.4.7 Meeting of the Joint Commission	December 3rd, 2012	Orinoco, Inírida – Guainía Hotel	1. The proposal for the workshop training to the Board of Councils and the Coordination Committee and the presentation of progress on the design of REDD+ project RIU-SM Project were approved.	
1.4.8 Meeting of the Joint Commission	December 6th, 2012	ACATISEMA office, Cumaribo – Vichada	1. The composition of the plots working groups is defined. 2. This project has enabled them to manage other projects that contribute to improving the living conditions of indigenous peoples.	
1.4.9 Meeting of the Joint Commission	January 24th to 26th, 2013	ACATISEMA office, Cumaribo – Vichada	1. “Having accessibility of workshop materials has allowed us to acquire skills in the ownership and control of the project themes”. 2. The project has enabled them to very important aspects of their protection and their communities.	

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.4.10 y 1.4.11 Meetings of the Joint Commission	June 16th to 18th, 2015	Villavicencio	1. The general guidelines of the Strategic Plan of the Alliance were defined. 2. The guidelines of the Operational Plan REDD+ project RIU-SM will be developed. 3.Organization and management of the Operational Plan is defined	1. Although conflicts persist with an opposition group.
1.4.12 Meetings of the Joint Commission, Members of ACATISEMA Coordination Committee, Zonal Coordinators and Zones 1 and 2 Leaders.	July 3rd and 4th, 2015	Bopone - Cumaribo- Vichada	1. Operating plan and timetable of Alliance ACATISEMA-MEDIAMOS Strategic Plan and number 310 administrative agreement were adopted. 2. Field activities are prepared for the audit of REDD+ project RIU - SM leading to certification. 3. Measures to address the conflict with the opposition were taken.	
1.4.13 Meetings of the Joint Commission, Members of ACATISEMA Coordination Committee, Zonal Coordinators and Zones 3, 4 and 5 Leaders.	July 5th and 6th, 2015	Puerto Inírida – Guainía	1. Operating plan and timetable of Alliance ACATISEMA-MEDIAMOS Strategic Plan and number 310 administrative agreement were adopted. 2. Field activities are prepared for the audit of REDD+ project RIU - SM leading to certification. 3. Measures to address the conflict with the opposition were taken.	

Source: Annex 1 of PD

Table 88. Socialization Workshops and Training ACATISEMA Coordinator Committee

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.1.2 Socialization and training workshop for the presentation of proposed REDD+ project	July 22nd and 23rd, 2012	ICBF Office, Inírida - Guainía	1. It must ensure the participation of the 6 ethnic groups living in the Unified Reservation. 2. The presented points are clear and agree to continue with the design of REDD+ project. 3. Youth, women and elders of the various indigenous communities that make up the Unified Reservation do not have the opportunity to participate in these workshops, therefore, they suggest bringing this proposal to all communities. 4. "REDD+ project has an educational component that is very important for us". 5. Registration is requested in a report to be socialized in all communities of the reservation.	1. There are doubts whether to do consultation for the development of such projects.
1.1.3 Workshop of socialization and training of REDD+ project RIU-SM	July 24th, 2012	ACATISEMA Office, Inírida – Guainía	1. To choose representatives for each area of the reservation that are responsible for coordinating the project in their respective zone arises as a necessity. As Zone 2 is very extensive, it is proposed to have two coordinators (Sector 1 and Sector 2). 2. The Project Joint Commission was formed to develop, coordinate and manage the project was formed. 3. Signing an agreement between ACATISEMA and MEDIAMOS to continue with the design of REDD+ project was unanimously approved.	
1.1.4 Workshop of socialization and training of REDD+ project RIU-SM	September 23rd and 24th, 2012	Indigenous community: Sarrapia, Cumaribo – Vichada	1. A determining factor is the sustainability of programs or sub-projects during the project period. 2. The definition of the sub-projects must consider the needs and preferences of indigenous communities. 3. We ratify the agreement between ACATISEMA and MEDIAMOS signed in Inírida.	1. There are doubts that the project will affect the autonomy and rights communities have of their territory and natural and cultural resources.

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
			4. To socialize and bring the results to the Board of Councils is required. 5. The wise men or chiefs of the Piaroa community asked for a deadline to more carefully examine the feasibility and desirability of the project. 6. The Coordinator Committee presents a proposal for the transparency of the process and ensure that effect is given to the institutional cycle.	

Source: Annex 1 of PD

Table 89. Meetings of Councils, Captains, Coordinator Committee Members and Leaders by zone

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.4.5.2 Socialization meeting on REDD+ project sectors Cano Bocon, Cumaral, Yuri, Giro and Morocoto Buenavista - Zone 5	October 7th, 2012	Indigenous community: Managuares, Cumaribo-Vichada	1. It is important to schedule a workshop socialization 2. Support for continuity in the design and formulation of REDD+ project RIU-SM.	
1.4.5.2 Socialization meeting on REDD+ project sectors Barranquito, Laguna Colorada – Zone 4	October 10th, 2012	Indigenous community: Laguna Colorada, Cumaribo-Vichada	1. Councils and captains will be the spokespeople to carry project information to each of their communities. 2. They like to have indigenous representatives in the Joint Commission involved in the design and formulation of the project. 3. They agree with the proposed programs in the project and that each must have its own budget.	1 General Coordinator Alexander Lopez clearly has no interest in supporting REDD+ project.
1.4.5.2 Socialization meeting on REDD+ project sector Caño Cawasi –Zone 1	October 24th, 2012	Main Office, Cumaribo-Vichada	1. Leaders are interested in knowing the studies on REDD+ project. 2. They propose further socialization talks.	

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.3.1.1 Socialization meeting and training workshop on REDD+ project sectors Cawasi y Aiwakuna Tsepajibo – Zone 1	January 27th to 29th, 2013	Indigenous community: Cumariana, Cumaribo - Vichada	1. It is necessary and important to have an internal rule that protects the Reservation (Safeguards). 2. The REDD+ project RIU-SM must be formulated and designed taking into account the problems and needs of indigenous communities. 3. MEDIAMOS has an advantage over other companies because it has been present in the areas, allowing to present the REDD+ project RIU-SM to their indigenous authorities. 4. It is important to have written evidence to support these projects if they are accepted. 5. Care should be taken when going to sign documents that would compromise important aspects of Reservation without proper understanding and information about them. 6. The project proposal presented in its basic outline is consistent with the mission of the Association, because it is a project that aims at the conservation and protection of the territory in our communities, particularly our forests, biodiversity and other natural resources. 7. The project proposal considers the Plan of Life, worldview, cultural integrity, autonomy and dignity of their communities and therefore have no negative impacts on our territory. 8. "We agree with management Land Plan". 9. "We ratify the Agreement between ACATISEMA and MEDIAMOS until the Assembly. 10. Similarly, the process of managing the Joint Committee on the development of the project is authorized, especially the legal representatives of both entities.	1 Some proposals on these projects involve misinformation and misrepresentation to perform them.
1.3.2 Socialization meeting and training workshop on REDD+ project Sector 1, Zone 2.	February 3rd, 2013	Indigenous community: Camunianae, Cumaribo - Vichada	1. This project does not belong to the company MEDIAMOS; It is the result of an idea of it ACATISEMA Coordinator Committee taking into account the overall objective of the Association. 2. Reference to the problem of global warming and the importance of the Mataven Forest in this context was made. 3. Masters propose that MEDIAMOS can continue to support the process up to 30 years in 5 years because young people cannot have management	

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
			capabilities of GIS and other technical topics. 4. Masters express their agreement to keep it running the REDD+ project.	
1.3.3 Socialization meeting and training workshop on REDD+ project Sector 2, Zone 2	February 5th to 7th, 2013	Indigenous community: El Progreso, Cumaribo - Vichada	1. The Coordinator Committee invites the company MEDIAMOS to work together with ACATISEMA to develop a REDD+ project in Reservation. 2. MEDIAMOS is a legal company with which can make the alliance. It has a qualified professional team and has experience in environmental and educational area, particularly the formation of youth and adults. 3. REDD+ project is consistent with the ACATISEMA Statute, specifically in its purpose and goals and seeks to halt deforestation in Reservation contributing to reduce the emission of gases into the atmosphere. 4. The project is aimed to the Safeguard Plan in regards to autonomy, territory and culture, as key elements. 5. The project is not to sell or rent the land, is to provide environmental services, protect biodiversity, communities and forests. 6. Deforesting does not mean banning the enjoyment of the forest. 7. These projects are recognized nationally and internationally. 8. Young people have to be trained to manage natural their own Reservation resources. 9. The ACATISEMA Association will have to work jointly to make progress in the future. 10. It should work with mutual responsibility. 11. According to the socialization made by company MEDIAMOS, the Sector 2 accepts the project to work together between ACATISEMA and MEDIAMOS.	
1.3.4 Socialization meeting and training workshop on REDD+ project Zone 3	February 10th to 11st, 2013	Indigenous community: Sarrapia, Cumaribo - Vichada	1. The project is an initiative of its own and seeks to address the needs of the Reservation, with ourselves as actors. 2. The project can be applied to the Reservation and handle it by ACATISEMA in future. 3. This project seeks to reduce global warming and a commitment of not to	

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
			deforest for 30 years is acquired or whether they should not cut the trees. 4. The Reservation area has mining and oil threats. 5. This project should consider the ecological calendar 6. We must remain united so that our REDD+ project works very well. We hope this project will be positive for everyone.	
1.3.5 Socialization meeting and training workshop on REDD+ project Zone 4	February 13rd to 14th, 2013	Indigenous community: Laguna Colorada, Cumaribo - Vichada	1. ACATISEMA is legally constituted for a REDD+ project. 2. A project is nothing without organization. 3. This project requires the commitment and seriousness of the Association. 4. Indigenous communities will be the directly beneficiaries through the project activities that are going to be implemented. 5. ACATISEMA will work with more strength to continue with REDD+ project. 6. The actors agree with the distribution of income and expenses generated by the project.	1 There are threats of minerals exploitation in the indigenous reserve.
1.3.6 Socialization meeting and training workshop on REDD+ project Zone 5	February 16th to 17th, 2013	Indigenous community: Yuri, Cumaribo - Vichada	1. It is a project that is being done in partnership, indigenous people should participate in the process. 2. When the project is ready must have a document to make it up. 3. Keep seriously to enforce the project. 4. It requires the training and education of indigenous to be professional so can manage the project in the future.	1. The project is dangerous and an agronomist comes to tell us how to use the land. 2. Some captains feel distrust.
1.6.3: Socialization meeting and training workshop on REDD+ project Sector Caño Cawasi – Zone 1	August 1st, 2013	Indigenous community: Morrocoy	1. The project is feasible on Reservation and they decide to support the REDD+ project. 2. They agree with productive projects proposed for sector. 3. They support the survey process that must be completed for each family.	1. There is misinformation by some of the participants with plots.
1.3.7 y **1.3.8** Socialization meeting and training workshop	May 28th and 29th, 2014	Indigenous community: Caño Pavita -	1. We affirm the decision of the Board of Councils to approve the continuation of REDD+ project RIU-SM and management reports and we authorize legal representatives to advance efforts in the areas of certification and funding.	1. The project has generated divisions in ACATISEMA (Fiscal

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
on REDD+ project zones 4 y 5		Cumaribo	2. The various efforts that were made in Bogota benefit the development of the project and therefore indigenous communities (APC, MINAMBIENTE, SENA, DPS).	veedor).
1.5.5 Socialization meeting and training workshop on REDD+ project Zone 1	June 12nd, 2014	Indigenous community: Morrocoy - Vichada	1. The Ministry of Environment presented through a statement, the support by Maria Claudia Garcia, Director of Forestry. 2. The procedure for 800 scholarships was managed by the Youth in Action program, for youth people of RIU-SM. 3. The continuity of REDD+ project is endorsed.	
1.3.11 y 1.3.12 Training Workshop - Indigenous facilitators. 310 Convention 2015 between ACATISEMA – MINAMBIENTE	July 29th to 31st, 2015	Indigenous community: Matsuldani - Bopone - Cumaribo - Vichada	1. The REDD+ project is today for and care of the environment and has trained the authorities and especially young people, in GIS management. 2. The socio-economic surveys have been filled out, installing and monitoring plots and being sensitized to indigenous communities about the care of forests and the defense of their territory. 3. To participate, entities such as the Ministry of Environment and Nature is appreciated and hope to continue to have them.	
1.3.13 y 1.3.14 Training Workshop - Indigenous facilitators. 310 Convention 2015 between ACATISEMA – MINAMBIENTE	August 2nd, 2015	Indigenous community: Matsuldani - Bopone - Cumaribo - Vichada	1. It is a project whose initiative is the Association and has a community nature. It is expected that after 5 years they have technical and professional capacity to take over the project. 2. It is a project that is within national REDD initiatives. 3. This project has enabled them to form and train their own authorities, helping to improve governance.	

Source: Annex 1 of PD

Table 90. Zonal Meetings

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.6.1 y 1.6.2: Zonal meeting: Zone 1	July 19th to 21st, 2013	Indigenous community: Matsuldani – Bopone, Sector Aiwakuna Tsepajibo	1. The organization we have been getting through developed project has made us more collective unity sense, around a single purpose. 2. The REDD+ project RIU-SM seeks to solve the most pressing needs by indigenous communities, especially in education. 3. The continuation of REDD+ project RIU-SM by the Zone is supported and endorsed. 4. Approval of finalizing the REDD + project RIU-SM managed in a strategic alliance ACATISEMA-MEDIAMOS and to be taken to the General Assembly. 5. The REDD+ project RIU-SM is consistent with the objectives of the Association. 6. MEDIAMOS has complied with all agreements with ACATISEMA.	1. There is concern about the legal certainty of the reservation and its properties.
1.6.4 - 1.6.5: Zonal meeting: Zone 2	July 23rd, 24th and 25th, 2013	Indigenous community: Camunianae	1. The company MEDIAMOS has been transparent during the design and project development. 2. The Ministry of Environment supports this kind of projects and is an initiative of the National Government. 3. The REDD+ RIU-SM is a pilot project in our country's own characteristics. 4. This project has an advantage for the unification and strengthening of the Reservation. 5. To establish working committees able to visit and learn about other projects. 6. REDD+ project RIU-SM was unanimously approved and can be brought to the General Assembly.	
1.6.6: Zonal meeting: Zone 3	August 14th and 15th, 2013	Indigenous community: San Luis de Sama	1. ACATISEMA REDD+ project was approved and is taken to the General Assembly. .	1. MEDIAMOS contract should be carefully reviewed.

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.6.7: Zonal meeting: Zone 4	July 31st, August 1st and y 2nd, 2013	Indigenous community: Berlín 1, Sector Anguilla Macarena	1. ACATISEMA REDD+ project was approved and is taken to the General Assembly.	
1.6.8 y 1.6.9: Zonal meeting: Zone 5	August 4th and 5th, 2013	Indigenous community: Manajuare	1. Training has been made to the Board of Councils, Coordinator Committee, captains and leaders of indigenous communities. 2. The REDD+ project RIU SM is consistent with the objectives of our Association, with the National Development Plan "Prosperity for All" and with international agreements on the environment and climate change mitigation. 3. ACATISEMA REDD+ project was approved. 4. REDD+ project RIU-SM design and implementation was definitively approved to develop and manage. 5. ACATISEMA – MEDIAMOS Strategic Alliance Agreement was approved.	

Source: Annex 1 of PD

Table 91. Discussion Board and Chieftain Summit

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.7.1: Table Meeting Conservatory	August 24th, 2013	Indigenous community: Atana, Sector Atana Pirariami	1. Discussion Board is made and installed. 2. The 6 Indigenous peoples have participation in the project and their role is in the translation of the most important project materials at 6 languages: Sikuani, Piaroa, Piapoco, Curripaco, Puinave and Kubeo.	
1.7.2: Chieftain Summit	August 24th and 25th, 2013	Indigenous community: Atana, Sector Atana Pirariami	1. The REDD+ project is collectively constructed by the 6 indigenous communities that make up the Reservation through a process of participation and socialization. 2. The REDD+ project fully corresponds to the mission of the Association to	1. The opposition says the REDD+ project involves the privatization and commodification of

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
			preserve and conserve our land, our forests, our biodiversity and our communities. 3. There is not a risk of privatization to the food sovereignty and autonomy of indigenous communities. 4. Project is supported to continue in Reservation.	forests, putting at risk food sovereignty and autonomy of indigenous communities.

Source: Annex 1 of PD

Table 92. ACATISEMA General Assembly

ANNEX	DATE	PLACE	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.8	September 7th, 8th and 9th, 2013	Laguna Cacao – Sector	1. The project profile is ready for review and approval. 2. The process of addressing organization given by the project has helped them to improve their governance. 3. Mr. Omar Briceño was elected as ACATISEMA General Coordinator, who knows and has participated from the beginning in the design and development of REDD+ project.	1. ACATISEMA-MEDIAMOS contract has a clause related to sanctions that is not suitable to the Association.

Source: Annex 1 of PD

Table 93. Public and Private Stakeholders Meetings

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.4.4.1	November 2012	Bogotá.	Republic Congress. Senate and House of Representatives. Participation of the Joint Commission to present the REDD+ project, with the support of Senator Mauricio Ospina, President of GLOBE International-Chapter Colombia.	1. There were favorable demonstrations by several Senators and Representatives of the House of the Congress of Colombia, in the sense that the project seemed appropriate for indigenous communities and express their willingness to support	
1.4.4.1	November 22nd, 2012	Bogotá.	Institute of Hydrology, Meteorology and Environmental Studies of Colombia - IDEAM	1. The importance of achieving a joint between IDEAM and local and regional projects that allow an adequate supplementation is manifested. 2. The will was expressed to support REDD+ project by the IDEAM offering a license to use your information. 3. The joint between IDEAM and ACATISEMA is of great benefit and complement as the participation of communities directly allow to have information more accurately and easily for field checks.	
1.4.4.1	November 22nd, 2012	Bogotá.	Ministry of Environment, Housing and Territorial Development	1. The possibility of registration of REDD+ project in the database of the Ministry of Environment and Sustainable Development is proposed. 2. It is very important to the formal presentation of REDD+ project to an expanded Ministry of Environment technical team.	
1.4.4.1	November 22nd, 2012	Bogotá.	Interior Ministry	1. It is important to start the process of Certification Presence of Ethnic Groups in the Jungle Mataven as soon as possible. 2. It is recommended to research the need for environmental investigation permit in the development of REDD+ projects.	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.4.5.1	November 22nd, 2012	Bogotá.	Ministry of Environment, Housing and Territorial Development	1. The advisor to the Minister, Dr. Diego de la Ossa, informed about the will of the Minister of Environment for the support of the Ministry in the design and development of the project. 2. The creation of a table accompanying relevant institutions for the project is proposed. ACATISEMA says that this is part of their institutional cycle. 3. The appointment of Mr. Ruben Dario Guerrero is proposed, to coordinate different aspects for accompaniment by the Ministry. 4. The presentation of a document project progress will be reviewed by Engineer Ruben Dario Guerrero, based on which will be identification and evaluation of other potential scenarios for supporting the development of the project. 5. The Ministry recommends to deliver a formal request for support to the project by ACATISEMA. 6. Conducting a joint working session for the identification and evaluation of other scenarios is recommended. 7. The Adviser to the Minister, Dr. Diego de la Ossa, welcomes the characteristics of the project because he considers that it met the stated objective and communication will accompany the design and development of the project. 8. It is considered that various points raised by the participants, the process being done in developing the project it is reliable for the obvious participation of indigenous communities and because the project is rooted in themselves. 9. Consideration of Senator Mauricio Ospina, in the sense that the project has the appropriate technical and social support and shows a significant level compared to that observed Ministry's technical team, is welcomed.	
1.5.4	April 23rd, 2013	Puerto Carreño, Vichada	Orinoco Regional Autonomous Corporation - CORPORINOQUIA	Several alternatives are arise that can be taken into account to support the REDD+ project: 1. PRADES: School Environmental Project (Environmental education in schools)	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
				2. CIDEA: Interagency Committee on Environmental Education. 3. PROCEDA: Citizen Environmental Education Projects.	
1.5.4	April 22nd, 2013	Puerto Carreño - Vichada	Vichada Departmental Planning. -The proposal REDD+ project was delivered. - The Vichada Departmental Development Plan was received. - The Advisory GSP delivered data related DANE census.	Advisory GSP believes it is important to another meeting in which the Head of Planning is present.	
1.5.4	April 22nd, 2013	Puerto Carreño - Vichada	Departmental Education Secretary	1. Was decided to carry out an alliance between ACATISEMA and the Ministry of Education, as currently members of ACATISEMA are receiving training through MEDIAMOS on Environmental Education. 2. The Professional Samuel Rodriguez requested to submit the portfolio of program services of the training institution, with profiles of professionals to evaluate with the Board and to make decisions and thus, to give an answer.	
1.5.4	April 22nd, 2013	Puerto Carreño - Vichada	Departmental Secretary of the Treasury	It is recommended to request in writing the economic resources required for ACATISEMA General Assembly and to develop REDD+ project.	
1.5.4.4	April 22nd, 2013	Puerto Carreño - Vichada	SENA Direction, Vichada	SENA Director expresses the possibility that you can establish a strategic alliance with ACATISEMA for the training of members of indigenous communities.	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.9.3.1	April 3rd, 2014	Bogotá.	ACTION FUND	1. It is considered that the REDD project RIU-SM has elements of great tenacity, given the complexity of the different aspects related to work. 2. ACTION FUND Director, Dr. José Luis Gómez, explicitly refers to the request to start the feasibility study; the Action Fund can perform the work of the REDD+ project. 3. ACTION FUND experience in financial management is an important strength in the development of the audit. 4. The Director is explicit in considering that in order to perform the work of ACTION TRUST FUND endorsement of communities and the Council of the Fund are required. If these guarantees are achieved, he considers useful to know more the fully characteristics of REDD+ project and the convenience of making a visit to the territory to meet and interact with the various ACATISEMA authorities ACATISEMA and MEDIAMOS technical team.	1. It is important to remember the experience of previous years on companies that distorted the nature of REDD+ projects with local communities and produced confusion concerning the characteristics and implementation thereof. This affected the agile and proper development of these projects with communities.
1.9.6.1	April 30th, 2014	Puerto Inírida	Learning National Service, SENA	The Director said that the SENA is able to provide training to members of the Indigenous Reservation in professional, technical and technological educational programs. It also states that the SENA is willing to also support in the production units generated by REDD+ project.	
1.9.5.1	May 14th, 2014	Bogotá	NATURA Foundation	Foundation representatives say it is important to know the technical and administrative aspects of REDD+ project RIU-SM project with the company MEDIAMOS.	
1.9.6.2	May 15th, 2014	Bogotá	Learning National Service, SENA	It is recommended to expand the presentation of REDD+ project RIU SM for its support to regional SENA in Vichada and Guainia.	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.9.3.2.1	May 16th, 2014	Bogotá	ACCIÓN FOUND	1. Copy of the REDD+ project RIU SM is requested for analysis. 2. The ACTION FUND consulted what is the procedure for the operation of special projects implemented with funds from FONAM and shared this information with ACATISEMA and MEDIAMOS. 3. ACTION FUND will provide a second approach with USAID during which the possible site visit will be treated to meet the project area. 4. ACTION FUND requested authorization to the Board to support this project and management resources. 5. ACTION FUND will prepare a memorandum of understanding between MEDIAMOS and ACATISEMA to work together on the project for the protection, conservation and recovery of natural RIU SM forest.	
	June 23rd, 2014	ACTION FUND office, Bogotá	Inter Alliance: Ministry of Environment, ACTION FUND, NATURA Foundation, ACATISEMA and MEDIAMOS	A schedule of activities of the Operational Plan of No. 310 Administrative Agreement is proposed, based on the review of meeting agenda of the ACATISEMA-MEDIAMOS, Strategic Alliance in Villavicencio, June 2015.	
1.11.5	July 24th, 2014	Villavicencio	Superior Court of the Judicial District of Villavicencio	The guardianship ruling states that: 1. MEDIAMOS or other operated institutions infringed the fundamental right of prior consultation of ACATISEMA or indigenous communities that comprise it. 2. The project aims to guarantee fundamental rights of indigenous communities that inhabit the Matavén area, because the forestry and ecological strengthening of territory is wanted. Consequently guardianship refuses is presented.	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.9.4.3.1	July 25th, 2014	Bogotá	Ministry of Environment, Housing and Territorial Development	It was issued by MADS the viability of the project: "Protection, conservation and recovery of forests and lands for sustainable development of the RIU-SM". The project with important comments on the process of REDD+ project is approved by Maria Claudia Garcia, Director of Forests, Biodiversity and Eco systemic services.	
1.9.3.4	September 16th, 2014	MEDIAMOS office, Cali	ACTION FUND	They expressed that it met ACTION FUND expectations related to the visit to MEDIAMOS office, in Cali, to verify the professional skills for the development of a REDD+ project and knowledge of the professional team members.	
1.10.1	December 6th, 2014	Ministry of Environment office, Forestry Division, Bogotá	Inter Alliance: Ministry of Environment, ACTION FUND, NATURA Foundation, ACATISEMA and MEDIAMOS	The Immediate Action Plan agreed with the MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT, ACTION FUND, NATURA FOUNDATION, ACATISEMA and MEDIAMOS under the project: "Protection, Conservation and Recovery of Forests and Lands for Sustainable Development RIU SM - Transition Gaza Orinoquía / Colombian Amazon."	
1.9.5.3.1	January 30th, 2015	Bogotá	NATURA Foundation	1. Mr. Roberto León Gómez reports that the NATURA Foundation is quieter with the internal situation of ACATISEMA. 2. Taking into account the definitions of the Ministry of Environment, Housing and Territorial Development and ACTION FUND, activities with which the NATURA Foundation will support the project submitted by the Ministry ACATISEMA are proposed. 3. Mutual Confidentiality Agreement signed between the NATURA Foundation and the Strategic Alliance ACATISEMA – MEDIAMOS is formalized and delivered. 4. The NATURA Foundation's terms of reference sent to the IDB for no objection. The call was issued for the award and contract consultants responsible for the review and adjustment of the PDD and validation / verification of the project. 5. The requests resume activities of created Committee which includes the Ministry of Environment, ACTION FUND Foundation NATURA, ACATISEMA and MEDIAMOS.	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.10.2.1	January 30th, 2015	NATURA Foundation office, Bogotá	Inter Alliance: Ministry of Environment, ACTION FUND, NATURA Foundation, ACATISEMA and MEDIAMOS	It is proposed to resume the activities agreed in the Immediate Action Plan by the Ministry of Environment, Housing and Territorial Development, ACTION FUND, NATURA FOUNDATION, ACATISEMA and MEDIAMOS, under the project: "Protection, Conservation and Recovery of Forests and Lands for Sustainable development of Indigenous Unified Resguardo - Forest Matavén - Transition Gaza Orinoquía / Colombian Amazon".	
1.9.5.4	February 1st, 2015	Bogotá	NATURA Foundation	It is expressed the need of signing the agreement on mutual confidence between the NATURA Foundation and the strategic alliance ACATISEMA – MEDIAMOS, in order to perform the Pre-Audit for REDD+ project.	
1.11.10	March 4th, 2015	Bogotá	Supreme Court, labor appeals	1. The judgment of the High Court of the Judicial District of Villavicencio is confirmed. 2. Refuses custody on appeal, as the REDD+ project RIU SM aims for the guarantee of fundamental rights of indigenous communities that inhabit the area Matavén.	
1.10.2.4	March 18th, 2015	Bogotá	Inter-American Development Bank	Is authorized a financing for the realization of a prior consulting the certification process consisting of the following: - Perform a thorough review of PDD REDD+ project RIU SM and the subsequent revision of the respective settings. - Working meetings at the headquarters of REDD+ project RIU SM in MEDIAMOS offices. - Preparation and delivery of the final report.	
1.10.3.1	April 29th, 2015	NATURA Foundation, Bogotá	Inter Alliance: Ministry of Environment, ACTION FUND, NATURA Foundation, ACATISEMA and MEDIAMOS	According to the report on the activities expressed under the Plan of Immediate Action agreed the Inter Alliance (Ministry of Environment, Housing and Territorial Development, ACTION FUND, NATURA Foundation, ACATISEMA and MEDIAMOS) under the project: "Protection, Conservation and Recovery Forests and Lands for Sustainable Development RIU Strip SM- Transition Orinoquía / Colombian Amazon".	

ANNEX	DATE	PLACE	STAKEHOLDERS	POSITIVE FEEDBACK	NEGATIVE FEEDBACK
1.9.4.2	May 29th, 2015	Bogotá	Ministry of Environment, Housing and Territorial Development	The feasibility of signing the inter-administrative agreements 310 2015 between the Ministry of Environment, Housing and Territorial Development and ACATISEMA is confirmed, in order to combine technical, administrative and financial efforts, for the formulation and implementation of strategies aimed at strengthening forest governance in order to reduce manifests the deforestation and forest degradation in RIU SM.	

Source: Annex 1 of PD

6.3 Summary of comments of the Stakeholders

The set of opinions Stakeholders is contained in the following facts:

STRATEGIC ALLIANCE INTERINSTITUTIONAL: MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT, ACTION FUND, FOUNDATION NATURA AND THE PERSONERIA MUNICIPAL OF CUMARIBO, PROCURADURIA of Vichada, REDD + SUPPORT PROJECT RIU-SM.
Main events of the strategic alliance:

- ✓ Constitution of the strategic alliance:
- ✓ MEDIAMOS joint meeting of the Alliance - ACATISEMA with representatives of institutions MINISTRY OF THE ENVIRONMENT, ACTION FUND, NATURA, PERSONERIA AND PROCURADURIA MUNICIPAL, held in the Community of the Reservation Unified Sarrapia Indigenous Jungle Mataven held on October 21, 2014.
- ✓ This meeting will have the respective minutes in which the representatives of the institutions express their favorable opinion to the Project (Annex 1: Annex 1.3.11).
- ✓ Strategic alliance meetings, held from December 6th to June 24th, 2015, of which we also have the respective records. The above tables about meetings (Annex 1: Annex 1.10) is presented.
- ✓ Administrative agreement 310 of 2015 signed on April 29, 2015, between the Ministry of Environment, Housing and Territorial Development and the Association of Indigenous Councils and Traditional Authorities of the Forest Mataven.
- ✓ Mutual Confidentiality Agreement signed on February 1, 2015 between the Nature Foundation and ACATISEMA-MEDIAMOS STRATEGIC ALLIANCE. (Appendix 1)
- ✓ Memorandum of Understanding between the Fund for Environmental Action - Action Fund, the Association Councils and / or Traditional Indigenous Authorities Jungle Mataven ACATISEMA and MEDIAMOS F & M (Appendix 1).

Primary actors:

Based on the above documentation and primarily in the Annex 1: "Socialization, training and consultation process" and in the Annex 2: Information about Unified ACATISEMA and Indigenous Reservation where minutes of meetings, workshops and tours are presented with communities it can be seen that most of the native defense Unified (95%) have indicated their acceptance and willingness to the project and a minority of them (5%) have made opposition to it (some veteran leaders), among the comments more important can specify the following by those who have approved the project:

- ✓ The project is a good way to protect their territory and Forest Matavén mining and other external agents.

- ✓ The project will generate economic resources that allow them to implement productive projects and also creates job opportunities and demands in the areas of health, education, sanitation, housing, among others.
- ✓ The project is consistent with the objectives of the Association presented in its statutes.

Reviews opponents:

- ✓ Fear over the ownership of territory, considered that the project involves a covert sale of the same.
- ✓ Loss of autonomy and cultural identity.
- ✓ Aggression on their ancestral constumbres and weakening the defense of the safeguards.
- ✓ Who had violated the law on internal consultation and free consent.

The discussion took opponents filed a protection before the Dispute Tribunal of Villavicencio Adminstrativo then appealed to the Supreme Court to sentence this that the project was beneficial to indigenous peoples of the reservation (see judgment in Annex 1). Opponents have maintained their opposition to the project so far generating different documents with different institutions and civilians which have expressed considerations.

The settlers have not had organized expression, his personal views are linked to family relations with the natives, leaning as the position taken by the family.

Illustration 42. Indigenous women

Source: REDD+ project RIU-SM

Secondary Actors:

Different institutions have different positions on the project and some of them such as the Ministry of Environment, Natura Foundation Fund Action and formed a support committee for the project, others as Corporinoquia neutral and has been completely marginalized in the process, the Interior Vichada through various manifestations has opposed the project while not explicitly; SENA, RESA, Youth in Action and the Ministry of Agriculture raised its good disposicón but have no real support materialized. Comenatrios arguments and are similar to those presented by sectors of support and opposition to the project. The Support Committee noted anterormente has a weak intervention in about 3 actions with very little economic value compared to the magnitude of the project, which is hiceron in 2014, in 2015 suspended its support to the argument that the division that communities do not allow them their action.

Third level participants:

The other indigenous communities are expressed through their organizations such as ONIC and also OPIAC with different opinions and critical support to the project and its process. Financial institutions have not shown any comment or support.

Currently, communities have expressed almost entirely supported the project, particualrmente a result of the audit process that is carried out and as can be seen in the various paperwork.

6.4 Legal rulings

- ✓ Judgment STL2620-2015 Filing No. 60341, Act 6 of the SUPREME COURT - Occupational Appeals Chamber in which it will be confirmed the ruling handed down by the Occupational Chamber of the SUPERIOR COURT OF THE JUDICIAL DISTRICT OF VILLAVICENCIO, on March 4, 2015. (Annex 1.11 legal validation).

- ✓ Ruling of the SUPERIOR COURT OF THE JUDICIAL DISTRICT OF VILLAVICENCIO, Labor Division, which is the plaint requested by Mr. Pedro Eliseo Roa Gaitan. November 14, 2014 is denied (Annex 1. 11 legal validation).

- ✓ Annex 1.11.8 on page 11 and following the explanations that the judgments of the Court and the Court are based. Literally, this ruling expresses:

Legal problem,

¿Did MEDIAMOS F & M SAS infringe the fundamental right to prior consultation of the plaintiff and indigenous communities of the Association of Councils and Traditional Authorities of Mataven Forest – ACATISEMA on the occasion of signing and promoting the denominated project "Protection,

conservation and recovery of forest and land to the sustainable development of Indigenous Unified Reservation – Mataven Forest?

Response to the legal exposed problem

PRIOR CONSULTATION AS FUNDAMENTAL RIGHTS OF INDIGENOUS COMMUNITIES

The Constitutional Court has emphasized that the constitutional protection of the right to self-determination of ethnic communities is effective, especially, by the government's duty to create a ***consultation process*** *before the adoption and implementation of decisions that may affect them directly; since its beginning, constitutional jurisprudence has recognized that the consultation is a fundamental right of group ownership headed by ethnic communities, developing the participation of these minorities in decisions that affect the permanence of their cultural traditions[1].*

So, as the consultation is a form of participation that makes the right to self-determination of ethnic communities and even, their right to survival as a special group, this mechanism has been protected by the Constitutional Court as a fundamental right, both exercise of constitutional control [2] as a guardianship[3] when it comes to the adoption of regulatory or administrative procedures that directly concern those communities.

It has also been stated that the consultation is ***intended*** *to (i) provide communities with full knowledge of the projects and decisions that affect them directly* ***-such as projects to explore or exploit natural resources in the territories they occupy or belong to them****, and the mechanisms, procedures and activities required to implement them; (ii) illustrate communities about how the implementation of* ***relevant projects*** *may involve effects or prejudice to the elements that form the basis of their social, cultural, economic and political cohesion and thus, the substrate for their livelihood as a human group with unique characteristics and; (Iii) provide an opportunity for communities to freely and without outside interferences, through the convening of its members or representatives, consciously assess to the advantages and disadvantages of the project; will be heard in relation to the concerns and claims they have with respect to the defense of their interests and to decide on the viability of project [4].*

That is why in recent jurisprudence[5] was emphasized that prior consultation should seek the free and informed consent of ethnic communities on the measures that may directly affect their interests. Such consent is necessary if the actions, in other extreme cases, (i) involve the removal or displacement of communities for the work or project; (ii) are related to the storage and dumping of toxic waste in ethnic lands; and/or (iii) represent a high social, cultural and environmental impact on an ethnic community, which may lead to endanger the existence of the same, among others".

In these cases, given the seriousness of the potential consequences, the duty of the authorities to conduct consultation processes with ethnic communities is strengthened, without this meaning in any way that communities will be dotted with a power of veto.

For this room, MEDIAMOS F & M SAS or other institutions operated and /or linked to this protective action, violated the fundamental right to prior consultation of the Association of Councils and Traditional Authorities of Mataven Forest - ACATISEMA or related indigenous communities, according to the following considerations of factual and legal order.

Revised the documentary part of the record shows that:

1- ACATISEMA is listed in the Register of Associations of Councils and/or Traditional Indigenous Authorities, through Resolution 117 of December 2002, as Council Association and/or Indigenous Authorities Jungle Mataven (folio 129 C.1).

2 The project for PROTECTION, CONSERVATION AND RECOVERY OF FOREST AND LAND FOR SUSTAINABLE DEVELOPMENT OF UNIFIED INDIGENOUS RESERVATION – MATAVEN JUNGLE Transition Strip Colombian Orinoco/Amazon was launched, which contains as intervening parties ACATISEMA and MEDIAMOS F&M SAS; however, it is evident, first, that the proponent of it is the Association of Councils and Traditional Indigenous Authorities Jungle Mataven (ACATISEMA), which was originated in the need of indigenous communities to ensure the conservation and protection of forest and other natural resources in their territory, as was stated in the project proposal; secondly, that in July 2012, the ACATISEMA convened the company MEDIAMOS F&M SAS, to form an alliance in order to conceive, design and develop a project that had as its objective the protection, conservation and recovery of natural forests and lands of Unified Indigenous Reservation – Mataven Forest, becoming eta how project developers in its first phase 8CD folio 246, documento_02_proy_desarrollo_RIU-SM.pdf, pages 1 and 16.

3. That after several meetings between the Joint Commission, Committee Coordinator, Council, captains, elders, community leaders and representatives of MEDIAMOS F&M SAS, held between July 6th, 2012 and November 23rd, 2013, in which they discussed, among others, issues related to the project proposal initially raised by ACATISEMA, discussion of the results of REDD+ Mataven Forest Project Work Plan and the agreements between ACATISEMA and MEDIAMOS F&M SAS, defining approval Contract Strategic Alliance between ACATISEMA and MEDIAMOS F&M SAS, definition of the organizational aspects for the finalization of the PDD and project management, authorization of ACATISEMA representatives for joint management with MEDIAMOS F&M SAS leading to certification, registration and project execution, socialization of the training process of the Coordinating Committee for the design and formulation of REDD+ project RIU-SM. Finally, on November 23rd, 2013, by meeting act of the Board of Councils and Coordinating Committee, ACATISEMA approved the continuity with the Project of Unified Indigenous Reservation REDD+ Mataven Forest with MEADIAMOS F&M SAS in strategic partnership and the Strategic Alliance Agreement for the Protection, Conservation and Recovery of Natural Forest Stewardship Unified Indian.

4- That the mentioned and now questioned project, being under the implementation of the REDD+ mechanism (International Mechanism under the UN Framework Convention on Climate Change - UNFCCC), which aims to help reduce carbon dioxide emissions produced by deforestation and degradation of forests to mitigate climate change, conserve and improve the services provided by forests (jungles) and the development of communities that live or depend on these (CD-folio246, 01_res_ejec_proy_REDDV2_2014_05.PDF document, 16 file), because it is an agreement for the protection, conservation and recovery of natural forests of the Unified Indigenous Reservation, clearly not those affecting native communities, the nature of their cultural environment, strengthen their idiosyncrasies and protect the land, as is known, it is part of the beliefs and origins of aboriginal communities.

According to the referred constitutional jurisprudence, in prior consultation it is mandatory if the measures taken are likely to affect specifically the indigenous communities in their capacity as such, and not those provisions are provided uniformly for the majority of Colombians. It was also established that not everything concerning indigenous and tribal peoples is subject to the duty to consult, since as we have seen, the Convention 169 itself is contemplated that when there is no direct involvement, the *commitment of States refers to the promotion of participation, opportunities that should be at least equivalent to those that are available to other sectors of the population.*

So in this case it is not mandatory prior consultation in the strict sense, as stated by the plaintiff, then, it is shown that the decision taken by ACATISEMA and MEDIAMOS F&M SAS in signing the strategic partnership agreement for the Protection, Conservation and Recovery of Natural Forest in the Unified Indigenous Reservation, is not of those that specifically affect communities in their condition, usages, territories or traditions, but on the contrary, tends to strengthen its ecological environment.

In that vein, it was enough to organize the participation of the ethnic groups that make up the area of Mataven Forest in developing the project to be executed in that area, intervention in this matter was achieved to a greater extent, since the indigenous communities living in the aforementioned environment, represented by ACATISEMA, acted as project proponents and, in that condition, actively involved in the development of the activities surrounding the finalization and signing of the agreement referred to, as stated in the lists of meetings and calls appended to the file.

¨In conclusion, no breach of the fundamental right to prior consultation of the indigenous communities living in the jungle area of Mataven with the behavior displayed by MEDIAMOS F & M SAS, and by the other subjects associated and/or linked to this constitutional action relating to the signing of the Strategic Partnership for Protection, Conservation and Recovery of Natural Forest Stewardship Unified Indigenous subjects ; on the contrary, the project tends to guarantee of the fundamental rights of the indigenous communities living area Mataven because it seeks to fortify the forest and ecological strengthening of the land for economic benefit (monetary income). In consequence, the protection requested by the plaintiff was denied˙.

In spanish:

Problema jurídico.

¿Vulneró MEDIAMOS F & M SAS el derecho fundamental a la consulta previa del accionante y de las comunidades indígenas de la Asociación de Cabildos y Autoridades Tradicionales de la Selva Matavén - ACATISEMA, con ocasión de la suscripción e impulso del proyecto denominado "Protección, conservación y recuperación de los bosques y tierras para el desarrollo sostenible del Resguardo Indígena Unificado - Selva de Matavén?

Respuesta al problema jurídico planteado.

LA CONSULTA PREVIA COMO DERECHO FUNDAMENTAL DE LAS COMUNIDADES INDÍGENAS.

Ha destacado la Corte Constitucional, que la protección constitucional del derecho a la libre determinación de las comunidades étnicas se hace efectiva, de manera especial, mediante el deber estatal de adelantar **procesos de consulta** antes de la adopción y la ejecución de decisiones que directamente puedan afectarles; desde sus comienzos la jurisprudencia constitucional ha reconocido que la consulta previa es un derecho fundamental de titularidad grupal en cabeza de las comunidades étnicas, que desarrolla la participación de tales minorías en las decisiones que afectan la permanencia de sus tradiciones culturales[1].

Así, por ser la consulta previa una forma de participación que realiza el derecho a la libre determinación de las comunidades étnicas e, incluso, su derecho a la supervivencia como grupo especial, este mecanismo ha sido protegido por la Corte Constitucional como un derecho fundamental, tanto en ejercicio del control de constitucionalidad[2] como en sede de tutela,[3] cuando se trata de la adopción de medidas normativas o administrativas que directamente conciernen a dichas comunidades.

También ha precisado que la consulta previa tiene **la finalidad** de **(i)** dotar a las comunidades de conocimiento pleno sobre los proyectos y decisiones que les conciernen directamente -**como los proyectos destinados a explorar o explotar los recursos naturales en los territorios que ocupan o les pertenecen**, así como los mecanismos, procedimientos y actividades requeridos para ponerlos en ejecución; **(ii)** ilustrar a las comunidades sobre la manera como **la ejecución de los referidos proyectos** puede conllevar una afectación o menoscabo a los elementos que constituyen la base de su cohesión social, cultural, económica y política y, por ende, el sustrato para su subsistencia como grupo humano con características singulares y; **(iii)** brindar la oportunidad a las comunidades para que libremente y sin interferencias extrañas, mediante la convocatoria de sus integrantes o representantes, valoren conscientemente las ventajas y desventajas del proyecto; sean oídas en relación con las inquietudes y pretensiones que tengan en lo que concierne a la defensa de sus intereses y puedan pronunciarse sobre la viabilidad del proyecto[4].

Es por ello que en reciente jurisprudencia[5] enfatizó que con la consulta previa se debe buscar el consentimiento libre e informado de las comunidades étnicas frente a las medidas que puedan afectar directamente sus intereses. Tal consentimiento es indispensable cuando las medidas, entre otros casos extremos, *"**(i)** impliquen el traslado o desplazamiento de las comunidades por la obra o el proyecto; **(ii)** estén relacionados con el almacenamiento o vertimiento de desechos tóxicos en las tierras étnicas; y/o **(iii)** representen un alto impacto social, cultural y ambiental en una comunidad étnica, que conlleve a poner en riesgo la existencia de la misma, entre otros*".

En estos casos, dada la gravedad de sus posibles consecuencias, el deber de las autoridades de llevar a cabo procesos de concertación con las comunidades étnicas se refuerza, sin que ello signifique, en modo alguno, que se dote a las comunidades de un poder de veto.

Para Esta Sala, MEDIAMOS F & M SAS ni las demás instituciones accionadas y/o vinculadas a esta acción de amparo, vulneraron el derecho fundamental de consulta previa de la Asociación de Cabildos y Autoridades Tradicionales de la Selva Matavén – ACATISEMA, ni de las comunidades indígenas que la integran, atendiendo a las siguientes consideraciones de orden fáctico y jurídico.

Revisada la documental obrante en el expediente se observa que:

1- ACATISEMA se encuentra inscrita en el Registro de Asociaciones de Cabildos y/o Autoridades Tradicionales Indígenas, mediante Resolución 117 de diciembre de 2002, como Asociación de Cabildos y/o Autoridades Indígenas de la Selva de Matavén (folio 129 C.1)

2- Se puso en marcha el proyecto denominado PROTECCIÓN, CONSERVACIÓN Y RECUPERACIÓN DE LOS BOSQUES Y TIERRAS PARA EL DESARROLLO SOSTENIBLE DEL RESGUARDO INDÍGENA UNIFICADO - SELVA DE MATAVÉN - Franja de Transición de la Orinoquia / Amazonia Colombianas, en el que figuran como partes intervinientes ACATISEMA y la sociedad MEDIAMOS F & M SAS; sin embargo, se evidencia, en primer lugar, que el proponente del mismo es la Asociación de Cabildos y Autoridades Tradicionales Indígenas de la Selva de Matavén (ACATISEMA), el cual tuvo origen en la necesidad de las comunidades indígenas de procurar la conservación y protección del bosque y demás recursos naturales de su territorio, tal como quedó consignado en la propuesta del proyecto; en segundo lugar, que en julio de 2012, ACATISEMA convocó a la empresa MEDIAMOS F & M SAS, para conformar una alianza con el fin de concebir, diseñar y desarrollar un proyecto que tuviera como objetivo la protección, conservación y recuperación de los bosques naturales y tierras del Resguardo Indígena Unificado - Selva de Matavén, constituyéndose de esta manera como desarrolladores del proyecto en su primera fase (CD - folio 246, documento 02_proy_desarrollo_RIU-SM.pdf, folios 1 y 16).

3- Que luego de múltiples reuniones entre la Comisión Conjunta, Comité Coordinador, Cabildos, Capitanes, Sabedores, Líderes y las comunidades con representantes de MEDIAMOS F & M SAS, celebradas entre julio 6 de 2012 y noviembre 23 de 2013, en las que se trataron, entre otros, temas relacionados con la propuesta de proyecto planteada inicialmente por ACATISEMA, discusión de los resultados del Proyecto REDD+ Selva Matavén, del Plan de Trabajo y los Acuerdos entre ACATISEMA y MEDIAMOS F & M SAS, definición de la aprobación del Contrato de Alianza Estratégica entre ACATISEMA y MEDIAMOS F & M SAS, definición de los aspectos organizativos para la elaboración definitiva del PDD y la gestión del Proyecto, Autorización de los representantes de ACATISEMA para la gestión conjunta con MEDIAMOS F & M SAS conducentes a la certificación, registro y ejecución del Proyecto, socialización del proceso de capacitación del Comité Coordinador para el diseño y formulación del Proyecto REDD+ RIU-SM ACATISEMA - MEDIAMOS (CD - folio246, documento 02_proy_desarrollo_RIU-SM.pdf, folios 59 a 63; folios 217 a 236 C.1); finalmente, el 23 de noviembre de 2013, mediante acta de reunión de la Junta de Cabildos y Comité Coordinador, ACATISEMA aprobó la continuidad del proyecto REDD+ Resguardo Indígena Unificado Selva Matavén en Alianza estratégica con MEDIAMOS F & M SAS y el Acuerdo de Alianza Estratégica para la Protección, Conservación y Recuperación de los Bosques Naturales del Resguardo Indígena Unificado (folios 240 a 241).

4- Que el proyecto mencionado y ahora cuestionado, por estar bajo la aplicación del mecanismo REDD+ (mecanismo internacional bajo la Convención Marco de las Naciones Unidas sobre Cambio Climático – CMNUCC), cuyo objetivo es ayudar a reducir las emisiones de dióxido de carbono producidas por la deforestación y degradación de bosques, para atenuar el cambio climático, conservar y mejorar los servicios que prestan los bosques (selvas) y al desarrollo de las comunidades que lo habitan o dependen de éstos (CD-folio246, documento 01_res_ejec_proy_REDDv2_2014_05.pdf, folios 16), por tratarse de un acuerdo para la protección, conservación y recuperación de los bosques naturales del Resguardo Indígena Unificado, claramente no es de aquellos que afectan a las comunidades nativas, ni a sus tradiciones, usanzas o costumbres, por el contrario, busca conservar la naturaleza de su entorno cultural, fortalecer su idiosincrasia y proteger la tierra que, como es sabido, hace parte de las creencias y orígenes de las comunidades aborígenes.

De acuerdo con la jurisprudencia constitucional referida, la consulta previa procede en forma obligatoria cuando las medidas que se adopten sean susceptibles de afectar, específicamente, a las comunidades indígenas en su calidad de tales, y no aquellas disposiciones que se han previsto de manera uniforme para la generalidad de los colombianos. Igualmente, se estableció que **no todo lo concerniente a los pueblos indígenas y tribales está sujeta al deber de consulta, puesto que como se ha visto, en el propio Convenio 169** se contempla que, cuando no hay una afectación directa, el compromiso de los Estados se remite a la promoción de oportunidades de participación que sean, al menos, equivalentes a las que están al alcance de otros sectores de la población.

Así, en este asunto no se hace obligatorio el agotamiento de la consulta previa en estricto sentido, como lo afirma el accionante, pues, se encuentra demostrado que la decisión tomada por ACATISEMA y por MEDIAMOS F & M SAS, al firmar el Acuerdo de Alianza Estratégica para la Protección, Conservación y Recuperación de los Bosques Naturales del Resguardo Indígena Unificado, no es de aquellas que afectan específicamente a las comunidades indígenas en su condición, usanzas, territorio o tradiciones, sino que por el contrario, propende por el fortalecimiento de su entorno ecológico.

En ese orden de ideas, bastaba con garantizar la participación de los grupos étnicos que conforman la zona de la selva del Matavén en el desarrollo del proyecto que se pretende ejecutar en esa zona, intervención que en este asunto se consiguió en mayor medida, toda vez que las comunidades indígenas que habitan en el entorno aludido, representadas por ACATISEMA, obraron como proponentes del proyecto y, en esa condición, intervinieron en forma activa en el desarrollo de las actividades que rodearon la finalización y la firma del acuerdo referido, tal y como consta en los listados de reuniones, y convocatorias allegadas al expediente.

En conclusión, no se observa vulneración del derecho fundamental a la consulta previa de las comunidades indígenas que habitan la zona de la Selva del Matavén, con la conducta desplegada por MEDIAMOS F & M SAS, ni por los demás sujetos accionados y/o vinculados a esta acción constitucional, relativas a la firma del Acuerdo de Alianza Estratégica para la Protección, Conservación y Recuperación de los Bosques Naturales del Resguardo Indígena Unificado; por el contrario, el proyecto a ejecutar propende por la garantía de los derechos fundamentales de las comunidades indígenas que habitan la zona del Matavén, porque lo buscado es el fortalecimiento forestal y ecológico del territorio a cambio de un beneficio económico (ingreso monetario). En consecuencia, se negará el amparo solicitado por el accionante.

Also in Annex 1.11.10 on pages 22 and following the Supreme Court are presented verbatim and say:

RESUELVE:

PRIMERO. CONFIRMAR el fallo proferido por la **SALA LABORAL DEL TRIBUNAL SUPERIOR DEL DISTRITO JUDICIAL DE VILLAVICENCIO** el 14 de noviembre de 2014, dentro de la acción de tutela promovida por **PEDRO ELICEO ROA GAITÁN,** en contra de la **DIRECCIÓN DE ASUNTOS INDÍGENAS ROM Y MINORÍAS** y la **DIRECCIÓN DE CONSULTA PREVIA** ambas del **MINISTERIO DEL INTERIOR, MEDIAMOS F&M SAS,** el **MINISTERIO DEL MEDIO AMBIENTE Y DESARROLLO SOSTENIBLE,** trámite al cual se vincularon al **PROCURADOR REGIONAL DEL GUAINÍA,** al **PROCURADOR REGIONAL DEL VICHADA,** a la **ASOCIACIÓN DE CABILDOS Y AUTORIDADES TRADICIONALES INDÍGENAS DE LA SELVA MATAVEN – ACES,** a la **ORGANIZACIÓN INDÍGENA ACATISEMA,** al

ACES, a la **ORGANIZACIÓN INDÍGENA ACATISEMA,** al **PRESIDENTE DE LA MESA COORDINADORA, LUIS FERNANDO PONARE GAITÁN,** a la **FISCALÍA GENERAL DE LA NACIÓN,** a la **CORPORACIÓN PARA EL DESARROLLO SOSTENIBLE DEL NORTE Y EL ORIENTE AMAZÓNICO – COA,** a la **AUTORIDAD NACIONAL DE LICENCIAS AMBIENTALES – ANLA,** al **GRUPO DE MITIGACIÓN DEL CAMBIO CLLMÁTICO DEL MINISTERIO DEL MEDIO AMBIENTE Y DESARROLLO SOSTENIBLE,** a **CONSERVACIÓN INTERNACIONAL COLOMBIA,** al **FONDO MUNDIAL PARA LA NATURALEZA, WWF COLOMBIA,** a la **FUNDACIÓN NATURA COLOMBIA,** a la **FUNDACIÓN THE NATURA COLOMBIA,** a **THE NATURAL CONSERVANCY-TNC- COLOMBIA,** al **CENTRO DE INVESTIGACIÓN EN ECOSISTEMAS Y CAMBIO GLOBAL CARBONO Y BOSQUES,** a la **ORGANIZACIÓN NACIONAL INDÍGENA DE COLOMBIA – ONIC-** y al **RESGUARDO INDÍGENA UNIFICADO DE LA SELVA MATAVÉN.**

7 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

The monitoring report presented corresponds to two periods:

Period 1: 2013

Period 2: 2014 and 2015

So that information about "Achieved GHG Emission Reductions and Removals" is presented separately for the two periods and then consolidated.

7.1 Data and Parameters Monitored

Table 94. Data and parameters at verification

VM0007: METHODOLOGY FRAMEWORK (REDD-MF) (Annex 9; PDD section 4.2)

Data / Parameter	$\Delta C_{WPS-REDD}$
Data unit	t CO_2e
Description	Net GHG emissions in the REDD project scenario up to year t*
Comments	Without comment

Data / Parameter	$\Delta C_{LK-AS, unplanned}$
Data unit	t CO_2e
Description	Net greenhouse gas emissions due to activity shifting for projects preventing unplanned deforestation
Comments	Without comment

VMD0001: Estimation of carbon stocks in the above- and below ground biomass in live tree and non-tree pools (CP-AB) (Annex 13; PDD section 4.2)

Data / Parameter	A_{sp}
Data unit	ha
Description	Area of sample plots in ha
Comments	This parameter was known ex-ante.

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points
Comments	This parameter was known ex-ante.

Data / Parameter	***DBH***
Data unit	cm
Description	Diameter at breast height of a tree in cm
Comments	This parameter was known ex-ante.

Data / Parameter	***H***
Data unit	m
Description	Total height of tree
Comments	This parameter was known ex-ante.

VMD0004: Estimation of stocks in the soil organic carbon pool (CP-S) (Annex 14; PDD section 4.2)

Data / Parameter	$C_{SOCsample}$
Data unit	g C/100 g soil (fine fraction <2 mm)
Description	Soil organic carbon of the sample in g C/100 g soil
Comments	This parameter was known ex-ante.

Data / Parameter	BD_{sample}
Data unit	g cm^{-3}
Description	Bulk density of fine (< 2 mm) fraction of mineral soil per unit volume of sample in g cm^{-3}; bulk density equals the oven dry weight of the fine fraction (< 2 mm) of the soil core divided by the core volume
Comments	This parameter was known ex-ante.

VMD0007: Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP) (Annex 10; PDD section 4.2)

Data / Parameter	***Any spatial feature included in the spatial model that is subject to changes over time (Factor Maps)***
Data unit	Depending on the spatial features selected
Description	Factor Maps
Comments	Without comment

Data / Parameter	***Risk Maps***
Data unit	ha
Description	This map shows, for each pixel, the risk for deforestation as a numerical scale (eg: 0 = 1 = minimal risk and the maximum risk)
Comments	Without comment

Data / Parameter	***Baseline Deforestation Maps***
Data unit	Depending on the spatial features selected
Description	Maps showing the location of deforested hectares in each year of the baseline period
Comments	Without comment

Data / Parameter	AA_U
Data unit	%
Description	Evaluation of the accuracy of unplanned deforestation rate (greater than or equal to 90%)
Comments	Without comment

Data / Parameter	***Correct***
Data unit	ha
Description	Area correct due to observed change predicted as change
Comments	This is generated from the intersection of two facts: The first is the deforestation observed through the satellite in the 2005-2011 period. The second is the projected deforestation (modeled) from 2005 to 2011 in the IDRISI software.

Data / Parameter	E_{rrA}
Data unit	ha
Description	Area of error due to observed change predicted as persistence.
Comments	Without comment

Data / Parameter	E_{rrB}
Data unit	ha
Description	Area of error due to observed persistence predicted as change.
Comments	Without comment

Data / Parameter	***FOM***
Data unit	Ha
Description	Figure of Merit
Comments	Without comment

Data / Parameter	***LB***
Data unit	ha
Description	Leakage belt área. Map showing the location and stratification of forests within the leakage belt. (100% forest at the beginning of the project).
Comments	The stratification is based on the official map of Biomes IGAC (2008), available at the national SIGOT.

Data / Parameter	***PA***
Data unit	Ha
Description	Unplanned deforestation project area. Map showing the location and stratification of forests within the project area (100% forest at the beginning of the project).
Comments	The stratification is based on the official map of Biomes IGAC (2008), available at the national SDI SIG-OT.

Data / Parameter	P_{LK}
Data unit	Dimensionless
Description	Ratio of the area of the leakage belt to the total area of RRD
Comments	Monitored at least once every 10 years (when the baseline is revisited). It was estimated at time zero, this estimate was used for ex-ante purposes

Data / Parameter	P_{PA}
Data unit	Dimensionless
Description	Ratio of the Project Area to the total area of *RRD*
Comments	Monitored at least once every 10 years (when the baseline is revisited). It was estimated at time zero, this estimate was used for ex-ante purposes

Data / Parameter	***RRD***
Data unit	ha
Description	Geographical limit of the reference region to project the rate of deforestation
Comments	100% forest at the beginning of the historical reference period.

Data / Parameter	***RRL***
Data unit	ha
Description	Geographical boundaries of the reference region to locate deforestation.
Comments	Without comment

Data / Parameter	***Factor Maps***
Data unit	ha
Description	13 maps used to calibrate the risk model.
Comments	Procedure described in section 3

Data / Parameter	***Project Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidence stratification and location of the forest in the Project Area at the beginning of each verification period. It shows if there deforested areas within the project area.
Comments	Stratification is the same as the one used at the beginning of the term.

Data / Parameter	***Leakage Belt Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidencing the stratification and location of the forest in the Leakage Belt at the beginning of each verification period. It has to be evidenced if there are deforested areas.
Comments	Stratification is the same as the one used at the beginning of the term.

VMD0010: Estimation of emissions from activity shifting for avoided unplanned deforestation (LK-ASU) (Annex 12; PDD section 4.2)

Data / Parameter	***MANFOR***
Data unit	ha
Description	Total area of forests under active management nationally
Comments	Without comment

Data / Parameter	***PROTFOR***
Data unit	ha
Description	Total area of fully protected forests nationally
Comments	Without comment

Data / Parameter	$TOTFOR$
Data unit	ha
Description	Total available national forest area
Comments	Without comment

Data / Parameter	$\Delta C_{P,LB}$
Data unit	t CO_2-e
Description	Net greenhouse gas emissions within the leakage belt in the project case
Comments	Without comment

Data / Parameter	$PROP_{IMM}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrating population
Comments	Without comment

Data / Parameter	$PROP_{RES}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by population that has been resident for ≥5 years
Comments	Without comment

Data / Parameter	$A_{DefLB,i,t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in the project case in stratum *i* in year *t*
Comments	Without comment

Data / Parameter	$A_{DefPA,i,t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in the project case in stratum *i* in year *t*
Comments	Without comment

Data / Parameter	***Leakage Belt Forest Cover Benchmark Map***
Data unit	This does not apply
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period. Only applicable where leakage is to be monitored in a leakage belt.
Comments	Without comment

VMD0015: Methods for monitoring of GHG emissions and removals (M-MON) (Annex 11; PDD section 4.2)

Data / Parameter	***Project Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidencing the stratification and location of the forest in the Project area at the beginning of each verification period. It has to be evidenced if within the Project area there are deforested areas.
Comments	Without comment

Data / Parameter	***Leakage Belt Forest Cover Monitoring Map***
Data unit	ha
Description	Map evidencing the stratification and location of the forest in the Leakage Belt at the beginning of each verification period. It has to be evidenced if there are deforested areas.
Comments	Without comment

Data / Parameter	$A_{DefPA, i,\underline{u},t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in stratum *i* converted to land use *u* at time *t*
Comments	Ex-ante, estimation was made of deforestation in the with-project case.

Data / Parameter	$A_{DefLB, i,\underline{u},t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt in stratum i converted to land use u at time t
Comments	Ex-ante, estimation shall be made of deforestation in the leakage belt in the with-project case. The area of deforestation shall be made conservatively equal to:

	$(\sum_{t=1}^{t} (1 - PROP_{IMM}) * A_{BSL,LK,unplanned,t}) * (1 - PROP_{LPA})$ Where: $PROP_{IMM}$ Estimated proportion of baseline deforestation caused by immigrating population; proportion (Calculated in LK-ASU) $A_{BSL,LK,unplanned,t}$ Project rate of unplanned baseline deforestation in the Leakage Belt Area at year t; ha. yr^{-1} (Output parameter from BL-UP) $PROP_{LPA}$ Estimated proportion of baseline deforestation agents given the opportunity to participate in leakage prevention activities; proportion (proportion shall be conservatively estimated and justifiable. Leakage prevention activities must be planned to fully replace income, product generation and livelihood. Projects have the option ex-ante to conservatively set PROPLPA as equal to 1). t 1, 2, 3 …t years elapsed since the start of the project activity

Data / Parameter	$A_{RRL, forest, t}$
Data unit	ha
Description	Remaining area of forest in RRL at time t
Comments	There is no evidence of degraded areas or plots ex-ante within the project area.

Data / Parameter	F_{LU}
Data unit	Dimensionless
Description	Land use factor before or after conversion
Comments	Without comment

Data / Parameter	F_{MG}
Data unit	Dimensionless
Description	Management factor before or after conversion.
Comments	Without comment

Data / Parameter	F_{i}
Data unit	Dimensionless
Description	Input factor before or after conversion
Comments	Without comment

VMD0016: Module: Methods for stratification of the project area (X-STR) (Annex 15; PDD section 4.2)

Data / Parameter	$A_{WPS,i}$ or A_i
Data unit	ha
Description	Area of project stratum *i*
Comments	Without comment

7.1.1 Monitoring results of deforested areas

Illustration 43. Maintenance of the plots – Siracusa community

Source: REDD+ project RIU-SM

The procedure description for the implementation of monitoring in the Project Area and in Leakage Belt Area according to digital image processing and monitored points on the ground with their respective results by period 2013 and period 2014-2015, are presented below.

Maps of deforestation and updating of land coverage were processed according to IDEAM approaches in its so-called guidelines "Protocol of digital image processing for the quantification of deforestation in Colombia national level - gross and fine scale" developed by the IDEAM (Cabrera, Galindo, & Vargas, Protocolo de Procesamiento Digital de Imágenes para la Cuantificación de la Deforestación en Colombia, Nivel Nacional Escala Gruesa y Fina, 2011), and their procedures are considered official for regional planning to scale 1:100000. This procedure consists of:

Selecting and downloading images to RRL Area (Region Reference to Locate Deforestation) in Glovis web site (USGS, nd).

Step 1: Radiometric calibration and atmospheric correction: It was used the conversion radiance and reflectance procedure by applying the COST model (Chavez, 1996), which incorporates all the elements of the model of subtraction by dark object (for the elimination of fog), the rigorous models of atmospheric correction are not applicable as there is with information from input to feed these models.

Step 2: Geometric correction: It wasn't applied the geometric correction, since the land sat images are already Ortho-corrected. On the other hand, also it will correct topographically, since the entire area is a subject of a flat studio with slope below 15% by 99%.

Initial classification forest coverage / No forest (automated tool application)

At this stage the source document: "book on REDD GOFC-GOLD" (GOFC-GOLD, 2013) and "Protocol of digital image processing for the quantification of deforestation in Colombia national level - coarse and fine scale" developed by the IDEAM (Cabrera, Galindo, & Vargas, 2011) should be taken as a reference.

Step 3: Change detection: the method of detecting changes between the pair of images from the latest update of the RRL Area and the new image will be applied. So both images will be in reflectance, in addition to add layers as NDVI and the first 3 main components of the bands (red, green, blue, near infrared, far infrared).

The change detection process generates three types of situations:

- Real changes
- Areas of change that were not detected
- Transform a polynomial vector.

Parameters for polygon generation rate:

- Polygons with areas greater than 1 ha.
- Polygons that are within the area of RRL

Step 4: Inspection: It will be an inspection and interpretation of each of the polygons of change detection:

Inspection 1: To detect changes that were not discovered by the algorithm of detecting changes and draw them according to the parameters.

Inspection 2: To delete exchange polygons that were detected by the algorithm as change due to fluctuations of phenology, floods or other phenomenon that alters the spectral values.

Step 5: Calculation of deforestation on the RRL forest

- Polygons that intersect with forest are cataloged as deforestation.

Step 6: Allocation of coverage: According to the interpretation of satellite images a category is assigned to define the uses of land cover giving for national land cover legend "Methodology Corine Land Cover adapted to Colombia scale 1:100 000" developed by the IDEAM (2010).

Selection of satellite images:

The images were acquired on United States Geological Survey GLOVIS "The USGS Global Visualization Viewer" (http://glovis.usgs.gov) server, which were visited by sensor type, date and percentage of cloud cover.

To estimate the Forest/Non Forest land sat satellite imagery was used, January 2014:

- ✓ LC80050572014028LGN00
- ✓ LC80040572013354LGN00

To estimate the Forest/Non Forest land sat satellite imagery was used, January 2013, since these images are banded and it was decided to work with two scenes per tile to complete the areas where no data:

- ✓ LE70040572012344EDC00
- ✓ LE70040572013010EDC00
- ✓ LE70050572013017EDC00
- ✓ LE70050572013001EDC00

Note that these images may only be acquired over a period between December and January of each year, since the remaining rainy season months do not allow to observe the earth's surface, given the percentage of cloud cover.

Processing of satellite images

For the processing of the selected satellite images IDRISI SELVA 17®, GDAL-Python and ArcGis 10.2.0® type will be used.

The processing of satellite images should include the following steps:

- ✓ Geometric correction

  This process is applied only if the land sat image does not come with this band composition process.

  It is applied to obtain a better quality in the classification of images by obtaining a single file per image.

✓ Visual classification

IDEAM methodology was used to classify the satellite images and working scale was 1:60000 and 1:70000. The identified types were:

- Forest
- Non forest land.

The last one was divided into sub categories:

- Pastures.
- Heterogeneous Agricultural Areas
- Secondary forest
- Grasslands – sheets
- Regenerating vegetation

An accuracy assessment was developed to analyze the precision of the final maps.

More details of the whole procedure can be seen in the final technical report made.

The results of the monitoring of deforestation in the periods 2013 and 2014-2015 are presented.

Table 95. Deforestation in the Project Area (PA) and Leakage Belt (LB) (2013; 2014-2015)

	Monitoring (2013)		**Monitoring (2014-2015)**				
	Has	**%**	**Has**	**%**	**Total (has)**	**%**	**Has/year**
Project Area (PA)	245.7	40.6%	788.5	45.1%	1,034.2	44.0%	344.7
Leakage Belt (LB)	358.8	59.4%	960.1	54.9%	1,318.9	56.0%	439.6
Total	**604.5**	**100%**	**1,748.6**	**100%**	**2,353.1**	**100%**	
Deforested/year	**604.5**		**874.3**				**784.4**

Source: REDD+ Project RIU-SM, GIS (file "monitoring.xlsx", folder "calculation_tables")

Deforested areas projected for the years 2013 to 2015 for the Project Area (PA) is 36,525 hectares. Deforestation found for these three years was 1,034.2 hectares which gives a percentage ratio of 2.8%, i.e., that are reached to stop deforestation in 97.2% in the Project Area (PA).

Deforested areas projected for the years 2013 to 2015 for Leakage Belt (LB) were 10,074 hectares. Deforestation found for these three years was 1,318.9 hectares which gives a percentage ratio of 13.1%, i.e., that are reached to stop deforestation in 86.9% in the Leakage Belt (LB).

Deforested areas projected for the years 2013 to 2015 for PA and LB were 46,599 hectares. Deforestation found for these three years is 2,353.1 hectares which gives a percentage ratio of 5%, i.e., that are reached to stop deforestation in 95% in the PA and LB.

Table 96. Deforestation 2013 and 2014-2015 in the Project Area (PA) by strata (biomes)

	Monitoring (2013)		Monitoring (2014-2015)				
Biome	**Has**	**%**	**Has**	**%**	**Total (has)**	**%**	**Has/year**
Helobiome	97.2	39.6%	405.2	51.4%	502.4	48.6%	167.5
Peinobiome	16.5	6.7%	45.5	5.8%	62.0	6.0%	20.7
Litobiome	0.0	0.0%	7.3	0.9%	7.3	0.7%	2.4
Zonobiome	132.0	53.7%	330.5	41.9%	462.5	44.7%	154.2
Total	**245.7**	**100%**	**788.5**	**100%**	**1,034.2**	**100%**	
Deforested/year	**245.7**		**394.2**				**344.7**

Source: REDD+ Project RIU-SM, GIS (file "monitoring.xlsx", folder "calculation_tables")

Table 97. Deforestation Leakage Belt (LB) by strata (biomes) (2013-2015)

	Monitoring (2013)		Monitoring (2014-2015)				
Biome	**Has**	**%**	**Has**	**%**	**Total (has)**	**%**	**Has/year**
Helobiome	119.4	33.3%	206.8	21.5%	326.3	24.7%	108.8
Peinobiome	33.1	9.2%	107.8	11.2%	140.9	10.7%	47.0
Litobiome	28.4	7.9%	16.6	1.7%	45.0	3.4%	15.0
Zonobiome	177.8	49.6%	628.9	65.5%	806.7	61.2%	268.9
Total	**358.8**	**100%**	**960.1**	**1.0**	**1,318.9**	**100.0%**	
Deforested/year	358.8		480.0				**439.6**

Source: REDD+ Project RIU-SM, GIS (file "monitoring.xlsx", folder "calculation_tables")

Deforestation in the LB is located at Zonobiome (61.2%) and the PA is located in Helobiome and Zonobiome (93.3%).

Table 98. Deforestation in the Project Area (PA) and Leakage Belt (LB) for land uses forest deforested

		Categories of land cover (ha)												
		HAA	%	**GL**	%	**BS**	%	**VR**	%	**WL**	%	**Total**	%	Has/year
Project Area (PA)	(2013)	222.9	27.2%	21.0	89.9%		0.0%	1.9	1.0%		0.0%	**245.7**	**23.8%**	245.7
	(2014-2015)	597.6	72.8%	2.4	10.1%	0.9	100.0%	184.2	99.0%	3.5	100.0%	**788.5**	**76.2%**	394.2
	Total	**820.5**	**100%**	**23.3**	**100%**	**0.9**	**100%**	**186.0**	**100%**	**3.5**	**100%**	**1,034.2**	**100%**	
	Defor/year	**273.5**		**7.8**		**0.3**		**62.0**		**1.2**				**344.7**
Leakage Belt (LB)	(2013)	260.9	27.7%	29.9	43.9%			68.0	22.0%		0.0%	**358.8**	**27.2%**	358.8
	(2014-2015)	680.2	72.3%	38.2	56.1%			240.7	78.0%	1.0	100.0%	**960.1**	**72.8%**	480.0
	Total	**941.1**	**100%**	**68.1**	**100%**	**0.0**		**308.7**	**100%**	**1.0**	**100%**	**1,318.9**	**100%**	
	Defor/year	**313.7**		**22.7**		**0.0**		**102.9**		**0.3**				**439.6**
	TOTAL	**1,761.6**		**91.5**		**0.9**		**494.7**		**4.5**		**2,353.1**		
	Defor/year	**587.2**		**30.5**		**0.3**		**164.9**		**1.5**				**784.4**
	%	**74.9%**		**3.9%**		**0.0%**		**21.0%**		**0.2%**				**100%**

Source: REDD+ Project RIU-SM, GIS (file "monitoring.xlsx", folder "calculation_tables")

Deforested land has been dedicated to Heterogeneous Agricultural Areas (HAA) (75%), Vegetation in Regeneration (VR) (21%) and little grasses (GL) (4%).

BS: Bare Soils; WL: Wetlands

7.2 Baseline Emissions

To calculate the baseline emissions the following three stages were fulfilled:

1. *Calculation of Carbon stocks and CO_2-e in biomass in following pools: Aboveground Tree Biomass ($C_{AB\_tree,i}$), Belowground Tree Biomass ($C_{BB\_tree,i}$) and Soil Organic ($C_{SOC,i}$), by stratum i, by hectare.*
2. *Determination of the unplanned deforestation within the Region Reference to project Deforestation rate (RRD) during historical reference period (HRP), to estimate the threat of deforestation within Project Area (PA)*
3. *Calculation of baseline Carbon stock changes and GHG emissions*

The following is a brief summary of each stage:

7.2.1 Calculation of carbon stocks in Aboveground tree biomass, Belowground tree biomass and Soil Organic

7.2.1.1 Estimation of carbon stocks in aboveground tree biomass ($C_{AB\_tree,i}$)

To calculate Aboveground Tree Biomass CO_2-e ($C_{AB\_tree,i}$) (Annex 13 VMD0001, part 1) following steps were fulfilled:

1: Determine the tree dimensions and size and amount of field plots

Procedures to determinate size and number of plots and parameters to be measured in each tree and results are presented in Annex 13 VMD0001, page 7 – 15 and section 3.1.2.1, step 1 in this document.

2: Selection of an appropriate and validated allometric equation

The equation used for estimation of biomass in trees was Equation 12 of "*Protocol for the national and subnational estimates of biomass - carbon Colombia - IDEAM, 2011*" (Yepes, et al., 2011) (Annex 13 VMD0001, page 15), and Equation 5 for palms applied according to the "G*ood practice guidance for land use, changing land use and forestry. 2003, Annex 4.A.2 (table 4.A.2, page 4.114 [513])" (IPCC, 2003)*: Procedures are also presented in section 3.1.2.1, step 2 in this document.

Aboveground tree biomass by plot: To calculate the Aboveground Tree Biomass by plot, all the results of the dry matter of each tree and palm in a same plot were added.

Results by plot are in "REDD+ Project RIU-SM Folder "calculation_tables", file "plot_study_fustales.xlsm", Sheet "estad grals"

Aboveground tree biomass by hectare: To calculate the Aboveground Tree Biomass by hectare, Equation 14 of "*Protocol for the national and subnational estimates of biomass - carbon Colombia - IDEAM, 2011*" (Yepes, et al., 2011) (Annex 13 VMD0001, page 17)

Equation used for estimation of biomass by hectare:

$$BA\ (t/ha) = BA\ (kg/plot) * (1\ t/1000\ kg) * 4$$

Where:

BA (t/ha): aboveground tree biomass by hectare (tones of dry matter in each hectare)

BA (kg/par): aboveground tree biomass by plot (kg of dry matter in each plot)

(1 t/1000 kg): conversion factor from kg to tones

4: conversion factor (FC) from plots to hectares (depended on the size of plot used: 50x50m=0,25 ha)

Results of Aboveground tree biomass by hectare can see in table 48 in this document.

3: Estimate Carbon stock in Aboveground Tree Biomass

The aboveground tree biomass of each individual already was estimated using the appropriate Equations (as it was explained before). Standard defines a parameter factor of 0.47 (CF in VMD0001, page 12; (IPCC, 2006) INV GLs AFOLU Chapter 4 Table 4.3) to estimate Carbon stock from Aboveground Tree Biomass.

According the Equation 1 of Module VCS-VMD0001 (page 5):

$$C_{AB\_tree,sp,i} = \Sigma_j^S\ \Sigma_{l=1}^{Nj,sp,i} f_j(X, Y \ldots) * CF_j$$

Where:

$C_{AB\_tree,sp,i}$ *: Carbon stock in aboveground biomass of trees in plot sp in stratum i* (ton C)

CF_j *: Carbon fraction of biomass for species group j* (0.47 ton C / ton d.m.)

$f_j(X, Y \ldots)$ *: Aboveground biomass of trees based on allometric equation for species group j based on measured tree variable(s)* (1 / ton d.m. tree)

Equation 1 of Module VCS-VMD0001 is equivalent to:

$$CBA = BA\ (t/ha) * CF$$

Where:

CBA: Carbon stock in aboveground tree biomass (tones of C / ha)

BA (t/ha): Aboveground tree biomass already converted to "ton dry matter / ha" from "ton dry matter / plot"

CF : Carbon fraction of biomass for species group j (0.47 ton C / ton d.m.)

Results for each tree, each plot and by hectare can see in: REDD+ Project RIU-SM Folder "calculation_ tables", file "plot_study_fustales.xlsm", in Sheets for each plot in each stratum, for example (for plot 10 of helobiome, the sheet is called H-10). A mean by stratum i of Carbon stock in aboveground tree biomass can see in REDD+ Project RIU-SM Folder “calculation_ tables”, file “plot_study_fustales.xlsm”, Sheets “estad H”, “estad P”, “estad L”, “estad Z”.

Results of Aboveground tree biomass Carbon stock by hectare can see in table 48 in this document.

4: Calculate Aboveground Tree Biomass Carbon stock converted to Carbon Dioxide equivalent

According the Equation 2 of Module VCS-VMD0001 (page 5):

$$C_{AB\_tree,i} = \Sigma_{sp=1}^{Pi} (C_{AB\_tree,sp,i} / A_{sp,i}) * 44/12$$

Where:

$C_{AB\_tree,i}$ *: Mean aboveground biomass carbon stock in stratum* i (t CO_2-e / ha)

$C_{AB\_tree,sp,i}$ *: Aboveground biomass carbon stock of trees in sample plot sp of stratum* i (t C / plot)

$A_{sp,i}$ *: Area of sample plot sp in stratum* i (ha)

To convert the values of “*Aboveground Tree Biomass Carbon stock* CAB (already converted in tones of C / ha)” into *Carbon Dioxide Equivalent* $C_{AB\_tree,i}$ (tones of CO_2-e / ha) the factor of 44/12 ≈ 3.67 was used (this factor by dividing the atomic weight of a molecule of carbon dioxide, by the specific weight of carbon), as recommended by the IPCC 2003, 2006. That is, the number of tones of “CAB” is multiplied by 3.67.

Results of aboveground tree biomass (BA), Carbon stock in aboveground tree biomass (CBA) and $C_{AB\_tree,i}$ can be seen in the table 48 in this document.

Detailed results by hectare in each plot are in “REDD+ Project RIU-SM Folder “calculation_tables”, file “plot_study_fustales.xlsm”, Sheet “estad grals”

7.2.1.2 Estimation of carbon stocks in belowground tree biomass ($C_{BB\_tree,i}$)

To calculate Belowground Tree Biomass CO_2-e ($C_{BB\_tree,i}$) (Annex 13 VMD0001, part 2) following steps were fulfilled:

1: Calculate the belowground tree biomass carbon stock for each plot:

According the Equation 5 of Module VCS-VMD0001 (page 7):

$$C_{BB\_tree,sp,i} = R * C_{AB\_tree,sp,i}$$

Where:

$C_{BB\_tree,sp,i}$ *: Belowground tree biomass carbon stock of trees in plot sp, in stratum i*; (t C / plot)

$C_{AB\_tree,sp,i}$: *Aboveground tree biomass carbon stock in sample plot sp, in stratum* i (t C / plot)

R : *Root to shoot ratio* (t root d.m. / t shoot d.m.)

The Belowground Tree Biomass Carbon stocks of each tree were obtained by multiplying the results of Part 1, Step 3 (Aboveground Tree Biomass Carbon stock (tones of C / ha)) with the Root to Shoot Ratio, equal to 0.24. This value is for tropical moist forest with Aboveground Tree Biomass higher than 125 t/ha, and was taken from the Module VCS VMD0001 CP-AB, version 1.1 [in Module VCS VMD0001 CP-AB a modified Table 4.4 of the AFOLU Guidelines (IPCC 2006, Chapter 4, page 4.49) is presented in page 17]).

Results of Belowground tree biomass Carbon stock by hectare can see in table 51 in this document.

2: Calculate Belowground Tree Biomass Carbon stock converted to Carbon Dioxide equivalent

According the Equation 6 of Module VCS-VMD0001 (page 7):

$$C_{BB\_tree,i} = \Sigma_{sp=1}^{Pi} (C_{BB\_tree,sp,i} / A_{sp,i}) * 44/12$$

Where;

$C_{AB\_tree,i}$: *Mean belowground biomass carbon stock in stratum* i (t CO_2-e / ha)

$C_{AB\_tree,sp,i}$: *Mean belowground tree biomass carbon stock of trees in plot sp of stratum* i (t C / plot)

$A_{sp,i}$: *Area of sample plot sp in stratum* i (ha)

To convert the values of "*Belowground Tree Biomass Carbon stock* CBB (already converted in tones of C / ha)" into *Carbon Dioxide Equivalent* $C_{BB\_tree,i}$ (tones of CO_2-e / ha) the factor of 44/12 ≈ 3.67 was used (this factor by dividing the atomic weight of a molecule of carbon dioxide, by the specific weight of carbon), as recommended by the IPCC 2003, 2006. That is, the number of tones of "CBB" is multiplied by 3.67.

Results of belowground tree biomass carbon stock (BB), Carbon stock in belowground tree biomass (CBB) and $C_{BB\_tree,i}$ can be seen in the table 51 in this document.

A study of the biomass in "vegetation on regeneration" was also carried out, but for conservative effects these amounts of carbon were not included in the total used in baseline.

7.2.1.3 Estimation of carbon stocks in soil organic

To calculate Soil Organic CO_2-e ($C_{SOC,i}$) (Annex 14 VMD0004, part 1) following steps were fulfilled:

1: Calculate of the Soil Organic Carbon stock

In some plots where Aboveground and Belowground were calculated, samples of ground were extracted as field sampling of soil organic.

To determine the bulk density of the soil samples, the protocol of Burton & Pregitzer (2008) was used. Volume and density of the rocks and fractions were calculated using the Equations 32, 33, 34 and 35 of such protocol.

For the determination of total organic carbon in a soil sample, method of wet combustion of Walkly - Black (Mendoza Squares, 2011) was used by sugerence of Soil Laboratory of IDEAM (see report analyzing soil organic carbon and bulk density "Annex14-1_report_soil_analysis', and the format Standardization "determination of organic carbon in soils-Walkley Black Method", IDEAM 2011 "Annex14-2_Walkley-Black_method").

The calculation of carbon stock was performed for each sampled depth in the pit in selected sample plot by stratum.

Equation 1 of VCS Module VMD0004 (page 2) is used to calculate the Carbon stock in soil organic carbon for each sample of ground.

(Equation 1 of VCS Module VMD0004 is equal to Equation 37 Burton & Pregitzer -2008)

$$C_{SOC,sp,i} = C_{SOCsample,sp,i} * BD_{sample,sp,i} * Dep_{sample,sp,i} * 100$$

Where:

$C_{SOC,sp,i}$: *Carbon stock in soil organic carbon for sample plot* sp*, stratum* i *(t C / ha).*

$C_{SOCsample,sp,i}$: *Soil organic carbon of the sample in sample plot* sp*, stratum* i*; determined in the laboratory (fine fraction <2 mm) (g C / 100 g soil).*

$BD_{sample,sp,i}$: *Bulk density of fine (<2 mm) fraction of mineral soil in sample plot* sp*, stratum* i*; determined in the laboratory (g fine fraction / cm*^{3} *total sample volume).*

$Dep_{sample,sp,i}$: *Depth to which soil sample is collected in sample plot* sp *in stratum* i *(cm).*

$C_{SOCsample,sp,i}$ is determined in the laboratory. This % value is calculated to each plot in each stratum. Results can see in *REDD+ Project RIU-SM Folder "calculation_tables", file "soil_analysis.xlsx"*, where each plot is identified by its code (for example, for plot 10 of helobiome, the sheet is called H-10).

In each plot $C_{SOC,sp,i}$ is calculated for each depth. Results can see in *REDD+ Project RIU-SM Folder "calculation_tables", file "soil_analysis.xlsx", Sheet "COS ac biom"* for each plot in each stratum.

Results of Soil Organic Carbon stock by hectare can see in table 99 in this document.

2: Calculation of Soil Organic Carbon stock converted to Carbon Dioxide equivalent:

Equation 2 of VCS Module VMD0004 (page 3) is used to calculate the Carbon stock in soil organic carbon converted to Carbon Dioxide equivalent for each sample of ground.

(Equation 2 of VCS Module VMD0004 is equal to Equation 38 Burton & Pregitzer -2008)

$$C_{SOC,i} = \Sigma_{sp=1}^{Pi} (C_{SOC,sp,i}) / P_i * 44/12$$

Where:

$C_{SOC,i}$: *Mean carbon stock in soil organic carbon for stratum* i *(t C / ha).*

$C_{SOCsp,i}$: *Carbon stock in soil organic carbon for sample plot sp, stratum i (t C / ha).*

sp *: 1, 2, 3, … Pi sample plots in stratum i.*

To convert the values of "*Soil Organic Carbon stock SOC*" into *Carbon Dioxide Equivalent* $C_{SOC,i}$ (tones of CO_2-e / ha) the factor of 44/12 ≈ 3.67 was used (this factor by dividing the atomic weight of a molecule of carbon dioxide, by the specific weight of carbon), as recommended by the IPCC 2003, 2006. That is, the number of tones of "*SOC*" is multiplied by 3.67.

Results have been calculated for different depths, but for REDD+ Project RIU-SM only a cumulative Soil Organic Carbon stock to depth 30 cm was considered. Results of Soil Organic Carbon stock and $C_{SOC,i}$ for depth 30 cm can be seen in the following table:

Table 99. Average of Soil Organic Carbon stock (tones C /ha) and Carbon Dioxide equivalent $C_{SOC,i}$ (tones CO_2 /ha) in depth 30 cm according stratum i

i=1 Helobiome		*i*=2 Peinobiome		*i*=3 Litobiome		*i*=4 Zonobiome	
SOC (ton C/ha)	$C_{SOC,i}$ (ton CO_2/ha)	SOC (ton C/ha)	$C_{SOC,i}$ (ton CO_2/ha)	SOC (ton C/ha)	$C_{SOC,i}$ (ton CO_2/ha)	SOC (ton C/ha)	$C_{SOC,i}$ (ton CO_2/ha)
33.7	123.5	53.4	195.8	56.7	207.8	54.3	199.2

Source: REDD+ Project RIU-SM Folder "calculation_ table", file "soil_analysis.xlsx", Sheets "COS ac biom" and "CO2 ac biom"

7.2.2 Determination of the unplanned deforestation within the RRD during historical reference period (HRP), to estimate the threat of deforestation within Project Area (PA)

In VMD0007 (Annex 10) the estimation of annual areas of unplanned deforestation was calculated (Part 2, page 35). The procedure was implemented by applying the following steps

7.2.2.1 Analysis of historical deforestation

A historical reference period (HRP) was defined to realize the study of historical deforestation in RRD. HRP consists in a period from 2001 to 2011, with three points (2001, 2005 and 2011).

Collection of appropriate data Sources: Landsat TM and ETM + images were used to identify the deforestation. A list of these images are in Annex 10 VMD0007, table 16, page 36.

Mapping of historical deforestation: Different procedures were implemented to analyze and interpret the digital information available in satellite images. These procedures are described in Annex 10 VMD0007, pages 37 - 42.

Calculation of the historical deforestation rate: Deforestation during historical reference period (hrp) is in section 3.1.2.5 in this document:

Map accuracy assessment: An evaluation of the verifiable accuracy of maps produced in the former step 2.1.4 (Annex 10 VMD0007) was required to produce a reliable estimate of the historical deforestation rate.

7.2.2.2 Estimation of the annual areas of unplanned baseline deforestation in the RRD, PA, LB

$A_{BSL,RRD,unplanned,t}$ = 13,857 ha / year

$A_{BSL,RR,unplanned,t}$ = 15,694 ha / year

$A_{BSL,PA,unplanned,t}$ = 11,031 ha / year

$A_{BSL,LK,unplanned,t}$ = 4,663 ha / year

The procedures and their results are in section 3.1.2.6 in this document.

Projected area of unplanned baseline deforestation in the project area / year was estimated by applying spatial model. Results are presented in the table 61 for PA and table 62 for LB in this document:

$A_{BSL,PA,unplanned}$ = 298,410 ha

$A_{BSL,LK,unplanned}$ = 169,828 ha

7.2.3 Calculation of baseline carbon stock changes and GHG emissions

7.2.3.1 Forest carbon stocks pre-deforestation

Baseline Carbon Stocks by pool per forest stratum i are presented in table 53 in this document:

7.2.3.2 Calculation of post-deforestation carbon stocks

Historical area-weighted average was used to estimate the post-deforestation carbon stocks.

Weightings by classes of land uses post-deforestation (2001-2011) are presented in table 63 in this document.

Estimations of carbon stocks after deforestation for land use by stratum are presented in tables 64, 65, 66 and 67 in this document.

Estimations of carbon stocks after deforestation for stratum are presented in table 68 in this document.

7.2.3.3 Calculation of changes of Carbon Stocks for stratum

Procedures and results of changes of Carbon Stocks for stratum are presented in section 3.1.2.8 and table 69 in this document

7.2.3.4 Calculation of the sum of baseline carbon stock changes

Procedures and results of changes of sum of baseline carbon stock changes in section 3.1.2.9 and table 70 for PA and table 71 for LB in this document

7.2.4 Baseline Emissions in 2013 period

The net GHG emissions under the baseline scenario in the 2013 period (table 70, year 2013):

Table 100. Net GHG emissions under the baseline scenario, 2013 period

t	Year	$\Delta C_{BSL,unplanned}$ (t CO2-e)
1	2013	5,151,681

Source: Annex 10 VMD0007, Table 46; File "monitoring.xlsx" section 7.2 and File "VMD0007.xlsx", sheet "P4 Step4.3 Eq24(PA) C stck chng" (folder "calculation_tables")

7.2.5 Baseline Emissions in 2014-2015 period

The net GHG emissions under the baseline scenario in the 2014-2015 period (table 70 years 2014 and 2015):

Table 101. Net GHG emissions under the baseline scenario, 2014-2015 period

t	Year	$\Delta C_{BSL,unplanned}$ (t CO2-e)
2	2014	4,742,981
3	2015	5,490,203
Total		**10,233,184**

Source: Annex 10 VMD0007, Table 46; File "monitoring.xlsx" section 7.2 and File "VMD0007.xlsx", sheet "P4 Step4.3 Eq24(PA) C stck chng" (folder "calculation_tables")

7.2.6 Baseline Emissions in 2013 and 2014-2015 periods

The net GHG emissions under the baseline scenario in the 2013 period and 2014-2015 period:

Table 102. Net GHG emissions under the baseline scenario, 2013 and 2014-2015 periods

t	Years	$\Delta C_{BSL,unplanned}$ (t CO2-e)
1 **2,3**	**2013** **2014, 2015**	**15,384,865**

Source: Based on Annex 10 VMD0007, Table 46; File "monitoring.xlsx" section 7.2 and File "VMD0007.xlsx", sheet "P4 Step4.3 Eq24(PA) C stck chng" (folder "calculation_tables")

7.3 Project Emissions

To calculate the Project Emissions the following stages were fulfilled:

1. *Calculation of Baseline Carbon stock by pool / stratum.*
2. *Calculation of Carbon stock after deforestation in all pools for land use / stratum.*
3. *Calculation of Net Carbon stock changes after deforestation in all pools for land use / stratum.*
4. *Determination of deforested área in Project Area in all pools for land use / stratum.*
5. *Calculation of Net Carbon stock changes after deforestation in Project Area, in all pools for land use / stratum.*

The following is a brief summary of each stage:

7.3.1 Calculation of Baseline Carbon stock by pool / stratum

Annex 10 VMD0007, Part 4, Step 4.2.1, presents the "*Estimation of Carbon stock changes by each pool in each stratum*"

$C_{BSL,i}$ is the subtotals from table 53 by each stratum.

Table 103. Baseline Carbon Stocks by pool per forest stratum i

C Pool	*i*=1 Helobiome	*i*=2 Peinobiome	*i*=3 Litobiome	*i*=4 Zonobiome
	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$
$C_{BSL,i}$	718.5	663.4	682.3	799.4

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0007.xlsx", Sheet "P4 Step4.2.1 forest C stock"

7.3.2 Calculation of Carbon stock after deforestation by pool for land use / stratum

Equation 6 of Annex 11 VMD0015 was used to calculate the Carbon stock in all pools in post-deforestation land use u in stratum i. Equation 6 is presented in section 3.2, numeral 2º.

$C_{post,u,i}$ are in table 73 by each stratum:

Table 104. Estimation of Carbon Stocks after deforestation for land use ($C_{post,u,i}$) ($t\ CO_2\text{-}e\ /\ ha$)

C Pool	*i*=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$C_{post,u,i}$	258.2	203.6	149.3	329.6	240.4	219.4	341.5	246.5	231.1	333.0	242.1	222.7

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq6 CP,post,u,i,t" and file "VMD0007.xlsx", Sheet "P4 Step4.2.2 postdef C stock"

7.3.3 Calculation of Net Carbon stock changes after deforestation in all pools for land use / stratum

Equation 5 of Annex 11 VMD0015 was used to calculate the Net Carbon stock changes in all pools as a result of deforestation in the project scene in land use use u in stratum i. Equation 5 is presented in section 3.2, numeral 2º

$\Delta C_{pools,Def,u,i,t}$ are in table 74 by each stratum:

Table 105. Estimation of Net Carbon stock changes after deforestation for land use ($\Delta C_{pools,Def,u,i,t}$) ($t\ CO_2$-e / ha)

	i=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$\Delta C_{pools,Def,u,i,t}$	460.3	514.9	569.2	333.8	423.0	444.0	340.8	435.8	451.2	466.4	557.3	576.6

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq5 Cpools,Def,i,t"

7.3.4 Determination of deforested área in Project Area in all pools for land use / stratum

Through cartographic review and field verification Area of recorded deforestation in the Project Area (PA) stratum i ($A_{DefPA,u,i,t}$) converted to land use u at periods 2013 and 2014-2015 was identified. Results are:

Table 106. Deforested área in Project Area in all pools for land use / stratum ($A_{DefPA,u,i,t}$, ha)

Periods	*i*=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
2013	1.2	96.0	0.1	0.0	16.5	0.0	0.0	0.0	0.0	0.7	110.5	20.9
2014-2015	98.6	302.7	0.9	19.1	25.9	0.0	0.5	6.7	0.0	66.0	262.3	1.5

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: Deforested area in the Project Area in all pools for land use / stratum ($A_{DefPA,u,i,t}$) during 2013 and 2014-2015 by strata and land use, according to monitoring study, is in Folder "calculation_tables", file "monitoring.xlsx" Sheets "Defor PA 2013", "Defor PA 2014-2015". Also, Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq3 CPDefPA,i,t Expost"

7.3.5 Calculation of Net Carbon stock changes after deforestation in Project Area, in all pools for land use / stratum

Equation 3 of Annex 11 VMD0015 was used to calculate the Net Carbon stock change as a result of deforestation in the project scene in the Project Area in stratum i:

$$\Delta C_{P,DefPA,i,t} = \Sigma_{u=1}^{U}(A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t})$$

Where:

Acronym	Unit	Description
$\Delta C_{P,DefPA,i,t}$	t CO_2-e	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t
$A_{DefPA,u,i,t}$	ha	Area of recorded deforestation in the project area stratum i converted to land use u at time t
$\Delta C_{pools,P,Def,u,i,t}$	t CO_2-e ha^{-1}	Net carbon stock changes in all pools in the project case in land use u in stratum i at time t

Source: VCS (2012) VMD0015- Methods for monitoring of GHG emissions and removals (M-MON) Equation 3, page 8

Table 107. Net Carbon stock change ($\Delta C_{P,DefPA,i,t}$) as a result of deforestation in the project scene in the Project Area in stratum i. Period 2013

	i=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$\Delta C_{pools,Def,u,i,t}$	460.3	514.9	569.2	333.8	423.0	444.0	340.8	435.8	451.2	466.4	557.3	576.6
$A_{DefPA,u,i,t}$ 2013	1.2	96.0	0.1	0.0	16.5	0.0	0.0	0.0	0.0	0.7	110.5	20.9
$\Delta C_{pools}*A_{DefPA}$	533.1	49,410.5	37.8	5.0	6,971.0	0.0	0.0	0.0	0.0	316.9	61,556.1	12,053.5
$\Delta C_{P,DefPA,i,t}$	$\sum_{i:1=}$ **49,981**			$\sum_{i:2=}$ **6,976**			$\sum_{i:3=}$ **0**			$\sum_{i:4=}$ **73,927**		

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq3 CPDefPA,i,t Expost"

Table 108. Net Carbon stock change ($\Delta C_{P,DefPA,i,t}$) as a result of deforestation in the project scene in the Project Area in stratum i. Period 2014 - 2015

	i=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$\Delta C_{pools,Def,u,i,t}$	460.3	514.9	569.2	333.8	423.0	444.0	340.8	435.8	451.2	466.4	557.3	576.6
$A_{DefPA,u,i,t}$ 2014-2015	98.6	302.7	0.9	19.1	25.9	0.0	0.5	6.7	0.0	66.0	262.3	1.5
$\Delta C_{pools}*A_{DefPA}$	45,365.7	155,852.4	490.4	6,384.7	10,949.2	0.0	185.2	2,926.1	0.0	30,761.5	146,175.3	865.1
$\Delta C_{P,DefPA,i,t}$	$\sum_{i:1=}$ **201,709**			$\sum_{i:2=}$ **17,334**			$\sum_{i:3=}$ **3,111**			$\sum_{i:4=}$ **177,802**		

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq3 CPDefPA,i,t Expost"

7.3.6 Project Emissions in 2013 period

During the monitoring, all the steps in M-MON module were followed to obtain the Net greenhouse gas emissions under the project scenario.

$$\Delta C_P = \Sigma_{t=1}^{t*} \Sigma_{i=1}^{M} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P\text{-}E,i,t} - \Delta C_{P,Enh,i,t})$$

Eq.1 VMD0015 M-MON

Where:

Acronym	**Unit**	**Description**
ΔC_P	*t CO_2-e*	Net greenhouse gas emissions within the project area under the project scenario
$\Delta C_{P,DefPA,i,t}$	*t CO_2-e*	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* at time *t*
$\Delta C_{P,Deg,i,t}$	*t CO_2-e*	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* at time *t*
$\Delta C_{P,DistPA,i,t}$	*t CO_2-e*	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* at time *t*
$GHG_{P\text{-}E,i,t}$	*t CO_2-e*	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* in year *t*
$\Delta C_{P,Enh,i,t}$	*t CO_2-e*	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum *i* at time *t*
i		1, 2, 3, …M strata
t		1, 2, 3, … t* years elapsed since the start of the REDD project activity

Table 109. Net greenhouse gas emissions under the project scenario (PA) (ΔCp), 2013 period

Stratum	$\Delta C_{pDef,PA,i,t}$	$\Delta C_{pDeg,PA,i,t}$	$\Delta C_{pDist,PA,i,t}$	$GHG_{p\text{-}E,i,t}$	$\Delta C_{p,Enh,i,t}$	TOTAL ΔCp
Helobiome	49,981	0	0	0	0	49,981
Peinobiome	6,976	0	0	0	0	6,976
Litobiome	0	0	0	0	0	0
Zonobiome	73,927	0	0	0	0	73,927
TOTAL	**130,884**	**0**	**0**	**0**	**0**	**130,884**

Source: Annex 11 VMD0015, Table 14; File "monitoring.xlsx" section 7.3 and File "VMD0015.xlsx", sheet "Eq3 CPDefPA,i,t Expost" (folder "calculation_tables")

7.3.7 Project Emissions in 2014-2015 period

Net greenhouse gas emissions under the project scenario (PA)

Table 110. Net greenhouse gas emissions under the project scenario (PA) (ΔCp), 2014-2015 period

Stratum	$\Delta C_{pDef,PA,i,t}$	$\Delta C_{pDeg,PA,i,t}$	$\Delta C_{pDist,PA,i,t}$	$GHG_{p\text{-}E,i,t}$	$\Delta C_{p,Enh,i,t}$	TOTAL ΔCp
Helobiome	201,709	0	0	0	0	201,709

Peinobiome	17,334	0	0	0	0	17,334
Litobiome	3,111	0	0	0	0	3,111
Zonobiome	177,802	0	0	0	0	177,802
TOTAL	**399,956**	**0**	**0**	**0**	**0**	**399,956**

Source: Annex 11 VMD0015, Table 14; File "monitoring.xlsx" section 7.3 and File "VMD0015.xlsx", sheet "Eq3 CPDefPA,i,t Expost" (folder "calculation_tables")

7.3.8 Project Emissions in 2013 and 2014-2015 periods

Table 111. Net greenhouse gas emissions under the project scenario (PA) (ΔCp), 2013 and 2014-2015 periods

Stratum	$\Delta C_{pDef,PA,i,t}$	$\Delta C_{pDeg,PA,i,t}$	$\Delta C_{pDist,PA,i,t}$	$GHG_{p-E,i,t}$	$\Delta C_{p,Enh,i,t}$	TOTAL ΔCp
Helobiome	251,690	0	0	0	0	251,690
Peinobiome	24,310	0	0	0	0	24,310
Litobiome	3,111	0	0	0	0	3,111
Zonobiome	251,729	0	0	0	0	251,729
TOTAL	**530,840**	**0**	**0**	**0**	**0**	**530,840**

Source: Based on Annex 11 VMD0015, Table 14; File "monitoring.xlsx" section 7.3 and File "VMD0015.xlsx", sheet "Eq3 CPDefPA,i,t Expost" (folder "calculation_tables")

7.4 Leakage Emissions

To calculate the Leakage Emissions the following stages were fulfilled:

1. *Calculation of area deforested by immigrants in the Project Area and Leakage Belt under the project scenario.*
2. *Calculation of Total area deforested by immigrant agents in the baseline and project scenario.*
3. *Calculation of the area deforested by immigrants outside the Leakage Belt and Project Area.*
4. *Calculation of Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt.*
5. *Determination of deforested área in Leakage Belt in all pools for land use / stratum.*
6. *Calculation of Net Carbon stock changes after deforestation in Leakage Belt, in all pools for land use / stratum.*
7. *Net CO_2 emissions due to unplanned deforestation displaced from the Project Area to the Leakage Belt*

The following is a brief summary of each stage:

7.4.1 Calculation of area deforested by immigrants in the Project Area and Leakage Belt under the project scenario

Equation 8 of Annex 12 VMD0010 was used to calculate the area deforested by immigrants in the project area and leakage belt under the project scenario in periods 2013 and 2014-2015:

$$A_{LK\text{-}ACT\text{-}IMM,t} = PROP_{IMM} * (\Sigma_{i=1}{}^{M} A_{DefPA,i,t} + A_{DefLB,it})$$

Where:

$PROP_{IMM}$ *= 0.0976: Proportion of Resident / Migrant Population that Deforests in the PA and LB = 402 migrants / 4,121 municipal population (Source: File "VMD0010.xlsx" Sheet "S2 defor inm" – Folder "calculation_tables")*

($A_{DefPA,i,t}$) deforested area in the Project Area and ($A_{DefLB,it}$) deforested area in the Leakage Belt during 2013 and 2014-2015 by strata and land use, according to monitoring study, are in Folder "calculation_tables", file "monitoring.xlsx" Sheets "Defor PA 2013", "Defor PA 2014-2015", "Defor LB 2013" and "Defor LB 2014-2015". Also, File "VMD0010.xlsx" Sheet "S4 ADef,PA,LK" – Folder "calculation_tables". Also $A_{DefPA,i,t}$ and $A_{DefLB,it}$ are in table 95 in this document.

Table 112. Area deforested by immigrants in the project area and leakage belt ($A_{LK\text{-}ACT\text{-}IMM,t}$)

Period	$A_{LK\text{-}ACT\text{-}IMM,t}$	$PROP_{IMM}$	$A_{DefPA,i,t}$	$A_{DefLB,it}$
2013	59.0	0.0976	245.7	358.8
2014-2015	170.7	0.0976	788.5	960.1

Source: File "VMD0010.xlsx" Sheet "S4 Eq8 ALK-ACT-IMM,t" – Folder "calculation_tables"

7.4.2 Calculation of Total area deforested by immigrant agents in the baseline and project scenario

Equation 7 of Annex 12 VMD0010 was used to calculate the Total area deforested by immigrant agents in the baseline and project scenario in periods 2013 and 2014-2015:

$$A_{LK\text{-}IMM,t} = PROP_{IMM} * A_{BSL,PA,unplanned,t}$$

Where:

$A_{BSL,unplanned,i,t}$ (PA): *Projected area of unplanned baseline deforestation in the project area*: Annex 10 VMD0007, Table 35 and file "spatial_model_results.xlsx" Sheet "PA" - Folder "calculation_tables".

Table 113. Total area deforested by immigrant agents in the BL and project scenario ($A_{LK\text{-}IMM,t}$)

Period	$A_{LK,IMM,t}$	$PROP_{IMM}$	$A_{BSL,PA,unplanned,t}$
2013	1,199	0.0976	12,276
2014-2015	2,367	0.0976	24,249

Source: File "VMD0010.xlsx" Sheet "S4 Eq7 ALK-IMM,t" – Folder "calculation_tables"

7.4.3 Calculation of the area deforested by immigrants outside the Leakage Belt and Project Area

Equation 9 of Annex 12 VMD0010 was used to calculate the area deforested by immigrants outside the Leakage Belt and Project Area in periods 2013 and 2014-2015:

$$A_{LK\text{-}OLB,t} = A_{LK,IMM,t} - A_{LK\text{-}ACT\text{-}IMM,t}$$

Where:

Acronym	Unit	Description
$A_{LK\text{-}OLB,t}$	ha	Area deforested by immigrants outside the Leakage Belt and project area under the project scenario in year *t*
$A_{LK,IMM,t}$	ha	Total area deforested by immigrant agents in the baseline and project scenario in year *t*
$A_{LK\text{-}ACT\text{-}IMM,t}$	ha	Area deforested by immigrants in the project area and Leakage Belt under the project scenario in year *t*

Table 114. Area deforested by immigrants outside the Leakage Belt and Project Area ($A_{LK\text{-}OLB,t}$)

Period	$A_{LK\text{-}OLB,t}$	$A_{LK,IMM,t}$	$A_{LK\text{-}ACT\text{-}IMM,t}$
2013	1,140	1,199	59
2014-2015	2,197	2,367	171

Source: File "VMD0010.xlsx" Sheet "S4 Eq9 ALK-OLB,t" – Folder "calculation_tables"

7.4.4 Calculation of Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt

Equation 11 of Annex 12 VMD0010 was used to calculate the Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt in periods 2013 and 2014-2015:

$$\Delta C_{LK\text{-}ASU,OLB} = C_{OLB} * (\Sigma_{t=1}^{t} * A_{LK\text{-}OLB,t})$$

Where:

C_{OLB}: *Average of CO_2 (tCO_2-e/ha) in Tropical wet rainforest. Source: (Phillips, et al., 2011), page 51, Table 3.1 Promedio de Carbono para Bosque húmedo tropical 132,1 ton C / ha = 484.4 tCO_2-e / ha*

$A_{LK\text{-}OLB,t}$ *from table 114.*

Table 115. Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt ($\Delta C_{LK-ASU,OLB}$)

Period	$\Delta C_{LK-ASU-OLB}$	C_{OLB}	$A_{LK-OLB,t}$
2013	551,946	484.4	1,140
2014-2015	1,064,006	484.4	2,197

Source: File "VMD0010.xlsx" Sheet "S4 Eq11 CLK-ASU,OLB" – Folder "calculation_tables"

7.4.5 Determination of deforested área in Leakage Belt in all pools for land use / stratum

Through cartographic review and field verification Area of recorded deforestation in the Leakage Belt (LB) stratum i ($A_{DefLB,u,i,t}$) converted to land use u at periods 2013 and 2014-2015 was identified. Results are:

Table 116. Deforested área in Leakage Belt in all pools for land use / stratum ($A_{DefLB,u,i,t}$, ha)

Periods	*i*=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
2013	43.6	75.8	0.0	2.6	27.3	3.2	0.0	25.0	3.4	21.8	132.8	23.3
2014-2015	48.9	65.8	0.0	126.0	156.9	42.0	16.6	464.7	0.0	0.0	0.0	38.2

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: Deforested area in the Leakage Belt in all pools for land use / stratum ($A_{DefLB,u,i,t}$) during 2013 and 2014-2015 by strata and land use, according to monitoring study, is in Folder "calculation_tables", file "monitoring.xlsx" Sheets "Defor LB 2013", "Defor LB 2014-2015". Also, Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq4 CPDefLB,i,t Expost"

7.4.6 Calculation of Net Carbon stock changes after deforestation in Leakage Belt, in all pools for land use / stratum

Equation 4 of Annex 11 VMD0015 was used to calculate the Net Carbon stock change as a result of deforestation in the project scene in the Leakage Belt in stratum i:

$$\Delta C_{P,DefLB,i,t} = \Sigma_{u=1}^{U}(A_{DefLB,u,i,t} * \Delta C_{pools,P,Def,u,i,t})$$

Where:

Acronym	Unit	Description
$\Delta C_{P,DefLB,i,t}$	t CO_2-e	Net carbon stock change as a result of deforestation in the project case in the leakage belt in stratum i at time t
$A_{DefLB,u,i,t}$	ha	Area of recorded deforestation in the leakage belt stratum i converted to land use u at time t
$\Delta C_{pools,P,Def,u,i,t}$	t CO_2-e ha^{-1}	Net carbon stock changes in all pools in the project case in land use u in stratum i at time t

Table 117. Net Carbon stock change ($\Delta C_{P,DefLB,i,t}$) as a result of deforestation in the project scene in the Leakage Belt in stratum i. Period 2013

	i=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$\Delta C_{pools,Def,u,i,t}$	460.3	514.9	569.2	333.8	423.0	444.0	340.8	435.8	451.2	466.4	557.3	576.6
$A_{DefLB,u,i,t}$ 2013	43.6	75.8	0.0	2.6	27.3	3.2	0.0	25.0	3.4	21.8	132.8	23.3
$\Delta C_{pools}*A_{DefLB}$	20,071.0	39,033.1	0.0	875.3	11,546.1	1,428.1	0.0	10,884.7	1,542.0	10,149.7	74,017.2	13,412.9
$\Delta C_{P,DefLB,i,t}$	$\sum_{i:1=}$**59,104**			$\sum_{i:2=}$**13,850**			$\sum_{i:3=}$**12,427**			$\sum_{i:4=}$**97,580**		

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq4 CPDefLB,i,t Expost"

Table 118. Carbon stock change ($\Delta C_{P,DefLB,i,t}$) as a result of deforestation in the project scene in the Leakage Belt in stratum i. Period 2014 - 2015

	i=1 Helobiome			*i*=2 Peinobiome			*i*=3 Litobiome			*i*=4 Zonobiome		
	VR	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*	*VR*	*HAA*	*G*
$\Delta C_{pools,Def,u,i,t}$	460,3	514,9	569,2	333,8	423,0	444,0	340,8	435,8	451,2	466,4	557,3	576,6
$A_{DefLB,u,i,t}$ 2014-2015	48,9	156,9	0,0	65,8	42,0	0,0	0,0	16,6	0,0	126,0	464,7	38,2
$\Delta C_{pools}*A_{DefLB}$	22,529,3	80,781,3	0,0	21,950,8	17,764,3	0,0	0,0	72,41,6	0,0	58,755,5	258,965,0	22,042,4
$\Delta C_{P,DefLB,i,t}$	$\sum_{i:1=}$**103,311**			$\sum_{i:2=}$**39,715**			$\sum_{i:3=}$**7,242**			$\sum_{i:4=}$**339,763**		

Land Uses: VR: vegetation on regeneration; HAA: Heterogeneous Agricultural Areas; G: Grassland

Source: REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0015.xlsx", Sheet "Eq4 CPDefLB,i,t Expost"

7.4.7 Net CO_2 emissions due to unplanned deforestation displaced from the Project Area to the Leakage Belt

Equation 1 of Annex 12 VMD0010 was used to calculate the Net CO_2 emissions due to unplanned deforestation displaced from the Project Area to the Leakage Belt in periods 2013 and 2014-2015:

$$\Delta C_{LK\text{-}ASU\text{-}LB} = \Delta C_{P,LB} - \Delta C_{BSL,LK,unplanned}$$

Where:

$\Delta C_{P,LB}$ *from table 117 (for 2013) and table 118 (for 2014-2015)*

$\Delta C_{BSL,LK,unplanned}$: *REDD+ Project RIU-SM. Folder "calculation_tables" file "VMD0007.xlsx", Sheet "P4 Step4.3 Eq24(LK) C stck chng"*

Table 119. Net CO_2 emissions ($\Delta C_{LK\text{-}ASU\text{-}LB}$) due to unplanned deforestation displaced from PA to LB. Period 2013

	i=1 Helobiome	*i*=2 Peinobiome	*i*=3 Litobiome	*i*=4 Zonobiome	Subtotal
	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	
$\Delta C_{P,DefLB,i,t}$	59,104	13,850	12,427	97,580	182,960
$\Delta C_{BSL,LK,unplanned}$	119,531	837	0	1,247,094	1,367,463
$\boldsymbol{\Delta C_{LK\text{-}ASU\text{-}LB}}$	**-60,427**	**13,012**	**12,427**	**-1,149,514**	**-1,184,502**

Source: REDD+ Project RIU-SM. File "VMD0010.xlsx" Sheet "S3 Expost Eq1 CLK-ASU,LB" – Folder "calculation_tables"

If $\Delta C_{LK\text{-}ASU\text{-}LB} < 0$, then $\Delta C_{LK\text{-}ASU\text{-}LB} = 0$

As $\Delta C_{LK\text{-}ASU\text{-}LB}$ in period 2013 <0 (-1,184,502), then

$\Delta C_{LK\text{-}ASU\text{-}LB(2013)} = 0$

Table 120. Net CO_2 emissions ($\Delta C_{LK\text{-}ASU\text{-}LB}$) due to unplanned deforestation displaced from PA to LB. Period 2014 - 2015

	i=1 Helobiome	*i*=2 Peinobiome	*i*=3 Litobiome	*i*=4 Zonobiome	Subtotal
	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	$t\ CO_2\text{-}e\ /\ ha$	
$\Delta C_{P,DefLB,i,t}$	103,311	39,715	7,242	339,763	490,030
$\Delta C_{BSL,LK,unplanned}$	2,817,428	1,590	547	60,218	2,879,783
$\boldsymbol{\Delta C_{LK\text{-}ASU\text{-}LB}}$	**-2,714,117**	**38,125**	**6,695**	**279,544**	**-2,389,753**

Source: REDD+ Project RIU-SM. File "VMD0010.xlsx" Sheet "S3 Expost Eq1 CLK-ASU,LB" – Folder "calculation_tables"

If $\Delta C_{LK\text{-}ASU\text{-}LB} < 0$, then $\Delta C_{LK\text{-}ASU\text{-}LB} = 0$

As $\Delta C_{LK\text{-}ASU\text{-}LB}$ in period 2014-2015 <0 (-2,389,753), then

$\Delta C_{LK\text{-}ASU\text{-}LB(2014\text{-}2015)} = 0$

7.4.8 Leakage in 2013 period

$$\Delta C_{LK\text{-}AS,unplanned} = \Delta C_{LK\text{-}ASU\text{-}LB} + \Delta C_{LK\text{-}ASU,OLB} + GHG_{LK,E}$$

Eq.16 VMD0010 LK-ASU

Where:

Acronym	Unit	Description
$\Delta C_{LK\text{-}AS,unplanned}$	$t\ CO_2e$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation Net CO_2 emissions
$\Delta C_{LK\text{-}ASU\text{-}OLB}$	$t\ CO_2e$	Net CO_2 emissions due to unplanned deforestation displaced outside the Leakage Belt
$\Delta C_{LK\text{-}ASU\text{-}LB}$	$t\ CO_2e$	Net CO_2 emissions due to unplanned deforestation displaced from the project

Acronym	Unit	Description
		area to the Leakage Belt
$GHG_{LK,E}$	t CO_2-e	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities

Table 121. Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation net CO_2 emissions, 2013 period

$\Delta C_{LK\text{-}ASU\text{-}LB}$	$\Delta C_{LK\text{-}ASU,OLB}$	$\Delta C_{LK\text{-}ASU\text{-}PEAT}$	$GHG_{LK,E}$	$\Delta C_{LK\text{-}AS,unplanned}$
0	551,946	0	0	551,946

Source: Annex 12 VMD0010, Table 15; File "monitoring.xlsx" section 7.4 and File "VMD0010.xlsx", sheet "S7 Eq16 CLK-AS,unp Expost" (folder "calculation_tables")

7.4.9 Leakage in 2014-2015 period

Table 122. Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation net CO_2 emissions, 2014-2015 period

$\Delta C_{LK\text{-}ASU\text{-}LB}$	$\Delta C_{LK\text{-}ASU,OLB}$	$\Delta C_{LK\text{-}ASU\text{-}PEAT}$	$GHG_{LK,E}$	$\Delta C_{LK\text{-}AS,unplanned}$
0	1,064,006	0	0	1,064,006

Source: Annex 12 VMD0010, Table 15; File "monitoring.xlsx" section 7.4 and File "VMD0010.xlsx", sheet "S7 Eq16 CLK-AS,unp Expost" (folder "calculation_tables")

7.4.10 Leakage in 2013 and 2014-2015 periods

Table 123. Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation net CO_2 emissions, 2013 and 2014-2015 periods

$\Delta C_{LK\text{-}ASU\text{-}LB}$	$\Delta C_{LK\text{-}ASU,OLB}$	$\Delta C_{LK\text{-}ASU\text{-}PEAT}$	$GHG_{LK,E}$	$\Delta C_{LK\text{-}AS,unplanned}$
0	1,615,952	0	0	1,615,952

Source: Based on Annex 12 VMD0010, Table 15; File "monitoring.xlsx" section 7.4 and File "VMD0010.xlsx", sheet "S7 Eq16 CLK-AS,unp Expost" (folder "calculation_tables")

7.5 Net GHG Emission Reductions and Removals

7.5.1 Net GHG Emission Reductions and Removals in 2013 period

(Annex 9 VM0007, REDD-MF)

Summary of GHG Emission Reductions and Removals

$$NER_{REDD} = \Delta C_{BSL\text{-}REDD} - \Delta C_{WPS\text{-}REDD} - \Delta C_{LK\text{-}REDD}$$

Eq.2 VM0007 REDD-MF

Where:

Acronym	**Unit**	**Description**
NER_{REDD}	t CO_2e	Total net GHG emission reductions of the REDD project activity up to year *t**
$\Delta C_{BSL\text{-}REDD}$	t CO_2e	Net GHG emissions in the REDD baseline scenario up to year *t**
$\Delta C_{WPS\text{-}REDD}$	t CO_2e	Net GHG emissions in the REDD project scenario up to year *t**
$\Delta C_{LK\text{-}REDD}$	t CO_2e	Net GHG emissions due to leakage from the REDD project activity up to year *t**

Table 124. Total net GHG emission reductions of the REDD project activity, 2013 period

Year	Baseline emissions or removals (tCO_2e) $\Delta C_{BSL,unplanned}$	Project emissions or removals (tCO_2e) ΔC_{WPS}	Leakage emissions (tCO_2e) $\Delta C_{LK\text{-}AS,unplanned}$	Net GHG emission reductions or removals (tCO_2e) NER_{REDD}
Period 2013	5,151,681	130,884	551,946	4,468,852

Source: File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals" 2013 (folder "calculation_tables")

Uncertainty, 2013 period

(Annex 16 VMD0017, Uncertainty)

Then, this result was adjusted to account for the uncertainty analysis:

$$Adjusted\_NER_{REDD} = NGR_{ARR} + (NER_{REDD} + NER_{WRC}) * (100\% - NER_{REDD+ERROR} + 15\%)$$

Eq.16 VMD0017 X-UNC

Where:

Acronym	**Unit**	**Description**
$Adjusted\_NER_{REDD}$	t CO_2e	Total net GHG emission reductions of the REDD+ project activities up to year *t** adjusted to account for uncertainty

Acronym	Unit	Description
NGR_{ARR}	t CO_2e	Total net GHG removals of the ARR Project activity up to year t*
NER_{REDD}	t CO_2e	Total net GHG emission reductions of the REDD project activity up to year *t**
NER_{WRC}	t CO_2e	Total net GHG emission reductions of the WRC project activity up to year *t**
$NER_{REDD+ERROR}$	%	Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year *t**

Adjusted_NER**$_{REDD}$* ***= 4,468,851.93 *(100% - 15% + 15%) = 4,468,851.93 t CO_2-e

Uncertainty does not exceed the 15%, is ***8.4%.*** (*File "VMD0007.xlsx", sheet "RIU-SM soils", folder "calculation_tables"*)

Buffer, 2013 period

(Annex 9 VM0007, REDD-MF)

A final discount due to Permanence Risk Buffer was made.

$$Buffer_{UNPLANNED} = \left\{ \begin{array}{c} \underbrace{(\Delta C_{BSL,unplanned} - \sum_{t=1}^{t^*}\sum_{i=1}^{M} (E_{FC,i,t} + N_2O_{direct,i,t}) -}_{\text{Baseline Unplanned}} \\ \underbrace{(\Delta C_{Punplanned} - \sum_{t=1}^{t^*}\sum_{i=1}^{M} (E_{FC,i,t} + N_2O_{direct,i,t})}_{\text{Project Unplanned}} \end{array} \right\} * (Buffer\ \%)$$

Eq.9 VM0007 REDD-MF

Where:

Acronym	Unit	Description
$Buffer_{Unplanned}$	*t CO_2-e*	Buffer withholding for avoiding unplanned deforestation project activities
$\Delta C_{BSL,unplanned}$	*t CO_2-e*	Net GHG emissions in the baseline from unplanned deforestation
$E_{FC,i,t}$	*t CO_2-e*	Emission from fossil fuel combustion in stratum i in year t
$N_2O_{direct,i,t}$	*t CO_2-e*	Direct N_2O emission as a result of nitrogen application on the alternative land use within the project boundary in stratum i in year t
ΔC_P	*t CO_2-e*	Net GHG emissions within the project area under the project scenario (The project emissions must be divided between the emissions arising from the respective project areas for planned and unplanned deforestation and degradation through fuelwood extraction/charcoal production.)
Buffer%	*t CO_2-e*	Buffer withholding percentages are based on the project's overall risk classification, the percentage of carbon credits generated by the approved project activity that must be deposited into the AFOLU pooled buffer account to cover non-permanence related project risks. Buffer withholding percentage was calculated using ***"VCS TOOL T-BAR: AFOLU Non-Permanence Risk Tool, VCS Version 3" (Annex 23; file***

		***"Risk_Report_Calculation_Tool_v3.xls" in folder "calculation_tables".*). Obtained value was 17%.**
i		1, 2, 3, …M (4) strata
t	*years*	1, 2, 3, … t* (30) years elapsed since the start of the REDD VCS project activity

$$Buffer_{UNPLANNED} = ((\Delta C_{BSL,unplanned} - 0) - (\Delta C_P - 0)) * 17\%$$

Source: Equation 9 VM0007 REDD-MF

[17% according to "VCS TOOL T-BAR: AFOLU Non-Permanence Risk Tool, VCS Version 3" (Annex 23; file "Risk_Report_Calculation_Tool_v3.xls" in folder "calculation_tables".].

So the final result is:

$$Buffer_{UNPLANNED} = ((5,151,681.43 - 0) - (130,883.97 - 0)) * 17\% = 853,536 \ t \ CO_2\text{-}e$$

$$Buffer_{UNPLANNED} = 853,536 \ t \ CO_2\text{-}e$$

VCUs, 2013 period

(Annex 9 VM0007, REDD-MF)

In this way, the total emission reductions due to project activity for 2013 period were obtained:

$$VCU_t = (Adjusted\_NER_{REDD,t2} - Adjusted\_NER_{REDD,t1}) - Buffer_{Total}$$

Equation 13 VM0007 REDD-MF

Where:

Acronym	Unit	Description
VCU_t	VCU	Number of Verified Carbon Units at year $t = t_2 - t_1$
$Adjusted\_NER_{REDD,t2}$	t CO_2e	Total net GHG emission reductions of the REDD+ project activity up to year t_2 adjusted to account for uncertainty
$Adjusted\_NER_{REDD,t1}$	t CO_2e	Total net GHG emission reductions of the REDD+ project activity up to year t_1 adjusted to account for uncertainty
$Buffer_{Total}$	t CO_2e	Total permanence risk buffer withholding

Table 125. Number of Verified Carbon Units, 2013 period

	NER_{REDD}	Adjusted $NER_{REDD,t}$	$Buffer_{UNPLANNED}$	VCU_t
Period 2013	4,468,852	4,468,852	853,536	**3,615,316**

Source: File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals / VCU_t" 2013 (folder "calculation_tables")

7.5.2 Net GHG Emission Reductions and Removals in 2014-2015 period

(Annex 9 VM0007, REDD-MF)

Table 126. Total net GHG emission reductions of the REDD project activity, 2014-2015 period

Year	Baseline emissions or removals (tCO_2e) $\Delta C_{BSL,unplanned}$	Project emissions or removals (tCO_2e) ΔC_{WPS}	Leakage emissions (tCO_2e) $\Delta C_{LK\text{-}AS,unplanned}$	Net GHG emission reductions or removals (tCO_2e) NER_{REDD}
Period 2014-2015	10,233,184	399,956	1,064,006	8,769,222

Source: File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals" 2014-2015 (folder "calculation_tables")

Uncertainty, 2014-2015 period

(Annex 16 VMD0017, Uncertainty)

Then, this result was adjusted to account for the uncertainty analysis:

$$Adjusted\_NER_{REDD} = 8{,}769{,}222.07 * (100\% - 15\% + 15\%) = 8{,}769{,}222.07 \text{ t } CO_2\text{-e}$$

Uncertainty does not exceed the 15%, is ***8.4%.*** (*File "VMD0007.xlsx", sheet "RIU-SM soils", folder "calculation_tables"*)

Buffer, 2014-2015 period

(Annex 9 VM0007, REDD-MF)

A final discount due to Permanence Risk Buffer was made.

$$Buffer_{UNPLANNED} = ((\Delta C_{BSL,unplanned} - 0) - (\Delta C_P - 0)) * 17\%$$

Source: Equation 9 VM0007 REDD-MF

[17% according to "VCS TOOL T-BAR: AFOLU Non-Permanence Risk Tool, VCS Version 3" (Annex 23; file "Risk_Report_Calculation_Tool_v3.xls" in folder "calculation_tables".].

So the final result is:

$$Buffer_{UNPLANNED} = ((10{,}233{,}183.83 - 0) - (399{,}955.71 - 0)) * 17\% = 1{,}671{,}649 \text{ t } CO_2\text{-e}$$

$$Buffer_{UNPLANNED} = 1{,}671{,}649 \text{ t } CO_2\text{-e}$$

VCUs, 2014-2015 period

(Annex 9 VM0007, REDD-MF)

In this way, the total emission reductions due to project activity for 2014-2015 period were obtained:

Table 127. Number of Verified Carbon Units, 2014-2015 period

	NER_{REDD}	Adjusted $NER_{REDD,t}$	$Buffer_{UNPLANNED}$	VCU_t
Period 2014-2015	8,769,222	8,769,222	1,671,649	**7,097,573**

Source: File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals / VCU$_t$" 2014-2015 (folder "calculation_tables")

7.5.3 Net GHG Emission Reductions and Removals in 2013 and 2014-2015 periods

Table 128. Total net GHG emission reductions of the REDD project activity, 2013 and 2014-2015 periods

Year	Baseline emissions or removals (tCO_2e) $\Delta C_{BSL,unplanned}$	Project emissions or removals (tCO_2e) ΔC_{WPS}	Leakage emissions (tCO_2e) $\Delta C_{LK-AS,unplanned}$	Net GHG emission reductions or removals (tCO_2e) NER_{REDD}
Period 2013	5,151,681	130,884	551,946	4,468,852
Period 2014-2015	10,233,184	399,956	1,064,006	8,769,222
Total	**15,384,865**	**530,840**	**1,615,952**	**13,238,074**

Source: Based on File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals" (folder "calculation_tables")

Uncertainty, 2013 and 2014-2015 periods

(Annex 16 VMD0017, Uncertainty)

Then, this result was adjusted to account for the uncertainty analysis:

$$Adjusted\_NER_{REDD} = 13{,}238{,}074 * (100\% - 15\% + 15\%) = 13{,}238{,}074 \ t \ CO_2\text{-}e$$

Uncertainty does not exceed the 15%, is ***8.4%.*** (*Based on File "VMD0007.xlsx", sheet "RIU-SM soils", folder "calculation_tables"*)

Buffer, 2013 and 2014-2015 periods

(Annex 9 VM0007, REDD-MF)

A final discount due to Permanence Risk Buffer was made.

$$Buffer_{UNPLANNED} = ((\Delta C_{BSL,unplanned} - 0) - (\Delta C_P - 0)) * 17\%$$

[17% according to "VCS TOOL T-BAR: AFOLU Non-Permanence Risk Tool, VCS Version 3" (Annex 23; file

Source: Equation 9 VM0007 REDD-MF

"Risk_Report_Calculation_Tool_v3.xls" in folder "calculation_tables".].

So the final result is:

$Buffer_{UNPLANNED}$ **= ((15,384,865.26 – 0) – (530,839.68– 0)) * 17% = 2,525,184 t CO_2-e**

$Buffer_{UNPLANNED}$ **= 2,525,184 t CO_2-e**

VCUs, 2013 and 2014-2015 periods

(Annex 9 VM0007, REDD-MF)

In this way, the total emission reductions due to project activity for 2013 and 2014-2015 periods were obtained:

Table 129. Number of Verified Carbon Units, 2013 and 2014-2015 periods

	NER_{REDD}	Adjusted $NER_{REDD,t}$	$Buffer_{UNPLANNED}$	VCU_t
Period 2013	4,468,852	4,468,852	853,536	**3,615,316**
Period 2014-2015	8,769,222	8,769,222	1,671,649	**7,097,573**
Total	13,238,074	13,238,074	2,525,184	**10,712,890**

Source: Based on File "monitoring.xlsx", section "7.5 GHG Emission Reductions and Removals / VCU_t" (folder "calculation_tables")

Illustration 44. Team recognizers tree species – Berlin community – Uva River

Source: REDD+ project RIU-SM

The evaluation of the monitoring of these three years (2013-2015) allows us to conclude the following:

1. The project has been implemented as designed (Logical Framework Matrix, management plan) in a highly satisfactory manner.
2. Deforestation has been stopped with an efficiency of 95%, indicating an achievement of goals (indicators) of the objectives and products very good.
3. Once the verification and certification of the project are done, the VCUs will be sold and thus achieve the balance point of the project in 2016, according to projections.
4. The team (ACATISEMA and MEDIAMOS) has been participating in the project as a good guarantee for success.
5. Strategic alliance between ACATISEMA and MEDIAMOS is based on the signed agreement as a guarantee of project success.

8 REFERENCES

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