TREES REGISTRATION DOCUMENT

JURISDICTIONAL REDD+ PROGRAM OF THE STATE OF TOCANTINS

Marcello de Lima Lelis

Esplanada das Secretarias, Praça dos Girassóis, s/nº, Centro, Palmas – Tocantins.

CEP: 77.001-002

gabinete@semarh.to.gov.br

+ 55 (63) 98402-9304 (MARCELLO LELIS – SECRETÁRIO)

+ 55 (63) 99200-8118 (MARLI SANTOS – SUPERINTENDENTE)

+ 55 (63) 99206 8395 (REDD+TEAM)

CREDITING PERIOD (**01/01/2020**) **–** (**12/31/2024**)

04/12/2024

ART
Architecture for REDD+ Transactions

TREES REGISTRATION DOCUMENT

SUMMARY

The TREES Registration Document and attachments provide a complete description of how the Participant meets and plans to meet the requirements of TREES. Please complete this form and submit it through your ART Registry account. Attachments may also be uploaded through the ART Registry account. Instructions for completing the template are included in *italics* and may be deleted before submitting the finished document. Grey fields are included where Participants are required to complete information. The grey cells may also be deleted to facilitate the inclusion of information needed.

FIGURES

TABLES

Symbols, Acronyms and Abbreviations

3Es	Equity, Efficieny and effectiveness
4CN	Fourth National Communication of Brazil to the UNFCCC
ABC/TO	Plan for Mitigation and Adaptation to Climate to Promote a Low Carbon Economy in Agriculture
ABC+/TO	Sectoral Plan for Climate Change Adaptation and Low Carbon Emissions in Tocantins Agriculture and Animal Husbandry
AEF	Forest Exploitation Authorizations
AGB	Aboveground biomass
AGROTINS	Agricultural Technology Fair of Tocantins
APAs	Environmental Protection Areas
APP	Permanent Preservation Areas
ARPA	Amazon Protected Areas Program
ARPIT	Articulation of Indigenous Peoples of Tocantins
ART	Architecture for REDD+ Transactions
art.	article
ATER	Technical Assistance and Rural Extension
ATM	Association of Municipalities of Tocantins
BGB	Belowground biomass
BPMA	Environmental Military Police Battalion
C	Carbon
CAF	National Registry of Family Agriculture
CAR	Rural Environmental Registry
CBD	Convention on Biological Diversity
CBMTO	Tocantins Military Fire Department
CCPEC	Cantão State Park Advisory Council
CCT-Salv	Thematic Consultative Chamber on Safeguards
CDM/MDL	Clean Development Mechanism
CDRU	Grant of Real Rights of Use
CEATO	Registry of Environmental Entities of the State of Tocantins
CECAR	Cartography Commision of the State of Tocantins
CeMAF/UFT	Fire Monitoring and Management Center
CEPDEC	State Coordination of Protection and Civil Defense
CEULP/ULBRA	Lutheran University Center of Palmas
CEVAT	State Committee for Validation and Monitoring
CGE-TO	State Office of the Comptroller General
CGU	Federal Comptroller General
CH4	Methane
CIDUC	Registry of Rural Properties for Donation in Conservation Units
CIF	Climate Investment Fund

Symbols, Acronyms and Abbreviations

CIGMA	Center fot Evironmental Management
CL	Crediting Level
CNPCT	National Council of Traditional Peoples and Communities
CNPSA	National Registry for Payment for Environmental Services
CNUC	National Registry of Protected Areas
CO2	Carbon Dioxide
CODEC	Civil Defense Operations Command
COEMA	State Council for the Environment
COEQTO	State Coordination of *Quilombola* Communities of Tocantins
CONAMA	National Environment Council
CONAREDD+	National Commission for REDD+
CREA/TO	Regional Council of Engineering and Agronomy of the State of Tocantins
CRFB/1988	Federal Constitution of the Republic of Brazil
CRQs	Quilombo Remnant Communities
CTPPMC	Permanent Thematic Chamber on Climate Change Research
CTREDD+	Permanent Technical Chamber for REDD+
d.m	Dry matter
DBAP	Directors for Biodiversity and Protected Areas
DETER	Real-Time Deforestation Detection System
DOE/MA	Official Gazette of the State of Maranhão
DOE/TO	Official Gazette of the State of Tocantins
DPE/TO	State Public Defender's Office of the State of Tocantins
DW	Dead wood
EBA	Estimating Biomass in the Amazon
EII	Earth Innovation Institute
Embrapa	Brazilian Agricultural Research Corporation
ENREDD+	National REDD+ Strategy
EPANB	Brazil's National Biodiversity Strategy and Action Plan
ERs	Emission Reductions
ESTOCS	Competitive and Sustainable Tocantins Strategy
FACIET	Federation of Commercial Associations of the State of Tocantins
FAET	Federation of Agriculture and Livestock of the State of Tocantins
FAO	Food and Agriculture Organization of the United Nations
FAPTO	Scientific and Technological Support Foundation of Tocantins
FEMC	State Forum on Climate Change
FERH	State Water Resources Fund
FETAET	Federation of Rural Workers and Family Farmers of the State of Tocantins

Symbols, Acronyms and Abbreviations

FF	Fire Frequency
FIETO/TO	Federation of Industries of the State of Tocantins
FNDF	National Forest Development Fund
FPIC	Free, Prior, and Informed Consultation (FPIC)
FREL	Forest Emissions Reference Level of Brazil
FRI	Fire Recurrence Index
FUEMA	State Environmental Fund
FUNAI	National Indigenous Foundation
FUNAPE	Research Support of the Federal University of Goiás
FunClima	State Climate Fund
GABAM	Global Annual Burned Area Map
GCF	Governor's Climate and Forests Task Force
GEE	Google Earth Engine
GEF Pro-Species	The National Strategy for the Conservation of Threatened Species
GESTO	Conservation Unit Management System
GHG/GEE	Greenhouse Gas
GIS	Geographical Information System
GT-MRV	Measurement, Reporting, and Verification Working Group
GTT – SAFEGUARDS	Technical Working Group on Safeguards
ha	Hectare
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources
IBGE	Brazilian Institute of Geography and Statistics
IBRD	International Bank for Reconstruction and Development
ICMBIO	Chico Mendes Institute for Biodiversity Conservation
ICMS	Tax on the Circulation of Goods and Services
IDE	Spatial Data Infrastructure of Tocantins
IFN	National Forest Inventory
IFTO	Federal Institute of Education, Science, and Technology of Tocantins
ILO Convention 169	International Labor Organization's Convention No. 169
INCRA	National Institute for Colonization and Agrarian Reform
INPE	National Institute for Space Research
IPAM	The Amazon Environmental Research Institute
IPCC	Intergovernmental Panel on Climate Change
IRS	Indian Remote Sensing Satellites
ITERTINS	Tocantins State Land Institute
ITPAC	President Antônio Carlos Institute of Tocantins
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture

Symbols, Acronyms and Abbreviations

ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
LAI	Access to Information Law
LAPIG	Laboratory of Image Processing and Geoprocessing
LI	Litter
LiDAR	Light Detection and Ranging
LULUCF	Land Use, Land –Use Change and Forestry
MAPA	Ministry of Agriculture and Livestock
MBRE	Brazilian Emission Reduction Market
MCTI	Ministry of Science, Technology and Innovation
MDS	Ministry of Social Development and Fight Against Hunger
MIF	Integrated Fire Management
MMA	Ministry of Enviroment and Climate Change
MPE/TO	State Public Prosecutor's
MPF	Federal Prosecutor’s Office
MPO	Ministry of Planning and Budget
MRV	Measurement, Reporting and Verification
N2O	Nitrous Oxide
Naturatins	Nature Institute of Tocantins
NDC	Nationally Determined Contribution
NSAPB	National Strategy and Action Plans for Biodiversity
OAS	Organization of American States
OECD/OCDE	Organization for Economic Cooperation and Development
OGE/TO	General Ombudsman of Tocantins
PAN	National Action Plan
PAs	Agricultural Settlement Projects
PAs	Protected Áreas
PAT	Territorial Action Plan
PEC/TO	Tocantins State Culture Plan
PEJ	Jalapão State Park
PEMC/TO	State Climate Change Policy of the State of Tocantins
PEPSA	State Environmental Services Policy
PES/PSA	Payment for Environmental Services
PF	Federal Police
PGS	Sociodiversity Conservation Program
PIQPCTAF	Indigenous Peoples, Quilombolas, Traditional Communities, and Family Farmers
PLANAVEG	National Plan for the Recovery of Native Vegetation

Symbols, Acronyms and Abbreviations

PNATER	Policy for Technical Assistance and Rural Extension for Family Agriculture and Agrarian Reform
PNB	National Biodiversity Policy
PNGATI	National Policy for Territorial and Environmental Management of Indigenous Lands
PNMA	National Environmental Policy
PNMC	National Policy on Climate Change
PNPCT	National Policy for the Sustainable Development of Traditional Peoples and Communities
PNPSA	National Policy on Payment for Environmental Services
PNRA	National Agrarian Reform Program
PPCD	Action Plans for the Prevention and Control of Deforestation
PPCDAm	Plans for the Prevention and Control of Deforestation in the Legal Amazon
PPCDIF	Plan for the Prevention and Control of Deforestation and Forest Fire
PPCDQ	Plan for the Prevention and Control of Deforestation and Forest Fires
PPCerrado	Action Plan for the Prevention and Control of Deforestation in the Cerrado Biome
PRA	Environmental Compliance Program
PRODES	Brazilian Amazon Deforestation Monitoring Project
PRONAF	National Program for Strengthening Family Agriculture
PROPSA	Environmental Services Payment Program
PROVEG	National Policy for the Recovery of Native Vegetation
PRV	Green Recovery Plan
QA/QC	Quality Assurance and Control
RDS	Development Reserves
RED	Reduced Emissions from Deforestation
REDD+	Reducing Emissions from Deforestation and Degradation
RESEX	Extractive Reserve
RL	Legal Reserve
RPPN	Private Natural Heritage Reserves
RTID	Technical Identification and Delimitation Report
Ruraltins	Rural Development Institute of the State of Tocantins
SC/TO	Tocantins Cultural System Policy
SDG/ODS	Sustainable Development Goals
SEAGRO	State Department for Agriculture and Livestock
SEFAZ	State Department for the Finance
SEMA-MA	Maranhão State Department for Environment
SEMARH	State Department for Environment and Water Resources
Se-OUV	Executive Branch's Ombudsman

Symbols, Acronyms and Abbreviations

SEPLAN	State Department for Planning and Budget
SEPOT	State Department for Indigenous and Traditional Peoples
SEUC	State System of Protected Areas
SFB	Brazilian Forest Service
SiBCS	Brazilian Soil Classification System
SICS	State Department for Industry, Commerce, and Services
SIGAM	Integrated Environmental Management System
SINIMA	National Environmental Information System
SisGen	System for the Management of Genetic Heritage and Associated Tradicional Knowledge
SISNAMA	National Environmental System
SISREDD+	Safeguards Information System
SNIF	National Forest Information System
SNUC	National System of Protected Areas
SOC	Soil Organic Carbon
SOM	Soil Organic Matter
SPU	Union Heritage Secretariat
TCA/ACT	Technical Cooperation Agreement
TCE-TO	State Court of Auditors
tCO2e	tonnes of Carbon Dioxide equivalent
TCT	Technical Cooperation Agreement
TCU	Federal Court of Auditors
TOCAR	Tocantins Carbon
TO-LEGAL	Environmental Adequacy Program for Rural Property and Activity
TOPAR	Tocantins Parcerias
UC	Conservation Units
UFG	Federal University of Goiás
UFPA	Family Farming Unit
UFT	Federal University of Tocantins
UNCCD	United Nations Framework Convention on Combating Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCPA	World Committee on Protected Areas
YSF	Years Since Last Fire
ZEE	Ecological-Economic Zoning
ZETI	Zones for Indigenous Territories
ZEUS	Special Zone for Sustainable Use

ART
Architecture for REDD+ Transactions

TREES REGISTRATION DOCUMENT

1. PARTICIPANT INFORMATION

ENTITY	
COUNTRY	**JURISDICTION** if registering as a sub-national Participant
BRAZIL	TOCANTINS

REPRESENTATIVE ORGANIZATION AND CONTACT INFORMATION	
ORGANIZATION NAME	**MAILING ADDRESS**
Secretaria do Meio Ambiente e Recursos Hídricos	Esplanada das Secretarias, Praça dos Girassóis, s/n°, Centro, Palmas – Tocantins CEP: 77.001-002
FIRST NAME	**LAST NAME**
Marcello	de Lima Lelis
E-MAIL ADDRESS	**TELEPHONE**
gabinete@semarh.to.gov.br	+55 (63) 98402-9304

DESCRIPTION OF LEGAL AUTHORITY TO REPRESENT COUNTRY OR JUSRISDICTION.

The Tocantins Secretary of State for Environment and Water Resources (*Secretaria Estadual do Meio Ambiente e Recursos Hídricos*, or SEMARH)[1] is vested with legal authority to represent the State of Tocantins in advancing the Jurisdictional Program for Reducing Greenhouse Gas Emissions from Deforestation and Degradation (REDD+) across the state. SEMARH was established in 2002 under the Government of the State of Tocantins, with its duties and jurisdiction expressly defined in Article 16, Item XII, of Law No. 3.421, dated March 8, 2019. These responsibilities encompass the planning, coordination, and oversight of state policies on environmental protection, water resource management, and the conservation and sustainable utilization of ecosystems, biodiversity, and forest resources. Law No. 4.111, dated January 5, 2023, which institutes the State Policy on Payment for Environmental Services (*Política Estadual de Pagamentos por Serviços Ambientais*, or PEPSA) for Tocantins, confers upon SEMARH, through Article 3, Item III, the authority to manage PEPSA. SEMARH's legal mandate is further elaborated in a Service Charter for users, detailing its functions in the measurement and valuation of the environmental assets of the State of Tocantins and the execution of climate adaptation projects.

[1] Mr. Marcello de Lima Lelis was appointed as the State Secretary for the Environment and Water Resources by the Governor's Act No. 273, published in the Official Gazette of the State of Tocantins No. 6.268, dated February 9, 2023.

2. PROGRAM PARTNERS

Provide a list of any other organizations and individuals who have or will assist in preparing the TREES documentation, including additional government agencies, non-governmental organizations (*NGOs*)*, and/or additional technical consultants. Please include a brief description of their role.*

As manager of the State of Tocantins' Jurisdictional REDD+ Program, SEMARH coordinates the collection and organization of information for TREES documentation. In collaboration with other government agencies, SEMARH is working with key partners to prepare the required documentation for submission to ART:

- **Geonoma**: Has been responsible for developing the State's Monitoring, Reporting, and Verification (MRV) methodology and quantifying emission reductions in collaboration with IPAM, overseeing the validation of activity data and the calculation of uncertainty, writing the MRV sections, revising the safeguards sections and the final version of the TREES documentation.
- **Amazon Environmental Research Institute (*Instituto de Pesquisa Ambiental da Amazônia* or IPAM):** IPAM has been responsible for developing the MRV methodology for the State and for quantifying emission reductions, with the UK Pact Brazil support.
- **Earth Innovation Institute (EII):** A state partner since 2018, EII has assisted the State of Tocantins in meeting TREES requirements. This support includes designing the State's emission reduction strategy, structuring the benefit-sharing mechanism, shaping the scope of safeguards, advising on consultation and participation processes, finalizing TREES documentation for submission, and writing the Safeguards and general sections of the TREES documentation.
- **United Nations Development Programme (UNDP)/ WayCarbon:** Provided advice to the State on reporting about safeguards compliance and on developing the MRV methodology.
- **Federal University of Tocantins (Universidade Federal do Tocantins or UFT)/ Scientific and Technological Support Foundation of Tocantins (*Fundação de Apoio Científico e Tecnológico do Tocantins* or FAPTO)**: Operates the Geographic Intelligence Center for Environmental Management (*Centro de Inteligência Geográfica em Gestão do Meio Ambiente*, or CIGMA) in Tocantins, providing environmental monitoring and analysis for the State, including deforestation, forest fires (degradation), hydrometeorological factors, and other areas.
- **Research Support Foundation of the Federal University of Goiás (*Fundação de Apoio à Pesquisa da Universidade Federal de Goiás* or FUNAPE)/ Federal**

University of Goiás (*Universidade Federal de Goiás* or UFG)/ Laboratory of Image Processing and Geoprocessing (*Laboratório de Processamento de Imagens e Geoprocessamento* or LAPIG): Validated the activity data used in the State's MRV, such as forest fire scars from MapBiomas Fire and deforestation polygons for the state of Tocantins from PRODES (*Projeto de Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite* or Brazilian Amazon Forest Deforestation Monitoring Project by Satellite), and calculated the associated uncertainty.

- **TOCANTINS PARTNERSHIPS, State of Tocantins Real Estate Holding, Investment and Partnerships Company (*Tocantins Parcerias, Companhia Imobiliária de Participações, Investimentos e Parcerias* or *TOPAR*):** Collaborates with SEMARH under Technical Cooperation Agreements 06/2022/GABSEC and 02/2024/GABSEC. This partnership provides technical support for managing personnel and assets, streamlining processes to advance strategic State projects, particularly in business development related to environmental assets, carbon credits, environmental services, asset management, and ecosystem restoration and conservation.
- **TOCANTINS CARBON, Specific Purpose Company** (***Tocantins Carbono, Sociedade de Propósito Específico* or TOCAR, SPE):** Responsible for channeling REDD+ financing to support activities essential for developing and operating the Jurisdictional REDD+ Program in the State of Tocantins, under Technical Cooperation Agreement No. 16/2023/GABSEC with SEMARH.

3. REFERENCE PERIOD AND CREDITING PERIOD

Please list the dates for the 5-year historical reference and crediting periods.

Reference Period		Crediting Period		
01/01/2015	12/31/2019	Start	01/01/2020	12/31/2024
mm/dd/yyyy	mm/dd/yyyy		mm/dd/yyyy	mm/dd/yyyy

4. ACCOUNTING AREA

Identify whether the proposed accounting area is national or subnational. If a subnational accounting area will be used, list which jurisdiction(s) and/or recognized Indigenous Peoples territory(ies) are included. Also, identify the total hectares of forest and the percentage of national forest covered by the accounting area. A georeferenced geographic information system (GIS) shape file of the accounting area (subnational or national) boundaries must be submitted along with this document.

The **accounting area** for the Tocantins' Jurisdictional REDD+ program is **subnational**, encompassing the entire state of Tocantins – one of the nine states in the Brazilian Legal Amazon. Tocantins spans an area of 27,742,363 hectares (ha) (IBGE, 2022). Located in central Brazil, Tocantins shares borders with the Maranhão and Piauí States to the northeast, Bahia State to the east, Goiás State to the south, Mato Grosso State to the west, and Pará State to the northwest (Figure 4-1). Its geographic coordinates are 10°11′S 48°20′W. The shapefiles for Figure 4-1 show the accounting area and boundaries and are available in Annex 1, "GIS Files". A description of each file is in Table 10-17.

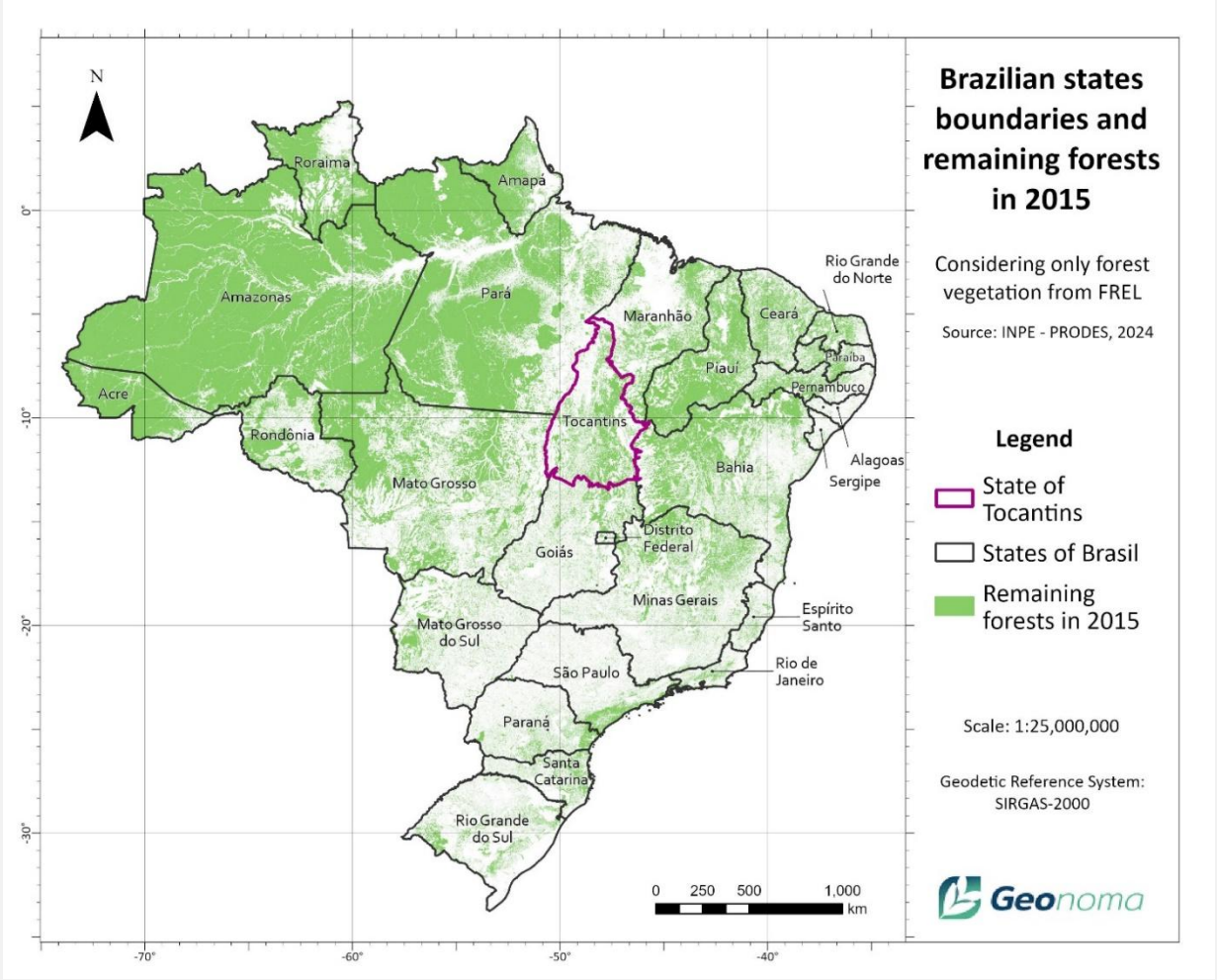

Figure 4-1. Brazilian states boundaries and remaining forests in 2015.

Prepared by Geonoma (2024), based on intact native forest data from PRODES (INPE, 2024b) Brazilian states boundaries of IBGE (2022).

The total forest area in 2015 (first year of the reference period) within the accounting area was **11,601,990 ha** (42% of Tocantins' State area). In 2020, the first year of the crediting period, the total forest area was **11,004,647 ha**, representing 39.67% of forest covered by the accounting area.

The percentage of national forest included in the accounting area in 2015 was **2.51%.**

The accounting area refers to the intact native forests (areas of forests remaining as forests) identified by the Project for **Remote Deforestation Monitoring in the Legal Amazon (*Projeto de Monitoramento do Desmatamento na Amazônia Legal, or* PRODES)**, produced by the **National Institute for Space Research (INPE or *Instituto Nacional de Pesquisas Espaciais*, hereinafter INPE)** (INPE, 2024b) within the forest phytophysiognomies defined in the **Forest Emissions Reference Level of Brazil (FREL; FREL-Brasil, 2024)**. Further details are provided in Sections 10.1.1. and 10.1.3. PRODES data is also the base for the emissions accounting used by the FREL and Brazil's national communications and biennial update reports to the United Nations Framework Convention on Climate Change (UNFCCC).

5. ELIGIBILITY CRITERIA

For each eligibility criterion below, please describe how the REDD+ program meets the criterion.

1. The ART Participant is a national government or subnational government no more than one level down from national level.

In Brazil's political-administrative structure, subnational entities include states and the Federal District, recognized as autonomous federative entities one level below the Union (Articles 1 and 18, 1988 Federal Constitution of the Republic of Brazil, *Constituição Federal da República do Brasil de 1988*, or CRFB/1988). The participant in this program is the **State of Tocantins**, represented by **SEMARH**, a member of the National Environmental System (*Sistema Nacional do Meio Ambiente*, or SISNAMA). SEMARH is responsible for designing and implementing environmental policies in the state, including the **State Policy on Climate Change, Environmental Conservation, and Sustainable Development of Tocantins (PEMC/TO, State Law No. 1.917/2008)** and the **State Policy on Payments for Environmental Services (PEPSA, State Law No. 4.111/2023)**, which form the legal foundations for the Tocantins Jurisdictional REDD+ Program.

2. If a subnational accounting area is proposed by a national government or by a subnational government:
    - The boundaries of a subnational accounting area shall correspond with the entire area of one or several administrative jurisdictions no more than one administrative level down from national level and one or several recognized indigenous territories; AND

- The accounting area is comprised of a total forest area of at least 2,5 million ha.

The accounting area comprises a total forest area of **more than 2.5 million ha**. It includes the entire territory of the State of Tocantins (27.74 million ha), with an estimated forest area of 11.00 million ha spanning the Amazon and Cerrado biomes (IBGE, 2022).

3. If the Participant is a subnational government, the Participant has or will have a letter from the national government authorizing the Participant's application to and participation in ART.

Article 18 of the **CRFB/1988** stipulates that Brazil's political-administrative structure consists of the Union, the States, the Federal District, and the Municipalities, all autonomous entities under said Constitution. The autonomy of the States includes the authority for self-governance, self-organization, self-legislation, and self-administration, encompassing the management of their assets.

The Federal Constitution allocates **legislative (Article 24) and executive (Article 23) powers** among these entities. In environmental matters, the Union and States have concurrent legislative competencies. The Union sets general principles, while States and the Federal District tailor these principles to regional needs. If federal legislation emerges, it preempts conflicting state laws (Art. 24, §§3-4).

Regarding executive or administrative competency or power for environmental public policy development and implementation (CRFB/1988, Art. 23, items III, VI, and VII), particularly command and control functions, the federative entities have common competencies to act. The Union, States, Municipalities and the Federal District share responsibility for developing and implementing environmental policies, particularly through conservation, inspection, and command-and-control functions. This shared responsibility enables States to manage and trade jurisdictional REDD+ credits generated from these activities.

Currently, Federal Law No. 15.042/2024 governs the Brazilian Emissions Trading System (*Sistema Brasileiro de Comércio de Emissões* or SBCE) and introduces important rules for jurisdictional REDD+ programs. Article 43, §13, explicitly assigns ownership of jurisdictional carbon credits to the state's executive branch responsible for developing the program. Article 42 permits that these credits be offered on the voluntary carbon market.

The **National Commission for REDD+ (*Comissão Nacional para REDD+,* or CONAREDD+)** is tasked with formulating guidelines and issuing resolutions on matters including "the formulation, regulation, and structuring of financial and market mechanisms to promote and incentivize REDD+" (art. 3, IX, of Decree No. 11.548/2023). In the absence of more specific federal legislation, states retain the authority to further regulate these matters, including establishing more detailed rules for the creation and commercialization of jurisdictional REDD+ credits than those set forth by Federal Law No. 15.042/2024.

Considering the States' concurrent legislative competency and common executive competency in environmental matters, Tocantins has been an "early mover," establishing its **State Policy on Climate Change, Environmental Conservation, and Sustainable Development, State Law No. 1.917/2008 (*Política Estadual sobre Mudanças Climáticas, Conservação Ambiental e Desenvolvimento Sustentável do Tocantins,* or PEMC/TO).** Among this Law's objectives are the regulation, promotion, and execution of REDD+ initiatives at the state level (art. 2, II). The Law also sets forth the necessary instruments to achieve these objectives, including a state inventory of emissions, diversity, and stock of greenhouse gases in a systematic and periodic manner, as well as promoting regional models of sustainable development in the State of Tocantins through financial and non-financial incentives. (art. 2, III and V).

Article 19 of **State Law No. 1.917/2008 (PEMC/TO)** authorizes Tocantins to manage emission reductions and carbon credits of which it is a beneficiary or owner, provided these are duly recognized or certified and arise from:

I. Avoided carbon emissions from projects under the Clean Development Mechanism (CDM), natural forest preservation, afforestation, and reforestation of degraded or converted lands.

II. Greenhouse gas reduction projects or activities under the United Nations Framework Convention on Climate Change (UNFCCC).

III. Other mechanisms and market schemes for greenhouse gas emissions reductions.

Under this Law (art. 19, sole paragraph), such carbon credits may be traded in national or international markets pursuant to applicable legislation. The enactment of Law No. 15.042/2024 reinforces the possibility of selling jurisdictional credits in both the voluntary carbon market and the SBCE.

The State Policy on Payments for Environmental Services (*Política Estadual de Pagamento por Serviços Ambientais* or PEPSA) was recently established in Tocantins through State Law No. 4.111/2023.This legislation encompasses a range of environmental services, including the protection and maintenance of native forests and the sequestration, conservation, maintenance, and enhancement of carbon stocks, as well as the reduction of carbon emissions (art. 12, I and II). The PEPSA Law defines jurisdictional carbon credits as a freely tradable asset resulting from the cumulative carbon emission reductions measured across the territory of Tocantins, in alignment with internationally recognized criteria for periodicity, territoriality, and accounting (art. 2, IX).

As recognized by Federal Law No. 15.042/2024 (art. 43, §13), the State of Tocantins has ownership rights over the jurisdictional carbon credits stemming from its efforts in command and control, conservation, inspection, and monitoring aimed at environmental preservation, protection, and restoration over the state's territory (art. 15, State Law No. 4.111/2023). In other words, the jurisdictional credits result from the state's exercise of the common executive competency or power in environmental matters, as determined by the Brazilian constitution.

Furthermore, the PEPSA Law authorizes using revenue from the sale of assets and credits related to state environmental products and services as economic and financial incentives (art. 23, VII).

The **PEPSA** authorizes the State of Tocantins to directly sell jurisdictional carbon credits or, in the case of transactions involving environmental assets derived from environmental services performed within the state's jurisdiction, to do so through the Real Estate Company for Investments and Partnerships of the State of Tocantins (*Tocantins Parcerias*), upon authorization from PEPSA's managing body, namely the State Department for the Environment and Water Resources (SEMARH) (Art. 15, § 3 c/c Art. 22, § 2 of Law No. 4.111/2023). These PEPSA provisions are in alignment with Article 42 of Federal Law No. 15.042/2024.

In this regard, on June 1, 2023, **AUTHORIZATION No. 01/2023/GABSEC** was published, whereby the Secretary for the Environment and Water Resources, exercising his authority, authorized *Tocantins Parcerias*, a private legal entity and part of the State's Indirect Administration, established as a mixed-capital corporation under CNPJ/MF No. 17.579.560/0001-45. Consequently, it is the sole entity authorized to transact environmental assets derived from environmental services performed by and owned by the State of Tocantins

The participation of subnational entities in results-based payments programs for jurisdictional-scale emission reductions has also been formally recognized and authorized by **CONAREDD+** (art. 2, Decree No. 11.548/2023). Through various resolutions, CONAREDD+ establishes criteria for allocating fundraising "allowances" or limits among States and the federal government to earn REDD+ payments for emission reductions claimed by Brazil before the UNFCCC. These include payments for the Amazon biome (Resolution No. 6/2017, Resolution No. 12/2018, Resolution No. 14/2018 and Resolution No. 11/2022) and for the Cerrado biome (Resolution No. 08/2022), recognizing these entities' efforts in reducing emissions from deforestation and forest degradation.

To access these fundraising allowances, States must undergo an **eligibility process** before CONAREDD+, as specified in Resolution No. 07/2017, for the Amazon biome, and Resolution No. 09/2022, for the Cerrado biome. In 2021, Tocantins received CONAREDD+'s approval for accessing its fundraising allowance for REDD+ results-based finance, granted by Resolution No. 05/2021, for the Amazon biome and Resolution No. 08/2022, on the results of the Cerrado biome.

Thus, under Brazil's legal framework, subnational entities like Tocantins have the authority to engage with TREES and transact jurisdictional REDD+ carbon credits.

4. The Participant or the Participant's country has included forests in their NDCs.

In its **third Nationally Determined Contribution (NDC) to the Paris Agreement,** submitted in 2024 to the UNFCCC, Brazil reinforces its goal of achieving net-zero emissions by 2050, and has committed to an economy-wide target of reducing its net greenhouse gas emissions by 59 to 67 percent below 2005 levels by 2035, which is consistent, in absolute terms, with an emissions level of 1.05 to 0.85 GtCO2e.

Brazil has included forests in its NDC. In the land use and forestry sector, Brazil intends to implement coordinated and continuous efforts to suppress illegal deforestation, encourage the preservation of native vegetation, and promote restoration, through key instruments: the Plans for the Prevention and Control of Deforestation in the Biomes – including the Legal Amazon (*Plano Plano para Prevenção e Controle do Desmatamento na Amazônia*, or PPCDAm) and Cerrado (*Plano Plano para Prevenção e Controle do Desmatamento no* Cerrado*, or* PPCerrado) – and the National Plan for the Recovery of Native Vegetation (*Plano Nacional de Recuperação da Vegetação Nativa*, or Planaveg).

5. The Participant or Participant's country has a system for providing information on safeguards.

As a federative unit of Brazil, the State of Tocantins aligns with the national guidelines for implementing and monitoring REDD+ safeguards. Brazil maintains a **national Safeguards Information System (*Sistema de Informação de Salvaguardas de REDD+*, or SISREDD+)** and has **two Summaries of Information on the Cancun REDD+ Safeguards** to the UNFCCC Secretariat:

- **First Summary**: encompassed the years 2006-2010 and detailed how the Cancun safeguards were addressed and upheld by the country during the implementation of RDED+ actions implemented to reduce deforestation emissions in the Amazon.
- **Second Summary**: encompassed the years 2011-2015 and had the same scope of the First summary for the subsequent period.

These documents are available on the Lima REDD+ Information Hub platform and the REDD+ Brazil website.

Regarding the national SISREDD+, the following milestones are noteworthy:

- **2015:** Establishment of the **National Strategy for REDD+ (*Estratégia Nacional de REDD+*, or ENREDD+, or ENREDD+).**
- **2016:** The National REDD+ Commission (CONAREDD+) created the **Thematic Consultative Chamber on Safeguards (*Câmara Consultiva Temática sobre Salvaguardas* or CCT-Salv)**, to provide technical support on formulating guidelines and standards to ensure compliance with the Cancun safeguards in Brazil and to develop the national SISREDD+.
- **2017:** CONARRED+ launched an effort to **create indicators for the national SISREDD+**, to evaluate compliance with safeguards throughout the implementation and

institutionalization of REDD+ actions in Brazil and the allocation of funds from results-based payments.

- **2018:** CONAREDD+ approved the **Cancun safeguards' interpretation for the Brazilian context** (Resolution No. 15/2018).
- **2021:** CONAREDD+ created **19 indicators for SISREDD+'s pilot monitoring phase** (Resolution No. 04/2021).
- **2022:** Implementation of pilot monitoring for the 19 SISREDD+ indicators, which involved monitoring the indicators to establish a baseline for future monitoring, testing variables and formulas, evaluating data sources and collection methods.
- **2024:** CONAREDD+ established the **Technical Working Group on Safeguards (*Grupo Técnico de Trabalho sobre Savaguardas*, or *GTT Salvaguardas*).**

The national SISREDD+'s pilot monitoring period covered years 2015 to 2021, and 2022 for some indicators. **Tocantins supplied data to CONAREDD+'s Executive Secretariat on the following indicators**:

- **1A:** Implementation of federal and state Action Plans for the Prevention and Control of Deforestation.
- **1B:** Effectiveness of public ombudsman offices in receiving and resolving complaints regarding non-compliance with REDD+ safeguards.
- **2B:** Governance spaces for forests with the participation of civil society.
- **3B:** Gender diversity across age groups and social segments in forest governance spaces.
- **2C:** Consultation processes in territories covered by REDD+ policies and programs.
- **1D:** Social participation in training processes for governance and/or monitoring of REDD+ actions.

The results of the national SISREDD+'s pilot monitoring have not yet been released by CONAREDD+, and Brazil has not yet submitted its third Summary of Information on the Cancun REDD+ Safeguards to the UNFCCC.

As Brazil continues to build the national SISREDD+, SEMARH, as the managing authority of the Tocantins Jurisdictional REDD+ Program has invested in deepening the understanding of TREEs' safeguard's indicators to ensure compliance with the standard's requirements. With support from the Governor's Climate and Forests Task Force (GCF Task Force) through the Unlocking and Leveraging Low Emission Development Project, managed by UNDP, SEMARH has been able to provide capacity-building for its staff on these themes.

Moreover, a technical proposal for the Tocantins Safeguards Information System has been under development since 2024, along with the creation of a dedicated Safeguards Working Group that will lead a participatory process to design and implement the state-level system. Tocantins is currently advancing an initial safeguards summary report covering years 2020 to 2023.

6. OWNERSHIP RIGHTS TO EMISSION REDUCTIONS AND/OR REMOVALS TO BE ISSUED BY ART

Provide a brief summary of the Participant's rights to the ERRs generated from the accounting area (regulatory frameworks, laws, or administrative orders) or describe how rights will be obtained under domestic law. It may not be necessary for the Participant to establish or enact new legislation or a legal framework to address carbon rights. However, the Participant must explain how carbon rights and related intangible property interests are established and addressed under existing constitutional or legal frameworks. This explanation should include how such carbon rights and intangible property interests would be established, the legal basis for creating such rights and interests, and how claims to such rights from private parties, Indigenous Peoples, or subnational entities will be resolved (consistent with applicable UNFCCC Cancun Safeguards and Section 12.0 herein). To address the latter, the Participant must describe any agreements in place, or that will be in place for the transfer of TREES rights or benefit allocation arrangements with landowners/resource rights holders that exist between the Participant and project owners, landowners, and other collective rights holders (including indigenous peoples and other traditional communities). TREES will only be issued that have demonstrated clear ownership or rights. Participants may provide this demonstration at a later date, within the same crediting period, or during a subsequent crediting period (provided the crediting periods are adjacent).

Under Brazil's constitutional framework, states hold significant autonomy in managing their assets and share legislative authority with the federal government in environmental matters. This concurrent competency, shared by states, the Federal Government, and the Federal District, covers areas such as forest management, wildlife protection (including hunting and fishing regulations), nature conservation, soil preservation, natural resource management, environmental protection, pollution control, and the safeguarding of heritage sites, cultural assets, tourist attractions, and landscapes. Articles 24 (VI, VII, and VIII) of the Constitution further grant states authority over environmental liability, consumer protection, and the preservation of properties with historical, aesthetic, or cultural value.

The **generation of jurisdictional REDD+ carbon credits** is a result of the state's conservation, inspection, and command-and-control actions, in line with its constitutional environmental responsibilities (Article 23, VI, and VII, CRFB/1988). **Federal Law No. 15.042/2024 (art. 43, §13) expressly grants ownership of jurisdictional carbon credits to the state executive**

branch responsible for developing the jurisdictional program. State Law No. 4.111/2023, which establishes the **PEPSA**, restates in Article 15 that Tocantins holds the original ownership rights to jurisdictional carbon credits generated within its territory, and that this ownership arises from the State's authority to implement command, control, conservation, oversight, and monitoring measures for environmental preservation and recovery.

Art. 42 of Federal Law No. 15.042/2024 allows states to sell their jurisdictional credits in the voluntary carbon market. Further regulating this provision at the state level, Article 19 of the **PEMC/TO (State Law No. 1.917/2008)** authorizes Tocantins to trade emission reductions and carbon credits in national or international markets, provided the State is the recognized or certified beneficiary or owner of the credits. Paragraph 3 of Article 15 further permits Tocantins to directly transact and/or trade its jurisdictional carbon credits.

Under the PEPSA Law, the State's Jurisdictional REDD+ Program operates on the principle of common but differentiated responsibilities. This principle allocates roles to public and private entities based on their respective capacities to stabilize greenhouse gas (GHG) concentrations (Art. 7, II). The law also recognizes the vital contributions of extractive and traditional communities, Indigenous peoples, and farmers in the conservation, sustainable use, and restoration of natural resources, particularly forests (Art. 7, V).

The State acknowledges the contributions of various stakeholders to emission reductions and removals. In line with the PEPSA Law, the State is committed to ensuring **justice and equity** in the distribution of the economic and social **benefits** arising from payments for environmental services (PES), including REDD+ initiatives. Additionally, Article 13, Paragraph 2 of the Law specifies that, alongside the State of Tocantins, other public or private entities and individuals may provide environmental services (e.g., through carbon projects), provided that they register in the public PEPSA Database (Art. 14) and are integrated into a formal **nesting/accommodation framework**. This framework ensures that these initiatives comply with safeguards, maintain accounting and environmental integrity, and meet methodological compatibility requirements with jurisdictional actions to prevent overlapping efforts and double counting (Art. 24, §1).

The State is committed to ensuring that the benefits of the Jurisdictional Program are shared with all stakeholders who contribute to its objectives, particularly in advancing the transition to a low-emission rural development model. To facilitate this, Tocantins has designed a **benefit-sharing proposal** that will undergo extensive public consultation. In developing and implementing this framework, the State has taken the following considerations into account:

- **Principles of Justice and Equity**: The design and implementation of the State's benefit-sharing strategy prioritizes equity, efficiency, and effectiveness (the 3Es), while also emphasizing co-benefit generation, participation, and transparency.

- **Respect for Cultural Diversity and Strengthening Identity**: In line with State Law No. 4.111/2023, the benefit-sharing provisions recognize the significant contributions of extractive and traditional populations, Indigenous peoples, and farmers in the conservation, preservation, sustainable use, and restoration of natural resources – particularly forests. The involvement of these stakeholders is vital to achieving jurisdictional emission reductions.
- **Stakeholder Distribution Across the State**: The benefit-sharing mechanism includes all key stakeholders across the State's territory, considering various land tenure categories. It incorporates diagnostic studies on the anthropic environment and the characterization of social actors and traditional populations from the State's Ecological-Economic Zoning (ZEE) proposal. Additionally, data from the National Institute for Colonization and Agrarian Reform (*Instituto Nacional de Colonização e Reforma Agrária*, or INCRA), the Tocantins Land Institute (*Instituto de Terras do Tocantins*, or ITERTINS), and the Rural Environmental Registry (*Cadastro Ambiental Rural*, or CAR) has been used to ensure all stakeholders are accounted for, regardless of land tenure status.
- **The "Stock-Flow" Methodology**: The benefit-sharing strategy draws on the Stock-Flow methodology to analyze the contributions of different land tenure categories (by beneficiary type) to the State's emission reductions from 2020 to 2023.
- **Consultation Process**: A comprehensive public consultation process will validate and adjust the proposed benefit-sharing framework. This process will also identify challenges related to conservation and emission reductions, assess the resources needed to overcome these challenges, and gather stakeholder feedback on their perceptions of the benefits of REDD+ and their priorities for allocating benefits at the local level (see Figure 6-1).

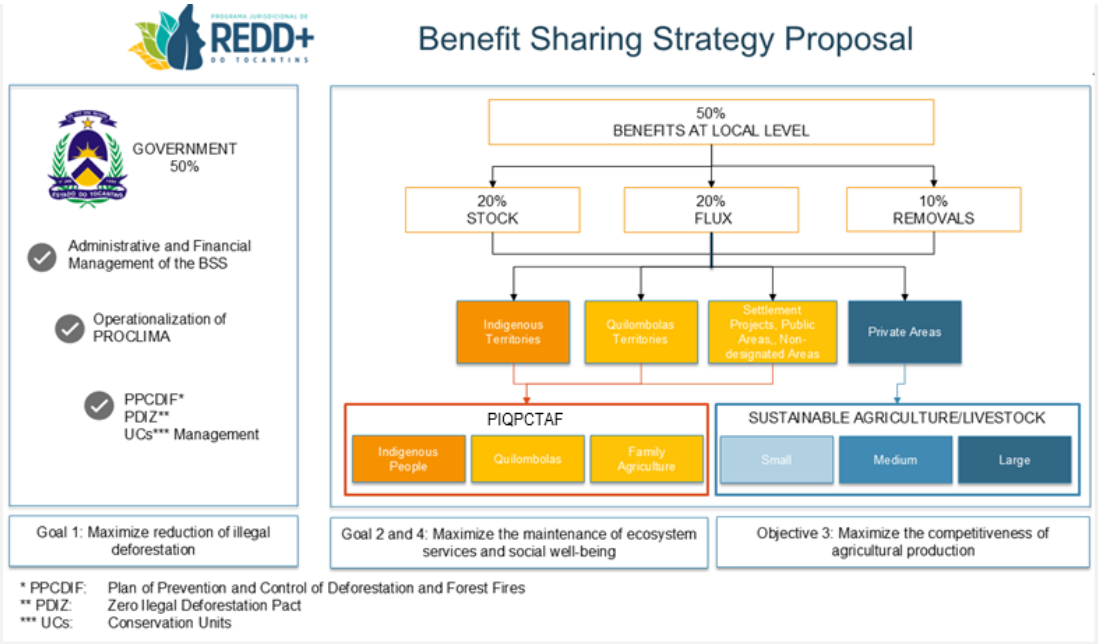

Figure 6-1. Benefit-Sharing Strategy.

Based on the assumptions, objectives, and beneficiaries outlined in Figure 6-1, the stock-flow analysis suggests that an equitable and effective benefit distribution should allocate 50% of the resources to the state government for efforts to control illegal deforestation and forest degradation. The remaining 50% would be evenly distributed among **Indigenous Peoples, Traditional Peoples, and Family Farmers (*Povos Indígenas, Quilombolas, Povos e Comunidades Tradicionais e Agricultores Familiares*, or PIQPCTAF), and small, medium, and large Farmers in the agricultural and cattle ranching sectors** (see Figure 6-2).

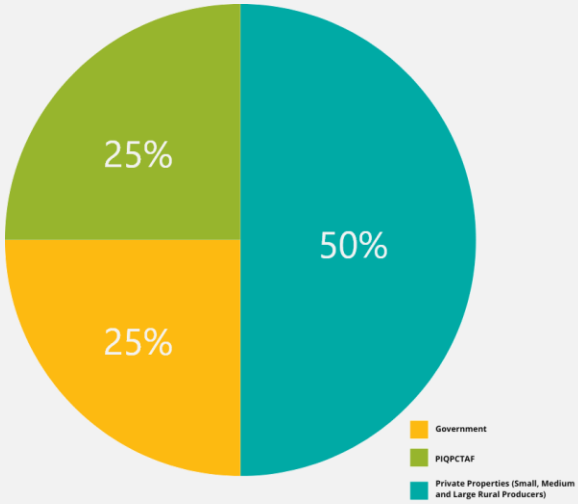

Figure 6-2. Distribution of Benefits among groups contributing to Jurisdictional Emission Reductions.

Tocantins initiated a **stakeholder engagement process** prior to the enactment of the PEPSA Law to formally recognize relevant groups. In 2023, the state hosted the **1st REDD+ Forum with Indigenous, Quilombolas, Traditional Peoples and Family Farmers, and the Tocantins Jurisdictional REDD+ Program**, attended by more than 300 participants. During the forum, each group shared their consultation preferences and offered initial perspectives on the potential benefits of REDD+.
Additionally, the state began engaging with farmers to clarify aspects of the Forest Carbon Incentives Program and to gather preliminary feedback on the specific benefits this sector seeks.

The State's engagement with key stakeholders in the Jurisdictional Program began in 2021. By 2024, approximately **20 sectoral meetings** had been held, alongside nine preliminary meetings with Indigenous chiefs and two with leaders of traditional communities, *Quilombolas*, and family farmers.

In the first half of 2025, around **fifty workshops with PIQPCTAF** are planned. These workshops will provide updates on REDD+, the proposed benefit-sharing strategy, nesting, financial

mechanisms like the Climate Fund (*FunClima*), and procedures for accessing the Jurisdictional Program's benefits and governance structures. Additionally, they will address actions to reduce deforestation and degradation, as well as gather investment suggestions to support sustainable development in forest communities. The outcome of these workshops will be four-year investment plans tailored to each sector and beneficiary group.

During the workshops, representatives from Indigenous groups, traditional populations, *Quilombolas*, and family farming communities will be elected to represent their sectors at a public hearing scheduled for mid-2025. The information gathered will be systematically compiled and published on SEMARH's website. This input will guide refinements to the State's benefit-sharing strategy and inform the design of subprograms for each stakeholder group.

An in-person **public hearing** in Palmas, the capital of Tocantins, will offer a comprehensive review of the Tocantins' Jurisdictional REDD+ Program, with the elected representatives acting as delegates for their groups. This process is coordinated by the Safeguards Working Group, established under SEMARH Ordinance No. 88 on September 5, 2024.

Regarding the **nesting** of private projects within the jurisdictional program, SEMARH has identified a private REDD+ project on the Bananal Island (*Ilha do Bananal*). A Nesting Working Group will be created under SEMARH's supervision to define the rules for integrating projects into the Jurisdictional Program.

7. SAFEGUARDS

The primary legal framework for **Tocantins Jurisdictional REDD+ Program** comprises State Law No. 1.917/2008, which establishes the **PEMC/TO**, and State Law No. 4.111/2023, which creates the **PEPSA**.

Key instruments for implementing these state policies during the proposed certification period include the **Plan for the Prevention and Control of Deforestation and Forest Fires of the State of Tocantins (PPCDIF/TO)** for 2021-2025, the **Tocantins Competitive and Sustainable Strategy** through 2040, and the **Sectoral Plan for Climate Change Adaptation and Low Carbon Emissions in Tocantins Agriculture and Animal Husbandry (ABC+TO),** covering 2020-2030.

In this context, compliance with safeguards and the associated themes and indicators discussed in this section is evaluated in relation to the established policy framework and implementation instruments.

Since Brazil has adopted a **national interpretation of the Cancun safeguards** (CONAREDD+ Resolution No. 15/2018), the State of Tocantins adheres to this framework. Additionally, Tocantins is eligible to receive results-based payments for the Amazon and Cerrado biomes, as recognized under CONAREDD+ Resolutions No. 5/2021 and No.9/2022. In the eligibility

process, the State had to demonstrate how it adhered to Cancun's safeguards as it implemented its REDD+ actions.

In addition to the national interpretation, the outcomes of the Safeguards Working Group, consisting of experts and technicians from the nine states of the Brazilian Amazon, were also considered. Supported by the UNDP and the GCF Task Force, this Group worked collaboratively to interpret and define the parameters necessary for states to demonstrate compliance with the safeguard indicators proposed by TREES within the Brazilian context.

CANCUN SAFEGUARD A

THEME A.1: Consistency with the objectives of national forest programs

STRUCTURAL INDICATOR: Domestic legal framework or policy (or national REDD+ strategy or action plan) for REDD+ actions is clearly defined and designed in consistency with national and if applicable, subnational, forest policies/programs.

Describe how this indicator is met.

Tocantins, in exercising its constitutional legislative powers, established its **Jurisdictional REDD+ Program through State Law No. 1.917/2008**, which created the **PEMC/TO**. Additionally, **State Law No. 4.111/2023** introduced the **PEPSA**. These state laws and policies align with, support and complement national forest legislation and policies, as detailed in Table 7-1:

Table 7-1. State and National Environmental Laws and Policies Referenced in State Legislation.

State	National
State Law No. 1.917/2008 establishes the State Policy on Climate Change, Environmental Conservation, and Sustainable Development of Tocantins (PEMC/TO).	Law No. 12.187/2009 establishes the National Policy on Climate Change (PNMC). While the PNMC was enacted after the PEMC/TO, they share aligned objectives, which ensure the continued relevance and validity of the state legislation.
State Law No. 4.111/2023 establishes the	Law No. 12.187/2009 establishes the National Policy on Climate Change (PNMC).

CANCUN SAFEGUARD A

Tocantins State Policy on Payment for Environmental Services (PEPSA).	Law No. 12.651/2012 addresses the protection of native vegetation, commonly referred to in Brazil as the Forest Code. Law No. 14.119/2021 establishes the National Policy on Payment for Environmental Services.

State Law No. 1.917/2008, which introduced the **PEMC/TO**, predates the crediting period covered in this document. However, it establishes the foundational principles, conceptual bases, and instruments underlying the Jurisdictional Program and REDD+ actions in Tocantins. One of **PEMC/TO**'s critical objectives is to create financial, fiscal, and economic tools to support its programs and policies and to promote market mechanisms that facilitate REDD+ initiatives (Art. 2nd, I and II).

Several provisions within this law align directly with national policies, reinforcing its integration with the federal legislative framework, as outlined in Table 7-2:

Table 7-2. Key Provisions of PEMC/TO (State Law No. 1.917/2008) in Alignment with National Laws and Policies.

Art. 7: Calls for national and international funding sources for project activities under the Clean Development Mechanism (CDM), Reduced Emissions from Deforestation (RED), and other efforts to curb greenhouse gases and may encompass, among other activities: Single paragraph. Projects funded under this article must adhere to relevant national and international legislation and yield measurable, long-term environmental and societal benefits, such as quality of life, for the people of Tocantins.
Art. 19. The State of Tocantins is authorized to market emission reductions and carbon credits of which it is a beneficiary or holder, provided they are duly recognized or certified. Single paragraph. The carbon credits in this article may be traded on the Brazilian Emission Reduction Market (*Mercado Brasileiro de Reduções de Emissões* or MBRE) or other national or international markets compliant with applicable legislation.

State Law No. 4.111/2023, also enacted during the crediting period, establishes the **PEPSA**. Designed in consideration of the National Policy on Payment for Environmental Services (Law No. 14.119/2021) and other national legislation, **PEPSA** supports a range of environmental services, including REDD+. It provides mechanisms for planning, managing, and implementing these services, with the aim of enhancing climate regulation, reducing

CANCUN SAFEGUARD A

deforestation-related GHG emissions, and generating financial resources for the state through carbon markets.

The **PEPSA law** also includes provisions that explicitly require its implementation in alignment with the **PEMC/TO**, the national laws and policies listed in Table 7-3, and other applicable regulations that support its objectives.

Table 7-3. Key Provisions of PEPSA (State Law No. 4.111/2023) in Alignment with National Laws and Policies.

Art. 2 The following definitions are considered for this law: Sole Paragraph: The provisions in this article respect current scientific understanding, aligning with definitions established by the United Nations Conference on Environment and Development (Rio-92) and the integrated approach to sustainable development – encompassing economic, ecological, and social dimensions. They reference vital international agreements, including the United Nations Framework Convention on Climate Change (UNFCCC), the Convention to Combat Desertification (UNCCD), and the Convention on Biological Diversity (CBD), as well as definitions outlined in Federal Laws No. 12.187/2009; No. 12.651/2012; No. 14.119/2021, and other applicable national and international rules applicable.
Art. 3 The provisions of this Law: II – are coordinated with other sectoral and environmental policies, especially those defined by Federal Laws No. 14.119/2021, No. 12.187/2009, and State Law No. 1.917/2008), among other applicable laws.
Art. 7 – PEPSA and its related actions must comply with national and international principles, notably: XII – integration with state, municipal, and federal public policies related to PSA; XVI – national and international cooperation promoted by the Direct and Indirect State Public Administration through bilateral projects across external, internal, and subnational domains, aiming to fulfill PEPSA's objectives. This aligns with the National Policy on Climate Change (PNMC), the UNFCCC, and related initiatives, upholding the goals of economic development, ecological balance, and intergenerational equity while recognizing activities, actions, services, products, and credits resulting from PEPSA; XVIII – compliance with Law No. 12.187/2009, which established the PNMC and with national policies and rules governing environmental service incentives and payments. Paragraph 2 – In implementing PEPSA, the objectives and principles outlined in the National Policy on Payment for Environmental Services (PNPSA) will be respected. PSA users will be guided based on the specific needs of the State of Tocantins and in line with other relevant principles established in this article.
Art. 8 – PEPSA is designed to support environmental services, as detailed in Article 12, as well as to bolster activities generating PSA, such as:

CANCUN SAFEGUARD A

b) the utilization of environmental resources for human activities, particularly in areas cited in Article 8 of Law No. 14.119/2021.

Art. 13. Art. 13 – The ecosystem services categories recognized by the State of Tocantins align with those defined in Law No. 14.119/2021, namely:

Art. 16. The PEPSA Database is established to register PSA operations conducted within Tocantins, including the methodologies and supporting documentation for implementation, such as:

Paragraph 4 – These records may be integrated with federal registration systems to coordinate and validate state contributions, avoid duplication and double counting, and enable other climate and environmental integrity measures.

Art. 18. The Department of Environment and Water Resources is tasked with:

IX – collaborating with other Direct Public Administration bodies, including the Executive Branch and Indirect Public Administration entities on a federal, subnational, or international level, as well as other bodies involved in PSA initiatives.

PROCESS INDICATOR: Public institutions have used mandates, procedures, and resources to ensure REDD+ actions are designed and implemented in consistency with the broader legal or policy framework of the forest sector, and inconsistencies are identified and resolved.

Describe how this indicator is met.

The National Policy on Climate Change (PNMC), established by Federal Law No. 12.187 in 2009, was enacted after the PEMC/TO. However, both policies share aligned goals. The PNMC outlines Brazil's strategy to address climate change, focusing on reducing GHG emissions, strengthening carbon sinks, adapting to climate impacts, preserving and restoring environmental resources, expanding protected areas, and fostering carbon markets. To achieve these objectives, the PNMC includes key instruments, such as the **Action Plans for Deforestation Prevention and Control across biomes** (Art. 6, III of Federal Law No. 12.187/2009), which are critical for implementing REDD+ initiatives at both the national and subnational levels.

The Action Plans for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) and the Cerrado (PPCerrado), integral to the PNMC, work in conjunction with related sectoral plans, like the Charcoal Plan, aimed at reducing emissions in the steel industry. Together, these plans form the core of the PNMC's approach to mitigating land-use and forestry emissions, directly supporting REDD+ efforts.

Given their importance, these instruments and the corresponding state plans are integrated at the tactical-operational level within **Brazil's National REDD+ Strategy (ENREDD+, MMA,**

CANCUN SAFEGUARD A

2016). This integration ensures a cohesive approach to implementing REDD+ actions across the national and subnational levels, aligning local actions with broader climate and environmental objectives.

The federal government has implemented several phases of these plans: the **PPCDAm** is currently in its 5th phase (2023 to 2027), the **PP**Cerrado is in its 4th phase (2023 to 2027), and the **Sectoral Plan for Climate Change Adaptation and Low Carbon Emissions Agriculture and Animal Husbandry (*Plano Setorial para Adaptação à Mudança do Clima e Baixa Emissão de Carbono na Agropecuária* or Plano ABC)** is now covered by the **ABC+ Plan**, spanning 2020 to 2030. In line with the National Policy on Climate Change (PNMC) and exercising its shared executive constitutional authority over environmental matters, the State of Tocantins developed its first **Plan for the Prevention and Control of Deforestation and Forest Fires in 2009 (*Plano de Prevenção e Controle do Desmatamento e Queimadas* or PPCDQ)**. It also created the **State Plan for Mitigation and Adaptation to Climate Change to Promote a Low Carbon Economy in Agriculture (*Plano Estadual de Mitigação e de Adaptação às Mudanças Climáticas para a Consolidação de uma Economia de Baixa Emissão de Carbono na Agricultura* or Plano ABC/TO)** in 2014.

Under the Tocantins Jurisdictional REDD+ Program, the state updated its **PPCDQ to the Plan for the Prevention and Combating of Deforestation and Forest Fires (*Plano de Prevenção e Combate aos Desmatamentos e Incêndios Florestais* or PPCDIF),** spanning 2021-2025. The Permanent Technical Chamber of Forests reviewed the updated plan, and it was approved by the **State Council for the Environment (*Conselho Estadual do Meio Ambiente* or COEMA/TO),** in a plenary session on July 12, 2021, under SEMARH Ordinance No. 119/2021.

SEMARH led the PPCDIF's development in collaboration with several state entities: the Department of Agriculture, Livestock and Aquaculture (*Secretaria de Agricultura, Pecuária e Aquicultura* or SEAGRO), the Tocantins Institute for Nature (*Instituto Natureza do Tocantins* or NATURATINS), the Institute of Rural Development of the State of Tocantins (*Instituto de Desenvolvimento Rural do Estado do Tocantins* or, RURALTINS), the Department of Industry, Commerce and Services (*Secretaria da Indústria, Comércio e Serviços* or, SICs) the Department of Finance (*Secretaria da Fazenda* or, SEFAZ), the Department of Planning and Budget (*Secretaria de Planejamento e Orçamento e Orçamento* or SEPLAN), the Tocantins Military Fire Department (*Corpo de Bombeiros Militar do Tocantins* or CBMTO), the State Coordination of Protection and Civil Defense (*Coordenadoria Estadual de Proteção e Defesa Civil* or CEPDEC), and the Fire Monitoring and Management Center (*Centro de*

CANCUN SAFEGUARD A

Monitoramento e Manejo do Fogo or CeMAF/UFT). The PPCDIF (2021-2025) is aligned with the latest PPCDAm and PPCerrado.

PPCDIF aims to eliminate 100% of illegal deforestation by 2025. It serves as a key tool for implementing both the **PEMC/TO** and the **PEPSA**, playing a crucial role in advancing the State Jurisdictional Program. The plan includes structured goals and actions designed to reduce deforestation and forest degradation in the State. Table 7-4 demonstrates how the PPCDIF/TO actions and goals align with relevant national and subnational forest policies.

Table 7-4. PPCDIF/TO Pillars, Actions and the Corresponding Forest Laws and Policies.

PPCDIF/Action	National and Subnational Forest Laws and Policies
Pillar: **Prevention**	
Conclude the Ecological-Economic Zoning (ZEE): The State has developed comprehensive studies for the entire territory, which are currently under review by COEMA.	This action aligns with the federal legal framework for Environmental Economic Zones (ZEEs) in Brazilian states includes the National Environmental Policy (Law No. 6.938/1981), Federal Decree No. 4.297/2002, and Law No. 2.651/2012, which establish criteria and guidelines for the creation and management of ZEEs. Additionally, it aligns with Law No. 2.656/2012, which mandates the Executive Branch to facilitate the completion and regular updating of the ZEE.
Create new Protected Areas (PAs) and strengthen existing ones: this involves a range of actions, including developing comprehensive management plans, enhancing the capacity of staff, securing funding for operational needs, and ensuring interoperability between the GESTO system, the CAR, and the Land Tenure System to support land regularization efforts.[2]	These actions are aligned with the National Environmental Policy (Law No. 6.938/1981), which outlines principles and guidelines for environmental protection, as well as the Law of the National System of Protected Areas (Law No. 9.985/2000) and Decree No. 4.340/2002, which together establish Brazil's legal framework for Protected Areas (PAs). At the state level, the State System of Protected Areas (*Sistema Estadual de Unidades de Conservação da Natureza* or SEUC/TO), State Law No. 1.560/2005), provides the regulatory framework for the creation and management of State PAs, including the criteria for their establishment and oversight.

[2] Strengthening existing PAs involves creating Councils, refining management plans, building team capacities, securing funding, and enhancing system interoperability and land regularization analysis. Federal law provides for the creation of PAs by states or municipalities in areas needing specific flora and fauna protections.

CANCUN SAFEGUARD A

PPCDIF/Action	National and Subnational Forest Laws and Policies
Implement the instruments of the Forest Code, such as the analysis and validation of the CAR (*Cadastro Ambiental Rural* or Rural Environmental Registry) and the Environmental Regularization Program (*Programa de Regularização Ambiental* or PRA).	The Native Vegetation Protection Law, commonly known as the Forest Code (Law No. 12.651/2012), works in tandem with the National Policy on Climate Change (PNMC). Together, they form the strategic foundation within which ENREDD+ is implemented, focusing on the protection of native vegetation and supporting REDD+ actions in Brazil. A key component of the Forest Code is the CAR, designed to consolidate environmental data from rural properties and possessions into a centralized database. This database serves critical functions such as environmental monitoring, planning, deforestation prevention, and regulatory oversight. To complement these efforts, Law No. 2.713/2013 established the Environmental Adequacy Program for Rural Property and Activity (*Programa de Adequação Ambiental de Propriedade e Atividade Rural* or TO-LEGAL). This program emphasizes environmental compliance by setting clear standards for regularizing rural properties and activities.
Advance the valuation of environmental services, achieve eligibility for REDD+ results-based payments before CONAREDD+, and qualify for generating carbon credits under at least one recognized carbon credit certification standard.	The activities that enabled the State's eligibility for results-based payments before CONAREDD+ were carried out in alignment with the PNMC (Federal Law No. 12.187/2009) and the PEMC/TO (State Law No. 1.917/2008). Both laws provide a framework for mitigating and adapting to climate change. Additionally, in accordance with the National Policy on Payments for Environmental Services (Federal Law No. 14.119/2021), Tocantins enacted the PEPSA through State Law No. 4.111/2023. This law establishes a comprehensive regulatory framework for environmental services within the State, including REDD+ initiatives.

CANCUN SAFEGUARD A

PPCDIF/Action	National and Subnational Forest Laws and Policies
Reduce areas affected by forest fires, regulate Integrated Fire Management (*Manejo Integrado do Fogo* or MIF) as a fire prevention method in Tocantins, and provide training on forest fire prevention and management.	These actions align with the Brazilian Forest Code, which restricts and regulates the use of fire, recognizing its risks and enforcing control measures to prevent environmental harm. At the state level, fire management initiatives comply with federal guidelines, which may allow fire use in agricultural or forestry practices in areas where it is considered a cultural tradition, provided it is authorized by the competent environmental agency. Controlled burning is permitted as an agricultural technique, but it requires approval from the state environmental agency based on detailed burning plans that outline the conditions and procedures to minimize risk. The Environmental Policy of the State of Tocantins, established by State Law No. 261/1991, aims to protect, conserve, and restore natural resources while promoting sustainable development. This law designates the Nature Institute of Tocantins (NATURATINS) as the primary agency responsible for enforcing environmental laws in the state. Under this framework, NATURATINS carries out monitoring, territorial planning, and forest management activities to protect forest areas.
Recover Degraded Areas	The Forest Code addresses the recovery of degraded areas in several articles, aiming to promote environmental restoration and the sustainable use of natural resources. Under specific criteria, the Forest Code requires the recovery of Permanent Preservation Areas (*Áreas de Preservação Permanente* or APPs) and Legal Reserve (*Reserva Legal* or RL) areas that have been deforested. Additionally, it establishes the Environmental Regularization Program (PRA) to bring non-compliant properties into alignment with its requirements. The National Policy for the Recovery of Native Vegetation (*Política Nacional de Recuperação da Vegetação Nativa* or Proveg), established by Federal Decree No. 8.972/2017, provides guidelines for restoring native vegetation across Brazil. At the state level, the Forest Policy of Tocantins (State Law No. 771/1995) sets out directives for the preservation, use, and recovery of forests within the state. It was further regulated by State Decree No. 838/1999, which specifies the rules for its implementation. Furthermore, COEMA/TO Resolution No. 74/2017 governs activities such as silviculture in converted areas, forest replacement, the issuance of forest credits, and other provisions related to forest management in the state.

CANCUN SAFEGUARD A

PPCDIF/Action	National and Subnational Forest Laws and Policies
Sustainable Production Initiatives: Expand the capacity for Technical Assistance and Rural Extension (*Assistência Técnica e Extensão Rural* or ATER) in forestry, promote certified production practices, and strengthen bioeconomy production chains.	Federal Law No. 12.188/2010, which established the National Policy for Technical Assistance and Rural Extension for Family Agriculture and Agrarian Reform (*Política Nacional de Assistência Técnica e Extensão Rural para a Agricultura Familiar e Reforma Agrária* or PNATER), provides the foundation for delivering these services. PNATER emphasizes supporting family agriculture by ensuring that family farmers have access to the resources and guidance needed to conduct their activities sustainably and efficiently. These initiatives align closely with the objectives of the PNMC, which aims to reduce GHG emissions and promote the adoption of clean technologies, contributing to the advancement of bioeconomy goals.
Strengthen Municipal Environmental Management	The National Environmental Policy (Federal Law No. 6.938/1981) establishes principles for the preservation, improvement, and restoration of environmental quality. It also defines the National Environmental System (*Sistema Nacional do Meio Ambiente* or SISNAMA), which integrates the participation of state and municipal agencies and entities in environmental management.
Pillar: Monitoring	
Monitor deforestation, fire incidence, and forest degradation, including the identification of degraded areas on small and medium-sized properties that can be restored with assistance from the relevant authorities.	The PNMC outlines the implementation of monitoring systems to control deforestation and forest degradation. This includes the use of remote sensing and geospatial technologies to track changes in forest cover. The policy also emphasizes the need to strengthen institutional capacities for forest monitoring and enforcement, ensuring that mitigation actions are effective and based on accurate, up-to-date data. At the state level, Law No. 771/1995, establishes the State Forest Policy. It mandates the Executive Branch to promote the inventory and mapping of native and exotic vegetation covers, as well as implement the necessary infrastructure for continuous monitoring of vegetation covers and water resources. This is to facilitate the adoption of special protection measures.
Train technicians in Geotechnology for the Monitoring Center	
Acquire high-resolution satellite imagery for one year; Monitoring course for firefighters	

CANCUN SAFEGUARD A

PPCDIF/Action	National and Subnational Forest Laws and Policies
Pillar: Command and Control	
Increase NATURATINS' and the State Environmental Military Police Battalion's (*Batalhão de Polícia Militar Ambiental do Tocantins* or BPMA) capacity to enforce environmental laws related to deforestation and wildfires, including improving infrastructure, equipment, and capabilities for monitoring, systematizing alerts for illegal deforestation, and forest fire incidents.	The National Environmental Policy (Federal Law No. 6.938/1981) establishes guidelines and principles for the protection, preservation, and conservation of the environment. It mandates that the federal, state, federal district, territorial, and municipal agencies, as well as public foundations responsible for protecting and improving environmental quality, form the National Environmental System (SISNAMA). Among these entities is the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), which is responsible for overseeing activities that may cause environmental degradation, including illegal deforestation and forest fires. The Environmental Policy of the State of Tocantins (State Law No. 261/1991) aims to protect, conserve, and restore natural resources, while promoting sustainable development. It designates the Tocantins Nature Institute (NATURATINS) as the agency responsible for implementing the state's environmental policy. Monitoring, territorial planning, and forest management actions for the protection of forests are carried out under the provisions of this law.

In addition to the 2021-2025 PPCDIF, Tocantins developed the **Sectoral Plan for Adaptation to Climate Change and Low Carbon Emission in Tocantins Agriculture (Plano ABC+/TO 2020-2030).** This plan serves as a sectoral instrument for climate change adaptation and low-carbon agricultural development, supporting the implementation of the PEMC/TO.

This initiative aligns with both the PNMC and the Brazilian Forest Code, promoting sustainable practices and contributing to emission reductions. It also complements the federal government's ABC+ Plan (2020-2030).

The **ABC+/TO Plan** includes targets for the recovery of degraded pastures, in line with the Forest Code's provisions on the restoration of APPs and RL areas. It further promotes environmentally sustainable agricultural practices, such as integrated crop-livestock-forest, which enhances soil conservation and biodiversity preservation. This approach follows the guidelines set by the National Policy for Crop-Livestock-Forest Integration (Federal Law No. 12.805/2013).

The 2019 **Tocantins Competitive and Sustainable Strategy (ESTOCS)** outlines the State's pathway to low-GHG emissions development through 2040. This initiative emphasizes rational resource use, intergenerational responsibility, improved quality of life, and climate

CANCUN SAFEGUARD A

change mitigation. Serving as an implementation tool for the PEMC and PEPSA, the Strategy operates under four pillars: Economic, Social, Environmental, and Infrastructure. Both the Economic and Environmental pillars include provisions to implement the PEPSA, aimed at promoting conservation in the Cerrado and Amazon regions, where socio-biodiversity products are harvested. The Environmental pillar also mandates the full implementation of the Forest Code and related legislation.

These actions demonstrate how state entities are aligning their efforts with national and state laws and policies to implement the legal framework for REDD+.

OUTCOME INDICATOR: Design and implementation of REDD+ actions have been consistent with or complemented the objectives of the national and if applicable, subnational, forest policies/programs.

Describe how this indicator is met.

To effectively monitor progress towards this indicator during the 2020-2024 crediting period, the state of Tocantins set the following objectives:

- **Achieving Eligibility for REDD+ Results-Based Payments through CONAREDD+**: the state aimed to meet the eligibility requirements established by the National REDD+ Commission (CONAREDD+) in Resolution No. 07/2022 for receiving payments for REDD+ results recognized by Brazil under the UNFCCC.
- **Means of verification**: CONAREDD+ resolution officially declaring the state as an eligible entity.
- **Updating the State's Sectoral Plans (PPCDQ and ABC/TO Plan**): the state planned to update its PPCDQ and ABC/TO Plan, which are vital instruments under the National Climate Change Policy, in alignment with national forestry policies, programs, and plans.
- **Means of verification**: Official documents detailing the updated plans and the Executive Order or equivalent enacting the plans.
- **Approving the State Policy on Payment for Environmental Services (PEPSA):** the state aimed to pass the Tocantins State Policy on Payment for Environmental Services (PEPSA) into law, in alignment with the National Policy on Payment for Environmental Services (PNPSA).

CANCUN SAFEGUARD A

- **Means of verification**: The final approved and published PEPSA law in the Official Gazette of the State of Tocantins.
- **Systematically monitoring compliance with Cancun Safeguards during the design and implementation of the State's REDD+ actions**: by the first half of 2025, the state plans to draft its first summary of information on safeguards and to establish a safeguards information system (SIS).
- **Means of verification**: Meeting minutes from COEMA (State Council for the Environment) approving the first summary, along with the final published summary. SIS usage reports, screenshots, and/or access links to the SIS online platform.

THEME A.2 Consistency with the objectives of relevant international conventions and agreements

STRUCTURAL INDICATOR: Domestic and if applicable, subnational, legal framework or policy (or national REDD+ strategy or action plan) for REDD+ actions recognize and promote the application of ratified relevant international conventions and agreements in the context of design and implementation of REDD+ actions.

Describe how this indicator is met.

Under the **Brazilian Federal Constitution**, the rights and guarantees it articulates do not exclude other rights and guarantees arising from international treaties to which Brazil is a party (Article 5, Paragraph 2, CRFB/1988).

Also, according to the Brazilian Federal Constitution, it is the President of the Republic's exclusive responsibility to enter international treaties, conventions, and acts, subject to ratification by the National Congress (article 84, VIII, of the CRFB/1988). After ratification by the National Congress, international agreements are incorporated into Brazilian law (Article 49, CRFB/1988). Once ratified, these instruments are binding for all federated entities (Union, States, Federal District, and Municipalities).

CANCUN SAFEGUARD A

Brazil has ratified **numerous international agreements on environmental protection**.[3] As a member of the International Tropical Timber Organization (ITTO), Brazil promotes sustainable tropical forest management and is a signatory to other critical treaties.

The implementation of these treaties is reflected in the national regulatory framework, highlighted by the following key instruments:

- **The Constitution of the Federative Republic of Brazil (CRFB/1988)** establishes a framework for environmental preservation across the country, recognizing certain territories and their components as specially protected. It designates the Amazon Forest as a national heritage and safeguards the fundamental rights of Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers. Additionally, it provides guidelines for Brazil's engagement in international treaties, ensuring that such commitments align with the Constitution's principles and objectives.
- **Federal Law No. 12.187/2009, National Policy on Climate Change (PNMC):** One of this policy's key directives is Brazil's commitments under the UNFCCC, the Paris Agreement, and any additional climate agreements Brazil may endorse. It advocates for the strategic use of financial and economic mechanisms to foster mitigation and adaptation initiatives, promote development models that ensure low GHG emissions, and safeguards the ecological functions of natural ecosystems.
- **Federal Law No. 12.651/2012**: The Forest Code reaffirms Brazil's sovereign commitment to protecting native vegetation and the integrity of the climate system for the well-being of present and future generations.
- **The National System of Protected Areas (*Sistema Nacional de Unidades de Conservação*, or SNUC, Federal Law No. 9.985/2000)** and its regulation (Federal Decree No. 4.340/2002) regulates aspects of the Convention on Biological Diversity (CBD) in Brazil.
- **The Biodiversity Law (Federal Law No. 13.123/2015),** its regulatory decree (Federal Decree No. 8.772/2016), and the **National Biodiversity Policy** (Federal Decree No.

[3] United Nations Framework Convention on Climate Change (UNFCCC), ratified in 1994; International Convention on Biological Diversity (CBD), ratified in 1994; International Tropical Timber Agreement, ratified in 1998; United Nations Convention to Combat Desertification and Mitigate the Effects of Drought (UNCCD), ratified in 1997; United Nations Declaration on the Rights of Indigenous Peoples; International Labour Organization (ILO) Convention 169, signed in 2002 and entered into force on July 25, 2003, when the country submitted the instrument of ratification to the ILO Executive Director; Kyoto Protocol, ratified in 2005; Paris Agreement, ratified in 2016.

CANCUN SAFEGUARD A

4.339/2002) regulate aspects of the CBD in Brazil, regarding the protection of Brazilian biodiversity.

- **The National Policy for the Sustainable Development of Traditional Peoples and Communities (*Política Nacional de Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais* or PNPCT, Federal Decree No. 6.040/2007)** is directly related to ILO Convention 169, and it seeks to guarantee traditional peoples' and communities' rights over their territories and access to the natural resources they traditionally use for their physical, cultural, and economic wellbeing.
- **National Policy for Territorial and Environmental Management of Indigenous Lands (*Política Nacional de Gestão Territorial e Ambiental de Terras Indígenas* or PNGATI, Federal Decree No. 7.747/2012)**: directly linked to ILO Convention 169 and the United Nations Declaration on the Rights of Indigenous Peoples, PNGATI acknowledges the rights of indigenous peoples concerning environmental services due to the protection, conservation, restoration, and sustainable use of natural resources they foster on their lands (art. 3, XII).

At the state level, the laws and policies framing the Jurisdictional REDD+ Program of Tocantins align with the conventions and agreements ratified by Brazil, explicitly referencing some of these instruments. The **PEMC/TO** (State Law No. 1.917/2008), in its Article 1, stipulates that the State must consider the following in implementing the policy:

- The UNFCCC, the Kyoto Protocol, and the subsequent decisions issued in conformity with the PEMC/TO (II, f).
- The significant social, economic, and environmental impacts of climate change and their effects, particularly concerning the State's forest reserves, according to national and international governmental and intergovernmental reports related to climate change (III); and
- The broad dissemination of the information and proposals consolidated by the Conference of the Parties to the UNFCCC and the Kyoto Protocol, as well as the encouragement of voluntary projects aimed at using the CDM and other mechanisms and/or certified carbon credit market regimes that effectively contribute to stabilizing GHG concentrations (VI).

The **PEMC/TO** further mandates that REDD+ initiatives (referred to as RED at the time of the Law) must comply with applicable national and international legislation and must provide accurate, measurable, and long-term benefits to the environment and the quality of life for Tocantins (Article 7º, sole paragraph). Furthermore, it stipulates that carbon credits owned by the state may be traded in the Brazilian Emissions Reduction Market (MBRE) or other national

CANCUN SAFEGUARD A

or international markets that adhere to national and international laws (Article 19, sole paragraph).

The PEPSA (State Law No 4.111/2023), according to its Art. 2, sole paragraph and Art. 7, item IV, is based on the UNFCCC, the United Nations Framework Convention on Combating Desertification (UNCCD), the International Convention on Biological Diversity (CBD), Convention 169 of the International Labor Organization (ILO); the United Nations Declaration on the Rights of Indigenous Peoples and other applicable international standards and principles.

The State also maintains a **State System of Protected Areas (*Sistema Estadual de Unidades de Conservação* or SEUC, Law No. 1.560/2005)**, a governance scheme designed to organize and protect the state's natural areas, adhering to the CBD principles regarding biodiversity conservation. SEUC is integrated into the National System of Protected Areas (*Sistema Nacional de Unidades de Conservação* or SNUC), strengthening the country's protected areas network and contributing to the national conservation targets established under the CBD.

Regarding international commitments undertaken by the state, Tocantins has been a member of the **Governors' Climate and Forests Task Force (GCF Task Force)** since 2014 and has signed the Rio Branco Declaration committing to reducing emissions from deforestation and forest degradation by up to 80% until 2020, dependent upon receiving financial support. The signatories to the Declaration reaffirmed these commitments in 2020.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to design and implement REDD+ actions that recognize and promote the application of ratified relevant international conventions and agreements.

Describe how this indicator is met.

At the national level, public institutions have been using mandates, procedures, and resources to design and implement REDD+ actions that recognize and promote the application of relevant ratified international conventions and agreements.

The **PNMC** and the commitments undertaken by Brazil at the international level are implemented through the **following instruments**:

- **The Action Plans for Prevention and Control of Biome Deforestation** serve as the primary instruments for implementing public policies in Brazil that contribute to reducing deforestation and forest degradation. Notably, the **PPCDAm** designates the Amazon Fund as a significant financial mechanism to implement its actions. In Brazil, national

CANCUN SAFEGUARD A

and state-level plans to combat deforestation and forest fires are the primary tools of the PNMC. These plans and their actions are pivotal for achieving REDD+ results and fulfilling Brazil's NDC under the Paris Agreement. Consequently, these instruments were integrated at the tactical-operational level within the legal framework and public policies of the **ENREDD+**. They were documented in Brazil's Fourth National Communication submitted to the UNFCCC in December 2020.

- **Sectoral Plan for Climate Change Adaptation and Low Carbon in Agriculture and Animal Husbandry aimed at Sustainable Development (2010-2020), the ABC Plan and ABC+ Plan (2020-2030)** under the responsibility of the Ministry of Agriculture and Livestock (*Ministério da Agricultura e Pecuária* or MAPA). These Plans seek to strengthen the national agricultural sector based on sustainable, resilient, and productive systems, serving as scientifically grounded solutions for adaptation and mitigation. They contribute to Brazil's commitment to reducing emissions, projecting a reductions scenario in the agricultural sector ranging from 133.9 to 162.9 million tonnes of CO_2 equivalent.
- **The National Climate Change Fund**, created to finance initiatives to mitigate and adapt to climate change. It is managed by the Ministry of Environment and Climate Change (*Ministério do Meio Ambiente e Mudanças Climáticas* or MMA).
- **Brazil's National REDD+ Strategy (*Estratégia Nacional de REDD*+ or ENREDD**+), created by Ordinance MMA 370/2015 and managed by the MMA, aims to mitigate climate change by eliminating illegal deforestation, conserving and restoring forest ecosystems, and fostering a sustainable, low-carbon, forest economy. The strategy aims to generate economic, social, and environmental benefits. The **National REDD+ Commission (*Comissão Nacional para REDD*+ or CONAREDD+)** is responsible for ENREDD+s coordination, monitoring, and evaluation.

At the state level, Tocantins' forest management policies are aligned with and complementary to the objectives of international conventions and agreements to which Brazil is a signatory. The State has voluntarily developed several instruments to contribute towards Brazil's international environmental commitments:

- **The Plan for the Prevention and Control of Deforestation and Wildfires (PPCDQ), originally spanning 2009 to 2014 (1st version) and 2015 to 2020 (2nd version), has evolved into the Plan for the Prevention and Control of Deforestation and Forest Fires (PPCDIF) for 2021 to 2025**. This plan, coordinated by SEMARH, is the primary framework for addressing deforestation and forest fires in Tocantins through prevention, enforcement, monitoring, and funding efforts. Its implementation is supported by a coalition of agencies, including SEAGRO, NATURATINS, RURALTINS, SICS, SEFAZ, SEPLAN, the Tocantins Military Fire Brigade (*Corpo de Bombeiros Militar do Tocantins*

CANCUN SAFEGUARD A

or CBMTO), CEPDEC, and CeMAF/UFT. The Fire Committee (*Comitê do Fogo*) has also been active since 1998, coordinating efforts to prevent, monitor, and control fire use.

- In line with the goals of the National ABC Plan, an instrument derived from the PNMC, the **State of Tocantins has implemented the State Plan for Low Carbon Agriculture (ABC/TO Plan, State Decree No. 5.000/2014).** Building on this initiative, the State has updated its framework and launched the **ABC+/TO Plan 2020-2030**, aligned with the National ABC+ Plan. Tocantins has committed to reducing between 8.5 and 10.5 million tonnes of CO_2 equivalent by 2030 under the ABC+/TO Plan. The plan is aligned with international climate conventions and treaties and Brazil's NDC through goals to reduce GHG emissions, namely: (i) Limiting emissions by 80-95% below 1990 levels: achieving a 40% reduction in annual deforestation rates in the Cerrado compared to the 1999-2008 average by 2020, decreasing deforestation in the Amazon by 80% from the baseline level, and eliminating illegal deforestation by 2050; and (ii) Contributing to the national goal of restoring 20 million ha of deforested land.
- The state participates in the **Forest Management and Fire Prevention Program in Brazil**, which includes all states in the Legal Amazon. This initiative aligns with the sustainable development goals and forest conservation targets outlined in international agreements.

OUTCOME INDICATOR: Design and implementation of REDD+ actions have been consistent with or has complemented the objectives of identified, ratified and relevant international conventions and agreements.

Describe how this indicator is met.

The State's REDD+ actions have been implemented by Tocantins in alignment with Brazil's international commitments on climate change mitigation and sustainable development.

- **Updating the State's Sectoral Plans (PPCDQ and ABC/TO Plan**): the state planned to update its PPCDQ and ABC/TO Plan into the PPCDIF and the ABC+/TO Plan, which are vital instruments under the National Climate Change Policy, in alignment with national forestry policies, programs, and plans.
- **Means of verification**: Official documents detailing the updated plans and the Executive Order or equivalent enacting the plans.
- **Achieving Eligibility for REDD+ Results-Based Payments through CONAREDD+**: the state aimed to meet the eligibility requirements established by the National REDD+

CANCUN SAFEGUARD A

Commission (CONAREDD+) in Resolution No. 07/2022 for receiving payments for REDD+ results recognized by Brazil under the UNFCCC.

- **Means of verification**: CONAREDD+ resolution officially declaring the state as an eligible entity.

- **Contributing to the development of Brazil's Safeguard Information System (SISREDD+)**: the State endeavored to contribute to Brazil's safeguards reporting to the UNFCCC, a requirement for the country to obtain and receive payments for REDD+ results.

- **Means of verification**: Official correspondence or other records demonstrating the state's contributions to the national SISREDD+.

CANCUN SAFEGUARD B

THEME B.1: Respect, protect, and fulfill the right of access to information

STRUCTURAL INDICATOR: Participants have in place a legal framework, policies and/or programs for accessing information related to REDD+ actions in accordance with international human rights standards, and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

In Brazil, the right of access to information is enshrined in the **Constitution (Articles 5, XIV, and XXXIII)** and regulated by **Federal Law No. 12.527/2011 (Access to Information Act, *Lei de Acesso à Informação* or LAI)**, thereby applying to all levels of government, including the State of Tocantins. It establishes mechanisms that allow any individual or legal entity, without the need for justification, to access public information from government agencies and entities regarding any policy, program, project, action, or budget.

The law applies to all three branches of government at the federal, state, and municipal levels, as well as the Federal District, including **Courts of Auditors (*Tribunais de Contas*)** and the **Public Prosecutor's Office (*Ministério Público*).** Nonprofit private organizations are also required to disclose information regarding the receipt and use of public funds.

To ensure effective access to public information, legislation on the right to information must adhere to a set of standards based on the best international practices. Among these principles, the following stand out:

CANCUN SAFEGUARD B

- **Access to information must be the default**: All public information should be accessible unless there is a clear and justified reason for confidentiality.
- **Confidentiality only in exceptional cases**: Information can only be withheld in exceptional circumstances, which must be explicitly defined by law, such as matters of national security.
- **Specific and limited exceptions**: Restrictions on access to information must be narrowly defined, and any decision to deny access must be justified in accordance with the law.
- **No justification required from the petitioner**: Individuals seeking information are not required to state why or how they intend to use it.
- **Free provision of information**: Information must be provided at no cost, except for reimbursement of reproduction expenses.
- **Proactive disclosure**: Information of collective and general interest should be disclosed proactively (active transparency).
- **Facilitated access through clear procedures and deadlines**: Procedures must be established to simplify and expedite access to requested information (passive transparency).

The federal government also has the **Open Data Policy (*Política de Dados Abertos do Poder Executivo Federal*),** enacted through Federal Decree No. 8.777/2016, which sets objectives and guidelines for the disclosure of government data.

The State of Tocantins is subject to the constitutional provisions guaranteeing access to information (Articles 5, XIV and XXXIII; Article 37, § 3, II; and § 2 of Article 216 of the Federal Constitution of 1988). This includes compliance with the LAI provisions (Federal Law No. 12.527/2011).

Article 45 of the LAI, in accordance with the **concurrent legislative authority or competency** outlined in Article 24 of the Federal Constitution, establishes that States, the Federal District, and municipalities are responsible for defining specific rules through their own legislation, provided they comply with the general standards set forth in the law. However, the general provisions of the LAI have immediate applicability, and the absence of specific state-level regulations does not prevent the law from being enforced or exempt administrative entities from compliance.

Article 9, Paragraph 3, Item "b," of the Tocantins State Constitution provides that legislation will govern how users can participate in direct and indirect public administration, regulating access to administrative records and information regarding government actions. In the context of the

CANCUN SAFEGUARD B

right to an ecologically balanced environment, the **State Constitution (Article 100, Section V)** assures access to information about sources and causes of pollution and environmental degradation.

State Law No. 2.286/2010 governs the dissemination of data and information by State bodies and entities via the Internet. It establishes the Transparency Portal of the State of Tocantins. State Decree No. 4.839/2013 regulates the LAI within the State.

State Law No. 1.917/2008 (which establishes the **PEMC/TO**) recognizes participation, transparency, and access to information as fundamental principles. It emphasizes the importance of voluntary, active participation opportunities in the prevention of global climate change (Article 1, sole paragraph, item II). The dissemination of information regarding the programs and actions covered by this law is also a guiding principle of the policy (Article 3, items V and VI).

The PEPSA includes, among its specific instruments (Article 5, items IX, X, and XI, of State Law No. 4.111/2023):

- Ensuring transparency in information related to the provision of environmental services, allowing for societal participation.
- Establishing data and information management mechanisms necessary for the implementation and monitoring of actions to fully execute environmental services.
- Recognizing and distributing, in a fair, equitable, and transparent manner, the benefits arising from its implementation.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources for accessing information related to REDD+ actions in line with relevant ratified international conventions and agreements and/or domestic and if applicable, subnational, legal framework, policies, and programs for accessing information.

Describe how this indicator is met.

Several federal platforms and tools that ensure the transparency of forest and environmental policies and relevant and apply to Tocantins' Jurisdictional REDD+ Program:

- The **official data platform for the National System of Nature Protected Areas (SNUC)** encompasses the **Brazilian protected areas' dashboard**, including those located in Tocantins.

CANCUN SAFEGUARD B

- The **open data portal of the Ministry of the Environment and Climate Change (MMA)**, where environmental information published by the Ministry is available in an open format and accessible through various panels distributed across the portal.
- The **National Forest Information System (*Sistema Nacional de Informações Florestais,* or SNIF)** is the authoritative source for forest data and information in the country, providing essential support for policies, programs, and projects that harmonize the use and conservation of Brazil's forests.
- The **Interactive Environmental Compliance Dashboard (*Painel Interativo da Regularização Ambiental*),** a digital tool created by the Brazilian Forest Service (*Serviço Florestal Brasileiro* or SFB), gathers and makes available data regarding intentions to enroll in state Environmental Compliance Programs (*Programas de Regularização Ambiental* or PRAs). It also offers a detailed overview of CAR registrations, Legal Reserve deficits, Areas of Permanent Preservation (*Áreas de Preservação Permanente* or APPs), and surpluses of native vegetation areas in properties.
- The **environmental legislation portal** provided by the MMA.

Public entities in Tocantins have created and implemented mechanisms to ensure access to information regarding the policies and programs they implement, including the following:

- The **General Comptroller's Office of the State of Tocantins** provides an **access to information portal** that includes information on governmental competencies, organizational charts, job roles and their holders; data on state initiatives, projects, and activities; results of inspections, audits, and financial reporting; details on the allocation and transfer of financial resources, budgetary and financial execution, tenders, contracts, procurements, information on personnel, fiscal management, news, laws, decrees, and guides on access to information.
- The State Government of Tocantins provides a comprehensive transparency platform (**Tocantins Government – Transparency Portal**) and an access to information portal (**Tocantins Government – Access to Information**), where data on public servants, revenue, expenditures, bids and contracts, assets, and more are disclosed.
- SEMARH maintains its own access to information portal (SEMARH – Access to Information) and a dedicated page for its jurisdictional REDD+ program (**SEMARH – REDD+** and **SEMARH – Jurisdictional REDD+ of Tocantins**).
- The **State Forum on Climate Change (*Fórum Estadual de Mudanças Climáticas,* or FEMC, State Decree No. 4.550/2012)** is tasked with overseeing and monitoring the State's Jurisdictional REDD+ Program, which includes raising awareness and mobilizing society to engage in discussions and make informed decisions about the challenges

CANCUN SAFEGUARD B

posed to the State by climate change; tracking and assessing the PEMC/TO; among other duties.

- Alternative means of disseminating information to multiple stakeholders include governance forums, where consultation and deliberation occur concerning the design and implementation of forest and climate policies in the State. The minutes of the meetings of the **State Forum on Climate Change (FEMC/TO)** available for the years 2011 to 2022 can be found on SEMARH's website, as well as the minutes of the ordinary and extraordinary meetings of the COEMA/TO, held since 1995 **(SEMARH – Minutes).** The website also contains the resolutions issued by **COEMA/TO since 2003**.
- The **State's General Ombudsman's Office (*Ouvidoria-Geral do Estado*),** via the Fala.BR platform, is another avenue provided to the public to access information. A Guide to Accessing the Comptroller is also available on the website. State Law No. 4.111/2023 establishes this Office as the primary channel for receiving complaints, grievances, suggestions, to facilitate and mediate conflicts related to the PEPSA and the Jurisdictional REDD+ Program.
- **Normative Instruction TCE No. 008/2012 of the Tocantins State Court of Auditors (*Tribunal de Contas do Estado,* or TCE)** stipulates access to information through the implementation of the LAI within the TCE's jurisdiction, as governed by State Decree No. 4.839/2013. This encompasses access to data and information related to the accountability of public administrators and other individuals responsible for managing public funds, assets, and resources. Access to information regarding the financial accountability and execution of the State REDD+ Program is guaranteed through this channel.
- Regarding access to information on land use and other territorial aspects of the State, the State Department of Planning and Budget (www.to.gov.br) (*Secretaria do Planejamento e Orçamento* or SEPLAN) provides access to a **platform with information on the state's Ecological-Economic Zoning (*Zoneamento Ecológico-Econômico* or ZEE),** containing technical reports, maps, satellite images, and studies used in the ZEE's proposal. The thematic and cartographic data produced by the State's Ecological-Economic Zoning Program (*Programa Estadual de ZEE*) are incorporated into the Geographic Database of Tocantins. This database is managed and updated by the Directorate of Territorial and Socioeconomic Information Management (*Diretoria de Gestão de Informações Territoriais e Socioeconômicas*) team, with tools from the Geoprocessing Laboratory of the Territorial Zoning Management Department (*Laboratório de Geoprocessamento da Gerência de Zoneamento Territorial*).
- Access to geographic information and spatial data generated within the scope of the State ZEE Program is provided through the **Geoportal of the State Department of**

CANCUN SAFEGUARD B

Planning and Budget, a digital platform that organizes and shares geographic information and spatial data produced by the Department.

- Regarding access to information related to the CAR, the CAR website provides monthly reports, details on property disputes by municipality, a thematic vector base, images, and more. This is a crucial resource for information about the state's native vegetation coverage.
- The **Fire Committee**, established by State Decree No. 645/1998, offers various information and data regarding the committee's activities on its website, including a **Guidebook**, data on the frequency of forest fires, and reports.
- **NATURATINS** provides a page for Access to Information, Services, strategic plans, manuals and guides.
- Information regarding State protected areas can be found here at the **GESTO platform**.
- **The Cartographic System of the State of Tocantins (*Sistema Cartográfico do Estado do Tocantins* or SCE),** established by State Decree No. 5.459/2016 (central.to.gov.br), consists of the Cartography Commission of the State of Tocantins (*Comissão de Cartografia do Estado do Tocantins* or CECAR), the Cartographic Plan of the State of Tocantins (*Plano Cartográfico do Estado do Tocantins* or PCE), and the Spatial Data Infrastructure of the State of Tocantins (*Infraestrutura de Dados Espaciais do Estado do Tocantins* or IDE). Among the core principles of the SCE are the transparency of the PCE and the dissemination of state geospatial data. Further information on the Cartography Commission, specifically its legal basis and minutes of meetings, can be found on the SEPLAN website (Cartography Commission of the State of Tocantins).

OUTCOME INDICATOR: The public has been aware of and exercised the right to seek and receive official information on REDD+ actions, as well as on how safeguards have been addressed and respected.

Describe how this indicator is met.

As a public policy of the State of Tocantins, the Jurisdictional REDD+ Program is subject to the entire national and state regulatory framework on access to information. **The public administration** (secretariats and agencies) is therefore **required to provide information to the public on all REDD+ actions being implemented**, as demonstrated in the process indicator for this topic.

CANCUN SAFEGUARD B

To comply with and monitor this outcome indicator during the crediting period (2020-2024), the state planned to:

- **Ensure that the public can request and receive information about the Jurisdictional REDD+ program and the State's REDD+ actions through existing federal and state access to information channels**, such as the Transparency Portal and the Ombudsman Management System (*Sistema de Gestão de Ouvidoria* or SGO) which are part of the Integrated Platform for Ombudsman Services and Access to Information Requests (*Plataforma Integrada de Ouvidoria e Pedidos de Acesso à Informação*), accessible via the online portal Fala.BR.
  - **Means of verification**: Reports providing detailed information on access to information requests regarding the Tocantins' Jurisdictional REDD+ Program. These reports will include data such as the number of requests, response times, the agencies and entities involved, the average response time, and the most frequently requested topics, among other relevant details.
- **Provide training to employees of the State Ombudsman System** to effectively manage information access requests and inquiries related to the Jurisdictional REDD+ program.
  - **Means of verification**: Records of training sessions, including presentation materials and attendance lists.
- **Engage in discussions, decision-making, and share information on the design and implementation of the Jurisdictional REDD+ Program through multistakeholder governance platforms**, such as the State Environmental Council (COEMA/TO), the State Climate Change Forum (FEMC/TO), and, once established, the State Validation and Transparency Commission (CEVAT).
  - **Means of verification**: Meeting minutes published on the webpages of the multistakeholder governance platforms.
- **Develop and implement a Consultation Plan** for all stakeholders regarding the key elements of the Jurisdictional REDD+ Program, including the benefit-sharing framework. Before and during the consultation meetings and workshops, conduct training sessions, share information about state REDD+ activities, and promote the program's access to information channels.
  - **Means of verification**: official document detailing the Consultation Plan.
- **Develop and publicize information** on the implementation of the State's REDD+ actions through **a dedicated Jurisdictional Program website, hosted by SEMARH's**

CANCUN SAFEGUARD B

website. This platform will also contain links to the Ombudsman's access to information channels.

- **Means of verification**: Link to the Jurisdictional Program's website.

THEME B.2: Promote transparency and prevention of corruption, including the promotion of anti-corruption measures

STRUCTURAL INDICATOR: Participants have in place anti-corruption measures and measures to promote transparency reflecting the principles of rule of law, proper management of public affairs and public property, integrity, transparency, and accountability, and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

Brazil is a signatory to **several international anti-corruption agreements**, including:

- **The United Nations Convention against Corruption,** ratified through Legislative Decree No. 348/2005, and enacted by Presidential Decree No. 5.687/2006.
- **The Organization of American States (OAS) Convention to strengthen mechanisms for preventing, detecting, punishing, and eradicating corruption**, approved by Legislative Decree No. 152/2002, and enacted by Presidential Decree No. 4.410/2002.
- **The Organization for Economic Cooperation and Development (OECD) Convention on Combating Bribery of Foreign Public Officials in International Business Transactions**, ratified on June 15, 2000, and enacted by Presidential Decree No. 3.678/2000.

Domestically, Brazil has established a robust legal framework to promote transparency and combat corruption. Key legislation includes:

- **The Brazilian Constitution and the Access to Information Act** (Federal Law No. 12.527/2011), which ensure access to public information.
- **Complementary Law No. 101/2000** (Fiscal Responsibility Law or *Lei de Responsabilidade Fiscal*), updated by Complementary Law No. 131/2009 and Complementary Law No. 156/2016, enhancing fiscal transparency.
- **Federal Law No. 12.846/2013 (Anti-Corruption Law or *Lei Anticorrupção***), which holds companies accountable for acts of corruption against public administration.

CANCUN SAFEGUARD B

- **Complementary Law No. 101/2000**, known as the Fiscal Responsibility Law, establishes public finance regulations aimed at ensuring fiscal responsibility and includes provisions applicable to all federative entities. Complementary Law No. 131/2009 introduced new provisions to the Fiscal Responsibility Law, requiring the real-time availability of detailed information on the budgetary and financial execution of the Union, States, Federal District, and Municipalities. Complementary Law No. 156/2016 further revised the reporting obligations established by the Fiscal Responsibility Law.
- **Federal Law No. 12.846/2013** governs the strict civil and administrative liability of companies for harmful acts against national or foreign public administration. In addition to meeting Brazil's international commitments, the law addresses a gap in the country's legal system by holding corrupt entities accountable. The law provides for penalties such as administrative fines and the use of leniency agreements, which enable quicker compensation for damages while facilitating ongoing investigations. Federal Law No. 12.846/2013 is regulated by Decree No. 8.420/2015.

Brazil also has specific legislation defining **sanctions for acts of administrative misconduct**, as outlined in § 4 of Article 37 of the Federal Constitution (Federal Law No. 8.429/1992, as amended by Federal Law No. 14.230/2021). Federal Decree No. 9.203/2017 establishes the Governance Policy for the Federal Public Administration (*Política de Governança da Administração Pública Federal*). Article 3 of the decree outlines key principles, including responsiveness, integrity, reliability, regulatory improvement, accountability, responsibility, and transparency.

At the subnational level, the State of Tocantins is subject to international treaties and agreements ratified by the Federal Government and incorporated into Brazilian law, as outlined above. Additionally, it is bound by federal legislation directly applicable to the states.

- **Tocantins was the first state to regulate the Anti-Corruption Law through State Decree No. 4.954/2013, which was later replaced by State Decree No. 6.105/2020.** This decree governs the strict administrative liability of legal entities for acts against the State Public Administration, as provided under Federal Law No. 12.846/2013.
- **State Law No. 3.608/2019,** which amends Law No. 3.421/2019, addresses the organization of the Direct and Indirect Administration of the State Executive Branch and establishes related provisions. It introduces a structure that includes a Management Division for Corruption Prevention, Research, and Strategic Information (Gerência de Prevenção à Corrupção, Pesquisa e Informações Estratégicas).
- **State Law No. 1.917/2008** recognizes participation, transparency, and information as key principles of the **PEMC/TO**, as specified in Article 1, sole paragraph, item II, "e".

CANCUN SAFEGUARD B

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to apply anti-corruption measures and measures to promote transparency in the implementation of REDD+ actions and the distribution of REDD+ benefits, according to relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal frameworks; the measures should reflect principles of the rule of law, proper management of public affairs and public property, integrity, transparency, and accountability.

Describe how this indicator is met.

The **governance framework of PEPSA** for planning, managing, regulating, organizing, implementing, communicating, and ensuring transparency in environmental services is seamlessly integrated into the State's administrative structure. This arrangement involves State agencies that hold primary responsibility for performing, validating, monitoring, and overseeing public policies in collaboration with environmental service providers.

The Tocantins Jurisdictional REDD+ Program, therefore, adopts a governance structure, comprising a consortium of selected, well-equipped institutions tasked with implementing the necessary actions to operate the Program and its regulatory instruments, each within their designated spheres of authority.

The Figure 7-1 illustrates the **Tocantins' Jurisdictional REDD+ Program's governance framework**:

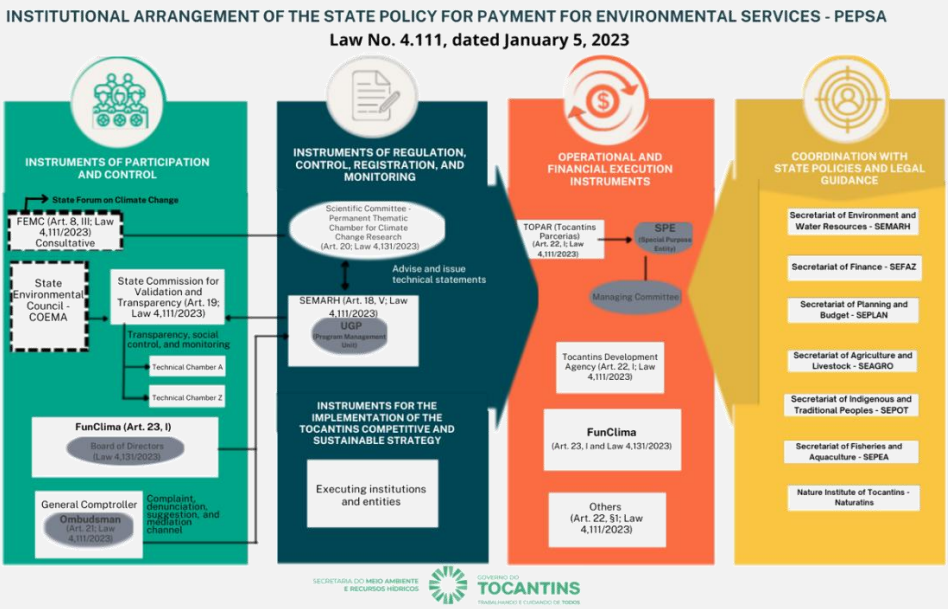

Figure 7-1. Institutional Arrangement of the state Policy for Payment for Environmental Services.

The **Jurisdictional Program's institutional framework** is organized around the following key areas of responsibility:

- **Public Policy Regulation;**
- **Implementation, Execution, and Monitoring of Program Activities.**

The **State Department for the Environment and Water Resources (SEMARH**), as the governmental entity tasked with implementing the State's environmental policies, holds the authority to issue regulations and actively participate in governance forums established under these policies.

The **primary governance forums** within this framework include:

- **State Council for the Environment (COEMA/TO);**
- **State Forum on Climate Change (FEMC/TO);**
- **Permanent Technical Chamber for REDD+ (*Câmara Técnica Permanente de REDD+*).**

These forums provide technical advice to support SEMARH and guide the State's regulatory and management decisions.

CANCUN SAFEGUARD B

Additionally, the **Climate Fund's Board of Directors (*Conselho Diretor do FunClima*)** is responsible for defining the Fund's strategic direction. This involves ensuring that financial resources are allocated effectively to meet the priorities and objectives outlined in the State's climate change policies. The Board evaluates projects submitted for funding to verify their alignment with these guidelines, adherence to environmental safeguards, and contribution to the implementation of the Competitive and Sustainable Tocantins Strategy (*Estratégia Tocantins Competitivo e Sustentável*, or ESTOCS).

The **Board of the Climate Fund** ensures equitable representation, comprising 13 members: seven from the public sector and six from organized civil society, including representatives of Indigenous peoples, traditional communities, family farmers, academia, and the private sector. The Board's structure, composition, responsibilities, and governance framework will be formalized in a State Decree currently under review by COEMA/TO and will be further detailed in the Board's Internal Bylaws.

The Program also designates specific **implementation entities**. These institutions are tasked with carrying out the activities defined in the Program's design, ensuring adherence to its performance and monitoring requirements. In addition to governmental entities, private-sector and third-sector organizations with proven capacity to execute relevant actions, initiatives, and projects will also be involved.

The Tocantins Jurisdictional REDD+ Program employs a **public-private governance model** to maximize benefits and foster synergistic collaboration among diverse stakeholders. This model ensures balanced representation between public sector entities (e.g., State Departments and agencies) and private entities (e.g., institutes, non-governmental organizations, associations, companies). This approach promotes inclusive participation while enhancing the effectiveness and reach of the Program.

In this context, the **State Validation and Transparency Commission (*Comissão Estadual de Validação e Acompanhamento*, or CEVAT)** serves as the board or committee with advisory and decision-making authority, aiming for transparency and social control of the Program. Decisions or resolutions are shared among public sector representatives and various societal sectors, ensuring equity in the final decision-making process. These are deliberative spaces where diverse experiences facilitate the proposal and more efficient performance in managing the Program.

In Tocantins, there are both **internal and external control bodies**, such as the **State Court of Auditors (*Tribunal de Contas do Estado do Tocantins*, or TCE/TO)** and the **State Office of the Comptroller General (*Controladoria Geral do Estado do Tocantins*, or CGE/TO),** which, according to the principle of federal symmetry, have the same responsibilities at the

CANCUN SAFEGUARD B

state level as the **Federal Accounting Court** and the **Office of the Federal Comptroller General (CGU).** The **TCE/TO** and the **CGE/TO** are tasked with overseeing the enforcement of laws and ensuring compliance with anti-corruption practices while also playing crucial roles in controlling public resource use, including those allocated to state REDD+ actions. In this framework, the **State Validation and Transparency Comission (CEVAT)** functions as an advisory and decision-making body, fostering transparency and social accountability within the Program. Its decisions and resolutions are collaboratively developed by representatives from both the public sector and various societal groups, ensuring equity in the decision-making process. These deliberative forums provide an inclusive space for diverse perspectives to contribute, fostering proposals and strategies to enhance the Program's performance.

Tocantins benefits from robust internal and external oversight mechanisms. **The State Court of Auditors (TCE/TO)** and the **Office of the State Comptroller General (CGE/TO)** operate in alignment with federal oversight bodies, such as the **Federal Court of Auditors (*Tribunal de Contas da União*, or TCU)** and the **Office of the Federal Comptroller General (*Controladoria Geral da União*, or CGU).** These institutions are responsible for enforcing laws, combating corruption, and monitoring the use of public funds, including those allocated to REDD+ actions.

The **State Public Prosecutor's Office (*Ministério Público Estadual do Tocantins*, or MPE/TO)** also plays a critical role by addressing corruption, protecting public assets, and upholding administrative integrity. Together, these entities form the foundation for transparency and accountability in the State's governance processes.

The **TCE/TO** is the primary authority responsible for monitoring the use of public funds by the State and its municipalities, including state-operated enterprises and public-private partnerships. It oversees the activities of SEMARH, the Climate Fund, and any other state entities involved in implementing REDD+ actions. This includes evaluating fund management, resource allocation, and compliance with legal mandates to ensure the institutions achieve their intended objectives.

Tocantins Carbono, a public-private partnership managing jurisdictional carbon credit transactions – assets owned by the State – is also subject to TCE/TO oversight. This includes scrutiny of funds raised for generating verified carbon credits and, in the future, revenue from their commercialization. This comprehensive oversight ensures the responsible management of resources and alignment with state goals for climate action and sustainability.

The **CGE/TO** holds the authority to audit and oversee all operations involving the State's public funds, including those managed by SEMARH and other entities implementing REDD+ actions at the state level. As the internal control body for the State's Executive Branch, CGE/TO

CANCUN SAFEGUARD B

monitors budgetary, financial, and asset management processes, both for direct and indirect state administration. This includes oversight of all State Departments, agencies, and public funds involved in REDD+ implementation, such as the Climate Fund, which was specifically established to manage REDD+ resources.

To ensure transparency, all state public entities, including **SEMARH**, produce annual accountability reports, which are subject to review by CGE/TO. These reports are publicly accessible on the CGE/TO website, facilitating broader oversight and accountability.

In preparation for the sale of carbon credits generated by the Tocantins Jurisdictional REDD+ Program, SEMARH engaged with various state departments, including oversight bodies like the MPE/TO, TCE/TO, and CGE/TO, to determine appropriate procedures. To formalize this process, a **Working Group** was established under Joint Ordinance No. 69**/2022**, and published in the Official Gazette of the State of Tocantins No. 6114 on June 24, 2022 (page 37).

This Working Group comprises: The Secretary of Finance (*Secretário da Fazenda*), the Secretary of Planning and Budget (*Secretário de Planejamento e Orçamento*), the Secretary of Partnerships and Investments (*Secretário de Parcerias e Investimentos*), the State Attorney General (*Procurador-Geral do Estado*), the Chairman of the State of Tocantins Real Estate Holding, Investment, and Partnerships Company (*Tocantins Parcerias*), and the Chief Secretary of CGE/TO (*Secretário Chefe da Controladoria-Geral do Estado*)

The group's primary mandate is to conduct a technical and legal analysis to evaluate the feasibility of adapting or creating an economic mechanism for facilitating jurisdictional carbon credit transactions. This mechanism would enable SEMARH, representing the State Government, to engage in carbon credit transactions with companies proposing business opportunities, ensuring legal compliance and economic viability.

The State Government of Tocantins operates a comprehensive Transparency Portal (**Government of Tocantins – Transparency Portal**), providing public access to a wide range of data. This includes information on state employees, revenue, expenditures, tenders, agreements, assets, management reports, and **accountability documentation** from various state departments and agencies, including those involved in implementing REDD+ actions.

As part of its commitment to transparency and citizen engagement, the state's REDD+ Strategy, which encompasses various state policies and programs, is supported by existing citizen assistance services provided through the Office of the State Ombudsman General. In addition, **SEMARH**, as the administrative agency coordinating the REDD+ Program, maintains

CANCUN SAFEGUARD B

a **dedicated** Ombudsman Office channel to address inquiries and complaints related to the Program efficiently.

To align with the requirements of the current legal framework, SEMARH has established a webpage dedicated to sharing information about the Jurisdictional Program. This platform serves as a resource for stakeholders to access Program-related updates. However, a more comprehensive dedicated website is currently under development for the REDD+ Program. This **upcoming website** will feature extensive information, including:

- Emissions quantification data
- Safeguards compliance updates
- Emissions reduction plans
- Benefit-sharing implementation details
- Evidence and documentation of consultation processes
- Information on participation in decision-making processes related to the Program's implementation

This dedicated platform aims to enhance transparency, foster public participation, and ensure accessibility to critical information about the Program.

In addition to the existing state anti-corruption control structures, Law 4.111/2023 established the State Validation and Transparency Committee (*Comissão Estadual de Validação e Transparência* or CEVAT) as a multi-sectoral platform to promote social oversight of programs, subprograms, and special projects within the framework of the PEPSA. This committee enhances transparency and accountability in the implementation of environmental services initiatives.

To further ensure technical accuracy and scientific integrity, the PEPSA has also formed a **Scientific Committee**, which operates through the **Permanent Thematic Chamber for Climate Change Research (*Câmara Temática Permanente de Pesquisas em Mudanças Climáticas*).** This body is a part of the FEMC/TO and was formally established by FEMC/TO's Decision No. 01/2021. Its primary purpose is to uphold the technical rigor of the State's emissions reduction estimates, providing a solid scientific foundation for REDD+ actions and other climate-related initiatives.

These structures collectively strengthen the State's governance framework, ensuring transparency, technical excellence, and social control in implementing climate and environmental policies.

CANCUN SAFEGUARD B

OUTCOME INDICATOR: The distribution of REDD+ benefits related to the implementation of the REDD+ results-based actions have been carried out in a fair, transparent, and accountable manner, as per relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The State has not yet conducted transactions involving jurisdictional carbon credits or received payments for REDD+ results achieved during the crediting period covered by this document. Consequently, **no benefit-sharing has occurred yet**.

To ensure that, in the future, the benefit-sharing of Tocantins' Jurisdictional REDD+ Program is carried out fairly, transparently, and responsibly, in alignment with ratified international conventions and agreements, as well as national and state legal frameworks, the State has planned the following actions:

- **Develop a benefit-sharing proposal** using the “stock-flow” methodology, analysing different land tenure categories to identify and acknowledge each stakeholder group’s contribution to jurisdictional results.
- **Means of verification**: Document outlining the benefit-sharing proposal.
- **Present a benefit-sharing proposal to stakeholders** through a comprehensive and participatory consultation process, including discussions in FEMC/TO.
- **Means of verification**: Consultation Plan document and records of consultation meetings and workshops. FEMC/TO’s meeting minutes.
- **Finalize the State Policy on Payment for Environmental Services (PEPSA) and pass it into law**, with the conceptual framework and guidelines for defining the Jurisdictional REDD+ Program’s benefit-sharing strategy.
- **Means of verification**: Final version of the approved and published PEPSA in the Official Gazette of the State of Tocantins.
- **Establish the State Validation and Transparency Commission (CEVAT),** a participatory body with the authority to monitor and oversee the implementation of benefit-sharing, **and the Climate Fund**, a public financial mechanism responsible for managing resources from the sale of J-REDD+ carbon credits and facilitating the implementation of benefit-sharing.

CANCUN SAFEGUARD B

- **Means of verification**: Law creating the Climate Fund published in the State's Official Gazette, draft Decree regulating CEVAT and the Climate Fund, and COEMA meeting minutes documenting discussions and approval for these regulations.

- **Develop and share information about the design and implementation of the state's Jurisdictional REDD+ Program's benefit-sharing proposal and mechanism** on the program's dedicated website.

- **Means of verification**: link to the information on benefit-sharing proposal on the Program's website, including minutes and records of decisions on benefit distribution, and comprehensive documentation of the criteria and methodologies applied to benefit-sharing.

- **Engage in discussions, decision-making, and share information about the design and implementation of the Jurisdictional REDD+ Program benefit-sharing mechanism**, through multistakeholder governance platforms such as the State Environmental Council (COEMA/TO).

- **Means of verification**: COEMA/TO's meeting minutes.

THEME B.3: Respect, protect, and fulfill land tenure rights

STRUCTURAL INDICATOR: Participants have in place a legal framework, policies or programs for the recognition, inventorying, mapping, and security of customary and statutory land and resource tenure rights where REDD+ actions are implemented, and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The State of Tocantins employs a robust legal framework to recognize, inventory, map, and safeguard customary and legal **land tenure rights** in its territory, including in the areas where its REDD+ actions are implemented. This framework is grounded in international conventions and other instruments ratified by Brazil, as well as a comprehensive body of national and subnational legislation.

Brazil is a signatory to international treaties[4] that guarantee **the right to property**, provided it fulfills its social function. For example, the Universal Declaration of Human Rights explicitly

[4]Universal Declaration of Human Rights, American Convention on Human Rights, International Labour Organization Convention No. 169, enacted through Federal Decree No. 10.088/2019.

CANCUN SAFEGUARD B

addresses this in Article 17, which states: “1. Everyone has the right to own property alone as well as in association with others; and 2. No one shall be arbitrarily deprived of their property.”

Brazil is a signatory to international treaties that ensure property rights, provided they fulfill their social function. For example, the Universal Declaration of Human Rights explicitly states in Article 17 that: 1. Everyone has the right to own property alone as well as in association with others. and 2. No one shall be arbitrarily deprived of his property.

The country has also ratified the American Convention on Human Rights (Pact of San José, Costa Rica), which, in Article 21, addresses the right to private property, stating: “1. Everyone has the right to the use and enjoyment of their property. The law may regulate such use and enjoyment in the interest of society; 2. No one shall be deprived of their property except upon payment of fair compensation, for reasons of public utility or social interest, and in the cases and according to the procedures established by law; and 3. Usury and any other form of exploitation of one person by another shall be prohibited by law.”

The **Brazilian Federal Constitution, in Article 5, Sections XII and XIII,** guarantees property rights while prescribing the social function of land. This social function is deemed fulfilled when rural property simultaneously satisfies the following requirements, as specified by law with established criteria and levels of compliance: 1. Rational and appropriate use of the land; 2. Proper use of available natural resources and environmental preservation; 3. Compliance with labor regulations; and 4. Uses that promotes the well-being of both owners and workers.

In Brazil, land ownership rights are protected by specific legislation aimed at promoting social justice in rural areas, protecting the environment, and ensuring the sustainable agricultural development. These rights are established under the following regulatory framework, which outlines the procedures and instruments for achieving these goals:

- **Land Statute (Federal Law No. 4.504/1964, *Estatuto da Terra*):** Regulates the rights and obligations related to rural properties, focusing on implementing agrarian reform and promoting agrarian policy.
- **Federal Law No. 8.629/1993:** Regulates constitutional provisions on agrarian reform, as outlined in Chapter III, Title VII, of the Federal Constitution. It stipulates that rural properties failing to fulfill their socio-environmental function are subject to expropriation in accordance with constitutional provisions (Article 2). It also establishes general rules for the settlement of rural workers (Article 17 and others).
- **Federal Law No. 10.406/2002 (Brazilian Civil Code, *Código Civil Brasileiro*):** Serves as the main legislative instrument for Property Law (Book III), covering possession, real rights, property, easements, usufruct, use, and more. It reinforces the socio-

CANCUN SAFEGUARD B

environmental function of property, stating (Article 1,228) that property rights must align with their economic and social purposes.

- **Federal Law No. 11.952/2009:** Addresses land tenure regularization for occupations on federal lands within the Legal Amazon region.
- **Federal Law No. 13.465/2017:** Covers rural and urban land tenure regularization, liquidation of credits granted to agrarian reform settlers, and tenure regularization in the Legal Amazon. It introduces mechanisms to improve the efficiency of processes for the alienation of federal property and includes other provisions.
- **Federal Law No. 6.001/1973 (Indigenous Statute, *Estatuto do Índio*):** Article 2, Section IX, mandates that the federal, state, and municipal governments, along with their indirect administrative agencies, ensure Indigenous peoples and communities the permanent ownership of their lands, granting them the exclusive right of usufruct over all natural resources and utilities found on those lands, as guaranteed by the Constitution.
- **Federal Decree No. 7.747/2012:** Establishes the National Policy for Territorial and Environmental Management of Indigenous Lands (PNGATI) to ensure and promote the protection, recovery, conservation, and sustainable use of the natural resources in Indigenous lands. It includes guidelines for protecting the territorial and environmental rights of both demarcated and non-demarcated Indigenous lands.
- **Federal Law No. 11.952/2009 (Legal Land Program, *Programa Terra Legal*):** Prohibits the alienation of or granting of real rights of use over lands traditionally occupied by Indigenous populations (Article 4, Section II), public forests (per Federal Law No. 11.284/2006), protected areas, or areas undergoing administrative proceedings for the creation of a protected area. It also states that lands occupied by *Quilombola* or traditional communities collectively using the area will be regularized according to specific regulations (Article 4, Paragraph 2).
- **Federal Decree No. 4.887/2003:** Regulates the procedures for identifying, recognizing, delimiting, demarcating, and titling lands occupied by *Quilombola* communities.
- **SNUC Law (Federal Law No. 9.985/2000):** Defines two categories of Protected Areas – Extractive Reserves and Sustainable Development Reserves (*Reservas Extrativistas* and *Reservas de Desenvolvimento Sustentável*) – designed to ensure conditions for the preservation and enhancement of traditional populations' lifestyles and sustainable use of natural resources. Article 42 ensures compensation or indemnification for traditional populations residing in protected areas where their presence is not permitted, requiring the government to relocate them under mutually agreed-upon conditions.

CANCUN SAFEGUARD B

- **Forest Code (Federal Law No. 12.651/2012):** Defines small family rural properties or possessions (Article 3, V) as those operated through the personal labor of family farmers or rural entrepreneurs, including agrarian reform settlements and projects, in compliance with Law No. 11.326/2006.
- **Federal Decree No. 6.040/2007:** Establishes the Policy for the Sustainable Development of Traditional Peoples and Communities (*Política para o Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais*), emphasizing the recognition, strengthening, and guarantee of their territorial, social, environmental, economic, and cultural rights while respecting their identity, organizational structures, and institutions.
- **National Environmental Policy (Federal Law No. 6.938/1981):** Introduced Ecological-Economic Zoning as an instrument for integrating environmental management and economic development at the federal and state levels, regulated by Federal Decree No. 4.297/2002.

Given that REDD+ actions, such as those in **PPCDIF** and the **ABC+/TO Plan**, among other related state policies and programs, are implemented on a statewide scale, all forms of land tenure, both customary and legal, must be inventoried and mapped. Considering the constitutional division of legislative powers, the State is required to adhere to the general regulations set forth by the Federal Government, particularly those aimed at safeguarding the rights of Indigenous peoples, *Quilombola* communities, traditional peoples and communities, and family farmers.

The **Constitution of Tocantins** mandates the protection of the traditions, customs, and practices of Indigenous groups, integrating them into the state's cultural and environmental heritage, as stipulated in Article 138, paragraph 3. The State's agricultural, land, and agrarian reform policy prioritizes rural settlement in parcels that ensure subsistence and encourage family labor, pursuant to the provisions of Article 120, paragraph 5.

According to State Law No. 87/1989, the **Tocantins State Land Institute (ITERTINS)** is responsible for implementing the state's agrarian policy. The regularization of *Quilombola* lands in Tocantins falls under the jurisdiction of ITERTINS, as established by state legislation.

State Law No. 1.560/2005, which establishes the **State System of Nature Protected Areas (SEUC/TO)**, mandates the development of strategies to reconcile the presence of individuals within State protected areas until their definitive relocation action is undertaken, should it be in the best interest of the communities involved (Art. 56 paragraph 2). To formalize this process, Commitment Agreements (*Termos de Compromisso*) are negotiated between the parties.

CANCUN SAFEGUARD B

The **Tocantins Rural Development Institute (RURALTINS)** was established under State Law No. 20/1989. Among its responsibilities is the initiation of land regularization processes throughout the State's territory, specifically in cases where there is a direct interest from the State (Art. 4, VIII).

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to recognize, inventory, map, and secure statutory and customary rights to lands and resources relevant to the implementation of REDD+ actions in line with relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

Given that the PPCDIF, the ABC+/TO Plan, and other related state policies and programs that contain the State's REDD+ actions, are implemented statewide, **all forms of land tenure in the State's territory – both customary and legal – are documented and mapped by relevant state agencies**.

The process of identifying, inventorying, mapping, and safeguarding customary and legal rights to lands and resources that are essential for the implementation of REDD+ actions involves distinct procedures for each type of territory, which are briefly outlined below:

- **Indigenous Lands:** The delimitation and identification of Indigenous lands are carried out by FUNAI (the official governmental body in Brazil responsible for promoting and safeguarding Indigenous rights). This process involves conducting anthropological, cartographic, environmental, and land tenure studies. Based on these studies, FUNAI issues an Ordinance (*Portaria*) that defines the boundaries of the Indigenous territory. The land demarcation is then ratified by a presidential decree, after which the Indigenous land is officially recorded in the real estate registry office.
- ***Quilombola* Territories:** The Palmares Cultural Foundation (*Fundação Cultural Palmares*), a federal institution dedicated to promoting and preserving Afro-Brazilian culture across the country, certifies the community as a quilombo remnant. Following this certification, the National Institute for Colonization and Agrarian Reform (*Instituto Nacional de Colonização e Reforma Agrária* or INCRA), the federal agency responsible for land management, prepares the Technical Identification and Delimitation Report (*Relatório Técnico de Identificação e Delimitação* or RTID). This report includes cartographic, land tenure, agronomic, ecological, geographical, socioeconomic, historical, and anthropological data collected both in the field and from public and private institutions.

CANCUN SAFEGUARD B

- **Land Titling:** INCRA grants the communal land title to the representative association of the *Quilombola* community, and the title is officially recorded in the real estate registry office.
- **Extractive Reserves (*Reserva Extrativista*, or RESEX) and Sustainable Development Reserves (*Reserva de Desenvolvimento Sustentável*, or RDS):** All protected areas, including RESEX and RDS, are established by government authorities – federal, state, or municipal – following comprehensive technical studies, public consultations, and the development of a participatory management plan.
- **Grant of Real Right of Use (Concessão *de Direito Real de Uso*, or CDRU):** Residents are granted a collective right to use the land, governed by a contractual agreement with the municipal, state, or federal government.
- **State Land Settlements:** The identification and selection of settlement areas are carried out by the state land agency (ITERTINS). When necessary, the agency expropriates the land to create a settlement, or it issues a grant of real right of use to the settlers, or it issues a land ownership title to the settlers.
- **Collective Rural Environmental Registry (*CAR coletivo*):** In accordance with MMA's Normative Instruction No. 2, from May 6, 2014, areas and territories designated for collective use, whether titled or granted to traditional peoples or communities, must be registered in the CAR (Rural Environmental Registry) by the competent authority or institution responsible for their management, or by the representative entity owning or granted the rural properties. These entities may avail themselves of the benefits provided under paragraph 3 of Article 8 of Federal Decree No. 7.830/2012. For territories designated for collective use that are titled or granted to traditional peoples or communities, the agreement for registration must be executed between the competent authority and the representative institution or entity of the traditional peoples or communities. Indigenous Lands listed in the SICAR database, as indicated by the FUNAI, are considered registered under the CAR. The environmental agency will review the submitted documentation and evaluate the environmental compliance of the area. Once approved, the collective CAR is issued.

At a state level, the **Ecological-Economic Zoning (ZEE)** serves as a strategic instrument for territorial planning and management, governed by Federal Decree No. 4.297/2002. Its primary aim is to support economic development on environmentally sustainable grounds. In support of the development of the state-wide ZEE, an assessment was conducted to recognize Indigenous territories, *Quilombolas* and other mapped traditional peoples. A diagnosis of the State's anthropic environment was also performed.

CANCUN SAFEGUARD B

Access to geographic information and spatial data generated under the State ZEE Program is facilitated through the **Geoportal of the State Department of Planning and Budget (SEPLAN)**, a digital platform designed by the organization to disseminate geographic information and spatial data produced by the Department.

The State of Tocantins maintains a CAR Registry that helps to identify the land tenure rights of various groups within its territory.

The **Competitive and Sustainable Tocantins Strategy (ESTOCS)**, serving as a declaration of intent for low-emission development from 2020 to 2040, identifies key focal points and priority themes aimed at upholding the PIQPCTAF' land rights, namely: 2.2. Land Regularization: 2.2.1. Ensure that property rights and customary land uses are upheld; 2.2.2. Ensure the regularization of rural properties through the issuance of definitive ownership titles; and 2.2.3. Promote the acceleration of agrarian planning and land regularization processes.

For the **Tocantins Jurisdictional REDD+ Program**, the identification conducted for the zoning proposal regarding Indigenous peoples and traditional communities in the state is supplemented with updated data from databases maintained by the institutions responsible for each land category – namely INCRA, FUNAI, Fundação Palmares, CAR, and ITERTINS. This comprehensive data is used to recognize efforts in conserving carbon stocks and reducing emissions.

OUTCOME INDICATOR: Stakeholders had access to, use of, and control over land and resources in line with relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework, and no involuntary relocation took place without the free, prior, and informed consent (FPIC) of any indigenous peoples and local communities (or equivalent) concerned.

Describe how this indicator is met.

No Indigenous peoples, *Quilombola,* or other traditional communities in Tocantins were involuntarily resettled during the crediting period (2020-2024).

The State has taken or planned the following actions to identify relevant stakeholders within its territory and to ensure their control over land and resources:

- **Identify lands occupied by Indigenous peoples, *Quilombolas*, and other traditional communities within the state of Tocantins.**

CANCUN SAFEGUARD B

- **Means of verification**: data from the Palmares Foundation, and the State of Tocantins Ecological-Economic Zoning (ZEE) proposal ("Characterization of Social Actors" and "Traditional Populations" technical reports).

- **Define Special Zones in the State's ZEE proposal** to protect the land rights of indigenous peoples (Special Zones for Indigenous Territories, *Zonas Especiais de Terras Indígenas*, or ZETIs) and traditional communities (Special Zones for Sustainable Use Protected Areas, or *Zonas Especiais de Unidades de Conservação uso Sustentável*)

- **Means of verification**: State of Tocantins Ecological-Economic Zoning (ZEE) proposal.

- **Recognize the rights of traditional communities in Tocantins to access and harvest the babassu coconut**, ensuring the sustainable use of the resource.

- **Means of verification**: **State Law No. 1.959/2008**, the **Phytoecological Region Mapping and Forest Inventory of Tocantins** (identifies areas where the babassu coconut occurs), State of Tocantins Ecological-Economic Zoning (ZEE) proposal ("Traditional Populations" technical report).

- **Develop and submit the Jurisdictional Program's benefit-sharing strategy for consultations with all stakeholder groups**. This strategy will define subprograms that will operationalize the program's benefit-sharing strategy according to the stakeholders' interests, needs, and demands, while respecting their legal and customary land rights.

- **Means of verification**: Jurisdictional Program's Benefit-Sharing Strategy and Consultation Plan.

- **Involve representatives of Indigenous peoples, *Quilombolas*, traditional communities, and family farmers in the various phases of the Jurisdictional Program's design and implementation** to ensure these social groups can monitor and verify that their rights have been protected during the program's implementation and that no involuntary relocations occur because of REDD+ activities.

- **Means of verification**: Minutes of meetings of multistakeholder governance platforms (FEMC/TO, COEMA/TO, etc.) and of the Safeguards Working Group.

THEME B.4: Respect, protect, and fulfill access to justice.

STRUCTURAL INDICATOR: Participants have in place procedures for guaranteeing non-discriminatory and non-cost prohibitive access to dispute resolution mechanisms at all relevant

CANCUN SAFEGUARD B

levels, and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

Article 5 of the Federal Constitution outlines an extensive array of individual and collective rights and duties, emphasizing access to justice and citizen empowerment. Key provisions include:

- **Clause XXXV**: Guarantees access to justice, ensuring that the law cannot exclude any injury or threat to a right from judicial review.
- **Clause XXXIV**: Establishes the right to petition governmental authorities for the protection of rights or to report illegality and abuse of power, as well as the right to obtain certificates from public offices for safeguarding rights and clarifying personal matters.
- **Clause LXXIII**: Affirms the right to file class-action lawsuits, empowering citizens to address collective grievances.
- **Clause LXXIV**: Guarantees free legal assistance to individuals who demonstrate financial insufficiency, ensuring equal access to justice, as initially provided by Federal Law No. 1.060/1950.

Under **Article 22**, the Federal Constitution grants the Federal Government exclusive authority to legislate on procedural law. Key laws have been enacted under this authority, including:

- **Federal Law No. 4.717/1965**: Governs Popular Actions (*Ação Popular*), allowing citizens to challenge acts harmful to public property, morality, administrative integrity, or the environment.
- **Federal Law No. 7.347/1985**: Regulates the Public Civil Action (*Ação Civil Pública*) for addressing liabilities related to damages to the environment, consumer rights, and assets or rights with artistic, aesthetic, historical, touristic, and landscape significance, among other provisions.

These mechanisms collectively strengthen the framework for reporting, investigating, and resolving disputes while ensuring the protection of collective and individual rights in Brazil.

Beyond these judicial remedies, the **Public Prosecution Service (*Ministério Público*)** and the **Public Defenders' Service (*Defensoria Pública*)** play pivotal roles in preventing and mediating conflicts while ensuring access to justice.

The **Public Defenders' Service** is a permanent institution integral to the judicial function of the State. Its mandate includes safeguarding the legal order, the democratic regime, and the

CANCUN SAFEGUARD B

inalienable social and individual interests, as established in Article 127 of the Federal Constitution of 1988.

Article 134 of the Federal Constitution of 1988 defines the **Public Defenders' Service** as an essential institution to the judicial function of the State, tasked with providing legal counsel and representation at all levels for those in need, as stipulated in Article 5, LXXIV. This constitutional foundation frames the role of public defenders through broadly inclusive principles such as essential legal aid, indigence, and comprehensive assistance. It ensures that the perception of this institution transcends an individualistic scope, emphasizing its critical role in promoting equality and access to justice for all.

Public Ombudsman Offices play a crucial role in administrative processes and proceedings, acting as channels for citizens to submit suggestions, commendations, requests, complaints, and reports of misconduct. In the public sector, the ombudsman's office serves as a "bridge" between citizens and public administration, encompassing agencies, entities, and officials at federal, state, and municipal levels.

The federal government maintains a dedicated webpage for services provided by **Ombudsman Offices (**Ouvidorias.gov**)**. This site offers detailed guidance on how to submit various types of communications and provides access to Fala.BR, an integrated platform for submitting requests for information, complaints, grievances, suggestions, commendations, and proposals for simplification. The platform directs communications to the appropriate public authorities and entities and is available 24/7 at **https://falabr.cgu.gov.br**.

Ombudsman Offices are governed by **Federal Law No. 13.460/2017**, which establishes guidelines for the participation, protection, and defense of the rights of public administration service users. Articles 14 (II) and 15 of the law require Ombudsman Offices to prepare an annual management report. This report must detail the number of complaints received in the previous year, the reasons for these complaints, an analysis of recurring issues, and the actions taken by public administration to address the reported concerns.

These mechanisms for conflict prevention and mediation are established at the federal and state levels. In Tocantins, they are represented by the **State Public Defender's Office (*Defensoria Pública do Estado do Tocantins*, DPE/TO)** and the **State Public Prosecutor's Office (*Ministério Público do Estado do Tocantins* or MPE/TO)**. These entities are actively involved in procedures to ensure non-discriminatory access to dispute resolution without prohibitive costs, as prescribed in Articles 6, VI, b49, and 53 and subsequent articles of the State Constitution.

CANCUN SAFEGUARD B

The **State Decree No. 6.312/2021**, regulates Federal Law No. 13.460/2017, at the Executive Branch of the State of Tocantins' level. It establishes the **State Executive Branch Ombudsman System (*Sistema de Ouvidoria do Poder Executivo Estadual*).**

Federal and state Ombudsman offices are the designated authorities to receive and address complaints regarding non-compliance with **REDD+ safeguards, the implementation of REDD+ actions, and the allocation of funds from REDD+ results-based payments**. **Federal and State Public Prosecutors' and Public Defenders' Offices** are responsible for representing individuals (when applicable) and/or the public in judicial and administrative proceedings regarding conflicts that may arise from the design and implementation of REDD+ actions.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to facilitate access to dispute resolution mechanisms for stakeholders involved in the implementation of REDD+ actions including judicial and/or administrative procedures for legal redress, which, inter alia, provide access for indigenous peoples, local communities, or equivalent stakeholders with a recognized legal interest.

Describe how this indicator is met.

The State of Tocantins is supported by the **State Public Defender's Office (DPE/TO)** and the **State Public Prosecutors' Office (MPE/TO),** as outlined in Articles 6, VI, b, in conjunction with Article 53 and subsequent articles, and Articles 49 and following of the State Constitution. These institutions implement procedures to ensure non-discriminatory access to justice and eliminate prohibitive costs associated with dispute resolution. Additionally, the **State has an Ombudsman Office** connected to the **State Office of General Internal Affairs (*Assuntos Internos Gerais do Estado*).**

The **Public Prosecutor's Office of the State of Tocantins (MPE/TO)** comprises approximately 12 attorneys, 100 prosecutors, and an auxiliary staff of 400 permanent employees, supplemented by interns and outsourced personnel. The institution operates with 20 prosecutors, housed in an institutional headquarters and an annex building. It maintains a presence in all districts of the State and serves 139 municipalities. More information about the services of the Public Prosecutor's Office can be found here.

The **Public Defender's Office of the State of Tocantins (DPE/TO)** is constitutionally mandated to provide free legal advice and representation across various areas of law for individuals unable to afford legal fees without jeopardizing their own livelihood. The DPE-TO

CANCUN SAFEGUARD B

operates in 42 municipalities across Tocantins, strategically organized into nine regional offices to ensure broad coverage and accessibility.

The **Office of the State Ombudsman (*Ouvidoria-Geral do Estado*, or OGE/TO)** has been publishing annual reports since 2013 and various channels for public access, including WhatsApp, email, phone number, and a free phone number.

Through Decree No. 6.312/2021, the Tocantins government regulated Federal Law No. 13.460/2017, establishing the **Ombudsman System for the State Executive Branch (*Sistema de Ouvidoria do Poder Executivo Estadual*).** The Normative Instruction of the State Comptroller General No. 04/2021 delineates the execution of duties by the OGE/TO and the sector-specific units within the Executive Branch's Ombudsman System (Se-OUV), outlining objectives for improvement and performance assessment. Under this arrangement, the State Ombudsman is responsible for developing a unified methodology for evaluating public services.

The State of Tocantins employs a centralized management model, anchored by the Office of the State Ombudsman and its affiliated agencies. These agencies, including **SEMARH**, have designated representatives to address the specific needs and priorities of each institution. This approach ensures streamlined oversight and tailored responses to enhance service delivery and user satisfaction. A **dedicated Ombudsman for the Tocantins Jurisdictional REDD+ Program** will be integrated into this system, under the scope of the Office of the State Comptroller General (CGE/TO), with the authority to:

- Receive and process:
  - statements made by the beneficiaries of the Jurisdictional REDD+ Program and the providers of environmental services;
  - information reports on the implementation of the Program.
- Implement measures to meet legal deadlines and ensure high-quality responses to feedback from public service users;
- develop, implement, and assess strategies and initiatives related to ombudsman activities;
- Actively or passively gather data on user satisfaction and the quality of the Program's implementation;
- Analyze received or collected data to generate insights for improving service delivery and addressing deficiencies;
- Ensure the relevance, timeliness, and quality of information included in the Service Charters of agencies participating in the Program;

CANCUN SAFEGUARD B

- Provide advisory assistance to SEMARH, the Program administrator, on matters within its jurisdiction.

OUTCOME INDICATOR: Resolved disputes, competing claims, and effective recourse and remedies have been provided when there was a violation of rights, grievance, dispute or claim related to the implementation of REDD+ actions.

Describe how this indicator is met.

To address and monitor this indicator during the crediting period (2020-2024), the state plans to accomplish the following:

- **Sign Terms of Commitment and cooperation agreements with traditional communities living in state protected areas** to establish coexistence rules and avoid land and resource use disputes.
  - **Means of verification**: Signed Terms of Commitment and Cooperation Agreements.
- **Equip the State's Ombudsman System** to handle complaints, claims, and requests about the Jurisdictional REDD+ program, and to coordinate with the appropriate entities to address conflict resolution needs.
  - **Means of verification**: records of training sessions, including presentations and attendance lists.
- **Establish a dedicated Ombudsman channel** to enhance public participation in the Jurisdictional Program. This channel will include mechanisms for receiving feedback through Fala.BR, the online platform of the Office of the Comptroller General.
  - **Means of verification**: Ombudsman report for the Jurisdictional REDD+ Program of Tocantins, detailing the number of information requests and corresponding responses from SEMARH.

CANCUN SAFEGUARD C

TEMA C.1: Identify the Indigenous peoples and local communities, or equivalent.

STRUCTURAL INDICATOR: Participants have in place a legal framework, policies or procedures for the identification or self-identification of indigenous peoples, and local communities, or equivalent, and for the respect of their rights, and these are anchored in relevant ratified

CANCUN SAFEGUARD C

international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The Federal Government is a signatory to **several key treaties** related to the identification and rights of **Indigenous Peoples, *Quilombola* Communities, Traditional Peoples and Communities, and Family Farmers (PIQPCTAF):**

- **International Labor Organization's Convention No. 169**, ratified by Federal Decree No. 10.088/2019, ensures rights such as self-determination, leadership, and the right to Free, Prior, and Informed Consultation for Indigenous and tribal peoples.
- **The Convention on the Protection and Promotion of the Diversity of Cultural Expressions**, enacted by Federal Decree No. 6.177/2007, guarantees the right to cultural lifestyles and sociocultural expressions.
- **The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)** and **the American Declaration on the Rights of Indigenous Peoples by the Organization of American States (OAS)**, which establish guidelines for national policies and legislation concerning Indigenous peoples, including the rights to self-determination and Free, Prior, and Informed Consent.

The **Federal Government** has established a regulatory framework to define and implement general standards essential for recognizing and protecting the rights of the PIQPCTAF. Key elements of this framework include:

- **Article 231 of the 1988 Brazilian Federal Constitution** recognizes Indigenous peoples for their unique social organization, customs, languages, beliefs, and traditions, as well as their inherent rights to the lands they have traditionally occupied. The Federal Government is responsible for demarcating, protecting, and ensuring respect for all Indigenous assets through the National Indigenous Peoples Foundation (FUNAI), established by Federal Law No. 5.371/1967.
- **Indigenous Statute (*Estatuto do Índio*, Federal Law No. 6.001/1973):** specifies in Article 2, Sections IV and X that it is the responsibility of the Federal Government, States, Municipalities, and their respective indirect administrative agencies to: 1. Ensure that Indigenous peoples have the freedom to choose their means of livelihood and subsistence; and 2. Guarantee Indigenous peoples the full exercise of their civil and political rights.

CANCUN SAFEGUARD C

- **Indigenous Lands Act (*Lei das Terras Indígenas*,** Federal Decree No. 1.775/1996**)**: outlines the administrative procedures for requesting the demarcation of Indigenous lands and implementing related measures
- **National Policy on Family Farming and Rural Family Enterprises (*Política Nacional da Agricultura Familiar e das Empresas Familiares Rurais***, Federal Law No. 11.326/2006**)**: It establishes guidelines for the development of public policies targeting family farming and rural family enterprises, emphasizing the importance of the Family Farming Unit (*Unidade Familiar de Produção Agrária*, or UFPA) and the National Registry of Family Agriculture (*Cadastro Nacional da Agricultura Familiar*, or CAF) as essential components.
- **National Policy for the Sustainable Development of Traditional Peoples and Communities (*Política Nacional para o Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais*,** Federal Decree No. 6.040/2007**):** The policy defines and recognizes "Traditional Peoples and Communities" as culturally distinct groups that self-identify as such and possess unique forms of social organization. It also establishes and recognizes Traditional Territories as essential spaces for the cultural, social, and economic continuity of these peoples and communities, in accordance with Article 231 of the Constitution, Article 68 of the Transitional Constitutional Provisions Act, and related regulations.
- **Federal Decree No. 4.887/2003**: regulates the procedures for identifying, recognizing, delimiting, demarcating, and titling lands occupied by remnants of *Quilombola* communities, as referenced in Article 68 of the Transitional Constitutional Provisions Act.
- **National Policy for Territorial and Environmental Management of Indigenous Lands (*Política Nacional de Gestão Territorial e Ambiental de Terras Indígenas* or PNGATI, Federal Decree No. 7.747/2012)**: the policy aims to promote the sustainable and integrated management of Indigenous lands, addressing both environmental protection and the socio-economic development of Indigenous communities.
- **Legal Land Program (*Programa Terra Legal*, Federal Law No. 11.952/2009):** establishes provisions for the land tenure regularization of occupied territories within federal lands in the Legal Amazon region. The law prohibits the sale or granting of usage rights for lands that are traditionally inhabited by Indigenous populations, designated as public forests or protected areas, or subject to administrative proceedings aimed at creating protected areas. Additionally, lands occupied by *Quilombolas* or other traditional communities that collectively use the area will be regularized according to specific rules, with relevant provisions applied where applicable.

CANCUN SAFEGUARD C

- **The Forest Code (Federal Law No. 12.651/2012)**: defines a small rural property or rural family holding in Article 3, V as land operated through the personal labor of a family farmer or rural family entrepreneur, including settlements and agrarian reform projects, and in compliance with the provisions of Article 3 of Law No. 11.326/2006.
- **CONAREDD+ Resolution No. 15/2018**: according to the Brazilian interpretation of the Cancun Safeguards within the national context, the rights guaranteed by national legislation and relevant international obligations for Indigenous Peoples, Traditional Peoples, and Communities in the context of REDD+ actions include: self-determination for Indigenous peoples and traditional communities; recognition of their sociocultural autonomy; protection of their ways of living, being, and organizing, and the appreciation and strengthening of their leadership.

Due to the constitutional system of competencies, the State is required to adhere to the general standards established by the federal government, as outlined in federal provisions – particularly those that guarantee the rights of Indigenous peoples, *Quilombolas*, traditional peoples and communities, and family farmers. Accordingly, the State of Tocantins has issued laws and regulations to reinforce these federal rules within its territory:

- **The Constitution of Tocantins, in Article 138, paragraph 3**, expressly stipulates that the traditions, customs, and practices of the Indigenous groups within the state are part of its cultural and environmental heritage and, as such, shall be protected.
- **State Law No. 1.560/2005** establishes the State System of Nature Protected Areas (SEUC/TO) and defines traditional populations as communities whose livelihoods are based on sustainable natural resource use systems, developed over generations and adapted to local ecological conditions. The system emphasizes community participation in the creation, implementation, and management of protected areas.
- **PEMC/TO (State Law No. 1.917/2008)**: Among the objectives of the Tocantins State Policy on Climate Change, Environmental Conservation, and Sustainable Development is: VII – Promoting initiatives to enhance environmental education about the impacts and consequences of climate change, as well as disseminating alternative practices to reduce greenhouse gas emissions. These efforts target the population of Tocantins, with a particular focus on traditional communities, underserved communities, and public school students.
- **Tocantins State Cultural System (*Sistema de Cultura do Tocantins*, or SC/T, State Law No. 3.252/2017)**: Article 15 establishes that cultural rights are recognized as human rights, and Article 17 mandates that the State must ensure the right to cultural identity and diversity through public policies. These policies aim to promote and protect

CANCUN SAFEGUARD C

Tocantins' cultural heritage, advance and safeguard Indigenous, popular, Afro-Brazilian, and *Quilombola* cultures, and foster initiatives focused on recognizing and valuing the cultures of other social, ethnic, and gender groups, in accordance with Articles 137 and 138 of the State Constitution.

- **The State Policy for the Sustainable Use of Golden Grass and Buriti (*Política Estadual de Uso Sustentável do Capim-Dourado e do Buriti*, State Law No. 3.594/2019)**: Traditional peoples and communities are defined as culturally distinct groups with unique social organization, territorial practices, and natural resource use that support their cultural, social, religious, ancestral, and economic continuity. This definition includes Indigenous peoples and the descendants of *Quilombola* communities. The policy's guidelines emphasize valuing the origins, techniques, and historical-cultural practices associated with artisanal activities. They also promote research focused on the sustainable use and conservation of golden grass and buriti, as outlined in the State Law's Article 3, V.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to respect the rights of the indigenous peoples and local communities, or equivalent in the design and implementation of REDD+ actions, according to relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The State of Tocantins must comply with international conventions and agreements ratified by Brazil, as well as national legislation to **recognize and uphold the rights of Indigenous peoples and local communities.**

Brazil has established procedures to identify and recognize Indigenous peoples, traditional communities, and other groups considered ethnic communities, enabling a thorough investigation of their identities and rights. The **Brazilian Institute of Geography and Statistics (IBGE, or *Instituto Brasileiro de Geografia Estatística*)** follows national and international guidelines, recognizing as Indigenous or *Quilombola* any individual who self-identifies as such. Recognition of traditional peoples and communities in Brazil is based on self-recognition and self-identification.

The procedures for identifying Indigenous peoples include a range of measures to ensure the recognition and protection of their cultural identities, territories, and rights. These measures may include collecting demographic and ethnic data, consulting Indigenous communities, conducting anthropological studies, and demarcating land boundaries.

CANCUN SAFEGUARD C

FUNAI plays a critical role in this process, applying legal and international guidelines to safeguard the rights and territories of Indigenous peoples. FUNAI and the PNGATI are tasked with: (i) Guiding Indigenous peoples on financing opportunities for territorial management activities, ecosystem service enhancement, environmental conservation, and sustainable development; and (ii) Integrating REDD+ actions with existing environmental and territorial management policies and strategies for Indigenous lands, ensuring natural resource protection and promoting the well-being of Indigenous communities. Given these responsibilities, FUNAI has developed a **document with recommendations regarding REDD+ projects in Indigenous lands**, addressing the specific needs and characteristics of Indigenous peoples.

The National Council of Traditional Peoples and Communities (*Conselho Nacional dos Povos e Comunidades Tradicionais*, or CNPCT) was established as an advisory body under the Ministry of Social Development and the Fight Against Hunger. Its primary purpose is to promote the inclusion and empowerment of traditional communities within public policies, contributing to sustainable development and addressing prejudice, intolerance, and discrimination. The CNPCT plays a crucial role in coordinating and representing the interests of traditional communities before the government and promoting initiatives to secure their rights and well-being.

The **National Institute for Colonization and Agrarian Reform (INCRA),** through Ordinance No. 175 of April 19, 2016, recognizes *Quilombola* family farmers as beneficiaries of the National Agrarian Reform Program (PNRA) and implements additional measures to support their inclusion and development.

At the sub-national level:

Ecological-Economic Zoning (ZEE) is a key territorial management tool for the State of Tocantins, aligning with the general standards and procedures established by the federal law and regulations. It is particularly significant for implementing the State's jurisdictional REDD+ program, as it identifies the various societal segments that occupy and utilize land and natural resources within the territory.

As part of its **Prevention Pillar**, the PPCDIF (2021-2025) set the goal of approving Tocantins' ZEE through the State ZEE Committee, the State Council for the Environment (COEMA), and the Legislative Assembly. This effort aims to support methodologies and actions that prevent forest fires and illegal deforestation.

According to the **Methodological Guidelines for the Ecological-Economic Zoning of Brazil**, published by the MMA in 2006, democratic participation – through the identification and engagement of social actors – is a fundamental principle of ZEE. To ensure compliance with

CANCUN SAFEGUARD C

this principle, the initial steps in developing the ZEE proposal for Tocantins included a detailed characterization of social actors to:

- Identify and profile key stakeholders, considering territorial, institutional, and socioeconomic factors.
- Foster institutional collaboration to encourage stakeholder involvement in diagnosis, prognosis, and planning.
- Mobilize stakeholders to actively participate in drafting and validating the ZEE/TO proposal through direct engagement, organized representation at participatory events, or individual contributions.
- Foster the active participation of social actors in the process of disseminating information about the ZEE/TO.

During the **2018 Public Hearings for the ZEE**, the preliminary zoning proposal was presented and refined with regional input. The mobilization efforts sought to involve as many stakeholders as possible, using a system that categorized operational segments into:

- **Community Segment**: Including traditional communities, such as *Quilombolas* and babassu coconut breakers.
- **Civil Society Organizations**: Including associations, settlement projects, committees, cooperatives, unions, fishermen colonies, and non-governmental organizations.

These participatory efforts ensured that diverse perspectives were incorporated into the ZEE proposal, contributing to its robustness and alignment with local realities (SEFAZ/GZT, 2020. Ecological-Economic Zoning – Summary, p. 58).

Tocantins Competitive and Sustainable Strategy (ESTOCS) prioritizes actions and goals through a thematic pillar-based approach. Within the Social Pillar, which focuses on promoting citizenship and empowering traditional peoples and communities, the strategy aims to contribute to local sustainable development and improve the Human Development Index (HDI) in regions where these groups reside. The theme of empowerment and autonomy (2.1) is emphasized, as ESTOCS supports the strengthening of social organizations of Indigenous peoples, *Quilombola* communities, riverside dwellers, extractive workers, and family farmers, enhancing their roles in community development (2.1.1).

To safeguard the rights of all groups involved in the jurisdictional REDD+ program, the State has established the **Safeguards Working Group** through SEMARH Ordinance No. 88/2024. This group is tasked with ensuring compliance with the Cancun Safeguards for all stakeholders

CANCUN SAFEGUARD C

within the scope of Tocantins' Jurisdictional REDD+ Program, and its members have been duly appointed.

OUTCOME INDICATOR: Indigenous peoples and local communities, or equivalent, have been identified and their respective rights have been respected in the design and implementation of REDD+ actions.

Describe how this indicator is met.

The State has taken or planned the following actions to identify Indigenous peoples, *Quilombolas*, and other local communities within its territory and to ensure that their rights have been respected:

- **Identifying and mapping Indigenous peoples, *Quilombolas*, and other traditional communities within the state of Tocantins.**
  - **Means of verification**: State of Tocantins Ecological-Economic Zoning (ZEE) proposal ("Characterization of Social Actors" and "Traditional Populations" technical reports).
- **Complementing existing studies** on the characterization of social actors and traditional populations that informed the ZEE **with more recent data on the location of Indigenous villages and *Quilombola* communities**.
  - **Means of verification**: Socioeconomic and infrastructure assessment conducted by the State Secretariat for Indigenous and Traditional Peoples (SEPOT).
- **Establishing the Safeguards Working Group** as part of the Jurisdictional REDD+ Program's governance, including participation from Indigenous Peoples, *Quilombolas*, and other traditional populations representatives, to ensure that these groups' rights and interests are respected and incorporated into the program's design and implementation.
  - **Means of verification**: Official acts establishing the Safeguards Working Group, published in the State's Official Gazette.
- **Incorporate questions into the consultation workshops with PIQPCTAFs, planned for 2025, and collect feedback** to assess what challenges to forest conservation are perceived by these groups, as well as what needs and interests they would like the state to consider when designing the PIQPCTAF subprogram to implement the benefit-sharing strategy.

CANCUN SAFEGUARD C

- **Means of verification**: Reports from the consultation workshops and the finalized version of the PIQPCTAF subprogram.

THEME C.2: Respect and protect traditional knowledge.

STRUCTURAL INDICATOR: Relevant ratified international conventions/agreements, and/or domestic and if applicable, subnational, legal framework define and provide guidance for respecting and protecting indigenous people's knowledge and/or local communities' knowledge.

Describe how this indicator is met.

Brazil has ratified **ILO Convention n. 169**, which guarantees the rights of indigenous and tribal peoples to consultation and participation in decisions that affect their communities, including those related to the use of their traditional knowledge.

The country has also endorsed key international conventions aimed at protecting natural forests, biological diversity, and ecosystem services, such as the **Convention on Biological Diversity (CBD), the Aichi Targets, and the Nagoya Protocol on Access and Benefit-Sharing**.

Federal Law No. 13.123/2015, known as the **Biodiversity Law (*Lei da Biodiversidade*)** regulates CBD's Article 1, subparagraph (j) of Article 8, subparagraph (c) of Article 10, Article 15, and paragraphs 3 and 4 of Article 16, in Brazil. It governs access to genetic resources, the protection and use of associated traditional knowledge, and benefit-sharing mechanisms to support biodiversity conservation and its sustainable use. In addition, the **National Biodiversity Policy (*Política Nacional da Biodiversidade*, Federal Decree No. 4.339/2002)** ensures PIQPCTAF's rights to traditional knowledge associated to biodiversity.

As a signatory to the **Convention on the Protection and Promotion of the Diversity of Cultural Expressions**, Brazil safeguards traditional knowledge as its intangible cultural heritage. **Federal Decree No. 3.551/2000** created instruments to recognize and preserve these intangible assets, allowing the registration of conventional wisdom in the **Book of Knowledge Register (*Livro de Registro dos Saberes*)** of the **National Institute of Historic and Artistic Heritage (*Instituto do Patrimônio Histórico e Artístico Nacional*, or IPHAN).**

In Brazil's legal framework, the federal government holds the authority to legislate, regulate, and enforce the protection of traditional knowledge. States must respect these general rules established by the Union and may enact complementary legislation. Accordingly, Tocantins

CANCUN SAFEGUARD C

has enacted its own rules to reinforce and complement the federal legal framework described before.

The **Constitution of the State of Tocantins**, in Article 127, paragraph two, guarantees Indigenous communities the right to utilize their language and learning processes. Furthermore, Article 138, paragraph three, stipulates that the traditions, customs, and practices of Indigenous groups within the State are part of its cultural and environmental heritage and, as such, shall be protected. The following State laws were enacted to this effect:

- **State Law No. 1.560/2005**: This law established the SEUC (State System of Protected Areas) to safeguard the natural resources essential for the survival of traditional communities. It emphasizes the value of their knowledge and culture while promoting equitable benefit-sharing from access to traditional knowledge. The law creates two categories of protected areas which aim to protect traditional communities and promote the sustainable use of natural resources: the Sustainable Development Reserve (RDS) and the Extractive Reserve (RESEX). It also mandates that protected areas must have a management plan developed by a multidisciplinary technical team, incorporating local knowledge.
- **State Law No. 1.959/2008**: This law prohibits the burning, cutting, and predatory use of the babassu palm tree while implementing additional protective measures. It directly supports the preservation of traditional knowledge associated with the sustainable use of the babassu species, ensuring the protection of both the plant and the livelihoods and traditions of the communities that depend on it.
- **State Law No. 3.594/2019**: This law creates the State Policy on Sustainable Use of Golden Grass and Buriti, promoting sustainable production and conscientious management to ensure the renewal of species in both public and private cultivation areas, as well as conservation areas. It aims to preserve the genetic resources associated with these species
- **State Law No. 3.252/2011**: This law established the Tocantins Cultural System Policy (*Sistema Cultural do Tocantins* or SC/TO), outlining mechanisms for its implementation. It guarantees cultural rights for all citizens of Tocantins and defines principles to be followed by policies, programs, projects, and actions implemented by the State. These policies are formulated through Cultural Conferences (*Conferências de Cultura*) with public participation and input from the Tocantins Cultural Policy Council (*Conselho de Políticas Culturais do Tocantins*).
- **State Law No. 4.111/2023**: This law established the PEPSA, which adheres to national and international principles protecting the rights of Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers. It also created the Environmental

CANCUN SAFEGUARD C

Services Payment Program (*Programa de Pagamentos por Serviços Ambientais*, or PROPSA) to promote the conservation of ecosystem services, recognizing the importance of traditional and ecosystemic environmental knowledge.

- **State Law No. 4.151/2023**: This law established the State Department for Indigenous and Traditional Peoples (SEPOT) within the Executive Branch of the State Government. The department is responsible for coordinating mediation efforts to resolve social conflicts involving Indigenous and traditional peoples. It also fosters exchange and cooperation with national and international public or private entities to recognize, defend, promote, and disseminate the cultures and rights of Indigenous and traditional peoples.
- **State Law No. 4.130/2023**: This law created the Tocantins State Culture Plan (*Plano Estadual de Cultura do Tocantins* or PEC/TO), which aims to promote ethnic and regional diversity, as stated in Article 1, V. It also recognizes the knowledge, traditional expressions, and rights of Indigenous peoples, *Quilombola* communities, riverside dwellers, and other traditional groups, as detailed in Article 3, X.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to respect and protect indigenous peoples and/or local communities' traditional knowledge in the implementation of REDD+ actions, in line with relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

Regarding access to traditional knowledge associated with biodiversity and genetic heritage, as protected under the **Biodiversity Law**, the federal government has implemented the **National System for the Management of Genetic Heritage and Associated Traditional Knowledge (*Sistema Nacional de Gestão do Patrimônio Genético e do Conhecimento Tradicional Associado*, or SisGen)** within the Ministry of the Environment (MMA).

SisGen includes mechanisms such as registries, funds, and benefit-sharing programs designed to safeguard traditional knowledge. It mandates the registration of activities involving access to traditional knowledge and genetic heritage, as well as prior notification for economic use. Additionally, when traditional knowledge associated with genetic heritage is involved, the prior consent of the respective traditional community or Indigenous group is required before access activities can begin.

For traditional knowledge to be characterized and protected as part of Brazil's cultural heritage, **Federal Decree No. 3.551/2000** established the **Registry of Intangible Cultural Assets (*Registro de Bens Culturais de Natureza Imaterial*)**. This decree authorizes state,

CANCUN SAFEGUARD C

municipal, and Federal District departments, as well as societies or civil associations, among others, to initiate the registration process. Once recognized, traditional knowledge can be officially recorded in the **Book of Knowledge Register (*Livro de Registro dos Saberes*)**.

These processes are described in **Brazil's 1st and 2nd Safeguards Information Summary** submitted by Brazil to the UNFCCC.

In the State of Tocantins:

The **ZEE Plan** outlines Programmatic Pillars, along with corresponding programs and projects, designed to support the respect and preservation of traditional knowledge. The State has also introduced measures to include traditional communities in tourism activities, such as in the Jalapão region, where *Quilombola* communities participate in initiatives aimed at harnessing and developing the region's tourism potential *(SEFAZ/GZT, 2020. Zoneamento Ecológico-Econômico – Síntese*, p. 28*)*.

The **NATURATINS Normative Instruction 03/2023**, which supersedes NATURATINS Normative Instruction 126/2021, establishes procedures for issuing licenses related to the collection, management, and transportation of **Golden Grass (*Syngonanthus nitens*) and Buriti (*Mauritia flexuosa*).** It also defines the process for the annual license renewal of individual extractivists, artisans affiliated with associations and cooperatives, and family farmers.

As part of its efforts, NATURATINS has been conducting participatory workshops with the communities of Jalapão to support the socio-economic development of traditional communities that have a long history of crafting golden grass and buriti handicrafts. These workshops provide information about the **State Policy on Sustainable Use of Golden Grass and Buriti's** objectives, guidelines, and tools, as well as the roles and responsibilities of harvesters, participants in the craft production chain, and public authorities.

The **Tocantins Competitive and Sustainable Strategy (ESTOCS)** incorporates, within its Social Pillar, priority investment actions for resources obtained through REDD+ (as legally provided in Article 25, paragraph 1, of the PEPSA). These actions include the preservation and promotion of traditional knowledge and culture, as well as encouraging the participation and entrepreneurship of vulnerable groups in sociobiodiversity value chains, while respecting their cultural heritage.

The **State Cultural Fund** will serve as the primary mechanism for promoting the objectives of the Tocantins State Culture Plan. State resources transferred to municipalities through this fund will be monitored and overseen by the Tocantins Cultural Policy Council.

CANCUN SAFEGUARD C

OUTCOME INDICATOR: Traditional knowledge of indigenous peoples and/or local communities, or equivalent, has been respected and protected in the design and implementation of REDD+ actions where permission for its use has been granted.

Describe how this indicator is met.

As part of the State's Ecological-Economic Zoning proposal, **Tocantins has conducted a study in 2016 to map and characterize the Indigenous and traditional peoples living in its territory**. The Traditional Populations technical report analyzed the following aspects: territorial characterization of communities (historical and geographical aspects, demographics, and land tenure structure); socio-environmental conflicts (land disputes, natural resources, deforestation, wildfires, and political-institutional issues); strengths and weaknesses of territorial units (natural resources, production, culture, infrastructure, and social aspects); territorial management (public policies and community organization); and issued recommendations (participation in Ecological-Economic Zoning (ZEE), land tenure, territorial management, culture, and other related areas).

To fulfill and monitor this indicator during the crediting period (2020-2024), the state plans to:

- **Establish a governmental body within the direct administration** to promote, coordinate, and implement public policies aimed at the inclusion and empowerment of Indigenous and traditional peoples in Tocantins, ensuring their rights, protecting their ways of life, and preserving their traditional knowledge.
  - **Means of verification**: Decree establishing the agency published in the State's Official Gazette.
- **Complementing existing studies** on the characterization of social actors and traditional populations that informed the ZEE **with more recent data on the location of Indigenous villages and *Quilombola* communities**. This step is crucial for integrating these groups into the Jurisdictional Program's activities and will be considered when detailing the implementation of the PIQPCTAF benefit-sharing subprogram, considering the traditional knowledge of Tocantins' peoples and communities.
  - **Means of verification**: Socioeconomic and infrastructure assessment conducted by the State Secretariat for Indigenous and Traditional Peoples (SEPOT).
- **Submit a benefit-sharing proposal** to a comprehensive and participatory consultation process with relevant stakeholders, particularly Indigenous peoples, *Quilombolas*, and other traditional peoples and communities, ensuring the integration of their traditional

CANCUN SAFEGUARD C

knowledge into the Jurisdictional Program's subprogram designed to benefit these groups.

- **Means of verification**: the Consultation Plan document, records of meetings and workshops.

THEME C.3: Respect, protect, and fulfill rights of indigenous peoples and/or local communities, or equivalent.

STRUCTURAL INDICATOR: Participants have in place legal framework, policies or programs to respect, protect and fulfill human rights of indigenous peoples and local communities, or equivalent, in conformity with customary law, institutions, and practices as applicable and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

In Brazil, human rights and fundamental freedoms, including those of Indigenous peoples and local communities, are protected through a combination of national laws, customary practices, and international agreements.

Brazil has endorsed the **United Nations Declaration on the Rights of Indigenous Peoples**, which provides a universal framework of minimum standards for the survival, dignity, and well-being of Indigenous peoples globally. It is also a signatory to the **American Declaration on the Rights of Indigenous Peoples**, adopted by the OAS.

The primary international treaty addressing the rights of Indigenous and tribal peoples is **ILO Convention 169**, which Brazil ratified through **Decree No. 10.088/2019**. This treaty guarantees rights to territory, self-determination, empowerment, cultural and sociocultural practices, as well as the right to Free, Prior, and Informed Consultation (FPIC).

Brazil is also a party to the **CBD**, which ensures the protection of traditional knowledge associated with genetic resources and establishes mechanisms for the fair and equitable sharing of benefits derived from their use. Additionally, Brazil adheres to the **Convention on the Protection and Promotion of the Diversity of Cultural Expressions**, formalized by **Federal Decree No. 6.177/2007**, which safeguards rights related to ways of life and sociocultural expressions.

Below are the key federal legal instruments safeguarding indigenous and local peoples' rights:

CANCUN SAFEGUARD C

- **Federal Constitution of 1988**: As the supreme law of Brazil, establishes the fundamental rights and guarantees of all citizens in Article 5, including the rights to life, liberty, equality, justice, security, and property. It encompasses a broad range of rights-social, civil, political, and economic – and ensures access to justice, freedom of expression, freedom of religion, and the right to privacy, among others. To protect these rights, the Constitution provides mechanisms such as the writ of habeas corpus and the writ of mandamus. Chapter VII specifically addresses Indigenous peoples, recognizing their original rights to lands traditionally occupied by them and mandating the State to demarcate these lands. It also guarantees the protection of Indigenous customs, languages, beliefs, and traditions.
- **Indigenous Statute (*Estatuto do Índio*, Federal Law No. 6.001/1973)**: Preceding the 1988 Constitution, this law set guidelines for integrating Indigenous peoples into the national community while safeguarding their rights and regulating government oversight.
- **National System of Protected Areas (*Lei do SNUC*, Federal Law No. 9.985/2000)**: This law establishes criteria for the creation, implementation, and management of protected areas, many of which are inhabited by Indigenous peoples and traditional communities. It ensures sustainable use and conservation of these areas while respecting the rights of their inhabitants.
- **Access to Information Act (LAI, Federal Law No. 12.527/2011)**: This law promotes transparency and public access to information, serving as a critical tool for Indigenous and local communities to defend their rights and hold public authorities accountable.
- **Forest Code (Federal Law No. 12.651/2012)**: This law governs environmental protection, including forests in traditionally occupied territories. It impacts the rights of local communities by regulating land use, conservation, and sustainable practices.
- **National Policy for Territorial and Environmental Management of Indigenous Lands (PNGATI)**: This policy focuses on ensuring the protection, restoration, conservation, and sustainable use of natural resources within Indigenous lands and territories. It aims to preserve Indigenous heritage, improve quality of life, and provide conditions for the physical and cultural continuity of Indigenous peoples across generations while respecting their sociocultural autonomy.

The State of Tocantins, exercising its constitutional legislative authority, has enacted its own legal provisions to complement and strengthen the federal legal framework:

- **Constitution of the State of Tocantins**:
- **Article 127, paragraph 2**: Guarantees Indigenous communities the right to use their native language and traditional learning processes.

CANCUN SAFEGUARD C

- **Article 137**: Mandates that the Public Administration ensure full access to cultural rights and sources for all individuals.
- **Article 138**: Provides for the integration and protection of the cultural heritage, traditions, practices, and customs of Indigenous groups within the State.

- **Forest Policy of the State of Tocantins (*Política Florestal do Estado do Tocantins*, State Law No. 771/1995)**:
  - **Article 1**: Declares that the forests and other forms of vegetation in the State, along with the lands they occupy, are assets of common interest for all citizens, subject to property rights but limited by this law and other applicable legislation.
- **State Policy for the Sustainable Use of Golden Grass and Buriti (State Law No. 3.594/2019)**:
  - This policy's guidelines emphasize the recognition of historical-cultural origins, artisanal techniques, and practices, as well as research outcomes related to the sustainable use and conservation of golden grass and buriti.
  - **Article 3, Section V**: Defines traditional peoples and communities as culturally distinct groups with unique social organization, territorial occupation, and natural resource use methods aimed at cultural, social, religious, ancestral, and economic sustainability. This includes Indigenous peoples and *Quilombola* descendants.
- **PEPSA (State Law No. 4.111/2023)**:
  - **Article 7, Section IV**: Requires that actions resulting from PEPSA align with national and international principles, particularly respecting the knowledge and rights of Indigenous peoples, traditional communities, family farmers, and extractivists, in accordance with Brazil's commitments under the United Nations and other international human rights agreements.
  - **Article 7, Section V**: The PEPSA aims to strengthen cultural identity and respect for cultural diversity, recognizing the role of extractivist and traditional populations, Indigenous peoples, and farmers in the conservation, preservation, sustainable use, and restoration of natural resources, particularly forests.
- **State Department for Indigenous and Traditional Peoples (State Law No. 4.151/2023)**:
  - Established the SEPOT, a State Department responsible for mediating social conflicts involving Indigenous and traditional peoples.

CANCUN SAFEGUARD C

- Its duties include fostering exchanges and collaborations with public and private institutions, both nationally and internationally, to recognize, defend, promote, and disseminate the cultures and rights of Indigenous and traditional peoples.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to respect, protect and fulfil rights of indigenous peoples, local communities, or equivalent throughout the implementation of the REDD+ actions, according to relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The **Federal Prosecutor's Office (MPF)** plays a crucial role in safeguarding the constitutional rights of Indigenous peoples and is empowered to take legal action in cases of violations. The **National Indigenous Foundation (FUNAI)** is the agency responsible for Indigenous policy in Brazil and is dedicated to the protection and advancement of Indigenous peoples' rights.

The **PNGATI Management Committee (*Comitê de Gestão do PNGATI*, or CG-PNGATI)** was established in 2013 following the implementation of the **National Policy for Territorial and Environmental Management of Indigenous Lands (PNGATI)**. It serves as the governance body responsible for coordinating, implementing, and monitoring the policy. The CG-PNGATI comprises eight representatives from federal public administration agencies and entities, as well as eight representatives from Indigenous organizations across the country, all of whom have the right to speak and vote. The chairmanship of the committee alternates between the federal government and Indigenous organizations.

Federal Decree No. 11.447/2023 establishes the **Aquilomba Brazil Program** within the federal public administration. This program promotes cross-sectoral measures to ensure the rights of *Quilombola* communities throughout the country.

The **National Council of Traditional Peoples and Communities (*Conselho Nacional dos Povos e Comunidades Tradicionais*, or CNPCT)** was established in 2016, evolving from its role as the National Committee since 2006. Now functioning as a consultative body, the CNPCT is part of the Ministry of Environment and Climate Change (MMA), within the National Department for Traditional Peoples and Communities and Sustainable Rural Development (*Secretaria Nacional de Povos e Comunidades Tradicionais e Desenvolvimento Rural Sustentável*). Its purpose is to monitor and enhance public policies for Traditional Peoples and

CANCUN SAFEGUARD C

Communities who identify as culturally distinct groups and recognize themselves as such, ensuring the preservation of their cultural, religious, economic, and territorial traditions.

The **National REDD+ Strategy (ENREDD+)** sets forth a series of premises for implementing REDD+ in Indigenous Lands (MMA Ordinance No. 370/2015). As the coordinating body, **CONAREDD+**, through **Resolution No. 15/2018**, establishes the rights guaranteed to Indigenous peoples and traditional communities within the scope of REDD+ initiatives. These rights include the assurance of territories, inherent rights, self-determination, sociocultural autonomy, protection of cultural heritage, defense of traditional lifestyles, promotion of leadership roles, and improvement of quality of life.

In the State of Tocantins:

The development process of the **ZEE/TO**, a key instrument for the state's REDD+ actions, included public participation. The public consultations aimed to present and discuss the preliminary zoning proposal for the territory of Tocantins, submitting it to public opinion for refinement and regional insights.

The **2020 ZEE/TO** established 134 homogeneous areas, referred to as **Zones**, configured into 11 types, grouped under three categories. Within the **Special Zones (*Zonas Especiais*, or ZEs)** category are areas designated for protecting natural resources and Indigenous communities. These zones have guidelines focused on ecological conservation and support activities with low impact and certain restrictions. Among the Special Zones:

- **Special Zone for Sustainable Use (*Zona Especial de Uso Sustentável*, or ZEUS)** – covering 8.31% of the territory.
- **Special Zone for Indigenous Lands (*Zona Especial de Terras*, or ZETI)** – covering 7.41% of the territory (SEFAZ/GZT, 2020. *Zoneamento Ecológico-Econômico – Síntese*, p. 86).

The ZEE/TO outlines **Programmatic Pillars**, along with their respective programs and projects, which can contribute to upholding the land rights of Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers (PIQPCTAF). The State Department of Planning and Budget (SEPLAN) is responsible for managing and conducting activities related to the state's ZEE. Within the **Social Management Pillar**, the **Social Development Program (*Programa de Desenvolvimento Social* or *PGS-POPULAÇÃO*)** is affiliated with projects such as:

- Preservation of Indigenous Culture (*PGS-POPULAÇÃO_Indígena*)
- Valorization of Traditional Populations (*PGS-POPULAÇÃO_Tradicional*)

CANCUN SAFEGUARD C

- Strategic Social Inclusion (*PGS_POPULAÇÃO Inclusão*)

Additionally, the **Sociodiversity Conservation Program (*Programa de Conservação da Sociodiversidade*, or *PGS-CULTURA*)** encompasses projects like:

- Preservation of Sociocultural Heritage (*PGS-CULTURA Preservação*).
- Socio-environmental Education and Monitoring (*PGS-CULTURA Educação*) (SEFAZ/GZT, 2020, p. 138).

The **Tocantins State Cultural Plan (PEC/TO)** was established through **State Law No. 4.130/2023**, to promote the appreciation of ethnic and regional diversity and to recognize the knowledge, expertise, traditional expressions, and rights of their holders, including Indigenous peoples, *Quilombolas*, river dweller communities, and other groups. The plan outlines various pillars and targets for each, notably including **Pillar 6**: territory, identity, recognition, and the promotion of cultural diversity.

As an extension of the Aquilomba Brazil Program at the state level, the Government of Tocantins has established the **Aquilomba Tocantins Program** through **State Decree No. 6.765/2024**. The state program is structured around five thematic pillars, each with its own objectives and an initial mapping of relevant institutions. The pillars are: (1) Territorial Management, Environmental, and Climate Change; (2) Infrastructure and Ethnodevelopment; (3) Communication, Ancestry, and Cultural Heritage; (4) Security, Social Organization, and Access to Justice; and (5) Health, Education, and Food Security.

To uphold the right to **Free, Prior, and Informed Consultation** during the implementation process of the **PEPSA** and **Jurisdictional REDD+ Program**, the State has adopted preparatory dialogues as a procedure for the consultation and participatory construction of the REDD+ strategy and benefit sharing strategy. This initiative began with the **1st Forum of the Jurisdictional REDD+ Program with Indigenous Peoples, Traditional Peoples and Communities, and Family Farmers**, organized by **SEMARH** in cooperation with **SEPOT** and **TOPAR**.

Eleven preparatory meetings have taken already place: **nine** with Indigenous peoples, **one** with *Quilombola* communities, and **one** with traditional peoples and communities, as well as family farmers.

These preliminary dialogues aim to provide information on the State's REDD+ Strategy and benefit-sharing mechanism, and to establish agreements for appropriate consultations with each group.

OUTCOME INDICATOR: Rights of indigenous peoples and local communities, or equivalent, have Been identified and respected, protected and fulfilled in the design and implementation of REDD+ actions.

Describe how this indicator is met.

Tocantins' **Ecological-Economic Zoning (ZEE) proposal** is a key territorial management tool for guiding the development and implementation of the State's REDD+ actions. In 2016, the **Characterization of Social Actors** technical report outlined the methodological procedures used, provided a list and description of the identified social actors, analyzed their representativeness within the State of Tocantins, and detailed the key guidelines, strategies, and tools for their engagement in the Ecological-Economic Zoning (ZEE). This study was the foundation for mapping social groups that contribute to the Jurisdictional REDD+ outcomes and that should be acknowledged in the benefit-sharing strategy.

The recognition of *Quilombola* communities and their rights has also been part of the State's efforts. Between 2016 and 2020, Tocantins officially recognized **38 *Quilombola* communities**, reaching **49 communities** recognized following the enactment of **Federal Decree No. 4.887/2003**. **42 of these communities** received a certification from the **Palmares Cultural Foundation**, which is the first of a series of legal steps to fully guarantee the rights of *Quilombolas*. These achievements reflect the State's efforts in recognizing *Quilombola* communities and their rights.

To address and monitor this indicator during the crediting period (2020-2024), the state intends to:

- **Establish a governmental agency within the direct administration** to promote, coordinate, and implement public policies aimed at the inclusion and empowerment of Indigenous and traditional peoples in Tocantins, ensuring their rights, safeguarding their ways of life, and preserving their traditional knowledge.
  - **Means of verification**: Decree establishing the state agency published in the official gazette.
- **Incorporate the conservation and restoration of ecosystem services, as well as principles that recognize and protect the rights of Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers into the text of the State Policy on Environmental Services (PEPSA).**
  - **Means of verification**: PESPA law published in the State's Official Gazette.
- Implement a **comprehensive participatory public consultation process** to improve the design and implementation of the Jurisdictional Program, a process that will be monitored through the following actions:

- **Hold a participatory event in Palmas** with representatives of PIQPCTAFs from the entire State to determine their preferred methods of consultation.
    - **Means of verification**: Report from the 1st Forum on the Jurisdictional REDD+ Program with Indigenous Peoples, Traditional Peoples, and Family Farmers of Tocantins. Documentation of dialogues that took place with leaders and representatives of these groups regarding the organization of the future consultation workshops.
- **Hold consultation workshops** to share and collect information on the Jurisdictional REDD+ Program, the environmental services provided by PIQPCTAFs, benefit-sharing, challenges, needs, and priorities for these stakeholders.
    - **Means of verification**: Consultation workshops' reports.
- **Establish the Safeguards Working Group as part of the Jurisdictional REDD+ Program's governance framework**, including participation from Indigenous Peoples, *Quilombolas*, and other traditional populations representatives, to ensure that these groups' rights and interests are respected and incorporated into the program's design and implementation.
    - **Means of verification**: Official acts establishing the Safeguards Working Group, published in the State's Official Gazette.

CANCUN SAFEGUARD D

THEME D.1: Respect, protect, and fulfill the right of all relevant stakeholders to participate fully and effectively in the design and implementation of REDD+ actions

STRUCTURAL INDICATOR: Participants have in place legal frameworks, policies or programs to respect, protect and fulfill the right of all relevant stakeholders to participate fully and effectively, including timely access and culturally appropriate information prior to consultations, and these are anchored in relevant ratified international conventions/agreements and/or domestic and if applicable, subnational, legal framework; access is established to recourse mechanisms to ensure the participation process is respected.

Describe how this indicator is met.

Brazil is a signatory to **ILO Convention 169**, which guarantees Indigenous peoples and traditional communities the right to be **consulted in a free, prior, and informed manner** and to participate in decisions regarding legislative and administrative measures that directly affect them. Additionally, Brazil is a signatory to the **Convention on Biological Diversity (CBD)**, incorporated into Brazilian law through **Federal Decree 2,519/1998**. This decree emphasizes

CANCUN SAFEGUARD D

the need to respect, preserve, and maintain the knowledge of local communities and Indigenous populations as it relates to biodiversity conservation, while encouraging their participation and ensuring the equitable sharing of benefits.

These principles are echoed in the Brazilian Constitution, as well as in federal and state legislation. The **Federal Constitution of 1988** enshrines social participation as a fundamental right, guaranteeing access to information and involvement in political processes and administrative proceedings (Article 5). It institutionalizes multiple forms of public participation, including referendums, plebiscites, popular initiatives, and policy management councils that incorporate representatives from the State, civil society, and other sectors.

At the federal level, the primary participatory body for managing environmental policy is the **National Environment Council (CONAMA)**. For REDD+ governance, this role is carried out by the **National Committee for REDD+ (CONAREDD+)**. **CONAREDD+ Resolution No. 15/2018** establishes general guidelines for participation and governance related to REDD+, focusing on transparency, representation, and access to information.

At the subnational level, the **PEMC/TO** (**State Law No. 1.917/2008**) serves as a foundational element of the **State's Jurisdictional REDD+ Program**. Article 1, sole paragraph, emphasizes the importance of **participation**, **transparency**, and **information** to achieve the law's objectives. The **PEPSA** outlined the governance structure for Tocantins' Jurisdictional REDD+ program, designating the **COEMA/TO** and the **FEMC/TO**, and their affiliated technical bodies, as the primary forums for discussing the design and implementation of REDD+ actions in the State. Stakeholder participation is guaranteed in all these forums.

Article 7, VII of the **PEPSA** (**State Law No. 4.111/2023**) underscores principles such as **transparency**, **efficiency**, and **effectiveness** in managing financial resources, while prioritizing **social participation** in the formulation, management, monitoring, evaluation, and revision of the system and its programs. Article 17 stipulated some mechanisms to enhance social participation in the design and implementation of the REDD+ Jurisdictional Program:

- **The State Validation and Transparency/Monitoring Committee (*Comissão Estadual de Validação e Transparência/Acompanhamento*)**: Affiliated with **COEMA/TO**, this committee comprises at least nine members, ensuring equal representation between organized civil society and public authorities. Members are appointed by the COEMA/TO Chair, subject to approval.
- **The Scientific Committee (*Comitê Científico*)**: Formed by the **Permanent Thematic Chamber for Climate Change Research (*Câmara Temática Permanente de***

CANCUN SAFEGUARD D

Pesquisas em Mudanças Climáticas) under **FEMC/TO**, this committee provides scientific guidance and oversight regarding the State's REDD+ actions.

- **The General Ombudsman of Tocantins (OGE/TO)**: Operates within the scope of the **State Comptroller General's Office (CGE/TO)**, ensuring accountability and responsiveness to stakeholders.

The **COEMA/TO** is the primary body responsible for managing environmental policies in Tocantins. It was established under State Law No. 1.789/2007 and subsequently amended by **State Laws Nos. 2.096/2009, 2.566/2012, 2.896/2014, and 3.699/2020**. This **advisory, normative, and deliberative body** operates under the oversight of **SEMARH**.

In addition to representatives from state and federal departments and agencies, **COEMA/TO** includes members from civil society, including **PIQPCTAF**, as determined by its **internal Bylaws** and State Law No. 1.789/2007, Article 3:

- One representative from the scientific community.
- One representative from Indigenous peoples (currently, the Articulation of Indigenous Peoples of Tocantins, *Articulação dos Povos Indígenas do Tocantins*, or ARPIT).
- The Federation of Agriculture and Livestock of the State of Tocantins (*Federação da Agricultura e Pecuária do Estado do Tocantins*, or FAET).
- The Federation of Rural Workers and Family Farmers of the State of Tocantins (*Federação dos Trabalhadores Rurais Agricultores e Agricultoras Familiares do Estado do Tocantins*, or FETAET).
- The Federation of Industries of the State of Tocantins (*Federação das Indústrias do Estado do Tocantins*, or FIETO).
- The Federation of Commercial Associations of the State of Tocantins (*Federação das Associações Comerciais do Estado do Tocantins* or FACIET).
- The Regional Council of Engineering and Agronomy of the State of Tocantins (*Conselho Regional de Engenharia e Agronomia do Estado do Tocantins*, or CREA/TO).
- A non-governmental environmental protection organization with statewide representation and registration in the Registry of Environmental Entities of the State of Tocantins (*Cadastro de Entidades Ambientais do Estado do Tocantins*, or CEATO).
- The National Foundation of Indigenous Peoples (FUNAI)

CANCUN SAFEGUARD D

The **FEMC/TO**, established by State Decree No. 3.007/2007 and expanded by State Decree No. 4.550/2012, serves as a high-level advisory body. Its primary mission, as stated in **Article 1 of Decree 4.550/2012**, is to raise public awareness and promote societal engagement in discussions and decision-making regarding climate change issues.

FEMC/TO's responsibilities include: monitoring and evaluating the **National Climate Change Policy**; encouraging, strengthening, and updating the **PEMC/TO** through participatory and decentralized processes involving public authorities, civil society, academia, and the media; proposing general guidelines and disseminating its findings; supporting initiatives to identify, secure, and disseminate financing sources for the sector; producing educational and intellectual materials on climate change; implementing measures for biodiversity conservation and climate change mitigation; promoting projects such as Reducing Emissions from Deforestation and Degradation (REDD) and Clean Development Mechanism (CDM).

The **FEMC/T**O includes **representatives from various organizations**, including:

- Association of Municipalities of Tocantins (*Associação de Municípios do Tocantins* – ATM)
- Health and Environment Commission of the State Legislative Assembly (*Comissão de Saúde e Meio Ambiente da Assembleia Legislativa do Estado*)
- Catholic University of Tocantins (*Faculdade Católica do Tocantins*)
- Federation of Agriculture and Livestock of the State of Tocantins (FAET)
- Federation of Industries of the State of Tocantins (FIETO)
- Federal University of Tocantins (UFT)
- Lutheran University Center of Palmas (*Centro Universitário Luterano de Palmas*, or CEULP/ULBRA)
- Regional Council of Engineering and Agronomy of the State of Tocantins (CREA-TO)
- Federal Institute of Education, Science, and Technology of Tocantins (*Instituto Federal de Educação, Ciência e Tecnologia do Tocantins*, or IFTO)
- OBJETIVO Teaching and Research Institute (*Instituto de Ensino e Pesquisa OBJETIVO*)
- President Antônio Carlos Institute of Tocantins (*Instituto Presidente Antônio Carlos Tocantinense*, or ITPAC)
- One representative from the COEMA/TO

CANCUN SAFEGUARD D

- Three representatives from NGOs registered with the Registry of Environmental Organizations of the State of Tocantins (CEATO), by invitation.

FEMC/TO's **Permanent Thematic Chamber of Research on Climate Change (*Câmara Temática Permanente de Pesquisas em Mudanças Climáticas***), as determined by the PEPSA**,** was established by FEMC/TO Decision No. 01/2021. This permanent scientific committee is tasked with:

- Evaluating the scientific quality and integrity of manuscripts, technical reports, and other documents prepared by the State of Tocantins and other institutions.
- Supporting the State's qualification process with CONAREDD+ for obtaining REDD+ resources.
- Scientifically assessing Tocantins' baseline for Jurisdictional REDD+ and evaluating REDD+ benefit distribution in alignment with Tocantins' safeguards.
- Assisting in the development and implementation of studies, programs, policies, and projects related to environmental services and GHG emission reduction.
- Monitoring programs, policies, and projects implemented in Tocantins and emissions levels over the next 20 years.
- Preparing and updating documents related to FEMC/TO as requested.
- Coordinating research lines and information to produce scientific knowledge in the climate field.
- Promoting the sharing of knowledge and technical experience.
- Proposing criteria for selecting and evaluating projects and researchers.
- Advising SEMARH on scientific and technological research matters.

Finally, the **State System of Protected Areas (SEUC)**, established by State Law No. 1560/2005, sets forth the criteria and regulations for creating and managing state protected areas. Each protected area has its own **Management Council**, where residing traditional populations participate and NATURATINS manages.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to respect, protect and fulfill the right to full, effective and timely participation in the design and implementation of REDD+ actions, as indicated in relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

CANCUN SAFEGUARD D

Describe how this indicator is met.

In 2022, the government conducted an **online public consultation** to develop **PEPSA** and organized three virtual meetings to discuss the draft law with strategic sectors. These meetings were held as follows:

- **February 8, 2022**: With representatives from the public sector.
- **February 10, 2022**: With environmental NGOs, Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers (**PIQPCTAF**).
- **February 11, 2022**: With representatives from the urban and rural business sectors and the academic community.

At the **15th meeting of the FEMC/TO**, held on **April 6, 2022**, the following agenda items were addressed:

- **Presentation of the Draft Bill** to amend the **PEMC/TO (Law No. 1.719/2008)** and the draft bill establishing **PEPSA**. These documents were submitted to the **Permanent Thematic Chamber on Climate Change Research (CTPPMC)** for review.
- **Presentation of the GHG Emissions Inventory for the State of Tocantins, prepared by the Ministry of Science, Technology, and Innovation (MCTI).**

In addition to online consultations, the **PEPSA Draft Bill** was submitted for **public consultation**, incorporating inputs from stakeholders. The revised version was forwarded to **COEMA/TO** for approval. Upon receiving COEMA/TO's approval, the bill was submitted to the **Tocantins State House of Representatives (*Assembleia Legislativa do Estado do Tocantins*)** for enactment.

In 2023, **SEMARH** and **RURALTINS** collaborated to develop a schedule for preparatory workshops for upcoming public consultations on integrating the state into **carbon markets**. These consultations introduced the topic to Indigenous communities, *Quilombola*s, and family farmers.

On **September 5, 2024**, **SEMARH Ordinance No. 88** established a **Working Group** to address compliance with the **Cancun Safeguards** while maintaining dialogue with technical teams from state departments and other relevant agencies. The Working Group includes three complementary **Sectoral Chambers (*Câmaras Setoriais*, or CS)**:

- **CS Safeguards for Indigenous Peoples.**
- **CS Safeguards for *Quilombola*s and Traditional Populations.**

CANCUN SAFEGUARD D

- **CS Safeguards for Family Farming.**

Each Sectoral Chamber comprises representatives from state and federal agencies as well as organizations representing the respective social groups.

The efforts to build the **Jurisdictional REDD+ Program** are supported by key stakeholders, including:

- The **State Department for Indigenous and Traditional Peoples (SEPOT)**.
- The **Rural Development Institute of the State of Tocantins (RURALTINS)**.
- The **Articulation of Indigenous Peoples of Tocantins (ARPIT)**.
- The **Federation of Rural Workers and Family Farmers of the State of Tocantins (FETAET)**.
- The **State Coordination of *Quilombola* Communities of Tocantins (COEQTO)**.
- The **Nature Institute of Tocantins (NATURATINS)**.

In 2023, a project submitted to the **Land Innovation Fund** was also approved, aimed at engaging small, medium, and large-scale rural producers through meetings and interviews. The objective is to discuss their participation in the Program and collaboratively identify initiatives and benefits tailored to the sector.

OUTCOME INDICATOR: Relevant stakeholders have participated fully, effectively and timely in the design and implementation of REDD+ actions.

Describe how this indicator is met.

The state has been dedicated to ensuring that public participation is not merely consultative but genuinely deliberative, enabling stakeholders to actively influence the design and implementation of REDD+ actions.

To monitor this indicator during the crediting period (2020-2024), the state plans to:

1. **Identify and engage relevant stakeholders:**
    - Carry out a **comprehensive and systematic mapping of strategic actors** involved in the design and implementation of the program. This will include governmental bodies (secretariats, agencies, oversight institutions, federal entities operating within the territory), academia and research institutions (universities, research institutes, EMBRAPA), civil society (associations, cooperatives, professional organizations),

CANCUN SAFEGUARD D

PIQPCTAFs, and the agricultural sector. The outcome is expected to include a matrix of relevant actors, their levels of engagement with the program, and a mobilization plan.

- **Means of verification**: Documentation of events conducted between 2022 and 2024, and the matrix of relevant actors.

2. **Implement measures and mechanisms to ensure continuous stakeholder engagement and participation through:**

- Integrate the Jurisdictional REDD+ agenda **into existing participatory governance spaces** established by the state and create additional dialogue platforms as needed for consultation and decision-making. These include:
  - The State Climate Change Forum (FEMC/TO)**,** a multistakeholder consultative body with participation from the public and private sectors, rural producers, the academic and scientific community, and civil society (SEMARH Ordinance No. 28/2020).
    - **Means of verification**: Meeting minutes and other documents reflecting discussions on REDD+ actions during the monitoring period (2020-2023).
  - The **State Environmental Council (COEMA/TO)**, a key decision-making body in charge of issuing state regulations and policies on environmental issues and climate change. COEMA/TO is composed of national, state, and municipal government entities, civil society representatives, representatives from Indigenous populations, family farmers, agricultural producers, the private sector, the scientific community, and the State legislative assembly.
    - **Means of verification**: Meeting minutes and other documents highlighting discussions and decisions related to climate change policies and REDD+ actions during the crediting period.
  - Establishing permanent Thematic Chambers and technical working groups **within existing governance spaces** to facilitate discussions and decision-making on aspects and actions related to Jurisdictional REDD+.
    - **Means of verification**: Acts of establishment, meeting minutes documenting discussions on relevant topics, deliberations, proposals, or resolutions from the relevant bodies.

3. **Implement a broad consultation and engagement process through the following activities:**

CANCUN SAFEGUARD D

- Provide **training sessions** throughout the planning and implementation process of REDD+ actions for government managers, technical staff, and leadership representatives of various relevant stakeholders.
  - **Means of verification**: Training records, attendance lists, and program schedules.
- **Conduct dialogues and consultation workshops with rural producers** throughout the planning and implementation process of REDD+ actions and the development of subprograms for implementing the benefit-sharing strategy.
  - **Means of verification**: Records of meetings, workshops, and events, along with attendance lists

THEME D.2: Promote adequate participatory procedures for the meaningful participation of indigenous peoples and local communities, or equivalent.

STRUCTURAL INDICATOR: Relevant ratified international conventions, agreements, and/or domestic legal framework recognizes, respects, and protects the respective rights to participation of indigenous peoples, local communities, or equivalent, through their respective decision-making structures and processes, which requires appropriate procedures take place in a climate of mutual trust.

Describe how this indicator is met.

Under **Convention 169**, PIQPCTAF are guaranteed the right to participate in public policies aimed at protecting their rights and ensuring respect for their integrity (Art. 2, 1). This participation must occur in ways that allow these groups to freely engage, at least on equal terms with other sectors of the population, in the decision-making processes of institutions and administrative bodies responsible for policies affecting them (Art. 6, 1, b).

The **Right to Free, Prior, and Informed Consultation (FPIC)** is also guaranteed in specific cases. This includes the obligation to consult affected people through **appropriate procedures**, particularly through their representative institutions, before implementing legislative or administrative measures likely to affect them directly (Art. 6, 1, a). Such consultations must be carried out in **good faith**, aiming to reach agreements and secure consent regarding the proposed measures (Art. 6, 2).

Federal Decree No. 6.040/2007 extends certain FPIC-related rights to traditional communities. Additionally, Convention 169 ensures that the rights of these peoples to natural resources on

CANCUN SAFEGUARD D

their lands are specially protected, including their right to participate in the use, management, and conservation of these resources (Art. 15).

CONAREDD+ Resolution No. 15/2018 outlined the requirements stemming from international conventions and agreements applicable to Brazil and, by extension, to its **subnational jurisdictions**:

- **FPIC and Consultation**: Ensuring free, prior, and informed consultation through representative institutions of Indigenous and traditional peoples, respecting existing consultation protocols and supporting autonomous consultation development in accordance with these peoples' unique organizational forms (**Art. 6.1 of ILO Convention 169**).
- **Participation in Agrobiodiversity Decisions**: Recognizing the right of small-scale and family farmers to participate in national decision-making on the conservation and sustainable use of agrobiodiversity (**Art. 9.2 c of the International Treaty on Plant Genetic Resources for Food and Agriculture, or ITPGRFA**).
- **Traditional Knowledge Protection**: Securing FPIC and participation of traditional knowledge holders in matters concerning the conservation and sustainable use of biodiversity (**Arts. 8 j, 10 c, and 15 of the CBD**).

The **State Constitution of Tocantins** is founded on principles that safeguard individual and collective rights, uphold human rights, and promote equality while combating discrimination. It ensures transparency and legality in public acts, preserves ethnic values and culture, promotes balanced regional development, eradicates poverty and marginalization, and guarantees access to education, healthcare, and assistance. It also fosters development through policies supporting free enterprise and social justice.

The **PEMC/TO (State Law No. 1.917/2008)** underscores the critical importance of **participation, transparency, and information** (Article 1, sole paragraph) in addressing climate change. Its objectives include expanding **environmental education** on climate change and promoting practices to reduce greenhouse gas GHG emissions, with a specific focus on **traditional communities**, **underserved populations**, and **public-school students** (**Article 2**). The law also emphasizes the dissemination of information about relevant programs and actions, fostering behavioral changes and practices that positively impact the climate.

The **PEPSA (State Law No. 4.111/2023)** builds on these principles by establishing a framework that ensures **transparency, efficiency, and effectiveness** in managing financial resources. It emphasizes **social participation** in the formulation, management, monitoring, evaluation, and revision of systems and programs (Article 7, VII). The law also calls for respect

CANCUN SAFEGUARD D

for the **knowledge and rights of PIQPCTAF,** alongside other commitments recognized under Brazil's international human rights obligations (Article 7, IV). Furthermore, it highlights the importance of strengthening **cultural identity and diversity**, acknowledging the vital role of extractivists, traditional populations, Indigenous peoples, and farmers in the conservation, sustainable use, and recovery of natural resources, particularly forests (Article 7, V).

This comprehensive framework provides the foundation for implementing the **PEPSA** and, consequently, the **Tocantins Jurisdictional REDD+ Program**, recognizing, respecting, and safeguarding the **participation rights** of Indigenous peoples, traditional communities, and their equivalents.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to promote the meaningful participation of indigenous peoples and local communities, or equivalent in the design, implementation and periodic assessments of REDD+ actions, according to their respective rights and decision-making structures and processes and to the relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework.

Describe how this indicator is met.

The participation of **Indigenous Peoples, *Quilombola* Communities, Traditional Peoples and Communities, and Family Farmers (PIQPCTAF)** in **COEMA/TO meetings** occurs through **entities** that represent each group, namely: the Articulation of Indigenous Peoples of Tocantins (ARPIT), the Federation of Agriculture and Livestock (FAET), the Federation of Rural Workers and Family Farmers of the State of Tocantins (FETAET), and the National Foundation of Indigenous Peoples (FUNAI).

In **FEMC/TO meetings**, **PIQPCTAF** are represented by members of **COEMA/TO**, with appointed representatives actively participating. Efforts are underway to enhance the direct involvement of **PIQPCTAF** in the **FEMC/TO**.

SEMARH has been actively engaged in the **Committee on Partnerships with Indigenous Peoples and Traditional Communities** (***Comitê de Parcerias com Povos Indígenas e Comunidades Tradicionais***) of the **Governors' Climate and Forests Task Force (GCF-TF)**. This committee operates under a charter of principles that promotes partnerships between Indigenous peoples, traditional communities, and GCF-TF member states to support initiatives and strategies for **emission reduction** and **sustainable development**. The committee includes Indigenous representation from **Tocantins**.

CANCUN SAFEGUARD D

Law No. 4.111/2023 established the **Tocantins State Climate Fund (FunClima)** as an economic and financial instrument to support the implementation of **PEPSA**. FunClima is the financial mechanism through which revenue from the sale of jurisdictional carbon credits will be distributed, according to the State's benefit-sharing strategy. The Fund is managed by a **Governing Board**, chaired by **SEMARH** and composed of seven government representatives and six civil society representatives, including members from the **private sector**, the **academic community**, and **PIQPCTAF** (**Article 4 of Law No. 4.131/2024**).

Law No. 4.111/2023 also established the **State Validation and Monitoring Committee**, which operates under **COEMA/TO**. This committee is composed of at least nine members, ensuring **equal representation** between organized civil society and public authorities. Representatives are appointed by the Chair of COEMA and are subject to approval.

OUTCOME INDICATOR: Design, implementation, and periodic assessments of REDD+ actions were, where relevant, undertaken with the participation of indigenous peoples and/or local communities, or equivalent, including if applicable through FPIC, in accordance with relevant international and/or domestic and if applicable, subnational, legal framework, and in accordance with their respective rights and decision-making structures and processes.

Describe how this indicator is met.

The state is implementing an action plan to expand stakeholder participation in the **Jurisdictional REDD+ Program** and its **benefit-sharing strategy**, ensuring a **Free, Prior, and Informed Consultation (FPIC)** with Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers. This process emphasizes the right of these groups to **meaningfully participate** in decision-making processes that affect their lives, lands, and livelihoods.

To support compliance and monitor this indicator during the crediting period (2020-2024), the state intends to:

- **Establish a governmental agency within the direct administration** to promote, coordinate, and implement public policies aimed at the inclusion and empowerment of Indigenous and traditional peoples in Tocantins, ensuring their rights, safeguarding their ways of life, and preserving their traditional knowledge.
- **Means of verification**: Decree establishing the state agency published in the official gazette.

CANCUN SAFEGUARD D

- **Carry out the Free, Prior, and Informed Consultation process for the Jurisdictional REDD+ Program and its benefit-sharing strategy**, engaging Indigenous peoples, *Quilombola* communities, other traditional peoples and communities, and family farmers.
- **Means of verification**: Consultation plan and records of meetings and workshops.
- **Establishing the Safeguards Working Group as part of Jurisdictional REDD+ Program's governance framework**, including participation from Indigenous Peoples, *Quilombolas*, and other traditional populations representatives, to ensure that these groups' rights and interests are respected and incorporated into the program's design and implementation.
- **Means of verification**: Official acts establishing the Safeguards Working Group, published in the State's Official Gazette.

CANCUN SAFEGUARD E

THEME E.1: Non-conversion of natural forests and other natural ecosystems.

STRUCTURAL INDICATOR: Relevant domestic legal framework, policies and programs consistently define the term natural forests and other natural ecosystems, distinguishing them from plantations, describe the process for mapping the spatial distribution of natural forests and other natural ecosystems, and policies or procedures are in place prohibiting the conversion of natural forests and other natural ecosystems as part of REDD+ actions.

Describe how this indicator is met.

Brazil has ratified numerous international conventions and accords related to **environmental protection** and the **conservation of natural forests**, supported by a robust domestic legal framework. This framework aligns with these treaties, enabling effective forest management, mapping, and conservation efforts, while prohibiting the conversion of **natural forests** to other land uses unless explicitly permitted by law and compensated.

In its submissions to the **United Nations Framework Convention on Climate Change (UNFCCC)**, the preparation of its **National Forest Inventory (IFN, or *Inventário Florestal Nacional*)**, and related activities, Brazil defines forests based on **United Nations Food and Agriculture Organization (FAO)** criteria. **The Brazilian Institute of Geography and Statistics (IBGE)** classifies these forests into categories such as Dense Ombrophilous Forest, Mixed Ombrophilous Forest, Deciduous Seasonal Forest, Cerrado formations, Coastal forests, and Mangroves, among others. This comprehensive classification ensures consistency in identifying and protecting natural forests.

CANCUN SAFEGUARD E

Tocantins adopts the same forest definition as used in **Brazil's Forest Reference Emission Level (FREL; FREL-Brasil, 2024)** submissions to the UNFCCC (2022 and 2024). Emissions from deforestation are calculated based on areas where native forest formations are converted to non-forest land uses. This approach aligns with national methodologies and restricts degradation analysis to carbon losses in Amazonian and Cerrado native forest phytophysiognomies due to fire scars.

Emissions resulting from deforestation are calculated based on areas where native forest phytophysiognomies are converted into other land use categories (non-forest lands). The ascertainment of these emissions is limited to data from activities occurring exclusively in the areas covered by the FREL forest map.

The definition of degradation adopted in this submission (see Section 10.3.2) refers to the carbon losses from natural vegetation that occur exclusively in the native forest phytophysiognomies in the Amazon and Cerrado biomes, resulting from fire scars.

Brazil has established a comprehensive legal framework to ensure the conservation of native forests, prohibiting or compensating their conversion into other land uses. The following federal policies and regulations emphasize sustainable forest management, biodiversity preservation, and climate change mitigation:

Several key federal laws and policies provide foundational standards for protecting natural forests and prohibiting or compensating their conversion:

- **National Environmental Policy (*Política Nacional do Meio Ambiente* or PNMA, Federal Law No. 6.938/1981):** the PNMA incorporates ecological-economic zoning (ZEE) as a key instrument for territorial organization. Regulated by **Decree 4.297/2002**, ZEE is a mandatory framework for the implementation of public and private plans, projects, and activities. Its objectives include protecting environmental quality, preserving water and soil resources, conserving biodiversity, and guaranteeing sustainable development to improve living conditions for current and future generations. ZEE systematically coordinates decisions by public and private entities, ensuring the sustainable use of natural resources, including native forests, and the maintenance of ecosystem services. The zoning process is collaborative across federal, state, and municipal levels, adhering to the federal pact and the National Environmental System (SISNAMA). Under Complementary Law No. 140/2011, the federal government develops ZEE at the national and regional levels, states develop it at the state level in alignment with federal zoning, and municipalities implement it through their master plans.
- **National System of Protected Areas Law (*Lei do Sistema Nacional de Unidades de Conservação or SNUC*,** Law No. 9.985/2000**):** the **SNUC Law** defines **protected**

CANCUN SAFEGUARD E

areas as territorial spaces with significant natural features established by federal, state, or municipal governments for conservation. These areas are managed under specific regimes to ensure protection and sustainable use, where: (i) **Full Protection Protected Areas (*Unidades de Conservação de Proteção Integral*)** aim to preserve nature, permitting only indirect use of natural resources unless explicitly allowed by law; and (ii) **Sustainable Use Protected Areas (*Unidades de Conservação de Uso Sustentável*)** aim to balance conservation with the sustainable use of natural resources (Art. 7, Paragraphs 1 and 2).

- **National Policy on Climate Change (*Política Nacional das Mudanças Climáticas* or PNMC, Law No. 12.187/2009):** the PNMC reaffirms Brazil's commitment to reducing deforestation and conserving forests. Key instruments include **Action Plans for the Prevention and Control of Deforestation (*Planos de Prevenção e Controle do Desmatamento* or PPCDs)** in all Brazilian biomes, targeting the preservation of native forests and mitigation of GHG emissions.
- **Forest Code (Federal Law No. 12.651/2012):** the **Forest Code** establishes robust standards for protecting native vegetation, and prohibiting conversion unless compensation occurs. These include: (i) requiring rural properties to maintain **Permanent Preservation Areas (*Áreas de Preservação Permanente* or APPs)** and **Legal Reserve (*Reserva Legal* or RL) areas**; (ii) regulation of the commercial use of forests and control over raw forest materials and their supply chains; and (iii) prevention and control of forest fires. The primary implementation tool of the Forest Code is the **Rural Environmental Registry (*Cadastro Ambiental Rural*, or CAR)**, a mandatory national database under the **National Environmental Information System (*Sistema Nacional de Informação sobre Meio Ambiente*, or SINIMA)**. CAR integrates environmental data from rural properties, forming a basis for: (i) monitoring and controlling deforestation; (ii) ensuring compliance with the Forest Code; and (iii) facilitating participation in state environmental regularization programs.
- **Public Forest Management Law (*Lei de Gestão de Florestas Públicas*, Federal Law No. 11.284/2006):** this law regulates the management of public forests for sustainable production. It establishes the **Brazilian Forest Service (*Serviço Florestal Brasileiro*, or SFB)**, and the **National Forest Development Fund (*Fundo Nacional de Desenvolvimento Florestal*, or FNDF).** This law defines public forests as "forests, whether natural or planted, located across various Brazilian biomes, on properties under the domain of the Federal Government, States, Municipalities, Federal District, or entities of indirect management" (art. 3, I). The law also mandates that the SFB shall establish and maintain the **National Forest Information System (*Sistema Nacional de Informações Florestais*, or SNIF)** in coordination with the SINIMA.

CANCUN SAFEGUARD E

- National Policy for the Recovery of Native Vegetation (*Política Nacional de Recuperação da Vegetação Nativa*, or PROVEG, Federal Decree No. 8.972/2017): aims (Art. 2) to coordinate, integrate, and promote policies, programs, and initiatives that drive the restoration of forests and other forms of native vegetation; and to propel the environmental compliance of Brazilian rural properties in accordance with the Forest Code, covering a total area of at least 20 million ha by December 31, 2030. The Policy is implemented through the National Plan for the Recovery of Native Vegetation (*Plano Nacional de Recuperação da Vegetação Nativa*, or PLANAVEG).

The **State of Tocantins** is subject to national policies aimed at **reducing deforestation** and promoting the **conservation and sustainable use of forests**. These policies align with international commitments, including the **UNFCCC**, the **Paris Agreement**, and the **CBD**. Tocantins implements national instruments such as the **ZEE**, the creation of **protected areas**, and the **CAR** to map native and planted forests and other ecosystems, prohibiting their conversion into other land uses unless explicitly permitted by law and compensated for.

- **Environmental Policy of the State of Tocantins (*Política Ambiental do Estado do Tocantins*, State Law No. 261/1991)**: this law establishes principles, goals, and standards to protect the environment and improve quality of life. Its objectives include ensuring adequate land use and water resource allocation for urban and rural areas and defining permitted uses and ecological management practices.
- **Forest Policy of the State of Tocantins (*Política Florestal do Estado do Tocantins,* State Law No. 771/1995)**: provides that "the forests within the territory of the State of Tocantins, along with other forms of vegetation recognized for their environmental value, and the lands they cover, are assets of common interest to all inhabitants of the State, subject to property rights with the limitations set forth by this Law and other applicable legislation." (art. 1 of State Law No. 771/1995). This Policy further stipulates that forest activities must ensure the maintenance of quality of life, ecological balance, and the preservation of genetic heritage, while observing, among other factors, the principle of the social function of property (Art. 2, II). It also sets prohibitions and conditions for the removal of native vegetation (**Art. 2, II**).
- **State System of Protected Areas (*Sistema Estadual de Unidades de Conservação*, or SEUC, State Law No. 1.560/2005)**: the **SEUC Law** establishes criteria for the creation and management of **protected areas in Tocantins**, defining nature conservation as a process encompassing **Preservation**, **maintenance**, **sustainable use**, **restoration**, and **recovery** of natural environments. The goal is to optimize the sustainable benefits of ecosystems for present and future generations while ensuring the survival of biodiversity.

CANCUN SAFEGUARD E

- **Tocantins State Policy on Climate Change (*Política Estadual sobre Mudanças Climáticas, Conservação Ambiental e Desenvolvimento Sustentável do Tocantins* or PEMC/TO, State Law No. 1.917/2008)**: the PEMC/TO highlights the importance of conserving **forests**, the Cerrado, and biodiversity to mitigate climate change impacts caused by human activities. The law's objectives include: (i) Developing action plans to mitigate climate change and integrating them into general and sectoral planning; and (ii) Establishing vulnerability indicators within the **Economic Ecological Zoning** to identify areas at greater risk from climate change (Art. 2, X and XIII)
- **Climate Fund (*FunClima*, State Law No. 4.131/2023):** Tocantins established the FunClima, linked to SEMARH. This fund will provide financial resources to support projects, programs, and initiatives aimed at mitigating climate change and adapting to its impacts. Among other activities, the resources must be allocated to projects aimed at reducing carbon emissions from deforestation and forest degradation, with priority given to natural areas under threat of destruction and relevant to biodiversity conservation strategies.

These state-level instruments demonstrate Tocantins' adherence to national policies and international agreements, and its commitment to the conservation of native forests and the prevention of their conversion into other land uses.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to ensure the design and implementation of REDD+ actions consider information of spatial distribution of natural forests and other natural ecosystems and avoids the conversion of these forests and other natural ecosystems, in line with relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal framework, policies and programs.

Describe how this indicator is met.

The State of Tocantins has implemented a comprehensive framework of policies and programs to ensure that actions to reduce deforestation and degradation are informed by official sources of spatial distribution data of natural forests and ecosystems used by Brazil, as well as by sources created by the State and tailored to its specific needs in preventing forest conversion.

Through its adherence to the **PNMA (Federal Law No. 6.938/1981)** and the **PNMC (Federal Law No. 12.187/2009)**, the State has adopted instruments such as the **Ecological-Economic Zoning (ZEE),** the **Rural Environmental Registry (CAR), and the State System**

CANCUN SAFEGUARD E

of Protected Areas (SEUC). It also engages with different official federal sources, such as the **National Forest Information System (SNIF)**, which is integrated into the **National Environmental Information System (SINIMA)**.

These tools ensure that all land use decisions made by SEMARH and other state departments and agencies are based on accurate data regarding the spatial distribution of natural forests and other ecosystems, preventing their unauthorized conversion and requiring compensation when applicable.

The following key initiatives demonstrate how Tocantins operationalizes these instruments:

- **Tocantins Ecological-Economic Zoning (ZEE/TO):** Tocantins has developed an **interactive GIS portal** to disseminate ZEE data, enhancing transparency and accessibility. In 2022, the ZEE was approved by the State Commission **(***Comissão Estadual*), and it has been undergoing review by **COEMA/TO** since 2023. Once finalized and passed into law by the State Legislative Assembly, the ZEE will provide a foundational tool for guiding land use decisions while prioritizing the conservation of forests and ecosystems. Nevertheless, the studies that underpin the ZEE/TO are already used to guide decisions by State agencies.
- **Rural Environmental Registry (CAR) in Tocantins:** The Forest Code mandates the implementation of the CAR by States, system designed to integrate environmental data from rural properties. CAR plays a critical role in identifying areas of natural forests and ensuring their protection against unauthorized conversion. Tocantins has tailored its CAR implementation through:
  - **Joint Normative Instruction No. 1, of July 3, 2024:** issued by **SEMARH** and **NATURATINS**, this Normative Instruction establishes procedures for **CAR registration and review** processes in Tocantins, and issues guidelines for drafting Terms of Commitment for adherence to the **Environmental Regularization Program (*Programa de Regularização Ambiental*, or PRA)**.
  - COEMA Resolution No. 61, of October 2, 2015: Establishes the **Rural Property Registry for Donations to Protected Areas (*Cadastro de Imóveis Rurais para Doação em Unidade de Conservação*, or CIDUC).**
  - Data on CAR implementation in Tocantins is continually updated and made available on **this platform**, which is used to inform State land use decisions and command-and-control actions to fight deforestation and forest degradation.
- **State System of Protected Areas (SEUC):** SEUC emphasizes preserving natural ecosystems and optimizing their sustainable use for present and future generations. SEUC is integrated into the National Registry of Protected areas (*Cadastro Nacional*

CANCUN SAFEGUARD E

de Unidades de Conservação, or CNUC), a national data system offering standardized information for the planning, management, and oversight of all protected areas in Brazil. At the state level, information about the SEUC can be found here.

- The State is currently using information from the CNUC, the CAR registry and the ZEE/TO studies to aid in **updating the Management Plans (***Planos de Manejo*) for the Lajeado State Park (*Parque Estadual do Lajeado*) and the Santa Tereza River Mouth Environmental Protection Area (*Área de Proteção Ambiental Foz do Rio Santa Tereza*).
- It is also using the same databases to help develop **five new Management Plans** for the following Environmental Protection Areas: Araguaína Springs (*Nascentes de Araguaína*), Lajeado, Peixe-Angical Lake (*Lago de Peixe-Angical*), Santa Isabel Lake (*Lago de Santa Isabel*), São Salvador of Tocantins Lake (*Lago de São Salvador do Tocantins*), Paranã and Palmeirópolis.
- **Cantão State Park Management Plan** is being updated through a Technical Cooperation Agreement with the Environmental Monitoring and Fire Management Center (CeMAF) at the Federal University of Tocantins (UFT).
- Similarly, the ***Ilha do Bananal*/Cantão Environmental Protection Area Management Plan** is undergoing revision through a Technical Cooperation Agreement (*Acordo de Cooperação Técnica*, or ACT) among COMUNITAS, SEMARH, and NATURATINS.

Plan for the Prevention and Control of Deforestation and Forest Fires (PPCDIF): as a cornerstone of Tocantins' climate strategy, the PPCDIF was informed, amongst other sources, by **official data gathered by the federal government** (e.g. PRODES from INPE), the **CAR**, and the **SEUC** to diagnose the causes of deforestation and forest degradation in the State, to set goals, and to define its priority actions to avoid the conversion of forests and other natural ecosystems to alternative land uses.

Focus on Fire Project (*Projeto Foco no Fogo*): through this project, SEMARH collaborates with the **State Fire Committee** to mitigate wildfire risks in priority municipalities, engaging in environmental education campaigns targeting agricultural producers, landowners, and local businesses. The priority municipalities were chose based on fire incidence data from the **National Institute for Space Research (INPE)**. The use of this data allowed the State to identify high-risk areas and deploy fire prevention teams.

CANCUN SAFEGUARD E

OUTCOME INDICATOR: REDD+ actions were designed and implemented avoiding the conversion of natural forests and other natural ecosystems to plantations or other land uses.

Describe how this indicator is met.

The Brazilian Forest Code establishes the essential guidelines for the protection, maintenance, and restoration of native vegetation on rural properties in the country. It is the main legislation in place to avoid the conversion of natural forests. The Code mandates forest conservation obligations for all rural properties, including the maintenance of Permanent Preservation Areas (*Áreas de Preservação Permanente* or APPs), the Legal Reserves (*Reserva Legal* or RLs), and the requirement to restore degraded areas in certain cases.

To support these obligations, the Forest Code introduced the Rural Environmental Registry (*Cadastro Ambiental Rural*, or CAR) as a critical tool for environmental monitoring and enforcement. The CAR serves two primary functions: identifying areas that are required by law to be preserved and mapping areas in need of environmental regularization through a Degraded Areas Recovery Plan (*Plano de Recuperação de Áreas Degradadas* or PRAD).

One of the key objectives of Tocantins' REDD+ actions, particularly those outlined and implemented through its sectoral plans to address and adapt to climate change, is to prevent and control the conversion of native vegetation into other land uses through the implementation of the Forest Code.

To ensure compliance and monitor this indicator during the crediting period (2020-2024), the state plans to:

- **Advance the implementation of the Rural Environmental Registry (CAR),** a tool for monitoring and ensuring environmental compliance by identifying permanent preservation areas, legal reserves, remnants, native vegetation, areas designated for alternative uses, and restricted-use areas within rural properties in the state. As of 2020, the state had registered 4.13% of its eligible area. By 2025, the state aims to validate 60% of the CAR records.
  - **Means of verification**: Reports from the online CAR platform, PPCDIF Monitoring Report.
- **Conduct a survey of degraded areas available for restoration,** with a goal of promoting the recovery of 1,000 ha of degraded land. To guide landowners in restoring degraded areas on their properties, NATURATINS has developed an informational booklet, a Native Vegetation Recovery Manual, and established procedures for producers to prepare their PRADs (Degraded Areas Recovery Plans).

CANCUN SAFEGUARD E

- **Means of verification**: Management reports from SEMARH and NATURATINS, including the number of PRADs developed.

- **Reduce the area affected by forest fires** compared to the 10-year moving average through preventive measures implemented under the "Focus on Fire" Project (*Projeto Foco no Fogo*) and firefighting efforts coordinated by the State Fire Committee in priority municipalities. This initiative also aims to decrease the number of priority municipalities at risk of forest fires.

- **Means of verification**: Reports on heat spots in Tocantins, operational reports from the Fire Committee on firefighting activities, and documentation on the number of firefighting brigades established and trained, including details on resources allocated for brigade infrastructure and the number of municipalities with active brigades

- **Monitor deforestation and wildfires** to obtain annual data on deforestation, areas affected by fire, and degraded areas to inform enforcement, control, and firefighting actions.

- **Means of verification:** Annual reports on deforestation and wildfires.

- **Carry out enforcement operations led by NATURATINS**, targeting unauthorized deforestation and wildfires, to prevent environmental crimes and achieve zero illegal deforestation.

- **Means of verification**: PPCDIF Monitoring Report, management reports from SEMARH and NATURATINS, detailing the number of infractions observed, inspected areas, and administrative procedures opened to sanction unauthorized deforestation.

- **Approve Tocantins' Ecological-Economic Zoning (ZEE/TO) proposal in the ZEE Commission and in COEMA**/TO.

- **Means of verification**: approval acts from the ZEE Commission and COEMA/TO.

THEME E.2: Protect natural forests and other natural ecosystems, biological diversity, and ecosystem services.

STRUCTURAL INDICATOR: Relevant ratified international conventions, agreements, and/or domestic legal framework or policies identify priorities for the protection and conservation of natural forest areas and natural ecosystems, biodiversity, and ecosystem services, to which REDD+ actions could contribute.

Describe how this indicator is met.

CANCUN SAFEGUARD E

Brazil has ratified **a series of international conventions regarding the protection of natural forests, biological diversity, and ecosystem services**, such as: Convention on Biological Diversity (Federal Decree No. 2.519/1998), highlighted by COP/CBD Decision XI/19 of 2012, Aichi Targets, Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits; United Nations Framework Convention on Climate Change (Federal Decree No. 2.652/1998); International Treaty on Plant Genetic Resources for Food and Agriculture (Federal Decree No. 6.476/2008); Convention on International Trade in Endangered Species of Wild Fauna and Flora (Federal Decree No. 3.607/2000); United Nations Convention to Combat Desertification (Federal Decree No. 2.741/1998); Convention on the Conservation of Migratory Species (Federal Decree No. 9.080/2017); Ramsar Convention on Wetlands (Decree No. 1.905/1996), among others.

The **Federal Government** also established general standards concerning the protection of natural forests and other types of vegetation, biological diversity, and ecosystem services, primarily:

- Article 225 of the **Brazilian Federal Constitution of 1988** establishes the constitutional order for the preservation of the environment in Brazil, including specific territorial areas and their components that are to be specially protected, and designates the Amazon Rainforest as national heritage.
- The **National Environmental Policy (PNMA, Federal Law No. 6.938/1981)** aims to preserve, enhance, and restore the environmental quality conducive to life, with the goal of ensuring conditions within the country for socio-economic development, national security interests, and the protection of human dignity.
- The **National System of Protected Areas Law (*Lei do SNUC*, Federal Law No. 9.985/2000)** establishes a set of categories for territorial spaces with native vegetation or relevant environmental attributes that warrant territorial demarcation and management of natural resources, which may be designated for full protection or sustainable use.
- The **National Biodiversity Policy (*Política Nacional de Biodiversidade*, or PNB, Federal Decree No. 4339/2002)** regulated commitments made by Brazil when it signed the CBD. The overarching structure of the PNB aims to address regulatory programs for the components of biodiversity: (i) knowledge of biodiversity; (ii) biodiversity conservation; (iii) sustainable use; (iv) monitoring, evaluation, prevention, and mitigation of biodiversity impacts; (v) access to genetic resources, traditional knowledge, and benefit-sharing; (vi) education, awareness, and dissemination of information on biodiversity; and (vii) legal and institutional strengthening for biodiversity management.

CANCUN SAFEGUARD E

- The **Forest Code** (Federal Law No. 12.651/2012), under its Article 41, I, authorizes the federal Executive Branch to establish, without prejudice to compliance with environmental legislation, a program to support and incentivize environmental conservation, as well as the adoption of technologies and best practices that reconcile agricultural and forestry productivity with the reduction of environmental impacts. This initiative is a means to promote sustainable development, always considering criteria of progression. It encompasses, among other categories and action lines, the payment or incentivization of environmental services as compensation, whether monetary or not, for activities that conserve and enhance ecosystems and generate environmental services. These services may include, either individually or cumulatively: a) the sequestration, conservation, maintenance, and increase of carbon stock and the reduction of its flow; b) the conservation of natural scenic beauty; c) the conservation of biodiversity; d) the conservation of water resources and hydric services; e) climate regulation; f) the appreciation of cultural and traditional ecosystem knowledge; g) soil conservation and improvement; and h) the maintenance of Permanent Preservation Areas, Legal Reserves, and areas under restricted use.
- Federal Law No. 14.119/2021 establishes definitions, objectives, guidelines, actions, and criteria for implementing the **National Policy for Payment for Environmental Services (*Política Nacional de Pagamentos por Serviços Ambientais*, or PNPSA),** creates the National Registry for Payment for Environmental Services (*Cadastro Nacional de Pagamentos por Serviços Ambientais*, or CNPSA), and the Federal Program for Payment for Environmental Services (*Programa Federal de Pagamento por Serviços Ambientais*, or PFPSA), and addresses agreements concerning payments for environmental services.

From the standpoint of frameworks for identifying priorities in the protection and conservation of natural forest areas and ecosystems, biodiversity, and ecosystem services – which REDD+ initiatives can support – **the State of Tocantins has a robust legal framework and governance structure in place**, notably:

- The establishment and management of protected areas are integral components of the territorial strategy, which aids in land-use planning and, consequently, in preventing the conversion of forests into other land uses. In this context, State Law No. 1.560/2005 establishes the **SEUC**.
- State Law No. 1.917/2008, the **Tocantins State Environmental Policy**, outlines its objective in recognizing the importance of conserving forests, the Cerrado, and biodiversity considering human activities that cause climate change. It underscores the State of Tocantins' fundamental commitments to the sustainable development of the economy, environment, technology, and the quality of life for present and future generations (Article 1, Sole Paragraph, I). The objectives also include the

CANCUN SAFEGUARD E

implementation of research projects within protected areas, the establishment of new protected areas in accordance with the SEUC, and the establishment of indicators or zones that highlight areas with heightened vulnerability to climate change within the scope of the Ecological Economic Zoning, (Art. 2, Sections XI, XII, and XIII). Among its guidelines is an emphasis on promoting the development of action plans by State agencies and entities, which contribute to reducing deforestation and net GHG emissions, environmental conservation, poverty alleviation, and the sustainable development of Tocantins (Art. 3, II).

- State Law No. 4.111/2023 established the **PEPSA** within the biomes of the State of Tocantins, outlining the associated concepts, objectives, and principles for its implementation. PEPSA introduced relevant concepts (Article 2) for its implementation and the conservation and maintenance of ecosystem services within the State, such as: I – Ecosystem services: Relevant benefits for society generated by ecosystems in terms of maintaining, restoring, or enhancing environmental conditions; and II – environmental services: individual or collective activities that favor maintenance, restoration, or improvement of ecosystem services. Among its objectives, the PEPSA anticipated: structuring and strengthening the role of public authorities in maintaining the integrity of ecosystems and the well-being of the population in the State of Tocantins, emphasizing the stakeholders and activities responsible for the preservation, conservation, maintenance, and improvement of environmental services; and continuously pursuing sustainable development (art. 5, IV and XIII).

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to protect and avoid adverse impacts on natural forest areas and natural ecosystems, biodiversity, and ecosystem services in the design and implementation of REDD+ actions, according to relevant ratified international conventions, agreements, and/or domestic legal frameworks, policies and programs.

Describe how this indicator is met.

The following processes established at the national level are particularly significant at the state level:

- The **National Biodiversity Committee**, created through the National Environmental Policy under Federal Decree No. 4.703/2003 and reviewed by Federal Decree No. 12.017/2024, is the joint body within the Ministry of the Environment and Climate Change's structure that is responsible for promoting actions to implement the Country's undertaken commitments before the CBD, and others related to biodiversity. It also includes the identification of priority areas for the conservation, sustainable use, and

CANCUN SAFEGUARD E

equitable sharing of biodiversity benefits, as well as the establishment of national lists of threatened and invasive species.

- The **Ministry of the Environment's Ordinance No. 148/2022**, revises the official list of endangered species of fauna and flora. In the new list, 7,524 species of Brazil's flora were assessed.
- The Biodiversity **Priority Areas and Actions for Conservation, Sustainable Use, and Benefit Sharing** formally established by Decree No. 5.092/2004, within the responsibilities of the MMA , serve as a public policy instrument aimed at objective and participatory decision-making. Key initiatives include: the creation of protected areas, licensing of potentially polluting activities, enforcement and monitoring, promotion of sustainable use practices, and environmental regularization. The list of these areas has undergone its first and second updates.
- The **National Program for the Conservation of Endangered Species** (*Programa Nacional para a Conservação de Espécies Ameaçadas de Extinção*, or *Pró-Espécies*), established by the MMA through Ordinance No.43/2014, seeks to meet Target 12 of the CBD. This program's implementation is enabled by **the National Strategy Project for the Conservation of Endangered Species (*Projeto Estratégia Nacional para a Conservação de Espécies Ameaçadas de Extinção* – GEF Pró-Espécies) United Against Extinction (*Todos contra extinção*)**. The project collaborates with the states of Maranhão, Bahia, Pará, Amazonas, **Tocantins**, Goiás, Santa Catarina, Paraná, Rio Grande do Sul, Minas Gerais, São Paulo, Rio de Janeiro, and Espírito Santo to develop comprehensive conservation strategies across 24 territories, covering a total area of 9 million ha. Its primary focus is fostering integration between federal and state actions in implementing public policies. Additionally, the project aims to enhance conservation efforts by reducing threats and improving the conservation status of at least 290 species classified as **Critically Endangered** (*Criticamente em Perigo* or CR**)** that currently lack dedicated conservation instruments.
- The **National Action Plan for the Conservation of Endangered Flora in the Upper Tocantins Basin** (*Plano de Ação Nacional* or PAN *da Bacia do Alto Tocantins*), formalized by Research Institute of the Rio de Janeiro Botanical Garden's (*Instituto de Pesquisas Jardim Botânico do Rio de Janeiro's* or JBRJ) Ordinance No. 15/2023, aims to enhance conservation efforts for target species, their habitats, and the maintenance of ecosystem services over a five-year period (2023-2028). To achieve these goals, specific initiatives have been developed, focusing on conservation strategies for target species and their habitats. These initiatives have specific objectives, including: (i) **Generating and disseminating knowledge** to support conservation and sustainable practices; (ii) **Expanding in situ and ex situ conservation and management**

CANCUN SAFEGUARD E

strategies for target species populations and their habitats; and (iii) **Promoting and strengthening public policies** that support conservation efforts.

- The PAN for the Upper Tocantins Basin encompasses an area of 55,637 square kilometers, covering parts of the **Federal District** and the **state of Goiás**, as well as 31 protected areas across various levels and categories. The plan addresses 98 target species currently at risk of extinction, including: 14 species classified as "Critically Endangered", 58 as "Endangered", and 26 as "Vulnerable". In addition, 44 other species indirectly benefit from the conservation measures detailed in the PAN. **COESC** and the **National Center for Flora Conservation (*Centro Nacional de Conservação da Flora*, or CNCFlora)** play a central role in coordinating and monitoring the implementation of this strategy, leveraging a broad network of partners dedicated to the recovery and protection of these species.

At the state level, the following initiatives are noteworthy:

- Among the instruments employed by Tocantins for planning and implementing the PEMC/TO and PEPSA, the PPCDIF 2021-2025 stands out.
- The State of Tocantins actively participates in the **GEF Pró-Espécies All Against Extinction** through the **PAT Tocantins** and the **PAT Meio-Norte**.
- The Action Plan for the Conservation of Threatened Species in the Cerrado Territory of Tocantins (*Plano de Ação para Conservação das Espécies Ameaçadas do Território Cerrado Tocantins* or PAT Tocantins) was officially promulgated through Ordinance No. 80/2020 in the State's Official Gazette. Located in the upper Tocantins River basin, the region is globally recognized for its extraordinary biological diversity. However, only 6.87% of its area is protected. The Cerrado Tocantins territory has been designated as a priority area for the conservation of endangered species. It spans 22 municipalities, stretching from the far eastern part of the state in the Serras Gerais region, through the Natividade area, and extending to the vicinity of the Tocantins River, from the municipality of Peixe to Miracema. This region covers a total of 3,721,203.59 ha, or over 37,000 square kilometers. The PAT Tocantins outlines and establishes priority conservation measures for 12 flora and fauna species classified as endangered. These species are listed in the National Endangered Species Lists (MMA Ordinances No. 443/2014, 444/2014, and 445/2014) and the Red Book of Brazilian Flora – Rare Plants of the Cerrado.
- The Territorial Action Plan for the Conservation of Endangered Species in the Meio Norte Territory (PAT Meio-Norte) serves as a strategic instrument to guide preservation efforts and mitigate threats to biodiversity. This initiative aims to develop measures to improve the conservation status of species at risk of extinction within the Meio-Norte Territory, encompassing the states of Maranhão, Pará, and Tocantins, specifically the

CANCUN SAFEGUARD E

Bico do Papagaio region. The **PAT Meio-Norte** is coordinated by the **NATURATINS**, in partnership with the **Maranhão State Department for Environment and Natural Resources (SEMA/MA)** and the **Forestry and Biodiversity Development Institute of the State of Pará (Ideflor-Bio)**, as part of the Pro-Species Project. On June 18, 2021, the Maranhão State Department for Environment (SEMA/MA) issued **Ordinance No. 44/2021**, published in the Official Gazette of the State of Maranhão (DOE/MA). Subsequently, on August 31, 2021, Naturatins issued **Ordinance No. 145/2021**, documented in the Official Gazette of the State of Tocantins (DOE/TO). Additionally, on August 12, 2021, Ideflor-Bio enacted **Ordinance No. 420/2021**, which established the creation of the **PAT Meio-Norte** and the **Technical Advisory Group (*Grupo de Assessoramento Técnico*, or GAT)**.

- **NATURATINS** is the executive body responsible for environmental law enforcement in the State (service charter) and has authority over state protected areas. It is responsible for the management, oversight, and Monitoring of protected areas, along with the implementation of the Forest Code. It plays a fundamental role in the monitoring and implementation of REDD+ actions in Tocantins, engaging in various efforts, primarily in deforestation and fire control to prevent adverse impacts. Within the framework of NATURATINS, the management of protected areas is structured as follows:
  - The management is conducted by the **Director for Biodiversity and Protected Areas (*Diretoria de Biodiversidade e Áreas Protegidas*, or DBAP).**
  - The institute integrates state protected areas into federal programs such as **ARPA (*Áreas Protegidas da Amazônia*, or Amazon Protected Areas Program).**
  - Participates in Environmental Protection Programs: **the Mergon Duck Conservation Program** in Jalapão (Ordinance No. 213/2024), and **the Ariranha Conservation Program** (Ordinance No. 70/2022).
  - Establishes limits to the use of natural resources in protected areas, involving traditional riverine communities and professional fishermen, for example: the **Suspension of Pirarucu Fishing Season** (NATURATINS Ordinance No. 045/2020), and the **Suspension of the Extension of the Pirarucu Fishing Season** (NATURATINS Ordinance No. 089/2021).
  - Monitoring and oversight of protected areas.
  - Environmental regularization of protected areas.
  - The **Tocantins Wildlife Center** (*Centro de Fauna do Tocantins*), established by NATURATINS Ordinance No. 158/2019, aims to ensure the protection of wildlife

CANCUN SAFEGUARD E

through the implementation of measures to assist animals in imminent danger, as well as socio-environmental and educational initiatives designed to promote public health and combat animal trafficking.

In 2020, the Tocantins Government engaged in the preparation of a Guidebook and a Manual on Restoring Native Vegetation to Ensure Environmental Compliance for Rural Properties across the State. This effort was part of the broader **Restoration Value Chain Incentive Program** (*Programa de Incentivos da Cadeia Produtiva da Restauração*). The program serves as a technical framework, providing guidelines and standards to support and streamline the implementation of vegetation restoration projects within Tocantins. It is designed for all professionals involved in these efforts, including engineers responsible for overseeing the restorations and NATURATINS personnel tasked with conducting inspections and certifying the results achieved (PPCDIF 2021-2025, p. 102).

- To support the production chains of sociobiodiversity, NATURATINS enacted Ordinance No. 042/2024 which regulates agro-extractive activities within the **Local Network for Sustainable Use of Natural Resources of the** Cerrado (*Rede Local de Uso Sustentado dos Recursos Naturais do* Cerrado), located in state-protected areas of the Jalapão region, commonly referred to as the **Jalapão Network** (*Rede Jalapão*).
- To promote the **bioeconomy** within Tocantins, a **Technical Cooperation Agreement** was established between **Conservation International (CI) Brazil** and **SEMARH** to develop the **State Bioeconomy Plan (*Plano Estadual de Bioeconomia*)**. Additionally, the bioeconomy was selected as a central theme for the AGROTINS agricultural and husbandry fair.

OUTCOME INDICATOR: REDD+ actions have promoted the protection of natural forest and other natural ecosystem areas, biodiversity and ecosystem services.

Describe how this indicator is met.

The **State System of Nature Protected Areas (SEUC),** in operation since 2005, serves as a key strategy for the preservation of natural forests, biodiversity, and ecosystem services, including the critically important water resources in the State. There are 42 protected areas in Tocantins, and **NATURATINS currently manages 13 of these protected areas**.

The following are classified as **Sustainable Use state protected areas**: Araguaína Springs Environmental Protection Area, Jalapão Environmental Protection Area, Serra do Lajeado Environmental Protection Area, *Ilha do Bananal*-Cantão Environmental Protection Area, Palmas Lake Environmental Protection Area, Santa Tereza River Mouth Environmental

CANCUN SAFEGUARD E

Protection Area, Peixe-Angical Lake Environmental Protection Area, São Salvador Lake Environmental Protection Area, and Santa Isabel Lake Environmental Protection Area.

The following are classified as **Full Protection state protected areas**: the State Natural Monument of Tocantins' Fossilized Trees (*Monumento Natural Estadual das Árvores Fossilizadas do Tocantins* or MONAF), the Cantão State Park, the Jalapão State Park, and the Lajeado State Park

To implement and monitor this indicator, the state planned to:

- **Revise and update management plans, internal regulations, and the composition of management councils for key state protected areas**, to ensure their effective implementation.
- **Means of verification**: Regulatory acts providing public notice of decisions, updated and revised plans and internal regulations.
- **Enhance management and monitoring of six protected areas using the "Tracking Tool",** a questionnaire developed based on the model established by the World Commission on Protected Areas (WCPA) of the International Union for Conservation of Nature (IUCN). It evaluates the performance of the areas through 33 objective questions divided into six strategic areas: context, planning, inputs, management processes, management outputs, and proposed outcomes and impacts. Each theme uses a gradient scale, where the lowest level is scored as zero, and the optimal level is scored as three.
- **Means of verification**: Reports on the effectiveness of the protected areas' management.
- **Develop programs and action plans for the conservation of endangered flora and fauna species**.
- **Means of verification**: Documents detailing the programs and action plans for endangered flora and fauna species, along with their official creation acts.
- **Secure financial resources to enhance the management of protected areas by granting concessions for tourism services at the Jalapão State Park**.
- **Means of verification**: Granted concessions' documents, PPCDIF Monitoring Report.
- **Continue to implement the Ecological Tax on the Circulation of Goods and Services (*Imposto sobre a Circulação de Mercadorias e Serviços Ecológico*, or ICMS Ecológico),** a state payment-for-environmental-services program designed to strengthen municipal environmental management. Through the Ecological ICMS, Tocantins allocates 13% of the resources from the Municipal Participation Index (*Índice*

CANCUN SAFEGUARD E

de Participação dos Municípios or IPM) based on the results of environmental actions conducted and verified by the municipalities.

- **Means of verification:** Management reports from SEMARH and SEFAZ detailing the number of municipalities participating in the Ecological ICMS and the total volume of resources allocated to municipalities through this mechanism.

THEME E.3: Enhancement of social and environmental benefits.

STRUCTURAL INDICATOR: Relevant ratified international conventions, agreements, and/or domestic legal framework, policies and programs regulate the assessment of potential social and environmental benefits of REDD+ actions.

Describe how this indicator is met.

Brazil has ratified key international conventions and agreements that contribute to the governance framework of REDD+. Moreover, the country has a domestic legal framework that aligns with these treaties and aids in assessing the social and environmental benefits of these interventions, including:

International Conventions and Agreements:

- The **UNFCCC** stipulates that the Parties are obligated to protect the climate system for the benefit of present and future generations of humanity, based on principles of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Consequently, developed country Parties are obligated to take the lead in addressing climate change and its adverse effects (Art. 3).
- **Article 5 of the Paris Agreement**, which pertains to the REDD+ mechanism, encourages Parties to promote social and environmental benefits that are not carbon related.
- Brazil is a signatory to the **CBD**, which is structured around three principal pillars: the conservation of biological diversity, the sustainable use of biodiversity, and the fair and equitable sharing of benefits arising from the use of genetic resources.
- The CDB serves as a broad legal and political framework for other more specific environmental conventions and agreements, such as the Cartagena Protocol on Biosafety; the International Treaty on Plant Genetic Resources for Food and Agriculture; the Bonn Guidelines; the Guidelines on Sustainable Tourism and Biodiversity; the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity; the Guidelines for the Prevention, Control, and Eradication of Invasive

CANCUN SAFEGUARD E

Alien Species; and the Principles and Guidelines for the Ecosystem Approach to Biodiversity Management, among others.

Federal legal framework:

- **Article 225 of the 1988 Constitution of the Federative Republic of Brazil (CFRB/1988)** establishes that everyone has the **right to an ecologically balanced environment**, which is a public asset and essential for a healthy quality of life. It mandates both the Government and society to protect and preserve the environment for present and future generations.
- The **National Environmental Policy (PNMA, Federal Law No. 6.938/1981)** aims to harmonize socio-economic development with the preservation of environmental quality and ecological balance.
- The **National System of Protected areas (SNUC, Federal Law No. 9.985/2000)** aims, among its objectives, to economically and socially value biological diversity and to protect the natural resources essential for the livelihoods of traditional populations, while respecting and promoting their knowledge and culture, as well as enhancing their social and economic development.
- The **National Biodiversity Policy (Federal Decree No. 4.339/2002)** encompasses, among other principles, the notion that the conservation and sustainable use of biodiversity should contribute to economic and social development, as well as to the eradication of poverty. Among its guidelines is the stipulation that substantial investments are required to preserve biological diversity, which will consequently yield environmental, economic, and social benefits. Furthermore, the sustainability of utilizing biodiversity components must be assessed from economic, social, and environmental perspectives, with particular emphasis on maintaining biodiversity.
- The **National Policy on Climate Change (PNMC, Federal Law No. 12.187/2009)** aims, among other objectives, to harmonize economic and social development with the protection of the climate system. The objectives of the PNMC must align with sustainable development to pursue economic growth, poverty eradication, and the reduction of social inequalities. Among its guidelines are the adaptation measures aimed at mitigating the adverse effects of climate change and reducing the vulnerability of environmental, social, and economic systems.
- The overarching aim of **Brazil's National REDD+ Strategy (ENREDD+)** is to contribute to climate change mitigation by eradicating illegal deforestation, conserving and restoring forest ecosystems, and fostering the development of a sustainable, low-carbon forest economy, thereby generating economic, social, and environmental benefits.

CANCUN SAFEGUARD E

- The **National Policy for the Restoration of Native Vegetation (PROVEG, Federal Decree No. 8.972/2017)** aims, among its objectives, to promote the restoration of native vegetation in a manner that integrates economic utilization and provides social benefits.
- The **National Policy for Payments for Environmental Services (PNPSA, Federal Law No. 14.119/2021)** includes as one of its guidelines the provision for utilizing payments for environmental services as a tool to promote the social, environmental, economic, and cultural development of populations in rural and urban areas, as well as rural producers, traditional communities, Indigenous peoples, and family farmers.
- **The National Bioeconomy Strategy (Federal Decree 12.044/2024)** was established with the purpose of coordinating and implementing public policies aimed at the development of the bioeconomy. This initiative is designed to work in collaboration with civil society and the private sector across the entire country. For the purposes outlined in the Decree, bioeconomy is defined as a model of productive and economic development that is grounded in the values of justice, ethics, and inclusion. This model can generate products, processes, and services efficiently, based on sustainable use, regeneration, and conservation of biodiversity. It is guided by scientific and traditional knowledge, alongside innovations and technologies, with the aim of adding value, creating jobs and income, promoting sustainability, and maintaining climate balance.

Regarding the regulatory framework for generating and optimizing benefits within the scope of the **State's REDD+ actions**, the following stands out:

- The **PEMC/TO (State Law No. 1.917/2008)** emphasizes the importance of conserving forests, the Cerrado, and biodiversity in response to the harmful effects of human activities on global climate change. It underscores the State of Tocantins' fundamental commitment to the sustainable development of its economy, environment, technology, and the quality of life for present and future generations (Article 1, Sole Paragraph, I). The PEMC/TO incorporates regional characteristics of Tocantins, emphasizing the preservation of forests and the Cerrado in alignment with the principle of sustainable development. This includes implementing measures to stabilize greenhouse gas concentrations in the atmosphere and preserve the environment while promoting social, economic, and ecological benefits. These efforts aim to combat poverty and enhance the quality of life for current and future generations. Additionally, the PEMC/TO outlines objectives such as implementing research projects within Protected Areas and establishing indicators or zones within the **Economic-Ecological Zoning (ZEE)** framework to identify areas most vulnerable to climate change (Art. 2, Sections XI, XII, and XIII).

CANCUN SAFEGUARD E

- **The PEPSA (State Law No. 4.111/2023)** serves as the State Policy for Payment for Environmental Services within the biomes of Tocantins, establishing the concepts, objectives, and principles guiding its implementation. PEPSA aligns with definitions set forth by the **United Nations Conference on Environment and Development (UNCED, Rio-92)** and incorporates an integrated approach to sustainable development, balancing economic, ecological, and social dimensions. This alignment extends to international agreements such as the **UNFCCC**, **UNCCD**, and **CBD**, as well as key national legislation, including Federal Laws No. 12.187/2009; No. 12.651/2012; and No. 14.119/2021. The policy stipulates that payments for environmental services in Tocantins must enhance ecosystem services in ways that are economically, socially, and culturally beneficial, while promoting sustainable development and safeguarding the social and cultural integrity of local communities. Among the mechanisms for payment for environmental services are provisions aimed at improving the social conditions of rural and urban communities.

PROCESS INDICATOR: Public institutions have made use of mandates, procedures, and resources to assess social and environmental benefits of REDD+ actions and to promote the enhancement of these benefits in the implementation of these actions, according to relevant ratified international conventions, agreements, and/or domestic and if applicable, subnational, legal frameworks, policies and programs.

Describe how this indicator is met.

At the national level, various procedures and instruments have been adopted to ensure the effective implementation of international treaties to which Brazil is a signatory. These measures also support the development of regulations and policies aimed at promoting and enhancing the social and environmental benefits of **REDD+ actions**, which, in turn, have direct implications for the State of Tocantins. These include:

- The **National Strategy and Action Plans for Biodiversity (*Estratégia e Planos de Ação Nacionais para a Biodiversidade, or EPANB*)** play a vital role as an integrated management tool for national actions aimed at the conservation of biodiversity and the sustainable use of its components. Furthermore, they promote the fair and equitable sharing of the benefits arising from the use of biodiversity. The EPANB serves as a critical instrument for monitoring the progress of Brazil's initiatives towards achieving the set targets, ensuring that the country fulfils its international commitments and promotes sustainable practices concerning biodiversity.
- The **latest version of Brazil's National Biodiversity Strategy and Action Plan (EPANB)** with its respective **monitoring indicators** was prepared for the 2010 to 2020

CANCUN SAFEGUARD E

period and published in 2017. This version addressed the Aichi Biodiversity Targets, adopted at the Tenth Conference of the Parties to the CBD (COP-10), where it was anticipated that all signatory countries were to achieve 20 targets.

- The **Kunming-Montreal Global Framework** was adopted during the Fifteenth Conference of the Parties (COP-15) to the CBD. Within this framework, 23 targets were set for 2030 (CBD Decision 15/4) with the aim of halting and reversing biodiversity loss to place nature on a recovery path for the benefit of people and the planet. This involves conserving and sustainably using biodiversity while ensuring the fair and equitable distribution of benefits arising from the use of genetic resources. CDB Decision 15/4 established the need to review and update national biodiversity strategies and action plans to align with the Kunming-Montreal Global Framework.
- The Ministry of Environment and Climate Change (MMA), through the Department of Conservation and Sustainable Use of Biodiversity (*Departamento de Conservação e Uso Sustentável da Biodiversidade*), oversees the revision of the EPANB in Brazil. This process is being developed collaboratively, through workshops aimed at gathering input from various sectors – including state governments, the federal Government, NGOs, the private sector, academia, Indigenous Peoples, Traditional Peoples and Communities, and Family Farmers – so that the contributions to the updates reflect the aspirations of society.
- The **National Bioeconomy Strategy (***Estratégia Nacional de Bioeconomia*) is primarily implemented through the **National Socio-Bioeconomy Plan (*Plano Nacional da Sociobioeconomia*)**, which aims to enhance forest and socio-biodiversity economies. This is achieved by identifying, innovating, and valuing their socio-economic, environmental, and cultural potential, thereby increasing market participation and income for Indigenous peoples, Quilombolas, Traditional Communities, and Family Farmers. The Socio-bioeconomy Dialogues are being conducted in the preparation of the Plan, marking a collaborative development process that coordinated by the MMA, together with the Ministry of Agrarian Development and Family Agriculture (*Ministério do Desenvolvimento Agrário e Agricultura Familiar*, or MDA), and the Ministry of Social Development and Fight Against Hunger (*Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome*, or MDS). To this end, five Regional Workshops were conducted, along with various discussion sessions with civil society, government bodies, partners, and relevant sectors. Records related to this proceeding can be found here.

At the state level, the following procedures and instruments are noteworthy:

- The **ZEE/TO** serves as a crucial instrument for preventing deforestation rollback, as it more accurately identifies areas best suited for agriculture as well as critical zones for

CANCUN SAFEGUARD E

biodiversity conservation and the provision of environmental services. Thus, it plays a crucial role in maintaining the balance between the preservation and the economic and social utilization of a territory (PPCDIF 2021-2025, p. 92).

- The **PPCDIF 2021-2025 (Plan for the Prevention and Control of Deforestation and Forest Fires)** builds on the evaluation of outcomes from the previous period (PPCDQ 2015-2020) and establishes new targets and actions to prevent the reversal of progress in reducing deforestation and forest degradation. The plan focuses on state-level implementation, prioritizing municipalities experiencing the highest pressures, including the greatest deforestation and fire rates and areas with ongoing conflicts. Actions under the plan are structured into four main pillars: 1. Prevention 2. Monitoring 3. Command and Control 4. Combat. Key actions under the Prevention pillar include:
  - **Finalizing the State's Ecological-Economic Zoning (ZEE/TO),** to ensure a balance between conservation and sustainable economic and social territorial occupation.
  - **Creating New Protected Areas**, supported by funds from the Sustainable Regional Development Program.
  - **Strengthening Protected Area Management** by updating and preparing management plans for all protected areas, granting concessions for state park tourist attractions, and providing professional training for managers.
  - **Updating Land Tenure Diagnosis for Protected Areas**, in collaboration with the State Attorney's Office (PGE), NATURATINS, and ITERTINS to define land regularization steps.
  - **Developing the Protected Areas Management System (*Sistema de Gestão de Unidades de Conservação*, or GESTO)** to promote interoperability with the Rural Environmental Registry (CAR).
  - **Decentralizing CAR Analysis**: Training technicians with support from Conservation International and coordinating with the Brazilian Forest Service through the FIP-CAR Project.
  - **Promoting the Environmental Regularization Program (PRA)**: Finalizing PRA regulations and fostering its implementation.
  - **Finalizing the REDD+ Regulatory Framework**: Establishing clear policies and guidelines to enable sustainable initiatives under REDD+.
  - **Fire Management and Prevention**: Reducing the area affected by forest fires through the regulation, dissemination and implementation of Integrated Fire Management (MIF), especially in and around protected areas, and providing Forest Fire Prevention and Combat training courses.

CANCUN SAFEGUARD E

- **Strengthening Forest-Based Technical Assistance and Rural Extension (ATER)**: Promoting certified production, encouraging the bioeconomy.
- **Strengthening municipal environmental management.**

- **Competitive and Sustainable Tocantins Strategy 2020-2040 (*Estratégia Tocantins Competitivo e Sustentável 2020-2040*, or ESTOCS)** is a "Letter of Intent aiming to make the State competitive and sustainable, with the goal of improving the quality of life for its population and ensuring the rational use of natural resources" (SEMARH n.d. c), including objectives for the maintenance, conservation, and recovery of natural resources (SEMARH n.d. d). The PPCDIF 2021-2025 is linked to the ESTOCS, which aims to "Promote the environmental compliance of production chains, focusing on a low-carbon economy, respecting the territorial potential, and enhancing environmental services" (PPCDIF 2021-2025, p. 45).
- The **ESTOCS** aims to advance the socioeconomic development of the State of Tocantins in a competitive manner, while enhancing the quality of life for its population and ensuring the judicious use of natural resources. The strategy is structured around four strategic development pillars – economic, social, environmental, and infrastructure – and is underpinned by **five guiding principles**: (i) Compliance with the UN Sustainable Development Goals (SDGs); (ii) Engagement and agreement of the various social sectors; (iii) Respect for the diversity and natural vocation of Tocantins and its people; (iv) Multisectoral governance, monitoring and transparency; and (v) Investments to achieve the targets (PPCDIF 2021-2025, p. 45).
- **NATURATINS** has been implementing **Terms of Commitment (*Termos de Compromisso,* or TC)** with communities situated within state protected areas to facilitate sustainable access to natural resources:
  - **TC No. 136/2019** regarding the collaboration of micro and small-scale agricultural producers and environmental advocates from the Cantão and Araguaia Islands, effective for a term of 2 years.
  - **TC 001/2022** to establish rules of coexistence among the members of the Jalapoeira Association of *Quilombola* Communities of the Boa Esperança Territory, residing in the Boa Esperança Territory claimed by the Boa Esperança *Quilombola* community and the Jalapão State Park
  - **TC 002/2022** to establish rules of coexistence among the members of the Mumbuca Village Association of Artisans and Extractivists residing in the Mumbuca *Quilombola* Territory claimed by the Mumbuca *Quilombola* community and the Jalapão State Park

CANCUN SAFEGUARD E

- **TC 003/2022** to establish guidelines for coexistence among the members of the Association of Artisans and Extractivists from the Villages of Carrapato, Formiga, Mata, and Ambrósio, domiciled within the *Quilombola* Territories of Carrapato, Formiga, Mata, and Ambrósio, as requested by the *Quilombola* communities of Carrapato, Formiga, Mata, and Ambrósio and the Jalapão State Park,
- **Technical Cooperation Agreement No. 006/2022**, entered between the NATURATINS and the City Hall of Mateiros, aimed at the effective execution of environmental and tourism regulatory actions within the scope of the Jalapão State Park and the Jalapão Environmental Protection Area, under the stewardship of Naturatins.
- NATURATINS also signed **Normative Instruction No. 09/2023**, which provides for measures adopted towards the development of the Community Tourism Base in the Jalapão State Park attractions, specifically targeting the territories of the Boa Esperança Quilombo and Mumuca Quilombo.
- Golden Grass within the Jalapão State Park has been mapped to support the **Policy for the Sustainable Use of Golden Grass and Buriti (State Law No. 3.594/2019).**

OUTCOME INDICATOR: REDD+ actions have contributed to enhancing social and environmental benefits.

Describe how this indicator is met.

During the crediting period, Indigenous peoples and traditional communities have been engaged in the design and planning of the Jurisdictional REDD+ program, as well as in the development of other public policies addressing land use, natural resource rights, livelihoods, health, and governance. This engagement is the foundation for the design and implementation of benefit-sharing measures that will enhance positive impacts of the Jurisdictional Program in Indigenous territories and traditional community areas.

To ensure compliance and effectively monitor this indicator during the crediting period (2020-2024), the state plans to:

- **Establish a governmental agency within the direct administration** to promote, coordinate, and implement public policies aimed at the inclusion and empowerment of Indigenous and traditional peoples in Tocantins, ensuring their rights, safeguarding their ways of life, and preserving their traditional knowledge.

CANCUN SAFEGUARD E

- **Means of verification**: Decree establishing the state agency published in the State's Official Gazette.

- **Carry out the Free, Prior, and Informed Consultation process** for the Jurisdictional REDD+ Program and its benefit-sharing strategy, engaging Indigenous peoples, *Quilombola* communities, other traditional peoples and communities, and family farmers, **collecting feedback on how benefits should be allocated** to these groups in a way that generates positive environmental, economic, and social impacts. The feedback collected, along with other data, **will be used to design the investment plan for the PIQPCTAF subprogram** that will share benefits from the Jurisdictional REDD+ Program among these groups.

- **Means of verification**: Consultation plan and records of meetings and workshops, descriptive document for the PIQPCTAF subprogram and its Investment Plan.

- **Continue to implement the RESTAURA-TO project**, a partnership between the State University of Tocantins (*Universidade Estadual do Tocantins*, or UNITINS) and RURALTINS, to restore degraded areas in the State.

- **Means of verification**: Management reports on the RESTAURA-TO project.

- **Update state sectoral plans,** as envisioned by the National Climate Change Policy. These plans are critical for implementing actions that generate environmental, social, and economic benefits while reducing emissions related to land use and supporting adaptation to climate change.

- **Means of verification**: Updated plans and their corresponding official acts of approval or institutionalization.

- **Continue to implement the Secretariat of Agriculture, Livestock, and Aquaculture's (SEAGRO's) Family Farming Program,** which aims to provide social and economic benefits to the people of Tocantins, while helping to reduce emissions in the land-use sector. During the crediting period, the following indicators will be monitored under SEAGRO's program:

- **Number of families supported by public policies for agro-extractive activities and agroecology:** This indicator reflects the strengthening and growth of family farming in the state while promoting sustainable rural development.

- **Number of families with issued and active Declarations of Aptitude (*Declarações de Aptitude*, or DAP) to the National Program for the Strengthening of Family Farming (*Programa Nacional de Fortalecimento da Agricultura Familiar*, or PRONAF):** This indicator measures the strengthening of

CANCUN SAFEGUARD E

family farming and equal opportunities through access to the PRONAF, which is among the most significant programs directed at this group at both state and federal levels.

- **Number of functioning Municipal Councils for Sustainable Rural Development:** These councils, provided they are properly established, operational, and have development plans created and implemented, are essential tools for strengthening family farming within municipalities and promoting equal opportunities.
- **Families served and quantity of seeds distributed through the "Mesa Farta" Program of the Tocantins Government:** This program supports food sovereignty by distributing seeds for food cultivation, including assistance to the Xerente Indigenous people through SEPOT.
    - **Means of verification**: Management Reports from SEAGRO and RURALTINS.

CANCUN SAFEGUARD F

THEME F.1 The risk of reversals is integrated in the design, prioritization, implementation, and periodic assessments of REDD+ polices and measures. [5]

PROCESS INDICATOR: Public institutions have identified and integrated measures to address the risk of reversals in the design, prioritization, implementation, and periodic assessments of REDD+ actions.

Describe how this indicator is met.

The State's REDD+ actions are systematically structured and strategically implemented through key instruments, including the **Plan for the Prevention and Control of Deforestation and Forest Fires (PPCDIF) for 2021-2025**, the **Pact for Zero Illegal Deforestation**, and the **Low Carbon Agriculture Plan (ABC+/TO Plan) for 2020-2030**. These plans are supported by a robust policy framework that aligns with REDD+ objectives. To mitigate the risk of reversals, the State employs a dual strategy:

1. **Combating Illegal Deforestation and Forest Degradation** to achieve immediate emission reductions.

[5] In accordance with and/or as a complement to the technical measures and procedures designed to address the reversals set forth in Chapter 7 of the Standard.

CANCUN SAFEGUARD F

2. **Prevention and Promotion of Sustainable Production** to prevent legal deforestation and ensure long-term sustainability of reductions.

As part of efforts to combat and control the unlawful conversion of forests and other ecosystems, the State has implemented the following key actions **within the frameworks of the PPCDIF 2021-2025 and the Pact for Zero Illegal Deforestation**:

Monitoring: The State utilizes advanced monitoring technologies at both national and state levels to track deforestation and forest degradation. This includes leveraging **satellite imagery** for comprehensive land-use monitoring, covering the Legal Amazon territory and its biomes. These tools allow for the detection of illegal activities that may lead to deforestation and degradation. Tocantins relies on national programs managed by the **National Institute for Space Research (INPE)**, which provides transparent data on deforestation and fires. This information is stratified by state, municipality, protected areas, and Indigenous lands, accessible through the **TerraBrasilis platform**. Specifically, the State of Tocantins relies on the following INPE databases and other information sources to monitor land use within its territory:

- **Deforestation and degradation**: PRODES Amazônia, PRODES Cerrado , DEGRAD, DETER.
- **Heat Sources**: TerraMA2Q/INPE, MapBiomas, CeMAF/Federal University of Tocantins – Gurupi.
- **High spatial and temporal resolution images**: the PlanetScope constellation (Dove and SuperDove satellites) provides the State with daily images, with pixel sizes around 3 meters and orthorectified. This matrix collection is made available daily by the Brazil+ Program (*Programa Brasil+*) of the Ministry of Justice (*Ministério da Justiça*, or MJ). These images are intended to enhance regulatory enforcement operations.

Forest Inventories: Brazil maintains a robust framework for forest management, supported by the **National Forest Information System (*Sistema Nacional de Informação Florestal*, or SNIF)** and the **Brazilian Forest Service (*Serviço Florestal Brasileiro*, or SFB)**. The Brazilian Forest Service is responsible for overseeing natural reserves, particularly public forests, and coordinates the **National Forest Inventory (*Inventário Florestal Nacional* or IFN).** The IFN employs a standardized methodology across all biomes, generating regular and detailed information on key forest attributes such as structure, composition, health, vitality, biomass, timber, and carbon stocks. At the state level, Tocantins complements these national efforts with specialized mapping of phytoecological regions at a 1:100,000 scale, accompanied by a comprehensive **State Forest Inventory**. This includes technical reports and descriptive data,

CANCUN SAFEGUARD F

offering insights into the specific characteristics and conditions of forests within the state's jurisdiction.

Center for Environmental Management (*Centro de Inteligência Geográfica em Gestão do Meio Ambiente*, or CIGMA): Tocantins is enhancing its environmental monitoring capacity by structuring the CIGMA, created by SEMARH Ordinance No. 15/2014, with the following responsibilities:

- To coordinate activities related to the fields of geoprocessing and remote sensing;
- To monitor the dynamics of deforestation and fires within the State;
- To prepare maps, charts, and related documents to support SEMARH's work;
- To propose and implement: environmental monitoring indicators for the State, Measures for environmental monitoring and management through the utilization of geoprocessing tools;
- Monitor and assess the implementation of the Rural Environmental Registry (CAR);
- Oversee and monitor protected areas, including the processes for legal reserve compensation;
- Monitor urban data and municipal Master Plans (*Plano Diretor*);
- Generate data for the Spatial Data Infrastructure of Tocantins (*Infraestrutura de Dados Espaciais do Tocantins,* or IDE).

The state aims to leverage **CIGMA** to enhance its capabilities in several key areas. These include analyzing the dynamics of deforestation and forest fires, improving annual routines for monitoring vegetation cover, and conducting both quantitative and qualitative analyses of legal and illegal land conversions. Additionally, the state seeks to ensure the systematic organization of data, develop and strengthen its capacity to monitor wildfires comprehensively, and identify and analyze soil degradation processes. This effort also involves assessing the extent of soil degradation and systematizing the resulting data for better management and decision-making.

Enforcement: Brazil has a legal framework for environmental protection, which includes the Environmental Crimes Act (*Lei de Crimes Ambientais*, Federal Law No. 9.605/1998) and its regulation (Federal Decree No. 6.514/2008). This framework specifies protected areas that cannot be converted and defines the crimes and administrative violations associated with unauthorized alterations. Additionally, the **Brazilian Forest Code** (Federal Law No. 12.651/2012) sets general guidelines for the protection of native vegetation, sustainable resource use, and ecosystem conservation.

CANCUN SAFEGUARD F

The following are the **main enforcement agencies and mechanisms in Tocantins**:

- **Tocantins Nature Institute (NATURATINS):** NATURATINS is the autonomous state agency responsible for **enforcing** environmental laws in Tocantins. Its mission includes advancing natural resource conservation and ensuring sustainable development while fostering compliance with environmental regulations. The agency handles the issuance of **environmental permits** for activities that may impact the environment, ensuring they adhere to applicable legislation. NATURATINS also conducts **inspections**, oversees potentially polluting activities, and takes corrective action to address environmental violations.
- **The Environmental Military Police Battalion (*Batalhão da Polícia Militar Ambiental*, or BPMA)**: conducts enforcement operations, including issuing citations for deforestation, wildfires, and logging activities, while also carrying out environmental education initiatives.
- **State Coordination of Protection and Civil Defense of Tocantins (*Coordenadoria Estadual de Proteção e Defesa Civil do Estado*, or CEPDEC)**: CEPDEC is responsible for managing prevention, control, and response to forest fires. Recognizing the increasing rates of wildfires, CEPDEC actively implements preventive and combat measures as outlined in the PPCDIF 2021-2025 (p. 19).
- **The State Committee for the Prevention, Control, and Combat of Wildfires (Fire Committee or *Comitê do Fogo*)**: established by Decree No. 645/1998, is composed of more than 30 institutions and is chaired by CEPDEC. The Fire Committee's activities encompass education and awareness initiatives, the promotion of municipal-level civil brigades for combating forest fires and their training, expanding actions to implement municipal fire use protocols, clearing priority areas, monitoring of illegal burning and forest fires, the development of Integrated Fire Management (IFM), the oversight and suppression of forest fires and controlled burning sites, in situ validation of satellite fire focus data, and the enforcement against illegal fire use (PPCDIF 2021-2025, p. 20).
- **The State Public Prosecutor's Office (*Ministério Público Estadual,* or MPE)**: also monitors illegal fires and burnings (PPCDIF 2021-2025, p. 78). The MPE supports enforcement actions by analyzing various sources of information, and providing the following data through the Deforestation Monitoring Panel of Tocantins: deforestation authorized by NATURATINS, pasture reform and clearance of conversion areas, deforestation alerts, deforestation within legal reserves, areas embargoed by environmental authorities, data on deforestation issued from the year 2024 onwards, updated weekly with the qualification of areas regarding their legality.

CANCUN SAFEGUARD F

- **Regulations Specific to Babassu Palm Conservation: State Law No. 1.959/2008** prohibits the burning, cutting, and unsustainable use of babassu palms. This regulation integrates directly into enforcement actions to preserve this critical resource

The **Working Group for Guidance on Actions to Combat Illegal Deforestation** was established by Ordinance No. 02/2023 and extended by NATURATINS Ordinance No. 25/2024. This group comprises the SEMARH, NATURATINS, the MPE, the BPMA, and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), that operates under the MMA and is responsible for implementing national environmental policies.

- In 2023, the Group focused on surveying areas authorized for deforestation, reviewing all areas from 2019 to the present date. This information is available on the MPE Deforestation Monitoring Dashboard: https://storymaps.arcgis.com/stories/ca3768747cdc4274bade5ed9179bed0d
- In 2024, the Working Group established procedures to keep the database of Forest Exploitation Authorizations (*Autorizações de Exploração Florestal*, or AEF) updated, as this information is not automatically provided by the Integrated Environmental Management System (*Sistema Integrado de Gestão Ambiental*, or SIGAM). Additionally, it defined enforcement actions against illegal deforestation.
- The Task Force, leveraging data from the MPE's Deforestation Monitoring Dashboard, has identified 88 rural properties for **priority inspection** due to illegal deforestation, covering a total area of 22,609 ha. This data was categorized based on property size: over 100 ha in 2023 and 2024 without authorization (64), and over 100 ha with deforestation exceeding the permitted clear-cutting limits (24). This group represents the initial phase of an environmental enforcement process aimed at combating large-scale illegal deforestation.
- Concurrently, SEMARH commenced a dialogue with the productive sector aimed at aligning economic development with environmental preservation. This initiative led to the signing of the **Pact for Zero Illegal Deforestation in Tocantins**, forming a coalition between the state government and representative entities from various economic sectors. The Pact aims to eradicate illegal deforestation by 2030 and includes commitments to improve the services provided by the State, in addition to engaging the productive sector in combating illegal deforestation
- Internal procedures were established through **SEMARH/NATURATINS Joint Normative Instruction No. 02/2024**, for the implementation of precautionary measures involving the suspension of the Rural Environmental Registry (CAR) and the embargo of areas, aiming to urgently curb incidents of illegal deforestation identified by SEMARH and NATURATINS.

CANCUN SAFEGUARD F

- SEMARH has engaged a specialized firm to develop analysis modules for the Rural Environmental Registry (CAR) and the Environmental Regularization Program (PRA). This initiative aims to expedite the **CAR validation process** and comply with the mandates set forth by the Forest Code (Federal Law No. 12.651/2012), in response to the requests from the productive sector that requires the expedited environmental regularization of their rural properties. A validated CAR provides a robust foundation for effective land use monitoring, facilitates the implementation of environmental prevention and restoration measures, aligns with climate adaptation policies, advances the environmental compliance of rural properties, and supports environmental audit processes. All these aspects contribute to maintaining the integrity of carbon stocks and preventing activities that could lead to reversals.

As preventive measures, the **Focus on Fire Project (*Projeto Foco no Fogo*),** coordinated by SEMARH, aims to guide rural property owners on risks posed to public health and the environment by illegal burning and wildfires.

Funding for Forest Fire Mitigation in Tocantins:

- Each year, SEMARH allocates funds from the **State Water Resources Fund (*Fundo Estadual de Recursos Hídricos*, or FERH)** and the **State Environmental Fund (*Fundo Estadual de Meio Ambiente*, or FUEMA)** to the Tocantins Military Fire Brigade (*Corpo de Bombeiros Militar do Tocantins*) for hiring brigade to hire brigade members and the Land Fund (*Fundo da Terra*) to procure protective equipment for Fire Brigade members.
- NATURATINS also allocates resources for the procurement of equipment and vehicles to combat forest fires.

The preventive actions and incentives for sustainable production to prevent legal deforestation, aimed at ensuring long-term emission reductions, are addressed within the deforestation prevention pillar of the PPCDIF. These are further complemented by additional policies **promoting sustainable rural production alternatives**, such as:

- **The Ecological-Economic Zoning of Tocantins (ZEE/TO)**: serves as a crucial planning tool designed to harmonize economic development with environmental protection. By guiding appropriate land use, protecting sensitive areas, and promoting sustainable practices, the ZEE/TO significantly contributes to maintaining carbon stocks and preventing activities that could lead to increased greenhouse gas emissions. The state aims to complete the ZEE/TO in accordance with the PPCDIF 2021-2025. The State Department of Planning and Budget (SEPLAN) has developed an interactive GIS portal to disseminate information on the State ZEE Program, enhancing public accessibilitybn. In 2022, the ZEE/TO was ratified by the State ZEE Committee and

CANCUN SAFEGUARD F

presented to the State Environmental Council (COEMA/TO) for deliberation and approval. In 2023, the ZEE was submitted for review and discussion to all COEMA/TO's Permanent Technical Chambers (*Câmaras Técnicas Permanentes*), and upon approval, it will be forwarded to the State Legislative Assembly to be enacted into law.

- The **strengthening of Protected Areas** involves enhancing their structuring and management. This is vital to ensure that these areas effectively fulfill their role in biodiversity conservation and the maintenance of carbon stocks. An effective management strategy prevents illegal activities that could result in reversals, such as deforestation or forest degradation. Within the framework of the PPCDIF, the state has planned actions to: i) design and update protect areas management plans, ii) implement a Public-Private Partnership (*Parceria Público-Privada*, or PPP) program for Cantão and Jalapão state park attractions to secure financial resources to manage all 13 State protected areas, iii) Structure the GESTO System and enhance interoperability with the state's CAR Registry and Land Property Management system.

- At the federal level, Climate Change Mitigation Policies are executed via sector-specific strategies, including the Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy in Agriculture (ABC Plan). This strategic plan has been in effect within the state since 2013 (ABC/TO Plan). In the current crediting period, the plan was updated and launched as the **ABC+/TO Plan for the period 2020-2030**. This plan includes the ABC Program, which is a **credit line** for rural producers and their organizations, aimed at financing technologies and production systems on rural properties, to promote agriculture and livestock more adapted to climate change, in addition to mitigating GHGs. The ABC+/TO Plan assists prevents reversals by reducing emissions from agricultural and livestock activities, which are the main drivers of deforestation in the State. It also promotes the use of sustainable technological systems through strategic actions. To achieve this, the plan is organized into seven distinct programs: Recovery of degraded pasturelands, Crop-Livestock-Forest Integration (*Integração lavoura-pecuária-floresta*, or ILPF), Agroforestry Systems (*Sistemas Agroflorestais*, or SAFs), No-Till System (SPD), Biological Nitrogen Fixation (*Fixação Biológica de Nitrogênio*, or FBN), Planted Forests, Animal Waste Treatment, and Climate Change Adaptation. The actions being implemented under the plan can be followed on the **Department of Agriculture and Livestock of the State of Tocantins (*Secretaria de Agricultura e Pecuária*) website.**

- The state promotes the sustainable use of some native species, with initiatives such as the **State Policy on Sustainable Use of Golden Grass and Buriti (State Law No. 3.594/2019)**, which establishes guidelines for the use of these species, necessary for the renewal of these species in public or private cultivation areas, as well as in conservation areas, aiming at preserving the corresponding genetic resources.

CANCUN SAFEGUARD F

- Coordination with the Brazilian Forest Service within the scope of the **FIP-CAR Project in the Cerrado**, financed by the Brazilian government through the Forest Investment Program (*Programa de Investimento Floresta*, or FIP), linked to the Climate Investment Fund (CIF). This initiative aims to train technicians to conduct CAR analyses through outsourced services (PPCDIF 2021-2025, p. 81).
- The government of Tocantins has commissioned the development of the **Manual for the Restoration of Native Vegetation to Ensure the Environmental Compliance of Rural Properties in the State of Tocantins**.
- In 2024, the government of Tocantins received authorization from the External Financing Committee (*Comissão de Financiamentos Externos*, or Cofiex), a joint body of the Ministry of Planning and Budget (*Ministério do Planejamento e Orçamento*, or MPO), to contract external credit to finance the **Productive Tocantins (*Tocantins Produtivo*) project,** in the amount of US$150 million with the World Bank (IBRD). The project aims to enhance and preserve the state's road network; to reduce transportation costs and travel time for passengers and freight; to improve productivity, income, and environmental sustainability for small rural producers, with an emphasis on family farming; to support and advance sustainable and inclusive tourism, among other objectives.
- The state participates in the **National Program for Strengthening Family Agriculture (Pronaf)**, a federal program that offers **lines of credit to family farmers** with lower interest rates and greater access guarantees. This encompasses the Pronaf Agroindustry (*Pronaf Agroindústria*) program, which provides financing for projects that enhance income-generating activities for family agriculture, fostering more sustainable practices. For the 2021/2022 year, Pronaf enhanced financing for conservation practices involving the use, management, and protection of natural resources, Agroforestry Systems, the establishment of bio inputs and biofertilizer production units, as well as rural tourism projects that add value to products and services derived from socio-biodiversity within the Pronaf Bioeconomy framework. These lines of credit are essential for facilitating the transition to more sustainable agricultural practices within the state.

No structure or outcome indicators have been developed for Safeguard F as these issues are broadly addressed by requirements in other sections of the Standard.

CANCUN SAFEGUARD G

THEME G.1 The risk of displacement of emissions is integrated in the design, prioritization, implementation, and periodic assessments of REDD+ policies and measures.

CANCUN SAFEGUARD G

PROCESS INDICATOR: Public institutions have identified and integrated measures to address the risk of displacement of emissions in the design, prioritization, implementation, and periodic assessments of REDD+ actions.

Describe how this indicator is met.

The coordinated effort among the States of the Legal Amazon, through the **Governors Forum (*Fórum de Governadores*) and the Forum of Environmental State Secretaries (*Fórum dos Secretários de Meio Ambiente*),** aims to mitigate the risk of displacing deforestation activities. The **Green Recovery Plan (*Plano de Recuperação Verde*, or PRV)** was developed by the **Interstate Consortium for Sustainable Development of the Legal Amazon (*Consórcio Interestadual de Desenvolvimento Sustentável da Amazônia Legal*).** It serves as a strategic framework for transitioning to a green economy, with objectives to eliminate illegal deforestation by 2030, address inequalities, and generate employment. The **PRV** engages in combating deforestation and degradation throughout the 9 States, aiding in displacement prevention through an integrated approach of state plans. It facilitates joint action in critical areas to achieve regional impact within a short timeframe (PRV, 2021, p. 44). This contributes to displacement prevention.

In Tocantins, the risk of emission displacement in the design, prioritization, and implementation of the State's REDD+ Actions is addressed through the following **measures outlined in the PPCDIF 2021-2025**:

- **Monitoring System Enhancement**: Deforestation and forest degradation monitoring at both national and state levels is comprehensive, with extensive satellite imaging coverage of the national territory and its biomes, facilitated by **INPE's** monitoring programs (**PRODES Amazon**, **PRODES Cerrado**, **DEGRAD**, **DETER**, **TerraMA2**). The data is categorized by state and municipality, protected areas, and Indigenous lands through the TerraBrasilis platform. Optimization efforts have enhanced the accuracy of detecting deforested areas and improved the ability to distinguish between deforestation and other changes in forest cover across different states. By enabling precise and rapid detection of forest cover changes, these improvements support the identification of deforestation displacement patterns within Tocantins and across state borders, facilitate the monitoring of forest degradation, and bolster the implementation of conservation policies. INPE provides essential tools to combat leakage effectively, while data transparency fosters a more coordinated and efficient response from stakeholders involved in conserving the Amazon and Cerrado biomes.
- In December 2022, a significant milestone was achieved with the official confirmation of SEMARH's definitive membership in the **Brasil MAIS Program** under the Ministry of Justice and Public Security (*Ministério da Justiça e Segurança Pública*). This

CANCUN SAFEGUARD G

membership grants access to a platform that provides alerts for fire scars and deforestation in areas monitored by the Federal Police (Polícia Federal), using high-resolution satellite imagery. This initiative has significantly enhanced the State of Tocantins' capacity for updated and precise monitoring of wildfire dynamics and native vegetation extraction. It also supports the development of strategic and integrated plans to more effectively combat illegal activities.

- The State also structured **CIGMA** to strengthen the State's capacity to analyze the dynamics of deforestation and forest fires, monitor protected areas and implement the CAR, with information and data made available through a publicly accessible Dashboard. The state also utilizes the Deforestation Monitoring Dashboard established by the State Public Prosecutor's Office (MPE/TO). These systems access data and official information from entities such as INPE and the Ministry of Justice and Public Security, as well as data from other independent monitoring systems, like MapBiomas and others.

- **Environmental and Territorial Management Instruments**: Tocantins established the completion of the Ecological-Economic Zoning (ZEE) as a key objective in the PPCDIF 2021-2025. The ZEE serves as a vital territorial planning instrument that integrates ecological and economic factors. It offers a detailed knowledge base of the state's territory, enabling the development of more effective public policies for environmental protection and management. This includes the identification of environmental "hotspots" where preventive actions should be prioritized, thus strengthening the state's ability to prevent and respond to potential environmental incidents, such as spills.

- **Protected areas** play a crucial role in the territorial management strategy of Tocantins, aiding in effective land-use planning and helping to prevent leakage. As part of its PPCDIF 2021-2025, Tocantins prioritized strengthening its protected areas, with specific goals to draft or update management plans for all such areas and to establish and maintain additional protected areas. The management and oversight of these areas are monitored through the Tocantins Protected Areas Management System (GESTO). Furthermore, the State has developed the Protected Areas Program for the State of Tocantins, which aims to establish and uphold a representative system of protected areas to preserve the State's biodiversity. This program focuses on consolidating existing areas. Within Tocantins, 9.24% of the total area falls under sustainable use protected areas, while only 5.78% is designated as full protection protected areas (PPCDIF 2021-2025, p. 47). The state's normative framework for protected area management includes the following:

CANCUN SAFEGUARD G

- **State Law No. 771/1995:** Establishes the State Forest Policy to ensure forest conservation by regulating the economic use, inspection, and oversight of forest products and by-products.
- **Law No. 1.560/2005**: Establishes the State System of Protected Areas (SEUC).
- **Decree No. 838/1999:** Regulates the protection of native vegetation and the state protected areas system (implements Law No. 771/1995).
- **Decree No. 4.750/2013**: Provides for the Private Natural Heritage Reserve (*Reserva Privada do Patrimônio Natural*, or RPPN).

- **CAR Validation**: The Forest Code (Law No. 12.651/2012) mandates the protection of native vegetation areas and the regularization of legal liabilities to safeguard forests and prevent displacement of deforestation. Tocantins has made substantial progress in registering rural properties under the Rural Environmental Registry (CAR) and is enhancing technical capacity by improving human resources and analysis systems to validate these registrations. This effort supports the implementation of the State's Environmental Regularization Program for Rural Properties (PRA). The State has further regulated these instruments through SEMARH/NATURATINS Joint Normative Instruction No. 01/2024. This regulation establishes procedures for the registration and review of the CAR, drafts Terms of Commitment for adherence to the PRA, and introduces additional measures.
- **Promotion of environmental management at the municipal level:** The State has begun charging the **Ecological Tax on the Circulation of Goods and Services (*Imposto sobre a Circulação de Mercadorias e Serviços Ecológico*, or ICMS Ecológico)**, a fiscal tool designed to allocate a greater share of ICMS revenues collected by the State to municipalities that meet environmental standards established under state legislation. Created in Tocantins by Law No. 1.323/2002 and Law No. 2.159/2015, the Ecological ICMS contributes to the prevention of emissions displacement. This instrument encourages initiatives such as environmental education, fire prevention and control, support for protected areas and Indigenous lands, basic sanitation, and soil conservation in municipalities, thereby promoting land-use planning and sustainable development.
- **Credit Restrictions**: The state, in coordination with federal policies, has established measures to ensure that public credit lines do not finance deforestation. These measures require environmental compliance as a prerequisite for accessing agricultural credit. This approach discourages illegal deforestation and helps prevent emissions leakage, aligning financial practices with sustainable land-use objectives.

CANCUN SAFEGUARD G

No structure or outcome indicators have been developed for Safeguard G as these issues are broadly addressed by requirements in other sections of the Standard.

8. PARTICIPATION IN OTHER PROGRAMS

Disclose any existing REDD+ programs or projects in which certain or all accounting areas may generate credits or performance-based payments during the credit acquisition period.

In the national context, it is critical to note that all emission reductions contribute to Brazil's commitments under its Nationally Determined Contribution (NDC). Consequently, carbon credits generated by the State under TREES will be used for **voluntary purposes only** and will still be accounted for within Brazil's national inventory.

The State of Tocantins has been eligible to collect performance-based payments under **CONAREDD+** since 2021, qualifying for results-based payments in both the Amazon and Cerrado biomes (Resolution No. 5/2021 and Resolution No. 9/2022). CONAREDD+ has an emissions reduction **allocation system** (Resolution No. 06/2017) for the Amazon and Cerrado biomes, covering the period from 2006 to 2020. Under this system, Tocantins has been allocated **154.6 million tCO_2 for performance-based payments**, according to InfoHub Brazil. However, to the date, Tocantins has not received any compensation for these results.

Article 13, paragraph 2 of the PEPSA Law acknowledges that environmental services can be conducted not only by the State of Tocantins but also by private entities. This provision respects constitutional rights regarding private property and the autonomy of Indigenous and traditional communities to establish their own REDD+ projects. These projects must be registered in the public PEPSA Database, and PEPSA is tasked with establishing a process for **nesting** such initiatives within the jurisdictional program. This alignment ensures compliance with safeguards, maintains accounting and environmental integrity, and specifies methodological compatibilities with jurisdictional actions to prevent duplications of effort and accounting (Article 24, paragraph 1).

The rules for nesting private REDD+ projects within the jurisdictional program, as stipulated by the PEPSA Law, will be defined by SEMARH in 2025. These rules will be developed following discussions within the Nesting Working Group.

Currently, SEMARH is aware of one REDD+ project actively advancing in the State's territory, on Bananal Island, which is in an Indigenous territory. This initiative, known as **Bananal Island ± (*Ilha do Bananal* +)**, has successfully issued and registered 3,800,754 carbon credits in the EcoRegistry, following the CERCARBONO standard.

9. DOUBLE COUNTING

Provide a description of the plan and procedures that were used to ensure double counting was avoided per Section 13 of TREES.

Tocantins has acknowledged that environmental services may also be undertaken by private entities, alongside the State of Tocantins. This approach respects constitutional rights to the enjoyment of private property and the autonomy of Indigenous and traditional peoples to establish their own REDD+ projects, as outlined in Article 13, paragraph 2 of the PEPSA Law (State Law No. 4111/2023). These private initiatives are subject to the following conditions:

- **Registration in the PEPSA Public Database**: All private REDD+ projects must be officially recorded in the state's PEPSA Database.
- **Integration (Nesting) with the Jurisdictional Program**: A process for integrating (nesting) such projects within the jurisdictional program will be established, ensuring the enforcement of safeguards as defined by the PEPSA Law.
- **Preservation of Accounting and Environmental Integrity**: Methodological similarities and compatibility with jurisdictional actions must be guaranteed, ensuring the prevention of duplication of efforts and accounting.

To operationalize this framework, the State of Tocantins, through the PEPSA Database, will monitor credits issued by private projects during each crediting period. These private credits will be deducted from the TREES credits issued. This monitoring will be conducted using a digitized system that enables annual tracking of credit levels and emissions as they accrue and are verified. The system will be integrated with credit management via the ART registry.

To further safeguard against double claims, the system will identify any utilization of carbon credits by either the State or private projects. The public PEPSA Database will provide transparency by disclosing all credits issued, registered, and retired, encompassing all records generated within Tocantins.

Currently, there is only one REDD+ project in Tocantins, the ***Ilha do Bananal* + Project**, which will be carefully analyzed to ensure compliance with these requirements and prevent double counting, as outlined above.

10. CREDITING LEVEL CALCULATION FOR THE CREDITING PERIOD

Include a detailed description of the calculated crediting level value including but not limited to the following:

This chapter details the Standard Operational Procedures (SOPs) adopted for calculating emissions from deforestation and forest degradation, as well as the results for the reference period (2015 to 2019).

The activity data used to measure emissions from deforestation are data from the Project for Remote Deforestation Monitoring in the Legal Amazon (PRODES, or *Projeto de Monitoramento do Desmatamento na Amazônia Legal*) of the National Institute for Space Research (INPE, or *Instituto Nacional de Pesquisas Espaciais*), also used in Brazil's Forest Reference Emissions Level (FREL-Brasil 2024, or the FREL), in Brazil's national communications and biennial update reports to the United Nations Framework Convention on Climate Change (UNFCCC).

The activity data used for calculating emissions from degradation are the fire scars from MapBiomas Fire Collection 3 (MapBiomas 2024, or MapBiomas Fire). The definition of degradation adopted is the reduction of carbon stocks caused by fire in areas of forests remaining forests.

The database used for the forest carbon stocks (emission factors) is from the FREL. The FREL emission factors originate from the compendium of carbon stock data found in the Brazilian Fourth National Communication (*Quarta Comunicação Nacional*, or 4CN 2020) to the UNFCCC. This document estimates Brazil's Greenhouse Gas (GHG) emissions due to land use change. Besides being the State of Tocantins' data source for emission factors, the FREL and the 4CN present a consolidated framework closely aligned with the Intergovernmental Panel on Climate Change (IPCC, 2006) recommendations for calculating emissions from deforestation and forest degradation.

However, both the FREL and the 4CN have yet to present a specific methodology for calculating emissions from the degradation of the Cerrado biome's main forest phytophysiognomy: the Wooded Savanna (Sa, or *Savana Arborizada*). To address this gap, the state of Tocantins employed the methodology developed by Gomes et al. (2024) with support from the Amazon Environmental Research Institute (*Instituto de Pesquisa Ambiental da Amazônia,* or IPAM).

Figure 10-1 contains a flowchart that summarizes how emissions from deforestation and degradation were calculated, applying the methodologies of Gomes et al. (2024) and the FREL.

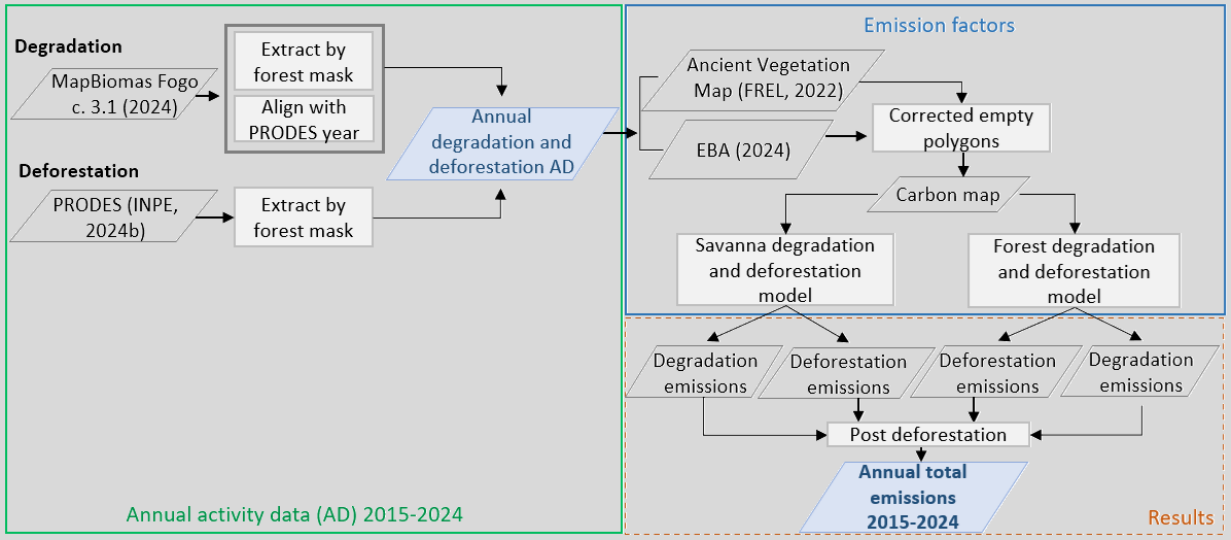

Figure 10-1. Flowchart of the Emissions Calculation Process.

Prepared by Geonoma, based on Gomes et al. (2024).

The following sections detail the approaches employed for stratification, for deriving emission factors, for obtaining activity data, and the scripts used to calculate deforestation and degradation. This chapter addresses the methodologies used to quantify emission reductions from deforestation and degradation for both the reference and crediting periods, as well as the resulting emissions for the reference period. The state of Tocantins will not provide accounting for removals for these initial reference and crediting periods.

10.1. Stratification

Stratification map, description, rules

The state of Tocantins encompasses the Cerrado and Amazon biomes (IBGE, 2024). Approximately 91% of the state territory is within the Cerrado biome and 9% within the Amazon biome (Fig. 10.2a). Due to this characteristic, Tocantins features typical vegetative formations from both biomes, and transitional vegetation between the Cerrado and the Amazon (ecotone) (Fig. 10.2b).

The Cerrado biome features vegetation that has evolved alongside fire (Simon and Pennington, 2012) and adapted to withstand wildfires and distinctly marked dry periods (Eiten, 1972; Ratter et al., 1997). There is a clear phytophysiognomic gradient in the Cerrado, ranging from grassland to forest formations, with a transition marked by the reduction of herbaceous components and

the increase of woody components (Ribeiro and Walter, 2008). The typical gradient includes grassland formations such as *campo rupestre* (rupestrian grassland in English), *campo limpo* (clean field – dry grassland without shrubs or trees), and *campo sujo* (dirty field – grassland with scattered shrubs and small trees), transitioning to savanna formations including *Cerrado rupestre* (rocky grasslands in English), *Cerrado ralo* (open Cerrado), typical Cerrado, and dense Cerrado (*Cerrado sensu stricto*), and culminating in forested Cerrados or *Cerradões* (Ribeiro and Walter, 2008).

According to the Brazilian Vegetation Classification System (IBGE, 2012), the vegetation map of Brazil (IBGE, 2004), and the FREL, the following phytophysiognomies predominate in the portion of Tocantins situated in the Cerrado Biome: Wooded Savanna (Sa – *Cerrado sensu stricto*), Forested Savanna (Sd – *Cerradão*), Savanna Grassy-Woody (Sg – campo *Cerrado*), and Savanna – parque (Sp – *campo sujo*), as well as Semi-Deciduous Seasonal Forest (F – gallery forests) and Deciduous Seasonal Forest (C – dry forests). According to the FREL, the only non-forest phytophysiognomies among these are Sg and Sp (see Table 10-1 below).

It is essential to highlight the differences between the two main forest phytophysiognomies of the Cerrado biome: Sa (Wooded Savanna) and Sd (Forested Savanna). The Sd physiognomy exhibits a typical forest structure, characterized by the dominance of the woody layer and the complete absence of an herbaceous and grass layer (Ribeiro and Walter, 2008; IBGE, 2012). In contrast, the Sa phytophysiognomy features a well-developed herbaceous and grass layer that, together with the woody layer, defines the characteristic physiognomy of this type of vegetation (Ribeiro and Walter, 2008; IBGE, 2012).

The herbaceous and grass layer of Sa is an essential component of the aboveground live biomass (AGB), playing a significant role in fire-related degradation emissions. While grasses contribute to immediate emissions, the woody component is responsible for late emissions (Gomes et al., 2020; Gomes et al., 2024). According to Ribeiro et al. (2011), 26% of the AGB in the Sa phytophysiognomy consists of grasses. Therefore, this proportion of Sa's AGB was used to estimate immediate emissions resulting from fire-induced degradation (Gomes et al., 2024).

The Amazon biome is predominantly forest. The vegetation consists of lush forests adapted to the humid climate without a well-defined dry season (IBGE, 2012; Aragão et al., 2014; Coutinho, 2016). The predominant phytophysiognomies within the Amazon biome found in Tocantins are (IBGE, 2012): Dense Humid Forest (D – humid forest) and Open Humid Forest (A – humid forest with a predominance of palms and open canopy), Semi-deciduous Seasonal Forest (F – gallery forests) and Deciduous Seasonal Forest (C – dry forests) (IBGE, 2004; FREL).

Due to its ecotonal characteristics – being a transitional area between two biomes – Tocantins contains transitional phytophysiognomies such as Contact Savanna/Ombrophilous Forest (SO) and Contact Savanna/Seasonal Forest (SN) (IBGE, 2004; FREL, 2024). Enclaves of Ombrophilous Forest are also found within the Cerrado biome, as well as Savannas within the

Amazon biome (IBGE, 2004; FREL, 2024). As noted above, Seasonal Forests are distributed across both biomes (IBGE, 2004; FREL, 2024).

10.1.1. Forest Definition

Brazil adopts the following forest definition in the FREL:

> "A minimum area of 0.5 hectares with trees having a minimum height of 5 meters and a minimum canopy cover of 10 percent, or trees with the potential to reach these thresholds in situ. This definition does not include areas of predominantly agricultural or urban use."

Table 10-1 outlines the phytophysiognomies grouped according to this forest classification and found in Tocantins, spanning both the Amazon and Cerrado biomes. The classification of forest phytophysiognomies follows the criteria established by the FREL. Figure 10-2 illustrates the spatial distribution of forest phytophysiognomies across the Tocantins territory. Although some forest phytophysiognomies are not present when using the forest mask (remaining intact forest), as explained in Section 10.1.3.

Table 10-1. List of Forest Phytophysiognomies found in the State of Tocantins, Categorized by Biome, with Abbreviations Aligned to IBGE (2012), FREL (2024), and 4CN (2020).

Biome	Strata	Phytophysiognomy	Acronym
Amazon	Forest (F)	Alluvial Open Humid Forest	Aa
		Lowland Open Humid Forest	Ab*
		Submontane Open Humid Forest	As
		Dense Alluvial Humid Forest	Da
		Lowland Dense Humid Forest	Db**
		Sub-montane Dense Humid Forest	Ds
		Alluvial Semi-deciduous Seasonal Forest	Fa
		Sub-montane Semi-deciduous Seasonal Forest	Fs*
		Forested Savanna	Sd
		Contact Savanna / Ombrophilous Forest	SO
		Contact Savanna / Ombrophilous Forest	SOs*
	Wooded Savanna (Sa)	Wooded Savanna	Sa
Cerrado	Forest (F)	Alluvial Open Humid Forest	Aa
		Sub-montane Open Humid Forest	As
		Montane Deciduous Seasonal Forest	Cm
		Sub-montane Deciduous Seasonal Forest	Cs
		Sub-montane Dense Humid Forest	Ds*
		Alluvial Semi-deciduous Seasonal Forest	Fa
		Montane Semi-deciduous Seasonal Forest	Fm
		Sub-montane Semi-deciduous Seasonal Forest	Fs
		Savanna	S
		Forested Savanna	Sd
		Contact Savanna / Seasonal Forest	SNm
		Contact Savanna / Seasonal Forest	SNs
		Contact Savanna / Seasonal Forest	SNts
		Contact Savanna / Ombrophilous Forest	SO**
		Contact Savanna / Ombrophilous Forest	Sos
	Wooded Savanna (Sa)	Wooded Savanna	Sa

*** Forest phytophysiognomies not present when using the forest mask (Section 10.1.3).**

**** Forest phytophysiognomies within forest mask that have not undergone deforestation or degradation.**

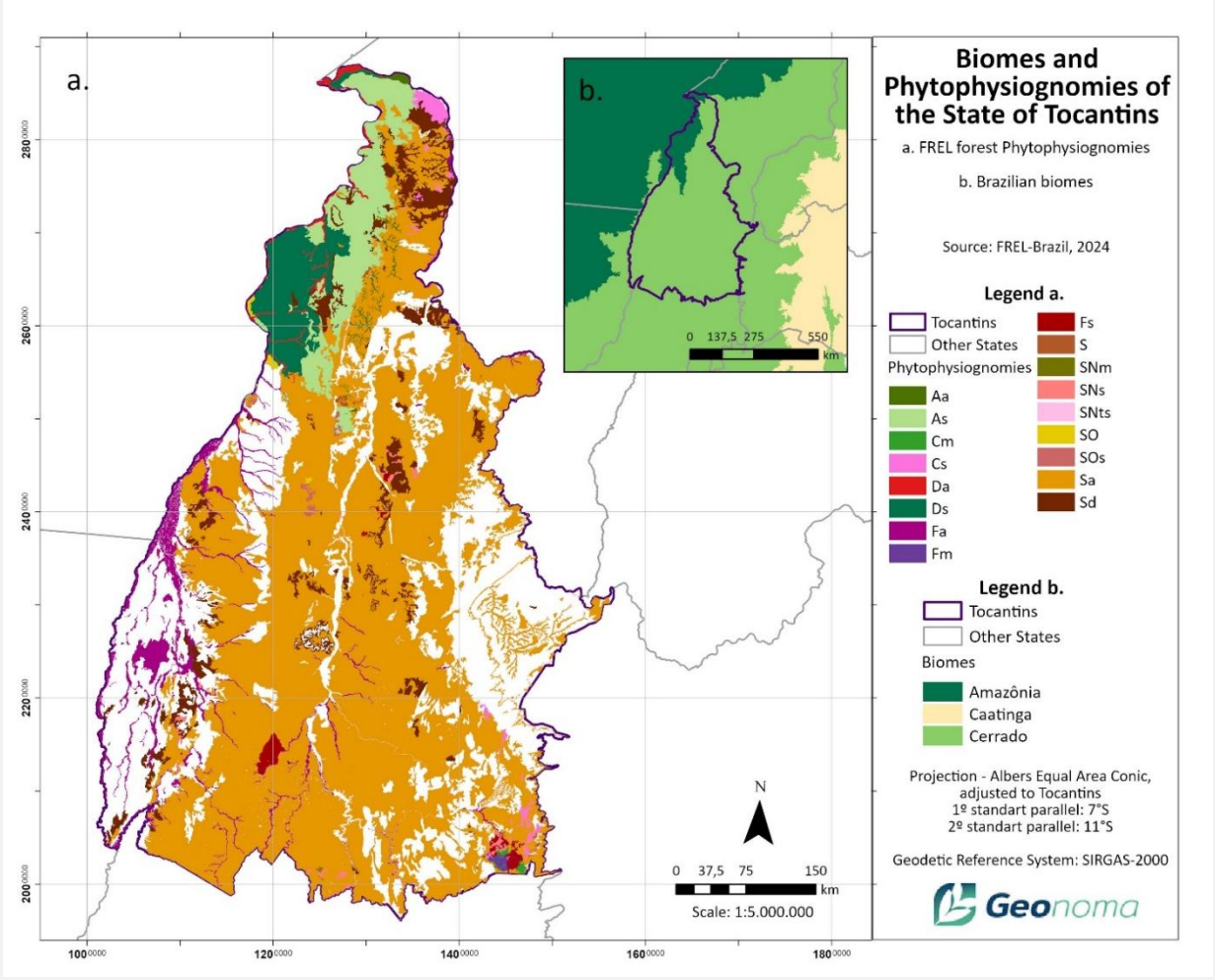

Figure 10-2. Biomes and Potential Forest Phytophysiognomies of the State of Tocantins.

Prepared by Geonoma, based on the Biomes limits from IBGE (2024) and phytophysiognomies from FREL (2024).

10.1.2. Strata (*k*)

There are two strata: Forest (F) and Wooded Savanna (Sa) (Table 10-1). The strata were defined based on forest phytophysiognomies (Table 10-1), in alignment with the FREL and the 4CN, and also considering the ecological behavior of the phytophysiognomies in response to fire degradation (Gomes et al., 2024). Thus, all forest phytophysiognomies, except Sa, are included in the Forest (F) stratum, while only the Sa forest phytophysiognomy belongs to the Wooded Savanna (Sa) stratum (Table 10-1). The forest carbon stock for Tocantins was estimated based

on the phytophysiognomies of these two strata and included all carbon pools: aboveground, belowground, dead wood, and litter.

The forests phytophysiognomies aligns with the "ancient vegetation" map created by the 4CN, which is part of the FREL and builds on the Brazilian Vegetation Map 1:250,000 by IBGE (2004). The classification of phytophysiognomies follows the Brazilian Vegetation Classification System (IBGE, 2012), a phytogeographic approach that considers both the vegetation's location and local ecological conditions. Phytophysiognomies are organized within a hierarchical system: Formation Class, Formation Subclass, Formation Group, and Formation Subgroup. For example, Dense Ombrophilous Forest (D) – is classified as Forest (Formation Class), Ombrophilous (Formation Subclass), Hygrophilous (Formation Group), and Dense (Formation Subgroup) (IBGE, 2012).

The Wooded Savanna phytophysiognomy (Sa) displays distinct ecological responses to fire degradation compared to other forest types (Gomes et al., 2024). Consequently, emissions from degradation in the Sa phytophysiognomy (Sa strata) are calculated using the methodology developed by Gomes et al. (2024), while other forest phytophysiognomies (F strata) follow the degradation calculation methodology established by the FREL.

10.1.3. Forest Mask

Emissions from deforestation and degradation are accounted for solely in intact native forests (areas of forests remaining forests). PRODES annually identifies intact native vegetation and forest areas, which serve as the standard framework for deforestation emissions accounting used by the FREL and the 4CN.

Therefore, the forest mask (or study area) in this report reflects the native forests or vegetation mapped by PRODES within the FREL-defined forest phytophysiognomies (refer to Table 10-1 and Figure 10-3) in the state of Tocantins. The forest mask is updated annually. Figure 10-3 illustrates the forest mask and corresponding phytophysiognomies within the forest mask for 2015.

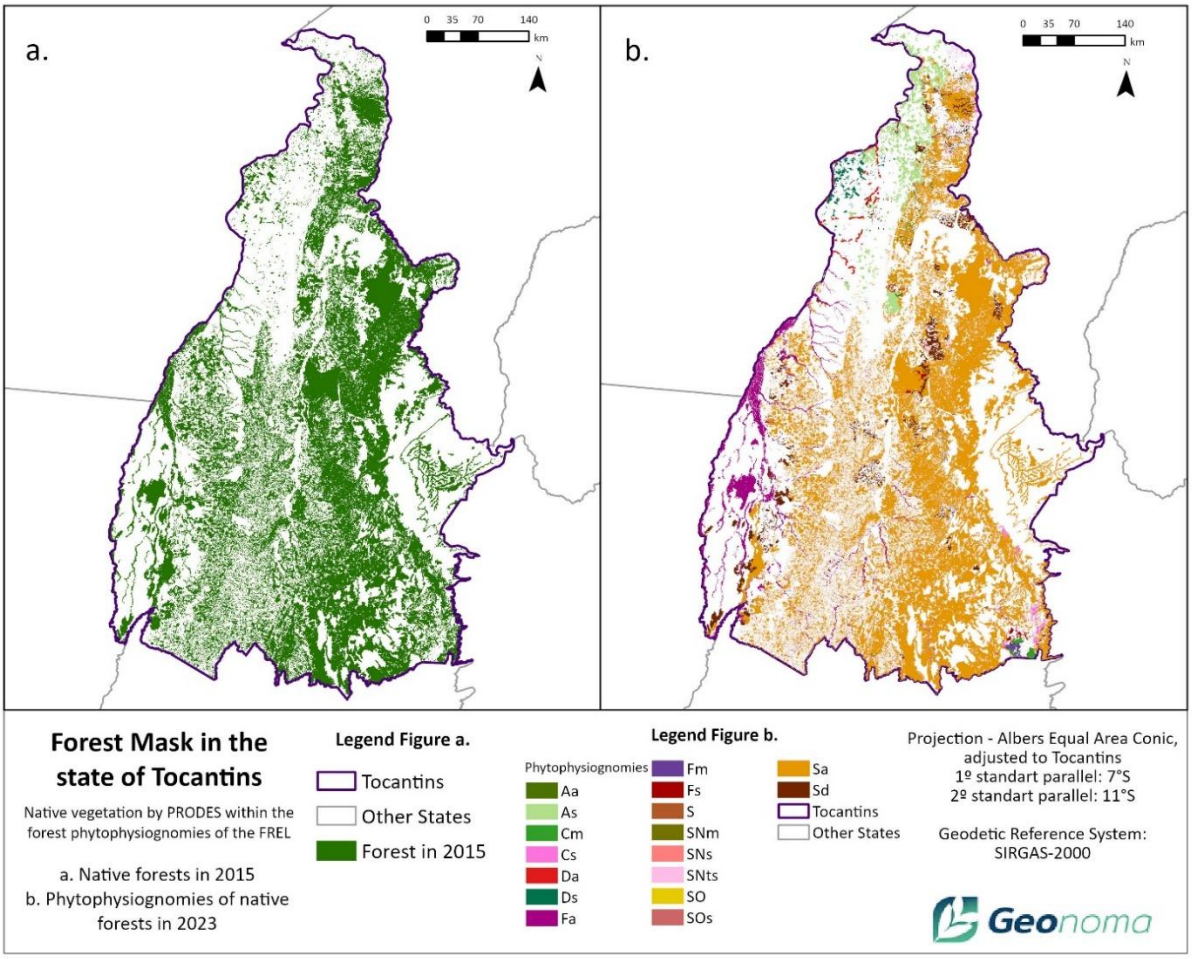

Figure 10-3. a) Forest mask; b) Forest Phytophysiognomies Within the Forest Mask.

Prepared by Geonoma, based on intact native forest data from PRODES (INPE, 2024b) within the forest phytophysiognomies of FREL-Brasil (2024).

10.2. Pools and Gases

- *Description of included pools and gases, and/or justifications for exclusions where applicable*

The pools and gases accounted for in the GHG emissions calculations are detailed in Table 10-2. The Soil Organic Matter from organic soils (peat soils) primary pool was excluded because peat soils are not present in the state of Tocantins. Peat soils, also known as Histosols according to the IUSS (2015), are classified as *Organossolos* under to the Brazilian Soil Classification System (*Sistema brasileiro de classificação de solos,* or SiBCS) (Santos et al., 2018) and, are

not found in Tocantins. Additionally, the Soil Organic Carbon (SOC) pool for Tocantins from mineral soils represents only 2.1% of total emissions in 2022 (SEEG11, 2023). For this reason, we also excluded the secondary pool "Soil Organic Matter (SOM) from mineral soil". Similarly, Brazil's FREL submission (FREL-Brasil, 2024) excludes both of these pools.

The primary and secondary gases listed in Table 10-3 have been included in the emissions calculations.

Table 10-2. Carbon Pools.

Primary	Aboveground biomass (*AGB*)
Secondary	Belowground biomass (*BGB*) Standing dead wood (*DW*) Down dead wood (*DW*) Non-tree live biomass *(AGB)* Litter/forest floor (LI)

Table 10-3. Gases.

Primary	Carbon Dioxide (CO_2)
Secondary	Methane (CH_4)
	Nitrous Oxide (N_2O)

10.3. Emissions Quantification

- *Data sources, if from literature or defaults*
- *Description of emission factors derived*
- *Uncertainty calculations*
- *Calculation* (*description and supporting workbook*)

This section begins by detailing the scripts[6] used for calculating emissions from deforestation and degradation that are in the Emissions Workbook[7]. It then describes carbon stocks, and the standard operating procedures applied to activity data and emission factors for both deforestation and degradation, along with their corresponding equations. Data sources are in References Chapter 17, and the geospatial data organization is in Table 10-17.

[6] The scrips for calculating emissions in Google Earth Engine can be found in Annex 2 "Scripts".
[7] The Emissions Workbook is in Annex 3 "Workbook".

Emissions calculations adhere to the methodology outlined by Gomes et al. (2024) and are implemented through scripts on Google Earth Engine. Three flowcharts are provided below, illustrating the calculation processes within the script (Figure 10-4 and Figure 10-5), and depicting the relationships between the formulas used for calculating total emissions (Figure 10-6).

Given the different dynamics of degradation in different phytophysiognomies, calculations are conducted separately for the strata Wooded Savanna (Sa) and the strata Forest (F) – other forest phytophysiognomies – (refer to Table 10-1). The input data for the scripts, determining the specific areas in which each method applies, is a raster file that classifies areas as 'forests' (pixels labeled as 100 and corresponding to forest strata (*k* = F) or 'savanna' (pixels labeled as 101, corresponding to the Wooded Savanna (Sa) strata (*k* = Sa)).

The script for calculating forest emissions (Figure 10-4) operates in three steps: (1) Data Import and Mask Creation – imports initial data, including state and phytophysiognomy boundaries and annual deforestation data from PRODES, followed by the creation of intact native forest masks and phytophysiognomic strata; (2) Data Integration and Filtering – imports degradation activity and biomass data, applying filters based on the masks generated in the first step; and (3) Emissions Calculation and Export of Results – calculates annual emissions and exports tables containing the results.

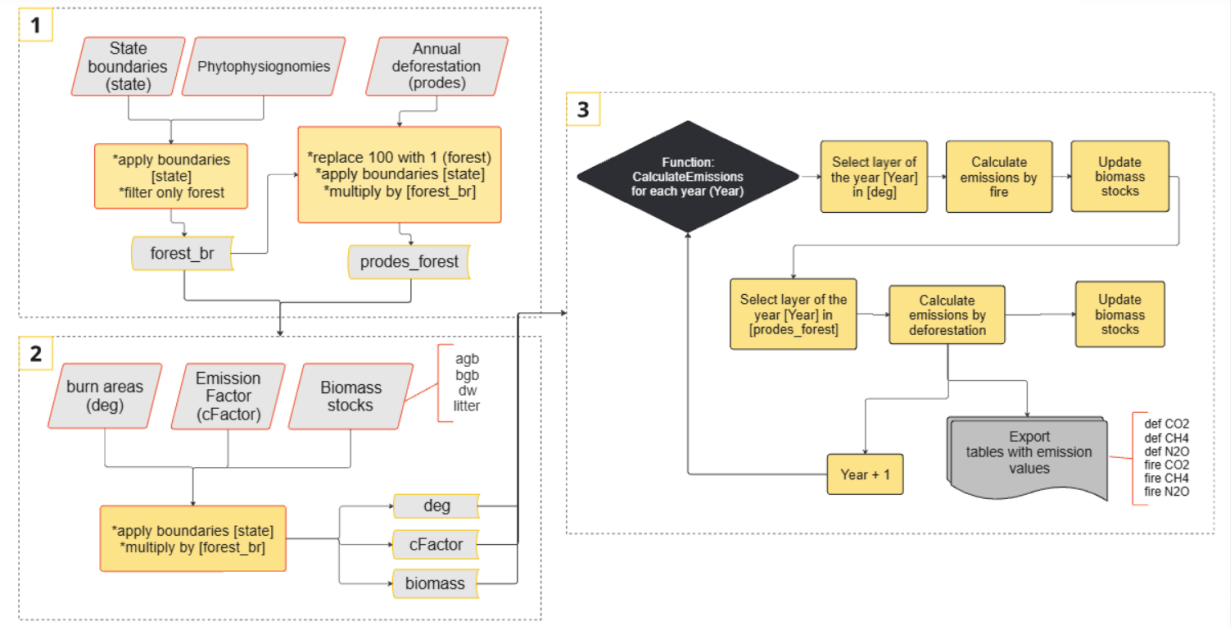

Figure 10-4. Simplified Flowchart Outlining the Degradation and Deforestation Script Used to Calculate Forest Emissions.

Prepared by Geonoma, based on Gomes et al. (2024).

The script used to calculate emissions in Wooded Savanna (Sa) (Figure 10-5) is structured in four stages: (1) Data Import and Mask Creation – imports initial data, including state and phytophysiognomy boundaries and annual deforestation data from PRODES, then generates intact native forest masks and establishes the forest phytophysiognomies layer; (2) Integration of Degradation and Biomass Data – imports degradation activity and biomass data, along with fire frequency and time-since-last-fire data, applying filters based on the masks generated in the previous step; (3) Fire Intervals and Return Index Calculation – implements a function to calculate fire intervals and the return index; (4) Emissions Calculation and Export of Results – calculates annual emissions and exports tables containing the results.

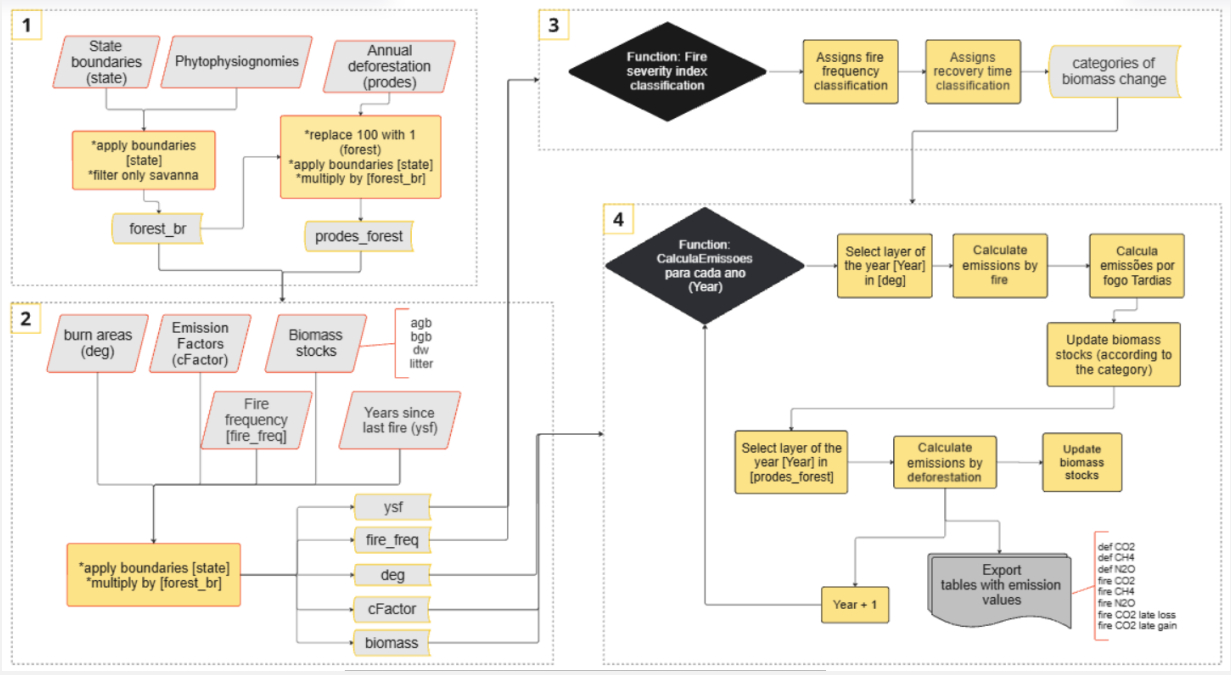

Figure 10-5. Simplified Flowchart of the Degradation and Deforestation Script for Calculating Emissions in Wooded Savanna Areas.

Prepared by Geonoma, based on Gomes et al. (2024).

A comprehensive explanation of the calculations and equations used in the script will be provided in the sections on emissions from degradation (10.3.2) and deforestation (10.3.3). The flowchart in Figure 10-6 shows a schematic representation of the equations used to calculate total emissions.

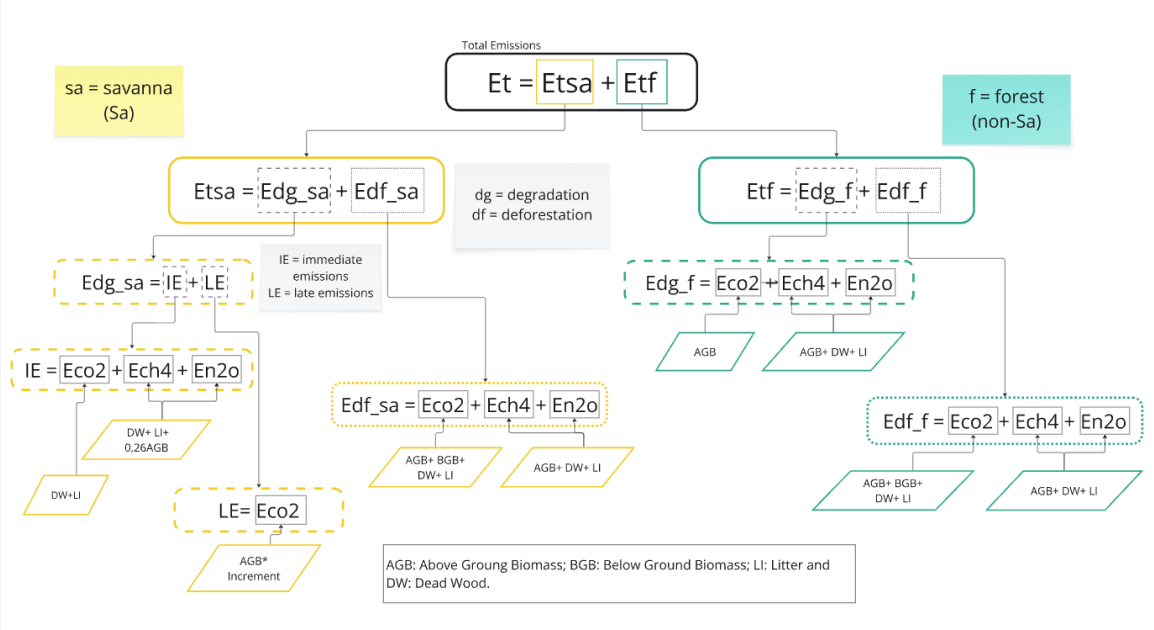

Figure 10-6. Flowchart of Equations for Emission Calculations.

Prepared by Geonoma, based on Gomes et al. (2024) and FREL (2024).

The emission factors for deforestation and degradation correspond to the carbon stocks for each forest phytophysiognomy within each biome in Tocantins and are the same as those used in the FREL and 4CN (Table 10-4). Emission factors are considered for the following carbon pools: Aboveground Biomass (AGB), Belowground Biomass (BGB), Dead wood (DW), and Litter (LI).

Table 10-4. Emission Factors in Tonnes of Carbon per Hectare (tC/ha) for Each Pool and Forest Phytophysiognomy by Biome Within the Forest Mask.

Biome (b)	Phytophysiognomy	Average AGB (tC/ha)	Average BGB (tC/ha)	Average DW (tC/ha)	Average LI (tC/ha)	Total Carbon Average (tC/ha)
Amazon	Open Alluvial Humid Forest (Aa)	116.88	11.69	6.90	6.90	128.57
	Sub-montane Open Humid Forest (As)	68.43	6.84	4.04	4.04	75.27
	Alluvial Dense Humid Forest (Da)	54.86	17.01	2.25	2.25	71.87
	Sub-montane Dense Humid Forest (Ds)	78.72	24.4	3.23	3.23	103.12
	Alluvial Semi-deciduous Seasonal Forest (Fa)	62.97	6.3	3.72	3.72	69.27
	Wooded Savana (Sa)	42.32	86.33	2.42	2.42	128.65
	Forested Savanna (Sd)	86.53	19.04	14.71	14.71	105.57
	Contact Savanna / Ombrophilous Forest (SO)	80.81	25.06	3.32	3.32	105.87
Cerrado	Open Alluvial Humid Forest (Aa)	117.2	11.72	6.91	6.91	128.92
	Sub-montane Open Humid Forest (As)	68.37	6.84	4.03	4.03	75.21
	Montane Deciduous Seasonal Forest (Cm)	84.38	20.25	13.63	13.63	104.63
	Sub-montane Deciduous Seasonal Forest (Cs)	41.4	15.32	6.10	6.10	56.72
	Alluvial Semi-deciduous Seasonal Forest (Fa)	53.00	5.3	3.13	3.13	58.3
	Montane Semi-deciduous Seasonal Forest (Fm)	50.48	11.86	2.52	2.52	62.34
	Submontane Semi-deciduous Seasonal Forest (Fs)	62.23	14.62	3.63	3.63	76.85
	Savanna (S)	24.56	15.59	4.49	4.49	40.15
	Wooded Savanna (Sa)	12.85	26.21	3.34	3.34	39.06
	Forested Savanna (Sd)	33.54	7.38	5.53	5.53	40.92
	Contact Savanna / Seasonal Forest (SNm)	34.05	12.07	4.17	4.17	46.12
	Contact Savanna / Seasonal Forest (SNs)	26.82	9.51	3.29	3.29	36.33
	Contact Savanna / Seasonal Forest (SNts)	34.1	12.09	4.18	4.18	46.19
	Contact Savanna / Ombrophilous Forest (SOs)	28.89	13.04	4.14	4.14	41.93

AGB: Aboveground Biomass; BGB Belowground Biomass; DW: Dead wood and LI: Litter

Prepared by Geonoma, based on biomass data from the FREL (2024) and 4CN (2020).

10.3.1. Carbon Stocks

The final carbon stocks assessment for the native forests of Tocantins is represented as a series of raster maps, each corresponding to a specific carbon pool. Each pixel on these maps has an assigned carbon stock value, determined by the biome, phytophysiognomy, and the respective pool it encompasses.

The carbon stock data for the Amazon biome's phytophysiognomies is sourced from the EBA (Estimation of Biomass in the Amazon or *Estimativa de Biomassa da Amazônia*) project (Ometto et al., 2023). This project quantified the total carbon stocks of the Amazon biome's phytophysiognomies and assessed their uncertainty through airborne LiDAR surveys calibrated with ground measurements (Ometto et al., 2023). The EBA data is classified as Tier 3, since it is a localized estimate involving direct measurements (IPCC, 2006).

In contrast, the Cerrado biome lacks a detailed biomass estimation project as comprehensive as the EBA. The carbon stocks for the Cerrado*'s* phytophysiognomies were instead derived from a compilation of peer-reviewed studies that conducted biomass assessments within the Cerrado biome (FREL, 4CN), with notable contributions from the work of Roitman et al. (2018). Since these studies are regional and not based on direct measurements, the Cerrado carbon stock data is classified as Tier 2 (IPCC, 2006).

The carbon stocks estimation procedure described here mirrors the methodology used by the FREL. Essentially, the carbon stocks used by Tocantins represent a subset of the FREL's data, specifically adapted for the state. Accordingly, the same databases and parameters from the FREL and the 4CN were employed to generate the Tocantins Carbon Stocks map.

The BGB, DW, and LI carbon pools are derived from the AGB. To obtain each of these pools, specific ratios were applied, considering the biome and the phytophysiognomy. Table 10-5 presents the ratios used to obtain the BGB, DW, and LI pools presented in Table 10-4.

Table 10-5. Ratios (R) for Estimating Belowground Biomass (BGB), Dead Wood (DW), and Litter (LI) by Biome and Phytophysiognomy.

Biome	Phytophysiognomy	R BGB	R DW	R LI
Amazon	Aa	0.100	0.081	0.059
	As	0.100	0.081	0.059
	Da	0.310	0.094	0.041
	Ds	0.310	0.094	0.041
	Fa	0.100	0.081	0.059
	Sa	2.040	0.0035	0.055
	Sd	0.22	0.110	0.170
	SO	0.310	0.094	0.041
Cerrado	Aa	0.100	0.081	0.059
	As	0.100	0.081	0.059
	Cm	0.240	0.110	0.1615
	Cs	0.370	0.150	0.1473
	Fa	0.100	0.081	0.059
	Fm	0.235	0.059	0.050
	Fs	0.235	0.0478	0,0583
	S	0.6347	0.1169	0.1828
	Sa	2.04	0.140	0.260
	Sd	0.22	0.110	0.165
	SNm	0.3546	0.098	0.1226
	SNs	0.3546	0.098	0.1226
	SNts	0.3546	0.098	0.1226
	SOs	0.4514	0.1056	0.1433

Prepared by Geonoma, based on biomass data from the FREL (2024) and 4CN (2020).

The detailed name of forest phytophysiognomies is available in Table 10-1.

Table 10-6 presents descriptive statistics for the distribution of AGB data across each phytophysiognomy and biome, including the mean, maximum, minimum, and standard deviation values, expressed in tonnes of carbon per hectare (tC/ha). Figure 10-3 illustrates the carbon stock map for the phytophysiognomies within the PRODES forest mask.

Table 10-6. Carbon Stock Values of Aboveground Biomass (AGB) per Pixel by Phytophysiognomy, Categorized by Biome, Showing the Mean, Maximum, Minimum, and Standard Deviation (std. dev.) in Tonnes of Carbon per Hectare (tC/ha).

Biome	Phytophysiognomy Acronym	Average AGB (tC/ha)	Max AGB (tC/ha)	Min AGB (tC/ha)	AGB Std. Dev. (tC/ha)
Amazon	Aa	116.88	117.29	2.35	5.22
	As	68.43	139.27	0.94	35.66
	Da	54.86	139.27	0.94	31.76
	Ds	78.72	139.27	0.94	49.69
	Fa	62.97	106.55	16.92	38.51
	Sa	42.32	106.55	0.94	20.21
	Sd	86.53	106.55	2.35	25.49
	SO	80.81	90.87	1.41	26.67
Cerrado	Aa	117.2	117.29	2.35	2.40
	As	68.37	106.55	1.41	21.01
	Cm	84.38	84.38	84.38	0
	Cs	41.4	41.4	41.4	0
	Fa	53.00	121.92	28.44	0.69
	Fm	50.48	50.48	50.48	0
	Fs	62.23	62.23	39.96	0.32
	S	24.56	45.04	3.76	4.95
	Sa	12.85	117.29	0.94	2.83
	Sd	33.54	100.41	7.99	4.19
	SNm	34.05	67.43	22.00	19.16
	SNs	26.82	51.81	21.33	6.41
	SNts	34.1	40.04	24.11	7.7
	SOs	28.89	70.71	23.47	15.05

The detailed name of forest phytophysiognomies is available in Table 10-1.

Prepared by Geonoma, based on biomass data from the FREL (2024) and 4CN (2020).

10.3.1.1. Uncertainties

To calculate the uncertainties associated with emission factors, Tocantins adopted a procedure similar to that used by the FREL. These uncertainties relate to the AGB calculation and the conversion factors for each of the other carbon pools (BGB, DW, and LI).

For the Amazon biome's phytophysiognomies, uncertainties in aboveground carbon stocks were sourced from the EBA project (Ometto et al., 2023), which provides an uncertainty value for each pixel in the AGB map for the Amazon biome.

In the Cerrado biome, uncertainties associated with AGB estimates for its phytophysiognomies were derived from standardized values for ecological zones, in line with Chapter 4 of Volume 4 of the IPCC's Guidelines for National Greenhouse Gas Inventories (2006). The IPCC ecological zones (IPCC, 2006) is reproduced and adapted in Table 10-7 below. The next step involved categorizing each phytophysiognomy by ecological zone and assigning the corresponding uncertainty values (Table 10-7), in alignment with the FREL.

Table 10-7. Uncertainties Associated with Ecological Zones, Adapted from IPCC (2006).

Domain	Ecological Zone	Continent	Aboveground Biomass (t.d.m/ha)	Uncertainty (%)
Tropical	Tropical rain forest (TRF)	South America and North America	300 (120-400)	43
	Tropical moist deciduous Forests (TMDF)	South America and North America	220 (210-280)	14
	Tropical dry forest (TDF)	South America and North America	210 (200-410)	38
	Tropical shrubland (TS)	South America and North America	80 (40-90)	33

Prepared by Geonoma, based on FREL (2024) and IPCC (2006).

Table 10-8. Association of Forest Phytophysiognomies with the IPCC Ecological Zones in Table 10-7, with their Uncertainty.

Phytophysiognomy	Acronym	Ecological Zone	Uncertainty (%)
Alluvial Open Humid Forest	Aa	TRF	43
Sub-montane Open Humid Forest	As	TRF	43
Montane Deciduous Seasonal Forest	Cm	TDF	38
Sub-montane Deciduous Seasonal Forest	Cs	TDF	38
Dense Alluvial Humid Forest	Da	TRF	43
Sub-montane Humid Dense Forest	Ds	TRF	43
Alluvial Seasonal Semi-deciduous Forest	Fa	TMDF	14
Montane Semi-deciduous Forest	Fm	TMDF	14
Sub-montane Semi-deciduous Seasonal Forest	Fs	TMDF	14
Savanna	S	ST	33
Wooded Savanna	Sa	ST	33
Forested Savanna	Sd	TDF	38
Contact Savanna / Seasonal Forest	SNm	ST	33
Contact Savanna / Seasonal Forest	SNs	ST	33
Contact Savanna / Seasonal Forest	SNts	ST	33
Contact Savanna / Ombrophilous Forest	SO	ST	33
Contact Savanna / Ombrophilous Forest	SOs	ST	33

Prepared by Geonoma, based on FREL (2024) and IPCC (2006).

The uncertainty values adopted for the conversion factors from AGB to the other pools (BGB, DW, and LI) were those used by the FREL. The FREL adopted the default values from the IPCC's Guidelines (2006), while consistently selecting the most conservative estimates. Table 10-9 provides the uncertainty values of the conversion factor from AGB to each of the other pools, used across all biomes and phytophysiognomies.

Table 10-9. Uncertainty Values for Aboveground Biomass (AGB) Conversion Factors Applied to Other Carbon Pools.

Pool	Conversion	Uncertainty (%)
Belowground Biomass (BGB)	AGB -> BGB	38
Dead wood (DW)	AGB -> DW	150
Litter (LI)	AGB -> LI	22

Prepared by Geonoma, based on FREL (2024) and IPCC (2006).

10.3.2. Emissions from Degradation

The definition of degradation adopted by Tocantins is the reduction of carbon stocks caused by fire in areas of forests remaining forests. The activity data are the fire scars (burned areas) from MapBiomas Fire.

For the Cerrado biome, which covers 91% of Tocantins' territory, the FREL considers fire scars as the main disturbance responsible for forest degradation. The FREL does not include emissions from fire degradation in the Cerrado due to the discontinuity of fire monitoring data from INPE's *Programa Queimadas* (Fire Monitoring Program). Considering the unavailability of consistent degradation activity data from INPE, MapBiomas Fire was used here as activity data.

In the Amazon biome, which covers 9% of Tocantins' territory, forest degradation, as defined by the FREL, encompasses reductions in carbon stocks due to fire, selective logging, and indiscriminate clear-cutting. INPE's Real-Time Deforestation Detection System (*Sistema de Detecção de Desmatamento em Tempo Real,* or DETER) provides degradation activity data for this biome (INPE, 2024a).

However, in Tocantins, the area of intact native forest within the Amazon biome is minimal (representing 9% of the potential area in 2022; INPE, 2024a), and degradation due to selective logging and indiscriminate clear-cutting represents only 0.27% of the state's territory (INPE, 2024a). As a result, the state of Tocantins opted to include in the present calculations only fire degradation in the Amazon biome, and to use the same activity data, emission factors, and modeling as those used for the Cerrado biome (MapBiomas Fire, the FREL, and Gomes et al.'s, 2024 methodology, respectively).

In summary, forest degradation is assessed using the same two methodologies, in both the biomes present in Tocantins: Gomes et al.'s (2024) methodology for the Wooded Savanna (Sa) and the FREL's methodology for all other forest phytophysiognomies. The methodologies differ in two key aspects: (1) the combustion factors that are used are different; and (2) for the Wooded

Savanna, emissions are quantified as immediate and late, while the FREL's methodology does not make this distinction.

The fire degradation model developed by Gomes et al. (2024) is based on years of research on the growth dynamics of the Wooded Savannas (Cerrado *sensu stricto;* Sa) after fire disturbances. Measurements of vegetation behavior related to biomass loss and gain across its different pools have been conducted since 1985 (Almeida et al., 2014). These studies were carried out in permanent plots located at 11 Wooded Savanna sites, which over the years were exposed to both natural and anthropic fire events. Measurements were taken immediately after and following the disturbance (Gomes et al., 2011; Almeida et al., 2014; Miranda et al., 2014a; Gomes et al., 2016; Lenza et al., 2017; Rios and Sousa-Silva, 2017; Passos et al., 2018; Machida et al., 2021; Gomes et al., 2024).

These long-term studies made it possible to determine methods for estimating the intensity of fire degradation using annual activity data (Sato et al., 2010), calculating the relative contributions of immediate and delayed greenhouse gas emissions, and identifying specific combustion factors for different vegetation components (Ward et al., 1992; Kauffman et al., 1994; Guild et al., 1998; Ribeiro et al., 2011; Santos et al., 2021). Additionally, they enabled the estimation of biomass loss or accumulation rates (Gomes et al., 2011; Maracahipes et al., 2011; Miranda et al., 2014a; Miranda et al., 2014b; Lenza et al., 2017; Passos et al., 2018; Rios and Sousa-Silva, 2017; Rios et al., 2018). The studies revealed that higher fire recurrence and shorter fire return intervals led to greater degradation and biomass loss. In contrast, lower fire frequency and longer fire-free intervals were associated with reduced degradation and, in some cases, biomass gain.

Thus, the work by Gomes et al. (2024) represents a synthesis of the knowledge accumulated over 29 years of studies and measurements on fire-induced degradation of the Wooded Savanna. It is the most advanced and comprehensive degradation model currently available. However, it is also a relatively simple model that effectively captures the dynamics of biomass loss and gain in the Wooded Savanna through degradation classes, determined within a given time frame of interest. Additionally, it is a practical model that provides combustion factors and requires activity data and emission factors available from official Brazilian sources.

The following sections detail the activity data, emission factors, and equations used to calculate emissions from degradation. Figure 10-4, Figure 10-5, and Figure 10-6 contain flowcharts summarizing these processes.

10.3.2.1. Activity Data

The activity data for forest degradation consists of fire scars (burned areas) from MapBiomas Fire Collection 3 (Alencar et al., 2022, 2024), updated to the MapBiomas Land Cover and Land

use Collection 9 (MapBiomas, 2023), generated from annual mosaics of Landsat images at a 30-meter resolution (Figure 10-7). Data processing is conducted by various institutions using Google Earth Engine and Google Cloud. Images are classified by biome and region, with burned and unburned samples collected to train algorithms. Reference maps include MODIS Burned Area (MCD64A1) at 500m resolution, the Global Annual Burned Area Map (GABAM) at 30m resolution, fire points and fire scars from INPE. A detailed description of the methodology can be found in Alencar et al. (2024). Details on the SOP for the degradation map accuracy assessment and area estimate confidence intervals are in Section 10.7.

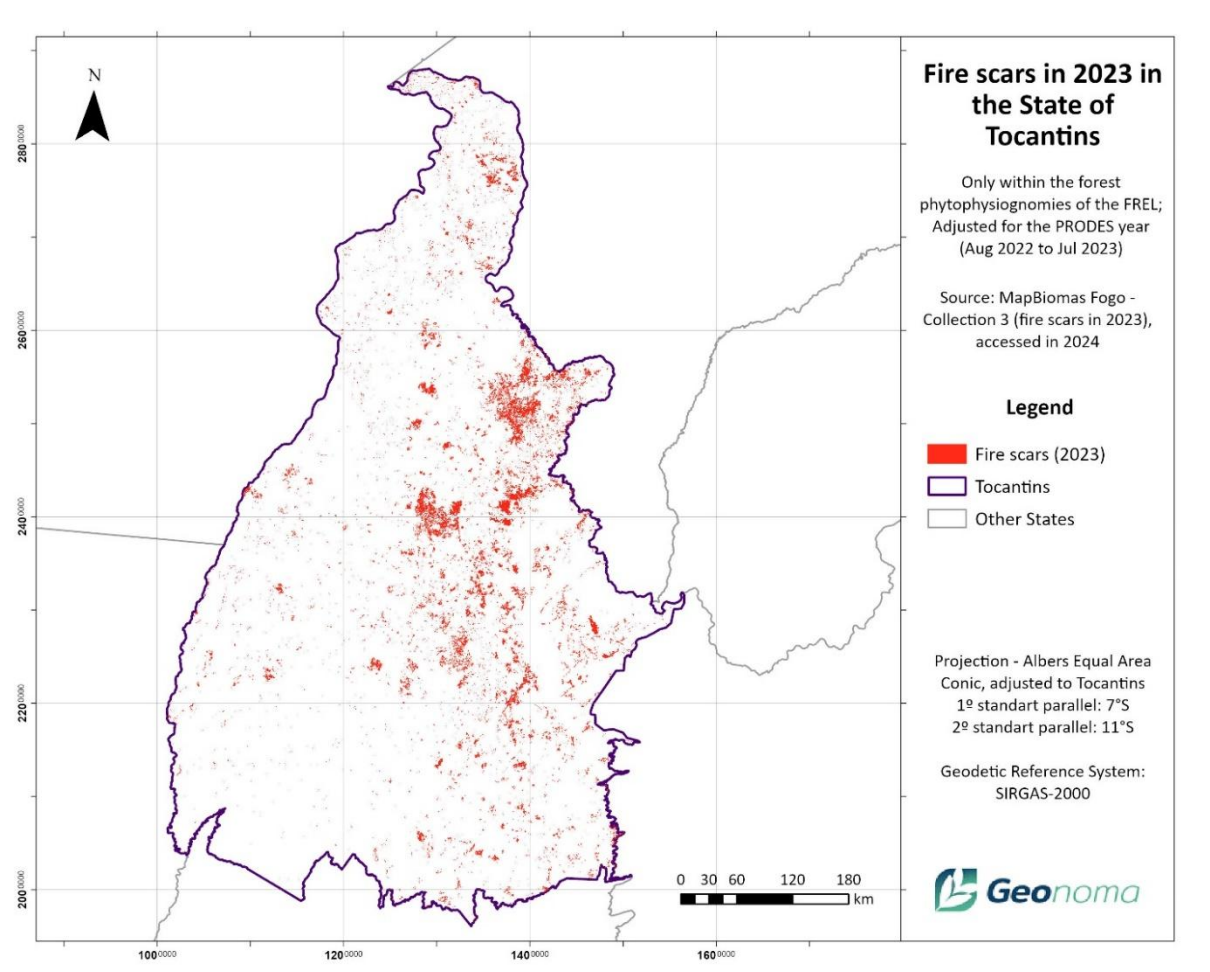

Figure 10-7. Fire Scars in Tocantins in 2023, Within the Forest Mask.

Prepared by Geonoma, based on MapBiomas Fire (2024).

MapBiomas Fire provides annual and monthly fire scar data. Since PRODES deforestation data (INPE, 2024b) accounts for deforestation from August of one year to July of the next and lacks monthly resolution, the monthly MapBiomas Fire data was used to align with the PRODES reporting period, as shown in Table 10-10. This approach ensures that deforestation and degradation emissions are reported on a consistent timescale and avoids double counting. Then, to align with the calendar year required by ART, the total emissions from each PRODES year were interpolated to correspond to a calendar year, as described in Section 10.8 and Table 10-42.

Table 10-10. PRODES Measurement Period.

Measurement Period of PRODES	PRODES Year
08/01/2014 – 07/31/2015	2015
08/01/2015 – 07/31/2016	2016
08/01/2016 – 07/31/2017	2017
08/01/2017 – 07/31/2018	2018
08/01/2018 – 07/31/2019	2019
08/01/2019 – 07/31/2020	2020
08/01/2020 – 07/31/2021	2021
08/01/2021 – 07/31/2022	2022
08/01/2022 – 07/31/2023	2023
08/01/2023 – 07/31/2024	2024

Prepared by Geonoma, based on data from INPE (2024b).

10.3.2.2. Emission Factors

The emission factors for deforestation and degradation are derived from the forest carbon stocks of each phytophysiognomy listed in Table 10-4 and Figure 10-2, categorized by carbon pools: AGB, BGB, DW, and LI (see Table 10-4 and Section 10.3.1).

10.3.2.3. Equations

The degradation driver considered by Tocantins is fire. Emissions resulting from fire degradation are calculated differently for the strata Wooded Savanna phytophysiognomy (Sa; k = Sa) and

for strata Forest (*k* = F). For the Sa, calculations follow the equations and methodology described by Gomes et al. (2024), whereas for other forest types, the calculations are based on the FREL approach and the IPCC Guidelines (2006).

All calculations are conducted in raster format, with 30m x 30m pixels[8], as described below.

- ***Activity Data – Fire Scars***

The degradation activity data (Adeg) is derived from MapBiomas Fire for the year of interest (*t*).

$$Adeg_{k,t} = \sum_{i=1}^{n} adg_{i,k,t} * 0{,}088$$

Where:

- $Adeg_{k,t}$ = Total degraded area in stratum *k* for year *t* in hectares (ha).
- $adg_{i,k,t,}$ = Pixel status *i*, in stratum *k*, year *t*, on the fire scar map. The value is binary (0 or 1): if a fire event (degradation) occurred in pixel *i* during year *t*, the value is 1; otherwise, the value is 0.
- 0.088 = Conversion factor from pixel area to hectares.

- ***Emissions from degradation in the Wooded Savanna Stratum*** (***Sa***; ***k = Sa***)

The total emissions from degradation in the Sa phytophysiognomy (*k* = Sa)

The total emissions from degradation in the Sa phytophysiognomy (ETdegSa) for year *t* are calculated by combining immediate and late emissions.

$$ETdegSa_t = EIdegSa_t + ETCO_2degSa_t$$

Where:

[8] Spatial resolution of PRODES products (Almeida *et al*., 2022).

- $ETdegSa_t$ = Total emissions from fire degradation in Sa phytophysiognomy for year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIdegSa_t$ = Total immediate emissions from fire degradation in Sa phytophysiognomy for year *t*, measured in tonnes of carbon dioxide equivalent (tCO_2e).
- $ETCO_2degSa_t$ = Late emissions from fire degradation in Sa phytophysiognomy for year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

Immediate Emissions Following Fire

Immediate CH_4 emissions following fire from litter ($EILCH_4degSa$) year *t*.

$$EILCH_4degSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * LI_{i,Sa,t} * 0{,}873 * \frac{1}{0{,}47} * 6{,}8 * 10^{-3} * 28$$

Where:

- $EILCH_4degSa_t$ = Immediate CH_4 emissions from litter fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
- $LI_{i,Sa,t}$ = Litter in pixel *i* in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4.
- 0.873 = Dimensionless combustion factor for leaf litter in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m.) to tonnes of Carbon (tC).
- 6.8 = CH_4 emission factor in grams per kilogram of dry matter (g/kg.d.m).
- 28 = Conversion factor from tonnes of CH_4 to tonnes of CO_2e (IPCC, 2014).

Immediate CH_4 emissions following fire from dead wood ($EIDCH_4degSa$) year *t*.

$$EIDCH_4degSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * DW_{i,Sa,t} * 0{,}459 * \frac{1}{0{,}47} * 6{,}8 * 10^{-3} * 28$$

Where:

- $EIDCH_4degSa_t$ = Immediate CH_4 emissions from dead wood fire degradation in Sa phytophysiognomy in year *t*, in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomies in year *t*, measured in hectares (ha).
- $DW_{i,Sa,t}$ = Dead wood in pixel *i* in Sa phytophysiognomy in year *t,* in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- 0.459 = Dimensionless combustion factor for dead wood in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from dry matter (t.d.m) to tonnes of Carbon (tC).
- 6.8 = CH_4 emission factor in grams per kilogram of dry matter (g/kg.d.m).
- 28 = Conversion factor from tonnes of CH_4 to tonnes of CO_2e (IPCC, 2014).

Immediate CH_4 emissions following fire from grasses (26% of the AGB) ($EIGCH_4degSa$) year *t*.

$$EIGCH_4degSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * AGB_{i,Sa,t} * 0{,}26 * 0{,}873 * \frac{1}{0{,}47} * 6{,}8 * 10^{-3} * 28$$

Where:

- $EIGCH_4degSa_t$ = Immediate CH_4 emissions from grasses (26% of AGB; Ribeiro et al., 2011) following fire degradation in the Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
- $AGB_{i,Sa,t}$ = Aboveground biomass in pixel *i* in Sa phytophysiognomy in year *t* measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- 0.26 = Proportion of grasses in AGB, according to Ribeiro et al. (2011).
- 0.873 = Dimensionless combustion factor for leaf litter in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).

- 6.8 = CH_4 emission factor in grams per kilogram of dry matter (g/kg.d.m).
- 28 = Conversion factor from tonnes of CH_4 to tonnes of CO_2e (IPCC, 2014).

Immediate N_2O emissions following a fire in litter layer ($EILN_2OdegSa$) year *t*.

$$EILN_2OdegSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * LI_{i,Sa,t} * 0{,}873 * \frac{1}{0{,}47} * 0{,}2 * 10^{-3} * 265$$

Where:

- $EILN_2OdegSa_t$ = Immediate N_2O emissions from litter fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
- $LI_{i,Sa,t}$ = Litter in pixel *i* in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4.
- 0.873 = Dimensionless combustion factor for leaf litter in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- 0.2 = N_2O emission factor, measured in grams per kilogram of dry matter (g/kg.d.m).
- 265 = Conversion factor from tonnes of N_2O to tonnes of CO_2e (IPCC, 2014).

Immediate N_2O emissions following dead wood fire ($EIDN_2OdegSa$) year *t*.

$$EIDN_2OdegSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * DW_{i,Sa,t} * 0{,}459 * \frac{1}{0{,}47} * 0{,}2 * 10^{-3} * 265$$

Where:

- $EIDN_2OdegSa_t$ = Immediate N_2O emissions from dead wood fire degradation in Sa phytophysiognomy year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).

- $DW_{i,Sa,t}$ = Dead wood in pixel *i* in Sa phytophysiognomy in year *t,* in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- 0.459 = Dimensionless combustion factor for dead wood in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- 0.2 = N_2O emission factor, measured in grams per kilogram of dry matter (g/kg.d.m).
- 265 = Conversion factor from tonnes of N_2O to tonnes of CO_2e (IPCC, 2014).

Immediate N_2O emissions following grass fires (26% of AGB; Ribeiro et al., 2011) ($EIGN_2OdegSa$) year *t*.

$$EIGN_2OdegSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * AGB_{i,Sa,t} * 0{,}26 * 0{,}873 * \frac{1}{0{,}47} * 0{,}2 * 10^{-3} * 265$$

Where:

- $EIGN_2OdegSa_t$ = Immediate N_2O emissions from grasses (26% of AGB; Ribeiro et al., 2011) following fire degradation in Sa phytophysiognomy year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
- $AGB_{i,Sa,t}$ = Aboveground biomass in pixel *i* in Sa phytophysiognomy in year *t,* measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- 0.26 = Proportion of grasses in AGB, according to Ribeiro et al. (2011).
- 0.873 = Dimensionless combustion factor for leaf litter in Wooded Savanna (Sa) (Gomes et al., 2024).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- 0.2 = N_2O emission factor, measured in grams per kilogram of dry matter (g/kg.d.m).
- 265 = Conversion factor from tonnes of N_2O to tonnes of CO_2e (IPCC, 2014).

Immediate CO_2 emission following fire from litter ($EILCO_2degSa$) year *t*.

$$EILCO_2degSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * LI_{i,Sa,t} * 0.873 * 44/12$$

Where:

- *EILCO₂degSa*$_t$ = Immediate CO_2 emissions from litter fire degradation in Sa phytophysiognomy year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- Adeg$_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
  - LI$_{i,Sa,t}$ = Litter in pixel *i* in Sa phytophysiognomy in year *t,* in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- 0.873 = Dimensionless combustion factor for litter in Wooded Savanna (Sa) (Gomes et al., 2024).
- 44/12 = Conversion factor from tonnes of Carbon (tC) to tonnes of Carbon Dioxide equivalent (tCO_2e), dimensionless.

Immediate CO_2 emission following fire from dead wood (EIDCO₂degSa) year *t*.

$$EIDCO_2degSa_t = \sum_{i=1}^{n} Adeg_{i,Sa,t} * DW_{i,Sa,t} * 0.456 * 44/12$$

Where:

- *EIDCO₂degSa*$_t$ = Immediate CO_2 emissions from dead wood fire degradation in Sa phytophysiognomy year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- Adeg$_{i,Sa,t}$ = Pixel showing degradation *i* in Sa phytophysiognomy in year *t*, measured in hectares (ha).
  - DW$_{i,Sa,t}$ = Dead wood in pixel *i* in Sa phytophysiognomy in year *t,* in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- 0.459 = Dimensionless combustion factor for dead wood in Wooded Savanna (Sa) (Gomes et al., 2024).
- 44/12 = Conversion factor from tonnes of Carbon (tC) to tonnes of Carbon Dioxide equivalent (tCO_2e), dimensionless.

Total Immediate Emissions in tCO_2e, for the Sa phytophysiognomy year *t* (EIdegSa).

$$EIdegSa_t = EILCH_4degSa_t + EIDCH_4degSa_t + EIGCH_4degSa_t + EILN_2OdegSa_t + EIDN_2OdegSa_t + EIGN_2OdegSa_t + EILCOdegSa_t + EIDCOdegSa_t$$

Where:

- $EIdegSa_t$ = Total immediate emissions from fire degradation in Sa phytophysiognomy for year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EILCH_4degSa_t$ = Immediate CH_4 emissions from litter fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIDCH_4degSa_t$ = Immediate CH_4 emissions from dead wood fire degradation in Sa phytophysiognomy in year *t*, in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIGCH_4degSa_t$ = Immediate CH_4 emissions from grasses (26% of AGB; Ribeiro et al., 2011) following fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EILN_2OdegSa_t$ = Immediate N_2O emissions from litter fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIDN_2OdegSa_t$ = Immediate N_2O emissions following dead wood fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIGN_2OdegSa_t$ = Immediate N_2O emissions from grasses (26% of AGB; Ribeiro et al., 2011) following fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EILCO_2degSa_t$ = Immediate CO_2 emissions from litter fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EIDCO_2degSa_t$ = Immediate CO_2 emissions from dead wood fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

- ***Late Emissions***

Late emissions refer to CO_2 emissions from AGB following a fire, based on an emission factor that considers the degree of fire severity or the Fire Recurrence Index (FRI) (Gomes et al., 2024).

To calculate the FRI, the first step, as described by Gomes et al. (2024), is to classify each pixel in relation to its fire frequency (FF), and years since the last fire (YSF).

- ***Fire Frequency*** (***FF***)

$$FF_i = \sum_{t=1}^{n} adg_{i,t}$$

Where:

- FF_i = Fire frequency of pixel *i* over the evaluated years (*t*).
- $adg_{i,t}$ = Pixel status *i*, year *t*, in fire scar map. Each pixel is assigned to a binary value (0 or 1) for each year within the fire scar mapping. If a fire event (degradation) happened in pixel *i* during the year *t*, the value is 1. Otherwise, the value is 0.

These FF_i values are then categorized into frequency classes, as shown in Table 10-11.

Table 10-11. Fire Frequency (FF_i) Classes as Defined by Gomes et al. (2024), Categorizing the Values of FF_i.

FF_i Class	FF_i values	Description
1	1 – 2	Pixels that were burned 1 to 2 times within the period of interest.
2	3 – 4	Pixels that were burned 3 to 4 times within the period of interest.
3	5 – 6	Pixels that were burned 5 to 6 times within the period of interest.
4	> 6	Pixels that were burned more than 6 times within the period of interest.

Prepared by Geonoma, based on Gomes et al. (2024).

- ***Years Since Last Fire* (*YSF*)**

The YSF is determined by counting the number of years without fire within the interval between fire events for each pixel and each year. The data is provided by MapBiomas Fire. Table 10-12 presents the YSF categories based on the classification by Gomes et al. (2024).

$$YSF_{i,t} = Y_{i,t} - \max_{m<t}\left(Y_{i,m} \times adg_{i,m}\right)$$

Where:

- $YSF_{i,t}$ = Years since the last fire for pixel *i* year *t*.

- $Y_{i,t}$ = Year *t* value for pixel *i*, years.
- $Y_{i,m}$ = Year *m* value for pixel *i* (where *m* < *t*), years.
- $adg_{i,m}$ = Is equal to 1 if a fire event (degradation) occurred in pixel *i* during year m; otherwise, the value is 0.
  - *m* = 1986, 1987, 1988, ..., 2023
  - *t* = 2015, 2016, …, 2024.

Table 10-12. Years Since Last Fire (YSF) Classes Based on Gomes et al. (2024), Categorizing Values as YSI_i.

YSF_i Class	YSF_i values	Description
4	1 – 3	Pixels with a fire recurrence interval of 1 to 3 years.
3	4 – 6	Pixels with a fire recurrence interval of 4 to 6 years.
2	7 – 9	Pixels with a fire recurrence interval of 7 to 9 years.
1	>9	Pixels with a fire recurrence interval exceeding 9 years.

Prepared by Geonoma, based on Gomes et al. (2024).

The second step involves calculating the Fire Recurrence Index (FRI) for each pixel, as described by Gomes et al. (2024):

$$FRI_{i,t} = FF_i + YSF_{i,t}$$

Where:

- $FRI_{i,t}$ = Fire Recurrence Index for pixel *i* over the evaluated years *t*.
- FF_i = Fire frequency for pixel *i*.
- $YSF_{i,t}$ = Years since the last fire of pixel *i* in the evaluated period *t*.

The $FRI_{i,t}$ values are categorized into classes, with each class assigned to a biomass growth rate post-fire, which can be positive or negative depending on fire severity. To maintain alignment with TREES (ART, 2021), cases classified as "Moderate" are excluded from the emissions total, meaning that biomass gains following degradation events are not taken into account during calculations. Table 10-13 shows the biomass growth rates and classes.

Table 10-13. Fire Recurrence Index (FRI_i) Classes with Values According to Gomes et al. (2024), Classification of Fire Severity in Vegetation, and the Respective Biomass Growth Rates (GR_i).

$FRI_{i,t}$ Class	$FRI_{i,t}$ values	Fire Severity	Biomass Growth Rate ($GR_{I,T}$)
1	2 – 3	Moderate	2.1%
2	4 – 6	Intermediate	- 0.4%
3	> 6	Extreme	- 2.0%

Prepared by Geonoma, based on Gomes et al. (2024).

The fourth step is to calculate the late CO_2 emissions associated with fire degradation in vegetation areas within the Sa phytophysiognomy.

$$ETCO_2degSa_t = \sum_{FRI=2}^{n=3} \sum_{i=1}^{n} Adeg_{i,FRI,Sa,t} * AGB_{i,FRI,Sa,t} * GR_{i,FRI,t} * -1 * 44/12$$

Where:

- $ETCO_2degSa_t$ = Late emissions from fire degradation in Sa phytophysiognomy in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{FRI,i,Sa,t}$ = Area of pixel *i* degraded by fire in FRI class > 1, within the Sa phytophysiognomy in year *t*, in hectares (ha)
- $AGB_{FRI,i,Sa,t}$ = Aboveground biomass in pixel *i* in FRI class > 1, within the Sa phytophysiognomy in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- $GR_{FRI,i,t}$ = Biomass growth rate for pixel *i*, in the FRI class > 1, in year *t*, as percentage (%),Table 10-13.
- 44/12 = Conversion factor from tonnes of Carbon (tC) to tonnes of Carbon Dioxide equivalent (tCO_2e), dimensionless.

- ***Emissions from Fire Degradation in Forest Strata* (*k = F*)**

For other forest phytophysiognomies (denoted as F) other than Sa, fire emissions are calculated following the FREL and IPCC Guidelines (2006).

The total fire emissions in other forest phytophysiognomies (F) (ETdegF) in year *t* are computed by the following equation.

$$ETdegF_t = ECO_2degF_t + ECH_4degF_t + EN_2OdegF_t$$

Where:

- $ETdegF_t$ = Total emissions from fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- ECO_2degF_t = Immediate CO_2 emissions from fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- ECH_4degF_t = Immediate CH_4 emissions following fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- EN_2OdegF_t = Immediate N_2O emissions following fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

The following equation calculates CO_2 emissions from other forest phytophysiognomies (*k* = *F*) (ECO_2degF) in year *t*.

$$ECO_2degF_t(tCO_2e) = \sum_{b=1}^{2}\sum_{F=1}^{22}\sum_{i=1}^{n} Adeg_{i,F,b,t} * AGB_{i,F,t} * Cf_b * 44/12$$

Where:

- ECO_2degF_t = Immediate CO_2 emissions from fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,F,b,t}$ = Pixel *i* degraded by fire in other forest phytophysiognomies (F) within the biome b (Amazon or Cerrado) in year *t*, in hectares (ha).
- $AGB_{i,F,t}$ = Aboveground biomass in pixel *i* within other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.

- Cf_b = Combustion factor for biome b; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless.
- 44/12 = Conversion factor from tonnes of Carbon (tC) to tonnes of Carbon Dioxide equivalent (tCO_2e), dimensionless.

CH_4 emissions from fire degradation in other forest phytophysiognomies (F) (ECH_4degF) in year *t* are calculated using the following equation:

$$ECH_4degF_t = \sum_{b=1}^{n=2} \sum_{F=1}^{n=F} \sum_{i=1}^{n} Adeg_{i,F,b,t} * \left[\frac{\left(AGB_{i,F,t} + DW_{i,F,t} + LI_{i,F,t}\right)}{0{,}47}\right] * Cf_b * 6{,}8 * 10^{-3} * 28$$

Where:

- ECH_4degF_t = Immediate CH_4 emissions following fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,F,b,t}$ = Pixel *i* degraded by fire in other forest phytophysiognomies (F) within the biome b (Amazon or Cerrado) in year *t*, in hectares (ha).
- $AGB_{i,F,t}$ = Aboveground biomass in pixel *i* within other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- $DW_{i,F,t}$ = Dead wood in pixel *i*, in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4.
- $LI_{i,F,t}$ = Litter or Leaf Litter in pixel *i*, within other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4.
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- Cf_b = Combustion factor for biome b; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless.
- 6.8 = CH_4 emission factor in grams per kilogram of dry matter (g/kg.d.m).
- 28 = Conversion factor from tonnes of CH_4 to tonnes of CO_2e (IPCC, 2014).

The N_2O emissions from fire degradation in other forest phytophysiognomies (F) (EN_2OdegF) in year *t*, are computed using the following equation:

$$EN_2OdegF_t = \sum_{b=1}^{n=2}\sum_{F=1}^{n=F}\sum_{i=1}^{n} Adeg_{i,F,b,t} * \left[\frac{\left(AGB_{i,F,t} + DW_{i,F,t} + LI_{i,F,t}\right)}{0{,}47}\right] * Cf_b * 0{,}2 * 10^{-3} * 265$$

Where:

- EN_2OdegF_t = Immediate N_2O emissions from fire degradation in other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adeg_{i,F,b,t}$ = Pixel *i* degraded by fire in other forest phytophysiognomies (F) within the biome *b* (Amazon or Cerrado) in year *t*, in hectares (ha).
- $AGB_{i,F,t}$ = Aboveground biomass in pixel *i* within other forest phytophysiognomies (F) in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- $DW_{i,F,t}$ = Dead wood in pixel *i*, within other forest phytophysiognomies (F) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4.
- $LI_{i,F,t}$ = Litter or Leaf Litter in pixel *i*, within other forest phytophysiognomies (F) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- Cf_b = Combustion factor for biome b; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless.
- 0.2 = N_2O emission factor, measured in grams per kilogram of dry matter (g/kg.d.m).
- 265 = Conversion factor from tonnes of N_2O to tonnes of CO_2e (IPCC, 2014).

- ***Aboveground Biomass* (*AGB*) *Post-Degradation Update***

Under the FREL methodology, AGB stocks must be updated following degradation to avoid overestimating emissions in future deforestation events. This procedure ensures that emissions calculations are based on accurately updated biomass stocks or emission factors.

- ***Strata: Wooded Savanna* (*Sa; k = Sa*)**

For the Wooded Savanna phytophysiognomy (Sa), biomass stocks are updated using the following equations.

$$AGB^{*}_{i,Sa,t} = AGB_{i,Sa,t} + (AGB_{i,Sa,t} * adg_{i,Sa,t} * GR_{i,FRI,t})$$

Where:

- $AGB^{*}_{i,Sa,t}$ = Aboveground biomass of pixel *i*, in Sa phytophysiognomy, in year *t*, with post-degradation update, in tonnes of Carbon per hectare (tC/ha).
- $AGB_{i,Sa,b,t}$ = Aboveground biomass for pixel *i*, in Sa Phytophysiognomy in year *t*, prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), see Table 10-4 or post-degradation updates.
- $adg_{i,Sa,b,t}$ = Status of pixel *i* in Sa phytophysiognomy within the biome *b* (Amazon or Cerrado) in year *t*. The value is binary (0 and 1); it is 1 if a fire occurred in pixel *i* during year *t*, and 0 if no fire occurred.
- $GR_{i,FRI,t}$ = Biomass growth rate for pixel *i*, in the FRI class for year *t*, expressed as percentage (%), as shown in Table 10-13.

$$(AGB + DW + LI)^{*}_{i,Sa,t} = AGB^{*}_{i,Sa,t} + DW_{i,Sa,t} + LI_{i,Sa,t}$$

Where:

- $(AGB+DW+LI)^{*}_{i,Sa,t}$ = Aboveground biomass of pixel *i*, in phytophysiognomy Sa, in the current year, updated after degradation, measured in tonnes of Carbon per hectare (tC/ha).
- $AGB^{*}_{i,Sa,t}$ = Aboveground biomass of pixel *i*, in Sa phytophysiognomy, in year *t*, updated after degradation, in tonnes of Carbon per hectare (tC/ha).
- $DW_{i,Sa,t}$ = Dead wood in pixel *i*, in Sa phytophysiognomy in year *t*, prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- $LI_{i,Sa,t}$ = Litter or Leaf Litter in pixel *i*, in Sa phytophysiognomy, in year *t*, before degradation, measured in tonnes of Carbon per hectare (tC/ha), as seen in Table 10-4.

- ***Other Forest Phytophysiognomies Strata*** (***k = F***)

For other forest phytophysiognomies, other than Sa, (denoted as F), AGB stocks are updated according to the following equations:

$$AGB^{*}_{i,F,b,t} = AGB_{i,F,b,t} - \left(AGB_{i,F,b,t} * adg_{i,F,b,t} * Cf_{b}\right)$$

Where:

- $AGB^{*}_{i,F,b,t}$ = Aboveground biomass for pixel *i* in other forest phytophysiognomies F, within biome *b* (Amazon or Cerrado), in year *t*, updated post-degradation, measured in tonnes of carbon per hectare (tC/ha).
- $AGB_{i,F,b,t}$ = Aboveground biomass for pixel *i*, in other forest phytophysiognomies F, within the biome *b* (Amazon or Cerrado) in year *t*, prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4 or updates post-degradation.
- $adg_{i,F,b,t}$ = Pixel status *i* in other forest phytophysiognomies F within the biome *b* (Amazon or Cerrado) in year *t.* The value is binary (0 and 1); it is 1 if a fire occurred in pixel *i* during year *t*, and 0 if no fire occurred.
- Cf_b = Combustion factor for biome *b*; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless.

$$(AGB + DW + LI)^{*}_{i,F,b,t} = \left(AGB_{i,F,b,t} + DW_{i,F,b,t} + LI_{i,F,b,t}\right) - \left(AGB_{i,F,b,t} * adg_{i,F,b,t} * Cf_{b}\right)$$

Where:

- $(AGB+DW+LI)^{*}_{i,F,b,t}$ = Aboveground biomass for pixel *i*, in other forest phytophysiognomies F, within biome *b* (Amazon or Cerrado), in year *t*, updated after degradation, measured in tonnes of Carbon per hectare (tC/ha).
- $AGB_{i,F,b,t}$ = Aboveground biomass for pixel *i* in other forest phytophysiognomies (F), within the biome *b* (Amazon or Cerrado), in year *t*, prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4 or post-degradation updates.
- $DW_{i,F,b,t}$= Dead wood for pixel *i*, in other forest strata (F), within biome *b* (Amazon or Cerrado), in year *t*, prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4.
- $LI_{i,F,b,t}$ = Litter or Leaf Litter for pixel *i*, in other forest phytophysiognomies (F), within biome *b* (Amazon or Cerrado) in year *t,* prior to degradation, measured in tonnes of Carbon per hectare (tC/ha), Table 10-4.

- $adg_{i,F,b,t}$ = Pixel status *i* in other forest phytophysiognomies F within the biome *b* (Amazon or Cerrado) in year *t.* The value is binary (0 and 1); it is 1 if a fire occurred in pixel *i* during year *t*, and 0 if no fire occurred.
- Cf_b = Combustion factor for biome *b*; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless.

10.3.3. Emissions from Deforestation

10.3.3.1. Activity Data

Deforestation activity data are obtained from PRODES (Figure 10-8), provided by INPE. Since 1988, PRODES has produced the official annual deforestation rates for Brazil for the Legal Amazon, and since 2013, it has also tracked deforestation in other Brazilian biomes, including the Cerrado (INPE, 2024b). PRODES is a publicly accessible, free data source that serves as a foundational reference for the FREL, Brazil's national communications and biennial update reports to the UNFCCC.

PRODES maps deforestation using satellite imagery from Landsat, CBERS, IRS, UK-DMC2, and Sentinel satellites (Almeida et al., 2022). The PRODES methodology defines deforestation as the "conversion, by suppression, of areas in primary forest physiognomies through anthropogenic actions". Once a pixel is identified as deforested, it is no longer classified as primary forest and is no longer tracked by PRODES. Deforestation data from PRODES (INPE, 2024b) are reported annually, covering deforestation from August of one year to July of the following year, as this period minimizes cloud coverage in satellite images (Almeida et al., 2022). Table 10-10 presents the procedure for interpolating the PRODES timeframe.

Data from PRODES Legal Amazon were used for the Amazon biome in Tocantins, which occupies 9% of the state's territory, against 91% of Cerrado. Data for the Cerrado biome was extracted from PRODES Cerrado (INPE, 2024b). Both datasets are available on the TerraBrasilis platform (Assis et al., 2019). The analysis in this document covers the years 2015 to 2023, which comprise the reference period and most of the first crediting period.

Details on the SOP for the deforestation map accuracy assessment and the confidence intervals for area estimates are provided in Section 10.7.

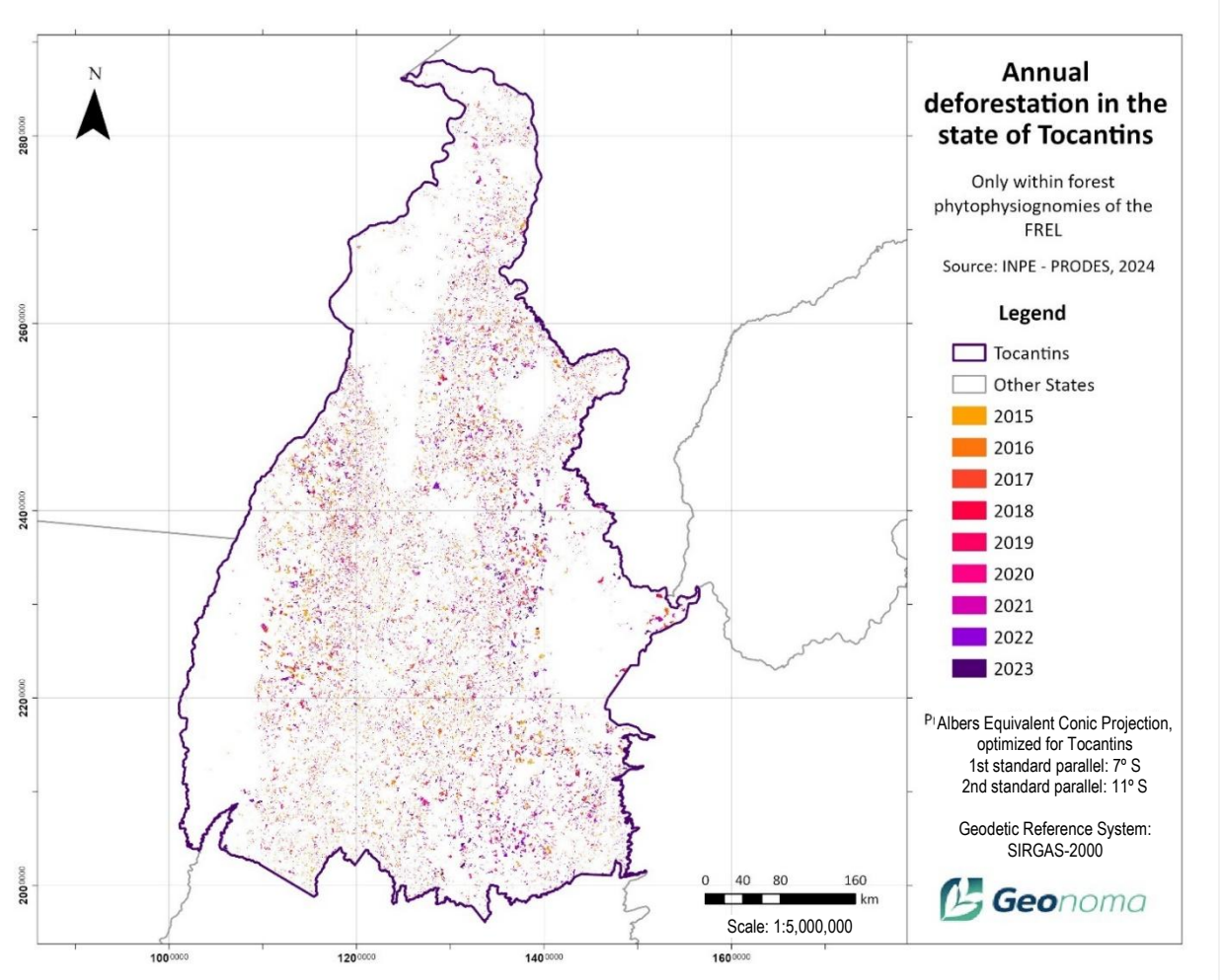

Figure 10-8. Annual Deforestation in the State of Tocantins, Within the Forest Mask.

Prepared by Geonoma, based on PRODES (INPE, 2024b) data.

10.3.3.2. Emission Factors

Emission factors for deforestation are based on forest carbon stocks for each phytophysiognomy across different carbon pools, including: AGB, BGB, LI, and DW (see Table 10-4 and Section 10.3.1).

10.3.3.3. Equations

The equations below describe how emissions from deforestation are calculated in accordance with the FREL and the IPCC Guidelines (2006). Calculations are performed in matrix format using raster data.

Calculating Deforestation Activity Data (Adef): Deforestation activity data (Adef) are derived from PRODES data for each year of interest (t).

$$Adef_{k,t}(ha) = \sum_{i=1}^{n} adf_{i,k,t} * 0{,}088$$

Where:

- $Adef_{k,t}$ = Total deforested area in phytophysiognomy *k,* in year *t* measured in hectares (ha).
- $adf_{i,k,t,}$ = Pixel status *i* in phytophysiognomy *k*, in year *t* on the deforestation map. The value is binary (0 and 1): it is set to 1 if deforestation occurred in pixel *i* during year *t*; otherwise, it is 0.
- 0.088 = Conversion factor from pixel area to hectares.

The second step involves calculating CO_2 emissions from deforestation (ECO_2def).

$$ECO_2def_{k,t} = \sum_{i=1}^{n} Adef_{i,k,t} * \left(AGB_{i,k,t} + BGB_{i,k,t} + DW_{i,k,t} + LI_{i,k,t}\right) * {}^{44}/_{12}$$

Where:

- $ECO_2def_{k,t}$ = CO_2 emissions from deforestation in phytophysiognomy (stratum) *k* during year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adef_{i,k,t}$ = Total deforested area in phytophysiognomy *k* in year *t,* measured in hectares (ha).
- $AGB_{i,k,t}$ = Aboveground biomass in pixel *i,* within phytophysiognomy (stratum) *k*, in year *t,* measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4 or post-degradation updates).

- $BGB_{i,k,t}$ = Belowground biomass in pixel *i,* in phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- $DW_{i,k,t}$ = Dead wood in pixel *i,* within phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- $LI_{i,k,t}$ = Litter or Leaf Litter in pixel *i*, within phytophysiognomy (stratum) *k* in year *t,* measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- 44/12: Conversion factor from tonnes of Carbon (tC) to tonnes of Carbon Dioxide equivalent (tCO_2e), dimensionless.

The third step involves calculating emissions of Methane (CH_4) and Nitrous Oxide (N_2O) that result from the combustion of biomass residues following deforestation.

$$ECH_4pdef_{b,k,t} = \sum_{i=1}^{n} Adef_{i,b,k,t} * \left[\frac{\left(AGB_{i,k,t} + DW_{i,k,t} + LI_{i,k,t}\right)}{0{,}47}\right] * Cf_b * 6{,}8 * 10^{-3} * 28$$

Where:

- $ECH_4pdef_{b,k,t}$ = CH_4 emissions from post-deforestation residue combustion in biome *b* (Amazon or Cerrado), within the phytophysiognomy (stratum) *k* during year *t*, measured in tonnes of carbon dioxide equivalent (tCO_2e).
- $Adef_{i,b,k,t}$ = Area of pixel that shows deforestation in biome *b* (Amazon or Cerrado), within stratum *k*, in year *t*, measured in hectares (ha).
- $AGB_{i,k,t}$ = Aboveground biomass in pixel *i,* within phytophysiognomy (stratum) *k*, in year *t,* measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4 or post-degradation updates).
- $DW_{i,k,t}$ = Dead wood in pixel *i,* within phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- $LI_{i,k,t}$ = Litter or Leaf Litter in pixel *i*, within phytophysiognomy (stratum) *k* in year *t,* measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- Cf_b = Combustion factor for biome *b*; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless
- 6.8 = CH_4 emission factor in grams per kilogram of dry matter (g/kg.d.m).
- 28 = Conversion factor from tonnes of CH_4 to tonnes of CO_2e (IPCC, 2014).

$$EN_2Opdef_{b,k,t} = \sum_{i=1}^{n} Adef_{i,b,k,t} * \left[\frac{\left(AGB_{i,k,t} + DW_{i,k,t} + LI_{i,k,t}\right)}{0{,}47}\right] * Cf_b * 0{,}2 * 10^{-3} * 265$$

Where:

- $EN_2Opdef_{b,k,t}$ = N_2O emissions from post-deforestation residue combustion in biome *b* (Amazon or Cerrado), in phytophysiognomy (stratum) *k* in year *t*, measured in metric tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adef_{i,b,k,t}$ = Area of pixel that shows deforestation in biome *b* (Amazon or Cerrado), within stratum *k*, in year *t*, measured in hectares (ha).
- $AGB_{i,k,t}$ = Aboveground biomass in pixel *i*, within phytophysiognomy (stratum) *k*, in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4 or updates post-degradation).
- $DW_{i,k,t}$ = Dead wood in pixel *i*, within phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- $LI_{i,k,t}$ = Litter or Leaf Litter in pixel *i*, within phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon per hectare (tC/ha) (see Table 10-4).
- 0.47 = Conversion factor from tonnes of dry matter (t.d.m) to tonnes of Carbon (tC).
- Cf_b = Combustion factor for biome *b*; set at 0.368 for the Amazon biome and 0.379 for the Cerrado biome, dimensionless
- 0.2 = N_2O emission factor, measured in grams per kilogram of dry matter (g/kg.d.m).
- 265 = Conversion factor from tonnes of N_2O to tonnes of CO_2e (IPCC, 2014).

The fourth step is to aggregate non-CO_2 greenhouse gases (CH_4 and N_2O) emissions resulting from post-deforestation residue combustion ($EnCO_2pdef$), considering both biomes (Amazon and Cerrado), within each phytophysiognomy (stratum) *k* at time *t*.

$$EnCO_2pdef_{k,t}\ (tCO_2e) = \sum_{i=b}^{n} \left(ECH_4pdef_{b,k,t} + EN_2Opdef_{b,k,t}\right)$$

Where:

- $EnCO_2pdef_{k,t}$ = Non-CO_2 greenhouse gas emissions (CH_4 and N_2O) from post-deforestation residue combustion in phytophysiognomy (stratum) *k*, in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ECH_4pdef_{b,k,t}$ = CH_4 emissions from post-deforestation residue combustion
- in biome *b* (Amazon or Cerrado), within the phytophysiognomy (stratum) *k* during year *t*, measured in tonnes of carbon dioxide equivalent (tCO_2e).
- $EN_2Opdef_{b,k,t}$ = N_2O emissions from post-deforestation residue combustion in biome *b* (Amazon or Cerrado), in phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

The fifth step aggregates all greenhouse gas emissions to calculate the Gross Deforestation Emissions (EBdef) for year *t*.

$$EBdef_t\ (tCO_2e) = \sum_{i=k}^{n} \left(ECO_2def_{k,t} + EnCO_2pdef_{k,t}\right)$$

Where:

- $EBdef_t$ = Gross deforestation emissions in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ECO_2def_{k,t}$ = CO_2 deforestation emissions in phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO2e).
- $EnCO_2pdef_{k,t}$ = Emissions of non-CO_2 greenhouse gases (CH_4 and N_2O) from biomass residue combustion following deforestation in phytophysiognomy (stratum) *k* in year *t*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

10.3.4. Post-Deforestation Land Use

Post-deforestation land use data were obtained from TerraClass (Almeida et al., 2016; TerraClass, 2024), developed by the Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária,* or Embrapa) and INPE. INPE is responsible for classifying land use in deforested areas monitored by PRODES; however, these data are not updated annually. The most recent data are for 2020 and 2022, covering the Cerrado and Amazon biomes. To address this gap, the State of Tocantins used TerraClass 2020 for PRODES deforestation years 2017, 2018, and 2019, and TerraClass 2022 for years 2020 and 2021. The post-deforestation land use area was calculated for each year (2017-2024). To establish post-deforestation land use carbon stocks, a weighted average of total area by land use category was

computed. This calculation incorporated the 4CN's carbon stocks for the Cerrado and Amazon biomes, applying a methodology similar to WayCarbon's (WayCarbon, 2024). This approach allowed the quantification of the post-deforestation stocks (Pdef). Table 10-14 presents the land use classes (*j*) observed after deforestation in the state, the respective size of the areas (ha), and the removal factors for each class, based on the 4CN and the FREL.

Table 10-14. Land Use Classes and Post-Deforestation Carbon Stocks.

Biome (b)	Land use class post-deforestation (*j*)	Area (2017 to 2021) (Apdf) (ha)	Post-Deforestation Stocks (Ep) (tC/ha)	Post-deforestation stock (WPdef) index (tC/ha)	Post-deforestation Stocks (WPdef) index (tCO_2e/ha)
Amazon	Secondary natural forest vegetation	696	3.03	7.30	26.78
	Shrubby/tree pasture	1,534	10		
	Herbaceous pasture	2,695	10		
Cerrado	Secondary natural forest vegetation	30,970	2.85		
	Pasture	506,185	7.57		
	Perennial agricultural crop	1,228	2.6		
Total		**543,308**			

Prepared by Geonoma, based on TerraClass (2024) and the 4CN (2020) data.

The post-deforestation stock (WPdef) index is calculated as a weighted average of the post-deforestation stock from land use (Ep) from Table 10-14, using the following equation:

$$WPdef = \sum_{j=1}^{n} Apdf_j * Ep_j \Big/ \sum_{j=1}^{n} Apdf_j$$

Where:

- WPdef = Post-deforestation stock index, measured in tonnes of Carbon Dioxide equivalent (tCO_2e/ha).
- $Apdf_j$ = Sum of the areas of each land use *j* in hectares (ha), Table 10-13.
- Ep_j = Post-deforestation stock from land use *j*, measured in tonnes of Carbon Dioxide equivalent (tCO_2e/ha).

The Post-deforestation ($Pdef_t$) values for each year of the reference and crediting periods are calculated by the following equation:

$$Pdef_t = \sum_{i=1}^{n} Adef_{t,i} * WPdef$$

Where:

- $Pdef_t$ = Post-deforestation stock in the reference and crediting periods (*t* = 2015,...,2024), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Adef_j$ = Deforested area in the pixel *i* in the year *t*, measured in hectares (ha).
- WPdef = Post-deforestation stock index, measured in tonnes of Carbon Dioxide equivalent (tCO_2e/ha).

10.3.5. Data Acquisition and Pre-processing

The detailed SOPs for the pre-processing of activity data and emission factors are described in Table 10-15. The files generated in this process are organized according to Table 10-17.

Table 10-15. Standard Operating Procedures (SOPs) for Data Acquisition and Pre-Processing of Activity Data and Emission Factors.

Step	Activity	Details
1	Create the project in ArcGIS and define the spatial reference system	Geodetic reference used: EPSG 4326 WGS84 Geographic to match the inputs from “MapBiomas Fire (.tif)”;
2	Add and prepare input data	Initial data: . State boundary (.shp) – reproject according to (1); . Fire data from “MapBiomas Fire (.tif)” (annual burned areas) for layer alignment reference (Snap); . "Ancient Vegetation (.shp)" of FREL– reproject according to (1), apply ‘*Snap’* with MapBiomas Fire, and crop to the “State Boundary (shp)”; . PRODES annual deforestation for Cerrado and Amazon (including deforestation in non-forest areas) – reproject according to (1), apply *‘Snap’* with MapBiomas, and crop to the “State Boundary (.shp)”;
3	Create forest formations mask	Exclude from "Ancient Vegetation (.shp)" the phytophysiognomies not considered as forest formations by FREL (Lb, Pa, RL, Rm, Rs, Sp, Te, Eg, Lg, Sg, Tg, Ar, Dn) and water bodies (A);
4	Fix geometries	Apply *‘Repair geometry’* to the "Ancient Vegetation (.shp)";
5	Fix AGB values [a]	Replace the 0 in the ‘cagb’ column in the "Ancient Vegetation (.shp)" with AGB values from EBA rasters (Estimativa de Biomassa na Amazônia);
6	Create forest formations raster (pretorig)	Apply *'Feature to Raster'* to the "Ancient Vegetation (.shp)" to create the forest formations raster with the "pretorig" column as reference; apply ‘*Snap’* to the MapBiomas layer.
7	Use Reclassify tool to create other formations	. Create a reclassified raster for Sa/other formations (Sa/F): . Wooded Savanna (Sa): 101; . Other forests phytophysiognomies (F): 100; . Apply *‘Snap’* to the MapBiomas layer; . Create the forest formations mask raster (dissolving all categories); apply *‘Snap’* to the MapBiomas layer.
8	Create biomass rasters	Apply *'Feature to Raster'* to the "Ancient Vegetation (shp)" to create biomass raster for AGB with the column "cagb"; . Based on the AGB raster values, create the BGB, DW and LI rasters according to the rations presented in “Table 10 5. Ratios (R) for Estimating Belowground Biomass (BGB), Dead Wood (DW), and Litter (LI) by Biome and Phytophysiognomy”.

Step	Activity	Details
9	Create mosaic with PRODES data	Apply mosaic to merge PRODES (.tif) for Cerrado and Amazon
10	Use Reclassify tool on PRODES data	Reclassify: . Deforestation before 2015: 0; . Deforestation between 2015 and 2023: keep numbering per year; . Vegetation remnants (100): 1; . Other values: 0;
11	Extract native vegetation remnants mask	Reclassify PRODES data: . Deforestation before 2015: 0; . Deforestation between 2015 and 2023: 1; . Vegetation remnants (100): 1; . Other values: 0;
11	Extract rasters as inputs for the GEE script	Extract: . Sa/F (other phytophysiognomies) mask; . AGB, BGB, DW, LI rasters; . PRODES reclassified (2015-2023 for deforestation, 1 for forest remnants);
12	Run Scripts on Google Earth Engine	. Run script for Sa and non-Sa (F); Download outputs: emissions for each gas, each year, for both Sa and non-Sa (F);
13	Process emissions data	. Merge datasets (GEE scripts outputs); . Calculate total values for deforestation, degradation, in Sa and non-Sa (F); . Calculate baseline (2015-2019 emissions average); . Calculate avoided emissions between 2020-2023.

Sources of the map described here are in Table 10-17. The detailed name of forest phytophysiognomies is available in Table 10-1.

[a] Step number 5 is required since the biomass values for geometries in the Amazon region in the official FREL map (Ancient Vegetation) are 0.

Prepared by Geonoma.

10.4. Quantification of Emission Reductions (ERs)

The calculation of emission reductions (ERs) will strictly adhere to the equations and procedures outlined in TREES (ART, 2021). This section describes the equations, parameters and steps that will be used to calculate ERs.

The initial step will be to determine annual emissions from degradation and deforestation during the reference period (2015-2019) (EAr) and the crediting period (2020-2024) (EAc).

$$EAr_t = [(ETdegSa_t + ETdegF_t) + EBdef_t] - Pdef_t$$

Where:

- EAr_t = Annual net emissions in the reference period (t = 2015,...,2019), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ETdegSa_t$ = Total emissions from fire degradation in Sa phytophysiognomy for the reference period (t = 2015,...,2019), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ETdegF_t$ = Total emissions from fire degradation in forest strata (F) for the reference period (t = 2015,...,2019), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EBdef_t$ = Gross deforestation emissions in reference period (t = 2015,...,2019), measured in metric tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Pdef_t$ = Post-deforestation land use carbon stocks in reference period (t = 2015,...,2019), measured in tonnes of carbon dioxide equivalent (tCO_2e).

$$EAc_t = [(ETdegSa_t + ETdegF_t) + EBdef_t] - Pdef_t$$

Where:

- EAc_t = Annual net emissions in crediting period (t = 2020,...,2024), measured in metric tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ETdegSa_t$ = Total fire degradation emissions in Sa phytophysiognomy in crediting period (t = 2020,...,2024), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $ETdegF_t$ = Total fire degradation emissions in forest strata (F) in crediting period (t = 2020,...,2024), measured in metric tonnes of Carbon Dioxide equivalent (tCO_2e).
- $EBdef_t$ = Gross emissions from deforestation in crediting period (t = 2020,...,2024), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $Pdef_t$ = Post-deforestation land use carbon stocks in crediting period (t = 2020,...,2024), measured in tonnes of carbon dioxide equivalent (tCO_2e).

The annual results of EAr and EAc were interpolated from the PRODES year to the calendar year, as required by TREES, in accordance with the standard operational procedures described

in Section 10.8. Accordingly, in the calculation steps below, the EAr and EAc results were used based on the calendar year.

The next step involves calculating the Baseline or Crediting Level (CL), based on the annual average emissions recorded during the reference period (2015 to 2019).

$$CL = \sum_{t=1}^{n=5} EAr_t \Big/ 5$$

Where:

- CL = Baseline or crediting level in tonnes of carbon dioxide equivalent (tCO_2e).
- EAr_t = Annual net emissions in the reference period (t = 2015,...,2019), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).

This TREES Registration Document (TRD) presents the results from the first and second steps. The TREES Monitoring Report (TMR) will detail the outcomes of the calculations outlined in the following steps.

In the next step, annual ERs will be calculated for each year (t), covering the crediting period (2020-2024).

$$GHG\ ER_t = CL - EAc_t$$

Where:

- GHG ER_t = Annual reduced greenhouse gas emissions during the crediting period (t = 2020,...,2024), in tonnes of Carbon Dioxide equivalent (tCO_2e).
- CL = Baseline or crediting level in tonnes of carbon dioxide equivalent (tCO_2e).
- EAc_t = Annual net emissions in crediting period (t = 2020,...,2024), measured in metric tonnes of Carbon Dioxide equivalent (tCO_2e).

Following that, the values for the Buffer (BUF), Leakage (LEAK), and Uncertainty (UNC) will be calculated for each calendar year of the crediting period and deducted from annual ERs. The following equations outline the calculations for the deductions.

$$BUF_t = GHG\ ER_t * Buffer\%$$

Where:

- BUF_t = Buffer year *t* (*t* = 2020,...,2024) in tonnes of carbon dioxide equivalent (tCO_2e).
- GHG ER_t = Annual reduced GHG emissions during the crediting period (*t* = 2020,...,2024), in tonnes of Carbon Dioxide equivalent (tCO_2e).
- Buffer%: The buffer percentage is calculated according to the buffer pool contribution determined by TREES (ART, 2021).

$$LEAK_t = GHG\ ER_t * Leakage\%$$

Where:

- $LEAK_t$ = Annual net emissions in crediting period (*t* = 2020,...,2024), measured in tonnes of carbon dioxide equivalent (tCO_2e).
- GHG ER_t = Annual reduced GHG emissions during the crediting period (*t* = 2020,...,2024), in tonnes of Carbon Dioxide equivalent (tCO_2e).
- Leakage%: The leakage percentage is calculated according to the leakage deduction determined by TREES (ART, 2020).

$$UNC_t = GHG\ ER_t * [0{,}524417 * (90\%CI_t / 1{,}645006)]$$

Where:

- UNC_t = Uncertainty value in year *t* (*t* = 2020,...,2024), measured in tonnes of carbon dioxide equivalent (tCO_2e).
- GHG ER_t = Annual ERs during the crediting period (*t* = 2020,...,2024), in tonnes of Carbon Dioxide equivalent (tCO_2e).
- $90\%CI_t$ = Semi-amplitude of the 90% confidence interval, expressed as a percentage of average emissions or removals year t (*t* = 2020,...,2024), as a percentage. The procedure for calculating the 90% confidence interval follows the methodology determined by TREES (ART, 2021).
- 0.524417 = Risk level allowed by TREES according to Student's *t*-distribution.
- 1.645006 = Student's t-distribution value with 90% confidence interval.

In the final step, the Emission Reductions (ERs) for each calendar year *t* will be calculated, resulting in the carbon credits to be issued under the Jurisdictional REDD+ Program of the state of Tocantins.

$$ER_t = GHG\ ER_t - BUF_t - LEAK_t - UNC_t$$

Where:

- ER_t = Annual ERs during the crediting period (t = 2020,...,2024), measured in tonnes of Carbon Dioxide equivalent (tCO_2e).
- GHG ER_t = Annual ERs during the crediting period (t = 2020,...,2024), in tonnes of Carbon Dioxide equivalent (tCO_2e).
- BUF_t = Buffer value in year t (t = 2020,...,2024) in tonnes of carbon dioxide equivalent (tCO_2e).
- $LEAK_t$ = Leakage value in year t, measured in tonnes of carbon dioxide equivalent (tCO_2e).
- UNC_t = Uncertainty value in year t (t = 2020,...,2024), measured in tonnes of carbon dioxide equivalent (tCO_2e).

10.5. Emissions Quantification for the Reference Period

Using all previously described methodologies and procedures, the state of Tocantins calculated the annual net emissions (EAr) in the reference period (2015-2019). Table 10-16 presents the results for each calendar year, along with the baseline or crediting level (CL), which amounts to 71,750,648 tCO_2e.

Table 10-16. Results for Annual Net Emissions (EAr t) During the Reference Period (2015-2019) and Baseline or Crediting Level (CL) in the Calendar year.

	[$ETdegSa_t + ETdegF_t$]	[$EBdef_t – Pdef_t$]	[$E\ Ar_t$]
Calendar Year	**Net Degradation Emissions (tCO_2e)**	**Net Deforestation Emissions (tCO_2e)**	**Total Net Emissions (tCO_2e)**
2015	65,662,063	27,792,617	93,454,680
2016	56,027,330	21,024,204	77,051,534
2017	50,007,748	18,079,373	68,087,121
2018	54,225,151	14,809,729	69,034,880
2019	36,857,522	14,267,504	51,125,027
Baseline Emissions or Crediting Level (tCO_2e)			**71,750,648**

***The annual net emissions were calculated in the PRODES year and then interpolated to the calendar year as explained in Section 10.8.**

Prepared by Geonoma.

10.6. Quality Assurance and Control (QA/QC)

Quality assurance and control measures were implemented by standardizing, thoroughly verifying, and repeatedly cross-checking databases to ensure the accuracy of emission factors, activity data, and uncertainties.

Each dataset was examined for outliers and validated through count and sum verifications, ensuring consistency with the respective strata sizes.

A standardized coordinate reference system was used for the spatial data, consistent with the standard reference system applied to the GIS activity data inputs (EPSG:4326 WGS 84 Geographic). This process ensured seamless integration and analysis of all data, without any loss of information.

Conversion, combustion, and emission factors reference values were rigorously verified multiple times against primary sources, including the FREL and the 4CN. This protocol minimized the risk of transcription or interpretation errors affecting the analysis.

All standard operating procedures (SOPs) underwent an internal review by the Geonoma team, followed by an assessment from the Monitoring, Reporting, and Verification Working Group (GT-MRV) within the Department of Environment and Water Resources (*Secretaria do Meio Ambiente e Recursos Hídricos,* or SEMARH) and LAPIG (*Laboratório de Processamento de*

Imagens e Geoprocessamento, or Image Processing and Geoprocessing Laboratory of the Federal University of Goiás) that validated the deforestation and fire data.

Table 10-17. Geospatial Data Used.

File Name	Description	Format	Source	Annex
Script_forest.txt	Script to calculate forest emissions (from Google Earth Engine)	.txt	Based on Gomes et al. (2024)	Annex 2
Script_savanna.txt	Script to calculate Wooded Savanna emissions (from Google Earth Engine)	.txt	Based on Gomes et al. (2024) and FREL-Brasil (2024)	Annex 2
TO_state_boundaries.shp	Tocantins state boundaries	Shapefile (zipped folder)	IBGE (2022)	Annex 1
BR_UF_2022	Brazilian states boundaries	Shapefile (zipped folder)	IBGE (2022)	Annex 1
0_Ancient_Vegetation.shp	Ancient vegetation (original from FREL)	Shapefile (zipped folder)	FREL-Brasil (2024)	Annex 1
lim_ Cerrado _TO.shp	Cerrado biome boundaries	Shapefile (zipped folder)	IBGE (2024)	Annex 1
lim_amazon_TO.shp	Amazonia biome boundaries	Shapefile (zipped folder)	IBGE (2024)	Annex 1
CER.2022.TOCANTINS.17.M	TerraClass Cerrado – TO	Raster (zipped folder)	TerraClass (2024)	Annex 1
AMZ.2022.TOCANTINS.17.M	TerraClass Amazônia – TO	Raster (zipped folder)	TerraClass (2024)	Annex 1
PRODES_TO_2015_2023.tif	Annual deforestation from 2015 to 2023 (PRODES) with remaining intact forests	Raster (zipped folder)	INPE (2024b)	Annex 1
Sa_forest_mask_ ancveg_FREL_proj.tif	Boundaries of Wooded Savanna (Sa) and Forest phytophysiognomies	Raster (zipped folder)	Based on FREL-Brasil (2024)	Annex 1
Agb.tif	Aboveground biomass values according to the phytophysiognomies from FREL	Raster (zipped folder)	Based on FREL-Brasil (2024)	Annex 1
Bgb.tif	Belowground biomass values according to the phytophysiognomies from FFREL	Raster (zipped folder)	Based on FREL-Brasil (2024)	Annex 1
Dw.tif	Deadwood values according to the phytophysiognomies from FREL	Raster (zipped folder)	Based on FREL-Brasil (2024)	Annex 1
Litter.tif	Litter values according to the phytophysiognomies from FREL	Raster (zipped folder)	Based on FREL-Brasil (2024)	Annex 1
burnedarea_PRODESyear _15a23-001.tif	Burned areas from MapBiomas Fire, adjusted to PRODES year, only between 2015-2023	Raster (zipped folder)	MapBiomas Fire (2024)	Annex 1
Forest_PRODES_2015.shp	Forest mask in 2015	Shapefile (zipped folder)	INPE (2024b)	Annex 1
Area_adjust_factors_rasters	Adjust factors for degradation and deforestation areas according to the map accuracy results	Raster (zipped folder)	Geonoma	Annex 1

Prepared by Geonoma.

10.7. Uncertainty

TREES requires that estimates of emission reductions (ERs) be adjusted to account for estimated uncertainty. Participants must apply an uncertainty deduction to the total ERs generated during the crediting period (see last equation in Section 10.4). This uncertainty calculation incorporates all estimation errors associated with both activity data and emission factors (ART, 2021).

These following sections describe the standard operating procedure (SOP) for assessing the accuracy of deforestation and degradation activity data maps, as well as for calculating confidence intervals for area estimates.

10.7.1. Maps Accuracy Assessment

Since the activity data were derived from remote sensing pixel counts from a wall-to-wall map, deforestation data from PRODES and degradation data from MapBiomas Fire, a stratified area estimation approach was used for the map accuracy assessment.

The sampling design, response analysis, and confidence interval estimation followed best practices outlined by Olofsson et al. (2014). A more detailed explanation of the methods and procedures used in the map accuracy assessment can be found in the Map Accuracy Report (Annex 5) and in the Accuracy Assessment Workbook (Annex 6).

The sampling design ensured balanced representation across different classes, thereby minimizing bias in the accuracy estimates. Sample size determination was based on the formula provided by Cochran (1977):

$$n = \frac{\sum_{h=1}^{H} \frac{W_h^2 S_h^2}{w_h}}{\left(\frac{E}{z_{1-\alpha/2}}\right)^2 + \frac{1}{N}\sum_{h=1}^{H} W_h^2 S_h^2}$$

Where:

- ***n*** = Number of sampling points
- ***N*** = Total number of pixels in the map (population size)
- ***H*** = Number of strata (distinct categories or regions)
- W_h = Proportion of stratum h relative to the total population (N)
- w_h = Proportion of the sample allocated to stratum h relative to its size, determined by the allocation method (e.g., uniform, proportional, or mixed allocation)

- S^2 = Variance within stratum h
- E = Maximum allowable margin of error for the estimate
- $z_{1-\alpha/2}$ = Z-score corresponding to the confidence level $(1-\alpha)$ x 100%.

To define the final sample size (n) for deforestation activity data, an interval estimation of proportions was used, with a 90% confidence level and a margin of error approximately equal to 1.55% (E = 0.015525). The variance per stratum was set at S_h^2 = 0.25. This variance value was calculated under the assumption that p = 0.5, which represents the maximum possible variability. By using p = 0.5, the calculation ensures that even if the internal variability of the strata is at its maximum, the margin of error and the confidence level remain within acceptable limits.

For degradation activity data, the fire scars, the sample size (n) was determined using an interval estimation for proportions, with a 90% confidence level, a margin of error of 7.9% (E = 0.079) and S_h^2 = 0.25. Stratification was conducted at two levels. The first level was based on the year of fire scar (Burned class), covering the period from 2015 to 2023 (only the results for the reference period – 2015 to 2019 – are presented here; the results for the crediting period will be provided in the TMR), as well as a category representing areas with no recorded fire scars (Unburned class) according to MapBiomas Fire. The second level of stratification was based on two groups: Forest (F) and Wooded Savanna (Sa). The Forest group includes all forest phytophysiognomies, as listed in Table 10-18, while the Wooded Savanna includes only one forest phytophysiognomy (Sa).

For deforestation activity data, the first level of classification includes three classes: the Deforestation class, the Natural class, and the Stable Non-Forest class. The Deforestation class includes areas of forest loss within a given year, capturing the annual conversion of native vegetation to other land uses between 2015 and 2023 (again, only the results for the reference period – 2015 to 2019 – are presented here). The Natural class represents areas with no recorded deforestation according to PRODES, indicating the persistence of native vegetation. Finally, the Stable Non-Forest class comprises areas that have already been significantly modified or transformed by long-term human activities and no longer retain the characteristics of native vegetation prior to the monitoring year. Examples of the Stable Non-Forest class include established agricultural lands, pastures, or urban areas before the 2015-2023 deforestation accounting period. Additionally, deforestation that occurred before the year under analysis is reclassified as Stable Non-Forest class. For instance, if the year under analysis is 2018, areas deforested before 2018 are classified as Stable Non-Forest.

The second level of stratification for deforestation activity data was based on two groups: Forest (F) and Wooded Savanna (Sa). The Forest group includes all forest phytophysiognomies, as listed in Table 10-18, while the Wooded Savanna includes only one phytophysiognomy (Sa).

Table 10-18. Groups and Phytophysiognomies.

Groups	Phytophysiognomies Acronym
Forest (F)	Aa+As+Da+Ds+Cm+Cs+Fa+Fm+Fs+SNm+SNs+ S+Sd+SO+SOs
Wooded Savanna (Sa)	Sa

The detailed name of forest phytophysiognomies is available in Table 10-1.

For the degradation activity data, the target population (N) comprised non-deforested areas from 2015 to 2019 across different forest phytophysiognomies. For each year and phytophysiognomy, a stratified probabilistic sampling approach was applied, using an allocation method that averaged between uniform and proportional allocation (Olofsson et al., 2014).

For the degradation activity data, distinct strata were established. These included: areas with fire occurrences, mapped by MapBiomas Fire and detected by the Fire Information for Resource Management System (FIRMS/NASA), were classified as Burned; and areas where no fire events were detected, were classified as Unburned. FIRMS/NASA data were specifically employed to delineate sampling units in locations prone to mapping omissions, following the recommendations of Olofsson et al. (2014).

The sampling and validation process included the following steps:

- **Random spatial distribution of sampling points:** Sampling points for different strata of deforestation and degradation activity data were spatially distributed using a tool in QGIS software.
- **Extraction and distribution of sampling points in FIRMS/NASA:** FIRMS/NASA data were processed using Google Earth Engine for data extraction, spatial clipping, and alignment with the forest mask (PRODES).
- **Visual inspection of deforestation:** Deforestation images were interpreted using the Temporal Visual Inspection (TVI) tool. LANDSAT images were used, along with Sentinel-2 images when available, as well as monthly mosaics of Planet images and KML files for use in Google Earth Pro. The images were classified into three categories: Natural, Stable Non-Forest, and Deforestation. Each point was inspected by three independent analysts.
- **Visual inspection of degradation:** The Map Grid Component tool developed by LAPIG/UFG was used for verifying degradation. The sample points were reviewed by three analysts.

- **Audit process for inspections:** Experienced interpreters, mainly LAPIG coordinators, supervised the training of interpreters, resolved interpretation doubts, and cast decisive votes in cases of conflicting interpretations.
- **Mappings Quality Analysis:** This final stage involved generating a confusion matrix (error matrix) to assess area quantification errors and calculate confidence intervals. The structure of the confusion matrix is presented in Table 10-19.

Table 10-19. Population Confusion Matrix with Cell Entries (p_{ij}) in Each Class C_i on the Map and Class C_j in the Reference Dataset (Expressed as a Percentage of the Area).

	Reference		
	C_1	C_2	Total
C_1	p_{11}	p_{12}	$p_{1.}$
C_2	p_{21}	p_{22}	$p_{2.}$
Total	$p_{.1}$	$p_{.2}$	1

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

The percentage of the area in each cell of the confusion matrix and the marginal percentages of rows and columns are calculated as: $p_{ij} = \frac{N_{ij}}{N} \times 100\%$, where: N_{ij} is the number of pixels in class C_i on the map and class C_j in the reference dataset, with $i, j \in \{1,2\}$ and N is the total number of pixels in the study population.

The accuracy metrics include:

- **Overall Accuracy (OA):** The ratio of correctly mapped samples to the total number of sample points: $OA = \sum_{i=1}^{2} p_{ii} = \sum_{i=1}^{2} \frac{N_{ii}}{N} \times 100\%$
- **Overall Error (EG):** The complement of OA, representing the total classification error: $EG = 100\% - EG$.
- **User's Accuracy (UA):** The proportion of a class in the map that matches the reference data: $UA_i = \frac{p_{ii}}{p_{i.}} = \frac{N_{ii}}{N_{i.}} \times 100\%$.
- **Commission Error (CE):** The proportion of false positives (incorrectly classified pixels in each class): $CE_i = 100\% - UA_i$.
- **Producer's Accuracy (PA):** The proportion of correctly classified samples within a reference class: $PA_j = \frac{p_{jj}}{p_{.j}} = \frac{N_{jj}}{N_{.j}} \times 100\%$.

- **Omission Error (OE):** The proportion of reference pixels that were omitted from the mapped class (false negatives): $OE_j = 100 - PA_j$.

The estimates, including OA, are obtained through stratified sampling. The confidence interval (CI) is given by $IC(A, \gamma 100\%) = \hat{p} \mp z_\gamma \, s(\hat{p})$, and the area estimate is $\hat{A} = \hat{p} \times A_{total} = \hat{p} \times N \times A_{pixel}$. The standard errors are calculated using the Taylor approximation method, employing R software with the survey package.

10.7.1.1. Degradation Map Accuracy Assessment

a. The Error Matrix Including all Classes Used in the Analysis

Estimated Proportions: Table 10-20 presents the error matrix of degradation map accuracy assessment. As explained above, there are two classes for degradation (Burned and Unburned). We used the Error Matrix to calculate the accuracy metrics of degradation maps.

Table 10-20. Degradation Error Matrix.

Year	Group	N	p11	p11_se	p11_LCI90	p11_LB90CI	p12	p12_se	p12_LCI90	p12_LB90CI	p21	p21_se	p21_LCI90	p21_LB90CI	p22	p22_se	p22_LCI90	p22_LB90CI
			%															
2015	Forest*	1995	3.70	0.07	3.59	3.82	0.34	0.07	0.23	0.46	6.89	1.13	5.03	8.75	89.06	1.13	87.20	90.92
	Sa**	124	9.81	0.54	8.92	10.71	0.78	0.54	0.00	1.68	11.50	2.75	6.98	16.02	77.90	2.75	73.38	82.42
2016	Forest*	2017	6.10	0.09	5.95	6.25	0.41	0.09	0.27	0.56	9.89	1.53	7.37	12.40	83.60	1.53	81.08	86.11
	Sa**	126	9.84	0.51	9.01	10.67	0.73	0.51	0.00	1.56	15.61	3.35	10.10	21.12	73.82	3.35	68.31	79.34
2017	Forest*	2133	5.98	0.15	5.73	6.23	0.41	0.15	0.16	0.66	3.57	0.97	1.97	5.17	90.04	0.97	88.44	91.64
	Sa**	137	8.63	0.41	7.95	9.31	0.60	0.41	0.00	1.28	1.63	1.17	0.00	3.54	89.15	1.17	87.23	91.07
2018	Forest*	1983	9.25	0.13	9.04	9.47	0.31	0.13	0.09	0.52	13.04	1.61	10.40	15.68	77.40	1.61	74.76	80.04
	Sa**	135	10.36	0.32	9.83	10.90	0.32	0.32	0.00	0.86	14.19	2.89	9.44	18.94	75.12	2.89	70.37	79.87
2019	Forest*	2101	2.74	0.04	2.67	2.81	0.08	0.04	0.01	0.15	5.48	1.05	3.75	7.21	91.69	1.05	89.96	93.42
	Sa**	142	4.33	0.00	4.33	4.33	0.00	0.00	0.00	0.00	5.00	1.81	2.01	7.98	90.68	1.81	87.69	93.66

p1: Burned area proportion class; **p2:** Unburned area proportion class; **Year:** Validation year. ***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna; **N**: Sample size; p_{ij}**:** Estimated proportion in cell (i, j) of the confusion matrix, where 'i' represents the reference (true) class and 'j' represents the mapped (classified) class; p_{ij}**_se:** Standard error of the estimated proportion in cell (i, j); p_{ij}**_LCI90:** Lower confidence interval 90% for the estimated proportion in cell (i, j); p_{ij}**_LB90CI**: Lower bound 90% confidence intervalfor the estimated proportion in cell (i, j).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

b. Map Areas for all Classes and Area Adjustment

The pixel count area estimate and the stratified area estimate for each class in the degradation activity data maps (Burned and Unburned areas) are presented in Table 10-21. Following the accuracy assessment, it was determined that the pixel count area estimate did not fall within the confidence interval of the stratified area estimate. Therefore, the stratified area estimate (bias-corrected) was adopted as the activity data, in accordance with TREES guidelines (ART, 2021).

The calculation of these stratified areas estimates, and their confidence intervals were based on a robust statistical methodology grounded in the principles of stratified sampling, consistent with the approach detailed by Stehman (2014). Following Stehman's framework, the estimation of a class's area proportion (P_k^A) is treated as the estimation of a population mean. This involves defining an indicator variable (y_u) for each pixel, which equals 1 if the pixel belongs to reference class *k* and 0 otherwise.

$$S(\hat{p}_k) = \sqrt{\sum_i W_i^2 \frac{\frac{n_{ik}}{n_i}\left(1 - \frac{n_{ik}}{n_i}\right)}{n_i - 1}} = \sqrt{\sum_i \frac{W_i \hat{p}_{ik} - \hat{p}_{ik}^2}{n_i - 1}}$$

Where, consistent with the terminology in Stehman (2014):

- W_i: the proportion of the total study area belonging to stratum i (corresponding to N_i^*/N, where N_i^* is the population size of stratum i and N is the total population size); in our case, the forest group.
- n_{ik}: the number of samples within stratum i classified as class k.
- n_i: the total number of samples taken in stratum i.
- $\hat{p}_{ik}$: the proportion of class k in stratum i (calculated as n_i^*/n_i).

Next, the standard error of the estimated area for class k, $S(\hat{A}_k)$, was derived by multiplying the standard error of the proportion $S(\hat{p}_k)$ by the total study area (A):

$$S(\hat{A}_k) = A * S(\hat{p}_k)$$

Finally, the confidence intervals for the estimated area $\hat{A}_k$ are constructed using the corresponding standard errors. As described in Stehman (2014), confidence intervals for population parameters (such as area estimates) are typically expressed as "estimate ± Z *

standard error". While a 95% confidence interval conventionally uses a Z-score of 1.96 (i.e., $\hat{A}_k \pm 1.96 * S(\hat{A}_k)$), a Z-score of approximately 1.645 was applied for the 90% confidence intervals (LCI90 and UCI90) presented in Table 10-21. This methodology ensures that the reported area estimates are statistically valid and bias-corrected, providing an accurate representation of the true extent of each class.

Table 10-21. Map Areas (Pixel Count) and Area Adjustment (Stratified Areas) for Degradation Classes.

Year	Group	Burned area				Unburned area			
		Pixel count area	Stratified area	Stratified area LCI90	Stratified area LB90CI	Pixel count area	Stratified area	Stratified area LCI90	Stratified area LB90CI
		ha							
2015	Forest*	84,076	220,135	181,397	258,874	1,993,089	1,857,029	1,818,291	1,895,768
	Sa**	1,052,879	2,121,345	1,662,881	2,579,808	8,899,407	7,830,942	7,372,478	8,289,406
2016	Forest*	134,136	328,085	276,388	379,783	1,917,962	1,724,013	1,672,315	1,775,710
	Sa**	1,027,545	2,478,663	1,935,552	3,021,775	8,712,271	7,261,153	6,718,042	7,804,265
2017	Forest*	130,919	194,574	161,592	227,555	1,905,486	1,841,831	1,808,849	1,874,813
	Sa**	887,162	987,625	791,692	1,183,559	8,742,686	8,642,222	8,446,289	8,838,156
2018	Forest*	194,338	451,201	397,562	504,840	1,829,470	1,572,607	1,518,968	1,626,246
	Sa**	1,013,350	2,334,816	1,880,377	2,789,256	8,495,190	7,173,724	6,719,285	7,628,163
2019	Forest*	57,151	165,545	130,707	200,384	1,955,327	1,846,932	1,812,093	1,881,771
	Sa**	406,087	876,870	596,095	1,157,646	8,999,204	8,528,421	8,247,645	8,809,197

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa**: Wooded savanna. **LCI90:** Lower confidence interval 90%; **LB90CI**: Lower bound 90% confidence interval.

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

c. User- and Producer Accuracy of the Classes Used for Activity Data Reporting

Overall Accuracy (OA): The results of the OA metric are presented in Table 10-22. The OA of the degradation maps is used to assess the uncertainty in area estimation.

Table 10-22. Degradation Overall Accuracy.

Year	Group	OA	OA_se	LCI90	LB90CI
		%			
2015	Forest*	92.76	1.13	90.90	94.63
	Sa**	87.71	2.80	83.10	92.32
2016	Forest*	89.70	1.53	87.18	92.22
	Sa**	83.66	3.39	78.09	89.24
2017	Forest*	96.02	0.98	94.40	97.64
	Sa**	97.78	1.24	95.74	99.81
2018	Forest*	86.65	1.61	84.00	89.30
	Sa**	85.49	2.91	80.71	90.26
2019	Forest*	94.44	1.05	92.71	96.17
	Sa**	95.00	1.81	92.02	97.99

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna; **OA:** Overall accuracy; **OA_se:** Standard error of overall accuracy; **LCI90:** Lower confidence interval 90%; **LB90CI**: Lower bound 90% confidence interval.

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

User and Producer Accuracy (UA, PA): Table 10-23 and Table 10-24 present the user's and producer's accuracy from the degradation maps, respectively. These metrics are used to assess the OA and to determine whether bias correction is needed for the degradation maps.

Table 10-23. Degradation User Accuracy.

Year	Group	UA_C1	UA_C1_ se	UA_C1_ LCI90	UA_C1_ LB90CI	UA_C2	UA_C2_ se	UA_C2_ LCI90	UA_C2_ LB90CI
		%							
2015	Forest*	91.53	1.76	88.63	94.43	92.82	1.18	90.88	94.76
	Sa**	93.63	1.40	91.34	95.93	89.42	1.64	86.73	92.11
2016	Forest*	93.63	2.39	89.70	97.56	96.18	1.04	94.47	97.89
	Sa**	96.79	1.38	94.51	99.06	85.58	1.78	82.66	88.50
2017	Forest*	97.14	1.49	94.68	99.59	94.36	1.08	92.58	96.14
	Sa**	92.16	0.65	91.08	93.23	89.95	1.45	87.58	92.33
2018	Forest*	84.19	2.99	79.28	89.10	92.67	1.40	90.38	94.97
	Sa**	81.48	3.31	76.05	86.92	93.82	1.29	91.71	95.94
2019	Forest*	88.02	1.28	85.92	90.12	94.04	1.12	92.20	95.87
	Sa**	92.59	5.14	84.14	100.00	87.13	3.07	82.08	92.19

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Burned class**; C2;** Unburned class**; Year:** Validation year; **N**: Sample size**;** **UA_C$_i$**: Estimated user accuracy, where 'i' represents the class; **UA_ C$_i$_se:** Standard error of user accuracy for class (i); **UA_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for user accuracy of class (i); **UA_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for user accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-24. Degradation Producer Accuracy.

Year	Group	PA_C1	PA_C1_ se	PA_C1_ LCI90	PA_C1_ LB90CI	PA_C2	PA_C2_ se	PA_C2_ LCI90	PA_C2_ LB90CI
		%							
2015	Forest*	34.96	3.76	28.77	41.14	99.62	0.08	99.49	99.75
	Sa**	46.03	6.09	36.01	56.05	99.00	0.69	97.87	100.00
2016	Forest*	38.16	3.67	32.13	44.19	99.51	0.11	99.33	99.68
	Sa**	38.66	5.24	30.05	47.28	99.02	0.67	97.91	100.00
2017	Forest*	62.61	6.40	52.08	73.14	99.55	0.17	99.27	99.83
	Sa**	84.14	9.59	68.37	99.91	99.34	0.46	98.58	100.00
2018	Forest*	41.51	3.01	36.56	46.46	99.60	0.17	99.33	99.88
	Sa**	42.21	5.02	33.95	50.47	99.57	0.43	98.87	100.00
2019	Forest*	33.36	4.28	26.32	40.39	99.91	0.05	99.84	99.99
	Sa**	46.41	9.03	31.55	61.27	100.00	0.00	100.00	100.00

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Burned class**; C2;** Unburned class**; Year:** Validation year; **N**: Sample size**; PA_C$_i$**: Estimated producer accuracy, where 'i' represents the class; **PA_ C$_i$_se:** Standard error of producer accuracy for class (i); **PA_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for producer accuracy of class (i); **PA_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for producer accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Commission and Omission Errors for Degradation (CE, OE): Table 10-25 and Table 10-26 show the commission and omission error results from the degradation maps. These metrics are used to assess the OA and to determine whether bias correction is required for the degradation maps.

Table 10-25. Degradation Commission Errors.

Year	Group	CE_C1	CE _C1_se	CE_C1_ LCI90	CE_C1_ LB90CI	CE_C2	CE_C2 _se	CE_C2_ LCI90	CE_C2_ LB90CI
		%							
2015	Forest*	8.47	1.76	5.57	11.37	7.18	1.18	5.24	9.12
	Sa**	7.41	5.14	0.00	15.86	12.87	3.07	7.81	17.92
2016	Forest*	6.37	1.40	4.07	8.66	10.58	1.64	7.89	13.27
	Sa**	6.90	4.79	0.00	14.77	17.45	3.75	11.29	23.62
2017	Forest*	6.37	2.39	2.44	10.30	3.82	1.04	2.11	5.53
	Sa**	6.45	4.49	0.00	13.83	1.79	1.28	0.00	3.90
2018	Forest*	3.21	1.38	0.94	5.49	14.42	1.78	11.50	17.34
	Sa**	3.03	3.03	0.00	8.01	15.89	3.23	10.57	21.21
2019	Forest*	2.86	1.49	0.41	5.32	5.64	1.08	3.86	7.42
	Sa**	0.00	0.00	0.00	0.00	5.22	1.90	2.10	8.34

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Burned class**; C2;** Unburned class**; Year:** Validation year; **N**: Sample size**; CE_C$_i$**: Estimated commission accuracy, where 'i' represents the class; **CE_ C$_i$_se:** Standard error of commission accuracy for class (i); **CE_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for commission accuracy of class (i); **CE_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for commission accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-26. Degradation Omission Errors.

Year	Group	OE_C1	OE_C1_se	OE_C1_LCI90	OE_C1_LB90CI	OE_C2	OE_C2_se	OE_C2_LCI90	OE_C2_LB90CI
		%							
2015	Forest*	65.04	3.76	58.86	71.23	0.38	0.08	0.25	0.51
	Sa**	53.97	6.09	43.95	63.99	1.00	0.69	0.00	2.13
2016	Forest*	61.84	3.67	55.81	67.87	0.49	0.11	0.32	0.67
	Sa**	61.34	5.24	52.72	69.95	0.98	0.67	0.00	2.09
2017	Forest*	37.39	6.40	26.86	47.92	0.45	0.17	0.17	0.73
	Sa**	15.86	9.59	0.09	31.63	0.66	0.46	0.00	1.42
2018	Forest*	58.49	3.01	53.54	63.44	0.40	0.17	0.12	0.67
	Sa**	57.79	5.02	49.53	66.05	0.43	0.43	0.00	1.13
2019	Forest*	66.64	4.28	59.61	73.68	0.09	0.05	0.01	0.16
	Sa**	53.59	9.03	38.73	68.45	0.00	0.00	0.00	0.00

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Burned class**; C2;** Unburned class**; Year:** Validation year; **N**: Sample size**; OE_C$_i$**: Estimated omission accuracy, where 'i' represents the class; **OE_ C$_i$_se:** Standard error of omission accuracy for class (i); **OE_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for omission accuracy of class (i); **OE_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for omission accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

10.7.1.2. Deforestation Maps Accuracy Assessment

a. Error Matrix Including all Classes Used in the Analysis

Estimated Proportions: Table 10-27 presents the error matrix used for the accuracy assessment of the deforestation map. This matrix was used to calculate the accuracy metrics of the deforestation maps.

Table 10-27. Deforestation Error Matrix.

Year	Group	N	p11	p11_se	p11_li90	p11_ls_90	p12	p12_se	p12_li90	p12_ls90	p13	p13_se	p13_li90	p13_ls90	p21	p21_se	p21_li90	p21_ls90	p22	p22_se	p22_li90	p22_ls90	p23	p23_se	p23_li90	p23_ls90	p31	p31_se	p31_li90	p31_ls90	p32	p32_se	p32_li90	p32_ls90	p33	p33_se	p33_li90	p33_ls90
			%																																				
2015	Forest*	4263	0.40	0.03	0.35	0.45	0.01	0.01	0.00	0.02	0.10	0.03	0.05	0.15	0.17	0.05	0.09	0.25	38.50	0.26	38.06	38.93	0.77	0.26	0.34	1.20	0.00	0.00	0.00	0.00	4.17	0.61	3.16	5.17	55.88	0.61	54.88	56.88
	Sa**	5122	0.90	0.04	0.83	0.97	0.06	0.02	0.03	0.09	0.37	0.04	0.30	0.44	0.23	0.06	0.13	0.33	62.86	0.20	62.52	63.19	1.12	0.19	0.80	1.44	0.01	0.01	0.00	0.03	2.08	0.29	1.61	2.55	32.37	0.29	31.90	32.84
2016	Forest*	4263	0.25	0.02	0.22	0.28	0.01	0.00	0.00	0.02	0.06	0.02	0.03	0.09	0.05	0.01	0.03	0.06	38.20	0.26	37.76	38.63	0.88	0.26	0.45	1.32	0.00	0.00	0.00	0.00	4.18	0.61	3.17	5.18	56.38	0.61	55.37	57.38
	Sa**	5122	0.53	0.02	0.49	0.57	0.04	0.01	0.02	0.06	0.12	0.02	0.09	0.16	0.17	0.03	0.13	0.22	62.12	0.20	61.78	62.45	1.23	0.20	0.90	1.56	0.06	0.06	0.00	0.16	2.08	0.28	1.62	2.54	33.65	0.29	33.18	34.12
2017	Forest*	4263	0.17	0.03	0.12	0.21	0.00	0.00	0.00	0.01	0.09	0.03	0.04	0.13	0.05	0.01	0.04	0.07	37.97	0.26	37.54	38.40	0.85	0.26	0.41	1.28	0.12	0.12	0.00	0.31	4.07	0.60	3.08	5.05	56.69	0.61	55.69	57.69
	Sa**	5122	0.56	0.02	0.52	0.60	0.03	0.01	0.01	0.04	0.17	0.02	0.14	0.21	0.15	0.05	0.06	0.23	61.38	0.21	61.04	61.72	1.23	0.20	0.90	1.56	0.03	0.02	0.00	0.07	2.08	0.28	1.62	2.54	34.37	0.28	33.90	34.83
2018	Forest*	4263	0.14	0.01	0.13	0.16	0.01	0.00	0.00	0.01	0.08	0.01	0.07	0.10	0.05	0.04	0.00	0.12	37.77	0.27	37.33	38.20	0.81	0.26	0.38	1.25	0.00	0.00	0.00	0.00	4.07	0.60	3.09	5.05	57.06	0.60	56.08	58.04
	Sa**	5122	0.54	0.02	0.51	0.57	0.03	0.01	0.01	0.05	0.08	0.02	0.05	0.10	0.03	0.01	0.01	0.04	60.78	0.21	60.44	61.12	1.30	0.21	0.96	1.64	0.01	0.01	0.00	0.03	2.10	0.28	1.64	2.56	35.13	0.28	34.67	35.59
2019	Forest*	4263	0.15	0.02	0.12	0.18	0.00	0.00	0.00	0.00	0.08	0.02	0.05	0.11	0.03	0.02	0.00	0.06	37.59	0.27	37.15	38.02	0.79	0.27	0.36	1.23	0.01	0.00	0.00	0.01	4.07	0.60	3.08	5.05	57.29	0.60	56.30	58.27
	Sa**	5122	0.51	0.02	0.48	0.55	0.02	0.01	0.00	0.03	0.12	0.02	0.09	0.15	0.03	0.02	0.00	0.07	60.22	0.21	59.88	60.56	1.21	0.21	0.87	1.55	0.00	0.00	0.00	0.01	2.12	0.28	1.66	2.58	35.76	0.28	35.30	36.23

p1: Deforestation area proportion class; **p2:** Natural area proportion class; **p3:** Stable Non-Forest area proportion class; **Year:** Validation year. ***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna; **N**: Sample size; $\mathbf{p_{ij}}$**:** Estimated proportion in cell (i, j) of the confusion matrix, where 'i' represents the reference (true) class and 'j' represents the mapped (classified) class; $\mathbf{p_{ij}}$**_se:** Standard error of the estimated proportion in cell (i, j); $\mathbf{p_{ij}}$**_LCI90:** Lower confidence interval 90% for the estimated proportion in cell (I, j); $\mathbf{p_{ij}}$**_LB90CI**: Lower bound 90% confidence intervalfor the estimated proportion in cell (i, j).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

b. Map Areas for all Classes

The pixel count area estimate and the stratified area estimate for each class of the deforestation activity data maps are presented in Table 10-28. Detailed formulas on the stratified area calculation are in Section 10.7.1.1. Following the accuracy assessment, it was determined that the pixel count area estimate did not fall within the confidence interval of the stratified area estimate. Consequently, the stratified area estimate (bias-corrected) was adopted as the activity data, in accordance with TREES (ART, 2021).

Table 10-28. Map Areas (Pixel Count) and Area Adjustment (Stratified Areas) for Deforestation Classes.

Year	Group	Deforested areas				Natural areas				Stable Non-Forest areas			
		Pixel count area	Stratified area	Stratified area LCI90	Stratified area LB90CI	Pixel count area	Stratified area	Stratified area LCI90	Stratified area LB90CI	Pixel count area	Stratified area	Stratified area LCI90	Stratified area LB90CI
		ha											
2015	Forest*	25,066	28,167	23,497	32,838	2,052,098	2,105,933	2,052,079	2,159,787	2,857,471	2,800,535	2,746,750	2,854,321
	Sa**	212,469	174,695	155,906	193,485	9,739,817	9,930,097	9,842,129	10,018,064	5,325,231	5,172,725	5,085,451	5,259,999
2016	Forest*	15,694	14,629	12,897	16,360	2,036,405	2,091,304	2,037,466	2,145,142	2,882,537	2,828,703	2,774,849	2,882,557
	Sa**	109,969	116,584	99,555	133,613	9,629,848	9,813,513	9,726,569	9,900,457	5,537,700	5,347,421	5,259,453	5,435,388
2017	Forest*	12,597	16,556	6,734	26,378	2,023,808	2,074,748	2,021,717	2,127,779	2,898,231	2,843,332	2,789,493	2,897,170
	Sa**	121,307	113,194	97,609	128,780	9,508,541	9,699,607	9,612,045	9,787,170	5,647,669	5,464,715	5,377,778	5,551,653
2018	Forest*	11,330	9,881	6,426	13,337	2,012,477	2,064,866	2,011,734	2,117,999	2,910,828	2,859,888	2,806,857	2,912,919
	Sa**	103,249	88,882	83,293	94,470	9,405,292	9,610,726	9,523,210	9,698,241	5,768,976	5,577,910	5,490,347	5,665,472
2019	Forest*	10,922	9,309	7,098	11,519	2,001,556	2,055,558	2,002,426	2,108,689	2,922,158	2,869,769	2,816,636	2,922,902
	Sa**	103,450	83,854	76,612	91,097	9,301,842	9,526,871	9,439,333	9,614,410	5,872,226	5,666,791	5,579,276	5,754,307

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa**: Wooded savanna. **LCI90:** Lower confidence interval 90%; **LB90CI**: Lower bound 90% confidence interval.

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

c. User- and Producer Accuracy of the Classes Used for Activity Data Reporting

Overall Accuracy (OA): Table 10-29 presents the results of the OA metric. The OA of the deforestation maps is used to assess the uncertainty in area estimation.

Table 10-29. Deforestation Overall Accuracy.

Year	Group	OA	OA_se	LCI90	LB90CI
		%			
2015	Forest*	94.77	0.66	93.68	95.87
	Sa**	96.12	0.35	95.54	96.70
2016	Forest*	94.82	0.66	93.73	95.91
	Sa**	96.29	0.35	95.72	96.87
2017	Forest*	94.83	0.66	93.74	95.92
	Sa**	96.31	0.35	95.73	96.88
2018	Forest*	94.97	0.65	93.89	96.05
	Sa**	96.46	0.35	95.88	97.03
2019	Forest*	95.02	0.65	93.94	96.10
	Sa**	96.49	0.35	95.92	97.07

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna; **OA:** Overall accuracy; **OA_se:** Standard error of overall accuracy; **LCI90:** Lower confidence interval 90%; **LB90CI:** Lower bound 90% confidence interval.

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

User and Producer Accuracy (UE, PA): Table 10-30 and Table 10-31 present the user's and producer's accuracy from the deforestation activity data maps. These metrics are used to assess the OA and to determine whether the deforestation maps require bias correction.

Table 10-30. Deforestation User Accuracy.

Year	Group	UA_C1	UA_C1_se	UA_C1_LCI90	UA_C1_LB90CI	UA_C2	UA_C2_se	UA_C2_LCI90	UA_C2_LB90CI	UA_C3	UA_C3_se	UA_C3_LCI90	UA_C3_LB90CI
		%											
2015	Forest*	77.8	5.9	68.1	87.5	97.6	0.7	96.5	98.7	93.1	1.0	91.4	94.7
	Sa**	67.6	3.2	62.3	72.9	97.9	0.3	97.4	98.4	93.9	0.8	92.6	95.3
2016	Forest*	77.2	5.9	67.6	86.8	97.6	0.7	96.5	98.7	93.1	1.0	91.4	94.8
	Sa**	76.6	3.2	71.3	81.8	97.8	0.3	97.3	98.3	94.0	0.8	92.7	95.3
2017	Forest*	64.5	11.2	46.1	82.9	97.7	0.7	96.6	98.8	93.1	1.0	91.5	94.8
	Sa**	73.7	3.1	68.5	78.8	97.8	0.3	97.3	98.3	94.2	0.8	92.9	95.5
2018	Forest*	62.3	4.1	55.5	69.0	97.7	0.7	96.6	98.9	93.3	1.0	91.7	94.9
	Sa**	83.6	2.8	79.1	88.2	97.9	0.3	97.3	98.4	94.3	0.8	93.1	95.6
2019	Forest*	65.1	8.5	51.1	79.0	97.8	0.7	96.7	99.0	93.4	1.0	91.8	95.0
	Sa**	79.2	3.2	74.0	84.4	98.0	0.3	97.4	98.5	94.4	0.7	93.2	95.6

Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Deforestation class**; C2;** Natural class**; C3;** Stable Non-Forest areas class**; Year:** Validation year; **N**: Sample size**; UA_C*i: Estimated user accuracy, where 'i' represents the class; **UA_ C*i*_se:** Standard error of user accuracy for class (i); **UA_ C*i*_LCI90:** Lower bound of the 90% confidence interval for user accuracy of class (i); **UA_ C*i*_LB90CI**: Upper bound of the 90% confidence interval for user accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-31. Deforestation Producer Accuracy.

Year	Group	PA_C1	PA_C1_se	PA_C1_LCI90	PA_C1_LB90CI	PA_C2	PA_C2_se	PA_C2_LCI90	PA_C2_LB90CI	PA_C3	PA_C3_se	PA_C3_LCI90	PA_C3_LB90CI
		%											
2015	Forest*	69.5	6.2	59.3	79.7	90.2	1.3	88.1	92.3	98.5	0.5	97.7	99.2
	Sa**	78.7	4.3	71.6	85.7	96.7	0.4	96.0	97.4	95.6	0.6	94.7	96.5
2016	Forest*	83.4	3.0	78.4	88.4	90.1	1.3	88.0	92.3	98.3	0.5	97.6	99.1
	Sa**	69.4	5.9	59.7	79.1	96.7	0.4	96.0	97.4	96.1	0.6	95.2	97.0
2017	Forest*	49.7	17.9	20.2	79.2	90.3	1.3	88.2	92.4	98.4	0.5	97.6	99.1
	Sa**	75.7	5.9	66.0	85.4	96.7	0.4	96.0	97.4	96.1	0.5	95.2	97.0
2018	Forest*	72.1	15.0	47.4	96.8	90.3	1.3	88.1	92.4	98.5	0.4	97.7	99.2
	Sa**	93.0	2.1	89.5	96.5	96.6	0.4	95.9	97.3	96.2	0.5	95.3	97.1
2019	Forest*	77.9	8.3	64.2	91.5	90.2	1.3	88.1	92.4	98.5	0.5	97.8	99.2
	Sa**	93.4	3.5	87.7	99.1	96.6	0.4	95.9	97.3	96.4	0.5	95.5	97.3

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Deforestation class**; C2;** Natural class**; C3;** Stable Non-Forest areas class**; Year:** Validation year; **N**: Sample size**; PA_C$_i$**: Estimated producer accuracy, where 'i' represents the class; **PA_ C$_i$_se:** Standard error of producer accuracy for class (i); **PA_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for producer accuracy of class (i); **PA_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for producer accuracy of class (i).

Commission and Omission Errors (CE, OE): Table 10-32 and Table 10-33 show the commission and omission results of the deforestation activity data maps. We use these metrics to access OA and to verify if the deforestation maps need bias correction.

Table 10-32. Commission Errors.

Year	Group	CE_C1	CE_C1_se	CE_C1_LCI90	CE_C1_LB90CI	CE_C2	CE_C2_se	CE_C2_LCI90	CE_C2_LB90CI	CE_C3	CE_C3_se	CE_C3_LCI90	CE_C3_LB90CI
		%											
2015	Forest*	22.2	5.9	12.5	31.9	2.4	0.7	1.3	3.5	2.4	0.7	1.3	3.5
	Sa**	32.4	3.2	27.1	37.7	2.1	0.3	1.6	2.6	2.1	0.3	1.6	2.6
2016	Forest*	22.8	5.9	13.2	32.4	2.4	0.7	1.3	3.5	2.4	0.7	1.3	3.5
	Sa**	23.4	3.2	18.2	28.7	2.2	0.3	1.7	2.7	2.2	0.3	1.7	2.7
2017	Forest*	35.5	11.2	17.1	53.9	2.3	0.7	1.2	3.4	2.3	0.7	1.2	3.4
	Sa**	26.3	3.1	21.2	31.5	2.2	0.3	1.7	2.7	2.2	0.3	1.7	2.7
2018	Forest*	37.7	4.1	31.0	44.5	2.3	0.7	1.1	3.4	2.3	0.7	1.1	3.4
	Sa**	16.4	2.8	11.8	20.9	2.1	0.3	1.6	2.7	2.1	0.3	1.6	2.7
2019	Forest*	34.9	8.5	21.0	48.9	2.2	0.7	1.0	3.3	2.2	0.7	1.0	3.3
	Sa**	20.8	3.2	15.6	26.0	2.0	0.3	1.5	2.6	2.0	0.3	1.5	2.6

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Deforestation class**; C2;** Natural class**; C3;** Stable Non-Forest areas class**; Year:** Validation year; **N**: Sample size**; CE_C$_i$**: Estimated commission accuracy, where 'i' represents the class; **CE_ C$_i$_se:** Standard error of commission accuracy for class (i); **CE_ C$_i$_LCI90:** Lower bound of the 90% confidence interval for commission accuracy of class (i); **CE_ C$_i$_LB90CI**: Upper bound of the 90% confidence interval for commission accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-33. Omission Errors.

Year	Group	OE_C1	OE_C1_se	OE_C1_LCI90	OE_C1_LB90CI	OE_C2	OE_C2_se	OE_C2_LCI90	OE_C2_LB90CI	OE_C3	OE_C3_se	OE_C3_LCI90	OE_C3_LB90CI
		%											
2015	Forest*	30.5	6.2	20.3	40.7	9.8	1.3	7.7	11.9	1.5	0.5	0.8	2.3
	Sa**	21.3	4.3	14.3	28.4	3.3	0.4	2.6	4.0	4.4	0.6	3.5	5.3
2016	Forest*	16.6	3.0	11.6	21.6	9.9	1.3	7.7	12.0	1.7	0.5	0.9	2.4
	Sa**	30.6	5.9	20.9	40.3	3.3	0.4	2.6	4.0	3.9	0.6	3.0	4.8
2017	Forest*	50.3	17.9	20.8	79.8	9.7	1.3	7.6	11.8	1.6	0.5	0.9	2.4
	Sa**	24.3	5.9	14.6	34.0	3.3	0.4	2.6	4.0	3.9	0.5	3.0	4.8
2018	Forest*	27.9	15.0	3.2	52.6	9.7	1.3	7.6	11.9	1.5	0.4	0.8	2.3
	Sa**	7.0	2.1	3.5	10.5	3.4	0.4	2.7	4.1	3.8	0.5	2.9	4.7
2019	Forest*	22.1	8.3	8.5	35.8	9.8	1.3	7.6	11.9	1.5	0.5	0.8	2.2
	Sa**	6.6	3.5	0.9	12.3	3.4	0.4	2.7	4.1	3.6	0.5	2.7	4.5

***Forest:** Aa, As, Da, Ds, Cm, Cs, Fa, Fm, Fs, SNm, SNs, S, Sd, SO, Sos (detailed name of forest phytophysiognomies is available in Table 10-1); ****Sa:** Wooded savanna**; C1:** Deforestation class**; C2;** Natural class**; C3;** Stable Non-Forest areas class**; Year:** Validation year; **N**: Sample size**; OE_C**$_i$: Estimated omission accuracy, where 'i' represents the class; **OE_ C**$_i$**_se:** Standard error of omission accuracy for class (i); **OE_ C**$_i$**_LCI90:** Lower bound of the 90% confidence interval for omission accuracy of class (i); **OE_ C**$_i$**_LB90CI**: Upper bound of the 90% confidence interval for omission accuracy of class (i).

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

10.7.2. Uncertainty Calculation

TREES approach for calculating uncertainties follows Approaches 1 and 2 of the IPCC Guidelines (IPCC, 2006), using equations for error propagation and Monte Carlo simulations to estimate unknown uncertainties. TREES requires that “uncertainty shall be quantified in terms of the half-width of the 90% confidence interval as a percentage of the estimated emissions”.

Approach 1 employs two equations to combine uncertainty through error propagation and to quantify the total uncertainty of a single parameter. The following equations are applied:

If the combination of uncertainties is a multiplication or division, the following equation is used:

$$U_{total} = \sqrt{U_1^2 + U_2^2 + \cdots + U_n^2}$$

Where:

- U_{total} = represents the uncertainty percentage of the added quantities, considering the half-width of the 90% confidence interval.
- U_i = Indicates the percentage of uncertainty associated with each individual quantity.

If the combination of uncertainties is an addition and subtraction, the following equation is applied:

$$U_{total} = \sqrt{\frac{(U_1 * x_1)^2 + (U_2 * x_2)^2 + \cdots + (U_n * x_n)^2}{|x_1 + x_2 + \cdots + x_n|}}$$

Where:

- U_{total} = represents the uncertainty percentage of the summed quantities, considering the half-width of the 90% confidence interval.
- U_i = Indicates the percentage of uncertainty associated with each individual quantity.
- x_i = Represents the amount of uncertainty linked to each quantity used in emissions calculations.

On the other hand, Monte Carlo simulations (Approach 2) are recommended for cases involving high uncertainty, non-normal data distributions, complex algorithms, and/or interdependent activities (IPCC, 2006).

A 90%CI_t factor is obtained after the total uncertainty is computed at the conclusion of the error propagation calculation procedure.

10.7.2.1. Uncertainty SOPs and Results

The uncertainty deduction of the ERs was assessed in accordance with SOPs, and a detailed Uncertainty Assessment Report is provided in Annex 7. This document presents the results for the reference period (2015 to 2019) and the uncertainty associated with the Crediting Level (CL).

- ***SOPs***

First, the specialized literature was reviewed to determine the uncertainty amount for each parameter and variable used to estimate the GHG Emission Reductions (GHG ER), and a

corresponding Probability Density Function (PDF) distribution was assigned. This process was assisted by specialist statisticians from LAPIG. Table 10-34, Table 10-35, Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-36 and Table 10-37 presents all the input parameters and variables used to estimate the GHG ER, along with their respective uncertainty values, literature references for the uncertainty values, and assigned distributions.

Table 10-34. Input Parameters and Variables Uncertainty used to Estimate the GHG Emission Reductions.

Parameter / Factor Name	Acronym	Mean	Standard Deviation	Unit	Source	Distribution
Carbon Factor	CF	0.47	0.05	tC/td.m.	IPCC (2006)	Uniform
Ratio of molecular weights	44/12	3.67		-	IPCC (2006)	Fixed
Emission factor of CH4	Gef CH4	6.8	2.00	g/kg d.m	FREL-Brasil (2024)	Normal
Emission factor of N2O	Gef N2O	0.2		g/kg d.m	FREL-Brasil (2024)	Fixed
Global Warming Power of CH4	GWP CH4	28		-	IPCC (2014)	Fixed
Global Warming Power of N2O	GWP N2O	265		-	IPCC (2014)	Fixed
Herb and grasses component of AGB in the Sa phytophysiongnomy	AGB26	0.26	0.02	-	Ribeiro et al. (2011)	Beta
Combustion factor for LI and AGB herb and grasses in the Sa phytophysiognomy	Cf LI-ABG26 Sa	0.87	0.08	-	Gomes et al. (2024)	Beta
Combustion factor for DW in the Sa phytophysiognomy	Cf DW Sa	0.46	0.07	-	Gomes et al. (2024)	Beta
Combustion factor for Amazon biome	Cfb Cerr	0.38	0.13	-	FREL-Brasil (2024)	Beta
Combustion factor for Cerrado biome	Cfb AMZ	0.37	0.13	-	FREL-Brasil (2024)	Beta
Conversion factor from pixel to area	CF area	0.09		ha	Almeida et al. (2022)	Fixed

Parameter / Factor Name	Acronym	Mean	Standard Deviation	Unit	Source	Distribution
Grow rate of FRI class moderate	GRI 1	2.1	0.56	%	Gomes et al. (2024)	Beta
Grow rate of FRI class intermediate	GRI 2	-0.4	0.03	%	Gomes et al. (2024)	Beta
Grow rate of FRI class extreme	GRI 3	-2	0.59	%	Gomes et al. (2024)	Beta
Cerrado Secundary Vegetation Post-deforestation Land-Use	Cerr Apdef	30,970	1,707	ha	FREL-Brasil (2024)	Normal
Cerrado Pasture Post-deforestation Land-Use	Cerr Apdef	506,185	5,682	ha	FREL-Brasil (2024)	Normal
Cerrado Perennial Agricultural Post-deforestation Land-Use	Cerr Apdef	1,228	192	ha	FREL-Brasil (2024)	Normal
Amazon Secundary Vegetation Post-deforestation Land-Use	Amz Apdef	696	10	ha	FREL-Brasil (2024)	Normal
Amazon Shrubby/Tree Pasture Post-deforestation Land-Use	Amz Apdef	1,534	86	ha	FREL-Brasil (2024)	Normal
Amazon Herbaceous Pasture Post-deforestation Land-Use	Amz Apdef	2,695	47	ha	FREL-Brasil (2024)	Normal
Cerrado Secondary Vegetation Post-deforestation Stock	Cerr Ep	2.85	0.73	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Pasture Post-deforestation Stock	Cerr Ep	7.57	2.90	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Perennial Agricultural Post-deforestation Stock	Cerr Ep	2.65	1.01	tC/ha	FREL-Brasil (2024)	Normal
Amazon Secondary Vegetation Post-deforestation Stock	Amz Ep	3.03	0.77	tC/ha	FREL-Brasil (2024)	Normal

Parameter / Factor Name	Acronym	Mean	Standard Deviation	Unit	Source	Distribution
Amazon Shrubby/Tree Pasture Post-deforestation Stock	Amz Ep	10	3.83	tC/ha	FREL-Brasil (2024)	Normal
Amazon Herbaceous Pasture Post-deforestation Stock	Amz Ep	10	3.83	tC/ha	FREL-Brasil (2024)	Normal

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-35. Input Ratios (R) Factors to Obtain Belowground Biomass (BGB), Dead Wood (DW) and Litter (LI) and Uncertainty Used to Estimate the Greenhouse Gasses (GHG) Emission Reductions.

Factor Name	Acronym	R BGB mean	R BGB sd	R DW mean	R DW sd	R LI mean	R LI sd	Source	Distribution
Amazon Aa	Amz Aa	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Amazon As	Amz As	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Amazon Da	Amz Da	0.310	0.060	0.094	0.072	0.041	0.005	FREL-Brasil (2024)	Normal
Amazon Ds	Amz Ds	0.300	0.058	0.094	0.072	0.041	0.005	FREL-Brasil (2024)	Normal
Amazon Fa	Amz Fa	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Amazon Sa	Amz Sa	2.040	0.396	0.004	0.003	0.055	0.006	FREL-Brasil (2024)	Normal
Amazon Sd	Amz Sd	0.220	0.043	0.110	0.084	0.170	0.019	FREL-Brasil (2024)	Normal
Amazon SO	Amz SO	0.310	0.060	0.094	0.072	0.041	0.005	FREL-Brasil (2024)	Normal
Cerrado Aa	Cerr Aa	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Cerrado As	Cerr As	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Cerrado Cm	Cerr Cm	0.240	0.047	0.110	0.084	0.162	0.018	FREL-Brasil (2024)	Normal
Cerrado Cs	Cerr Cs	0.370	0.072	0.150	0.115	0.147	0.017	FREL-Brasil (2024)	Normal
Cerrado Fa	Cerr Fa	0.100	0.019	0.081	0.062	0.059	0.007	FREL-Brasil (2024)	Normal
Cerrado Fm	Cerr Fm	0.235	0.046	0.059	0.045	0.050	0.006	FREL-Brasil (2024)	Normal
Cerrado Fs	Cerr Fs	0.235	0.046	0.048	0.037	0.058	0.007	FREL-Brasil (2024)	Normal
Cerrado S	Cerr S	0.635	0.123	0.117	0.089	0.183	0.021	FREL-Brasil (2024)	Normal
Cerrado Sa	Cerr Sa	2.040	0.396	0.140	0.107	0.260	0.029	FREL-Brasil (2024)	Normal
Cerrado Sd	Cerr Sd	0.220	0.043	0.110	0.084	0.165	0.019	FREL-Brasil (2024)	Normal
Cerrado SNm	Cerr SNm	0.355	0.069	0.098	0.075	0.123	0.014	FREL-Brasil (2024)	Normal
Cerrado SNs	Cerr SNs	0.355	0.069	0.098	0.075	0.123	0.014	FREL-Brasil (2024)	Normal
Cerrado SNts	Cerr SNts	0.592	0.115	0.108	0.083	0.108	0.012	FREL-Brasil (2024)	Normal
Cerrado SOs	Cerr SOs	0.451	0.088	0.106	0.081	0.143	0.016	FREL-Brasil (2024)	Normal

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-36. Input Aboveground Biomass (AGB) Factors and Uncertainty Used to Estimate the – Greenhouse Gasses (GHG) Emission Reductions.

Factor name	Acronym	Mean	Standard deviation	Unit	Source	Distribution
Amazon Aa AGB	Amz Aa AGB	116.88	4.43	tC/ha	EBA (2014)	Normal
Amazon As AGB	Amz As AGB	68.43	3.24	tC/ha	EBA (2014)	Normal
Amazon Da AGB	Amz Da AGB	54.86	1.86	tC/ha	EBA (2014)	Normal
Amazon Ds AGB	Amz Ds AGB	78.72	3.27	tC/ha	EBA (2014)	Normal
Amazon Fa AGB	Amz Fa AGB	62.97	1.79	tC/ha	EBA (2014)	Normal
Amazon Sa AGB	Amz Sa AGB	42.32	2.17	tC/ha	EBA (2014)	Normal
Amazon Sd AGB	Amz Sd AGB	86.53	2.82	tC/ha	EBA (2014)	Normal
Amazon SO AGB	Amz SO AGB	80.81	4.64	tC/ha	EBA (2014)	Normal
Cerrado Aa AGB	Cerr Aa AGB	117.2	25.71	tC/ha	FREL-Brasil (2024)	Normal
Cerrado As AGB	Cerr As AGB	68.37	15	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Cm AGB	Cerr Cm AGB	84.38	16.36	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Cs AGB	Cerr Cs AGB	41.4	8.03	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Fa AGB	Cerr Fa AGB	53	3.79	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Fm AGB	Cerr Fm AGB	50.48	3.61	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Fs AGB	Cerr Fs AGB	62.23	4.45	tC/ha	FREL-Brasil (2024)	Normal
Cerrado S AGB	Cerr S AGB	24.56	4.14	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Sa AGB	Cerr Sa AGB	12.85	2.16	tC/ha	FREL-Brasil (2024)	Normal
Cerrado Sd AGB	Cerr Sd AGB	33.54	6.5	tC/ha	FREL-Brasil (2024)	Normal
Cerrado SNm AGB	Cerr SNm AGB	34.05	5.73	tC/ha	FREL-Brasil (2024)	Normal
Cerrado SNs AGB	Cerr SNs AGB	26.82	4.52	tC/ha	FREL-Brasil (2024)	Normal
Cerrado SNts AGB	Cerr SNts AGB	34.1	5.74	tC/ha	FREL-Brasil (2024)	Normal
Cerrado SOs AGB	Cerr SOs AGB	28.89	4.86	tC/ha	FREL-Brasil (2024)	Normal

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Table 10-37. Input Areas and Uncertainty used to Estimate the Greenhouse Gasses (GHG) Emission Reductions.

Name	Acronym	Year	Area	Standard deviation	Unit	Source	Distribution
Deforestation in Forest group (F)	Def F	2015	28,167	2,840	ha	PRODES	Normal
		2016	14,629	1,053			
		2017	16,556	5,971			
		2018	9,881	2,101			
		2019	9,309	1,344			
Deforestation in Wooded Savanna (Sa)	Def Sa	2015	174,695	11,423	ha	PRODES	Normal
		2016	116,584	10,353			
		2017	113,194	9,475			
		2018	88,882	3,398			
		2019	83,854	4,403			
Degradation in Forest group (F)	Deg F	2015	220,135	23,551	ha	MapBiomas Fogo	Normal
		2016	328,085	31,430			
		2017	194,574	20,052			
		2018	451,201	32,610			
		2019	165,545	21,180			
Degradation in Wooded Savanna (Sa)	Deg Sa	2015	2,121,345	278,726	ha	MapBiomas Fogo	Normal
		2016	2,478,663	330,188			
		2017	987,625	119,119			
		2018	2,334,816	276,279			
		2019	876,870	170,700			

Prepared by LAPIG (Annex 5) and Geonoma (Annex 6).

Second, the uncertainty of the post-deforestation stock variable (WPdef), as defined in Section 10.3.4, was evaluated. The IPCC (2006) guideline Vol. 1 Chapter 3 Approach 1 was applied to calculate error propagation using the uncertainty values for the variables that quantify WPdef. Below, the calculation steps are presented, employing the values from Table 10-34.

- Step 1: Each area was multiplied by its corresponding carbon stock value for post-deforestation land use in the Amazon and Cerrado biomes. The combined uncertainty was evaluated using the error propagation equation for multiplication. The calculation for this step is presented in Table 10-38.

Table 10-38. Step 1: Uncertainty Calculation of Post-Deforestation Carbon Stock using the Error Propagation Equation for Multiplication and Division.

Biome	Land Use Class Post-Deforestation (*J*)	Apdf (ha)	Ep (tC/ha)	Land Use Stock (Apdef * Ep) (tC)	Uncertainty $(\sqrt{U_1^2 + U_2^2})$
Amazon	Secondary Natural Forest Vegetation	696	3.03	2,109	50.08%
Amazon	Shrubby/Tree Pasture	1,534	10.00	15,340	75.80%
Amazon	Herbaceous Pasture	2,695	10.00	26,950	75.08%
Cerrado	Secondary Natural Forest Vegetation	30,970	2.85	88,264	51.15%
Cerrado	Perennial agricultural crop	1,228	2.60	3,193	81.00%
Cerrado	Pasture	506,185	7.57	3,831,820	75.03%

Prepared by Geonoma.

- Step 2: The areas for each land use category (column "Apdf" in Table 10-38) were summed, along with the total carbon stock associated with each land use (column "Land use (Apdf * Ep)" in Table 10-38). The combined uncertainty was then evaluated using the error propagation equation for addition. The results of this calculation are presented in Table 10-39.

Table 10-39. Step 2: Uncertainty Calculation of Post-Deforestation Carbon Stock Using the Error Propagation Equation for Addition and Subtraction.

Biome	Land use class post-deforestation (*j*)	Apdf (ha)	Land use stock (tC)
Amazon	Secondary Natural Forest Vegetation	696	2,109
	Shrubby/Tree Pasture	1,534	15,340
	Herbaceous Pasture	2,695	26,950
Cerrado	Secondary Natural Forest Vegetation	30,970	88,264
	Perennial agricultural crop	1,228	3,193
	Pasture	506,185	3,831,820
Sum Σ		543,308	3,967,677
Uncertainty $\left(\frac{\sqrt{(U_1*x_1)^2+(U_2*x_2)^2+\cdots+(U_n*x_n)^2}}{(x_1+x_2+\cdots+x_n)}\right)$		2.14%	72.47%

Prepared by Geonoma.

- Step 3: Final Calculation Step. This step involves dividing the sum of areas by the total land use carbon stock, as presented in Table 10-39. The final uncertainty calculation for *WPdef* is shown in Table 10-40.

Table 10-40. Step 3 (Final Step) of Uncertainty Calculation of Post-Deforestation Carbon Stock Using the Error Propagation Equation for Multiplication and Division.

	Σ Apdf (ha)	Σ Land Use Stock (tC)	Wpdef (Σ Land Use Stock / Σ Apdf) (tC/ha)	Wpdef (tCO_2eq/ha)
Total	543,308	3,967,677	7.30	26.78
Uncertainty $\left(\sqrt{U_1^2+U_2^2}\right)$	2.14%	72.47%	**72.51%**	

Prepared by Geonoma.

Third, considering IPCC (2006) guidance, an algorithm that reproduces every step of the GHG ER estimation for each pixel and calculates error propagation using a Monte Carlo simulation with 10,000 runs was developed in collaboration with statisticians from LAPIG. This procedure was also used as a quality assurance and quality control measure, as it required a detailed review of every step of the ERs estimation. This process enabled all results generated by the

script in Sections 10.3, 10.4, and 10.5, including the interpolation procedure outline in Section 10.8, to be thoroughly verified. Annex 7 provides the uncertainty calculation algorithm script along with the complete set of results.

Finally, Table 10-41 presents the half-width of the 90% confidence interval (90% CI), the TREES uncertainty adjustment factor (UA) for each calendar year of the reference period (2015 to 2019), as well as for the Crediting Level (CL).

Table 10-41. Half-Width of the 90% Confidence Interval (90% CI) for Each Calendar Year of the Reference Period (2015-2019) and the Crediting Level (CL).

Parameter	2015	2016	2017	2018	2019	CL
90% CI	16.8	17.5	18.4	18.8	17.0	16.4

Prepared by Geonoma.

10.8. Interpolation

Emissions from deforestation and degradation were calculated based on the PRODES year (August of one year to July of the next), due to the lack of monthly PRODES data. To meet the calendar year reporting requirement set by TREES, total emission reduction estimates calculated for the PRODES year were subsequently interpolated to align with the calendar year, as described in Table 10-42. This ensured that both the final claimed emission reduction results and the corresponding Monte Carlo uncertainty analysis were expressed in a compatible and standardized calendar-year format.

Table 10-42. Interpolation from PRODES Year to Calendar Year.

Measurement Period of PRODES	PRODES Year	Interpolation Period Based on PRODES Year	Interpolation to Calendar Year
08/01/2014 –12/31/2014	2015	5 months of 2014 (August- Dezember)	-
01/01/2015 – 07/01/2015		7 months of 2015 (January-July)	2015
08/01/2015 –12/31/2015	2016	5 months of 2015 (August- Dezember)	
01/01/2016 – 07/01/2016		7 months of 2016 (January-July)	2016
08/01/2016 –12/31/2016	2017	5 months of 2016 (August- Dezember)	
01/01/2017 – 07/01/2017		7 months of 2017 (January-July)	2017
08/01/2017 –12/31/2017	2018	5 months of 2017 (August- Dezember)	
01/01/2018 – 07/01/2018		7 months of 2018 (January-July)	2018
08/01/2018 –12/31/2018	2019	5 months of 2018 (August- Dezember)	
01/01/2019 – 07/01/2019		7 months of 2019 (January-July)	2019
08/01/2019 – 07/31/2019	2020	5 months of 2019 (August- Dezember)	
01/01/2020 – 07/01/2020		7 months of 2020 (January-July)	2020
08/01/2020 –12/31/2020	2021	5 months of 2020 (August- Dezember)	
01/01/2021 – 07/01/2021		7 months of 2021 (January-July)	2021
08/01/2021 –12/31/2021	2022	5 months of 2021 (August- Dezember)	
01/01/2022 – 07/01/2022		7 months of 2022 (January-July)	2022
08/01/2022 –12/31/2022	2023	5 months of 2022 (August- Dezember)	
01/01/2023 – 07/01/2023		7 months of 2023 (January-July)	2023
08/01/2023 –12/31/2023	2024	5 months of 2023 (August- Dezember)	

Prepared by Geonoma.

11. MONITORING PLAN

Provide the program's monitoring plan in accordance with the requirements of TREES Section 6, including, but not limited to:

- *Standard Operating Procedures (SOPs) for data collection (e.g., field-based, remote- sensing, QA/QC, training of staff, and other),*

The SOPs for data collection and monitoring include regularly updating activity data on deforestation, sourced from the Satellite-Based Deforestation Monitoring Project the Legal

Amazon (PRODES; INPE, 2024b), and degradation, obtained from MapBiomas Fire (MapBiomas, 2024).

The activity data for the entire country of Brazil is produced by the National Institute for Space Research (INPE) and MapBiomas. The operational procedure involves refining these data to the state of Tocantins and quantifying annually deforested and degraded areas.

To meet QA/QC criteria, the procedure ensures alignment of MapBiomas Fire degradation data with the deforestation period tracked by PRODES. While PRODES data covers August to July, degradation data from the MapBiomas Fire is organized on a January-to-December basis. However, monthly degradation data enables alignment with the PRODES deforestation period. This adjustment is performed with technical support from the MapBiomas team and the Amazon Environmental Research Institute (IPAM), which oversees the data production.

In the context of QA/QC, although validated at a national level by the data-producing institutions, the activity data will undergo validation specific to the state of Tocantins.

All operational procedures will be conducted by the technical team of Tocantins through Working Groups, which will also train staff from other state government departments or agencies.

- *Procedure for updating the stratification map*

The stratification map will be updated as more precise vegetation and land-use mappings for Tocantins become available, along with additional information from studies and new samplings of native vegetation remnants.

The updates will focus on quantifying biomass in degraded vegetation remnants compared to preserved or pristine areas, aiding in understanding emission and combustion factors resulting from degradation in the Amazon and Cerrado biomes.

Since emission factors are aligned with the FREL national database, updates will reflect national revisions, ensuring Tocantins remains aligned with Brazil's stratification and emission factor standards.

- *Data storage and sharing plan*

Data Storage and Sharing Plan: SEMARH manages all project-essential data and information through an information system, which includes a GIS database to store all maps, collected data, and methodological details. A web-based portal also provides stakeholders, users, and reviewers with access to detailed program information. This portal publicly shares

primary data, methodologies, and steps to enable accurate calculation and reproduction of calculations leading to carbon credits issuance and emissions reported. The following information will be accessible online:

- Forest phytophysiognomies in Tocantins
- Emission factors for each forest phytophysiognomy in Tocantins
- Detailed methods and procedures for preparing activity data and emission factors.
- Detailed methods and procedures for validating activity data
- Detailed methods and procedures for estimating degradation emissions
- Detailed methods and procedures for estimating deforestation emissions
- Detailed methodologies and operational procedures for calculating uncertainties associated with emissions during the crediting period.
- Procedures for calculating Buffer and Leakage.
- Emission estimates for the reference period.
- Emission estimates for the crediting period.
- Summary of issued Carbon Credits.
- Biomass data, covering all carbon pools, provided in raster format (emission factors).
- Stratum data in raster format.
- Deforestation data in raster format (activity data).
- Degradation data in raster format (activity data).
- Classification data for fire degradation types.

12. REVERSALS

Identify the anticipated buffer pool contribution by applying the buffer contribution assessment tool. Provide evidence for mitigation factors claimed

Tocantins claims mitigation factors 1 and 3, resulting in a 15% deduction from the total volume of credits.

Mitigation factor 1: *Legislation or executive decrees actively implemented and demonstrably supporting REDD+, issued by a relevant government agency, or with leadership from the Presidential or Prime Ministerial Office.*

REDD+ actions under **TOCANTINS' JURISDICTIONAL REDD+ PROGRAM** are supported by a robust regulatory framework at both national and state levels, including the following:

- **Federal Constitution (CFRB/1988):** Establishes the state's concurrent legislative authority on environmental matters.
- **National Environmental Policy (PNMA, Federal Law No. 6.938/1981):** Provides guidelines and principles for environmental protection, preservation, and conservation.
- **Forest Code (Federal Law No. 12.651/2012):** created the **Permanent Preservation Areas (APPs) and Legal Reserves (RL),** which are critical for maintaining forest cover and reducing emissions from deforestation and degradation. Established other key instruments that support REDD+ efforts, including: (i) **Rural Environmental Registry (CAR):** A system to monitor and ensure compliance with environmental legislation; (ii) **Environmental Regularization Program (PRA):** Supports recovery efforts for degraded lands; and (iii) the **Environmental Reserve Quota (*Cota de Reserva Ambiental*, or CRA):** Provides economic incentives for conservation. Also, together with Federal Decree No. 4.297/2002, it establishes criteria and guidelines for **Ecological-Economic Zoning (ZEE)**.
- **National Policy on Climate Change (PNMC, Federal Law No. 12.187/2009):** Formalizes Brazil's voluntary commitment to reducing greenhouse gas emissions, emphasizing deforestation mitigation.
- **Public Forest Management Law (Federal Law No. 11.284/2006):** Regulates the sustainable management of public forests, aligning with REDD+ objectives.
- **National System of Protected Areas (SNUC, Federal Law No. 9.985/2000):** Defines and regulates **Integral Protection Protected Areas** and **Sustainable Use Protected Areas** at federal, state, and municipal levels.
- **National REDD+ Strategy (ENREDD+):** Formalized in 2015, this strategy established the **National Committee for REDD+ (CONAREDD+)** through Federal Decree No. 8.576/2015, and currently active through **Federal Decree No. 11.548/2023**. **CONAREDD+** is tasked with coordinating, overseeing, and monitoring REDD+ implementation.
- **Federal Decree No. 10.606/2021:** Establishes the **Integrated Information System** for the Sectoral Plan for a Low-Carbon Emission Economy in Agriculture. Creates the **Technical Committee for Monitoring the Sectoral Plan**, facilitating alignment with REDD+ initiatives.
- **PEMC/TO (State Law No. 1.917/2008):** Includes the regulation of REDD+ initiatives in Tocantins as one of its objectives. The PEMC/TO is aimed at protecting, conserving, and restoring natural resources while promoting sustainable development. It also created the **State Environmental System (SISEMA)** and tasked **NATURATINS** with

implementing it. REDD+ actions related to monitoring, territorial planning, and forest management to safeguard forest areas are supported by the PEMC/TO.

- **PEPSA Law (State Law No. 4.111/2023):** Recognizes sequestration, conservation, maintenance, and stock enhancement, as well as reductions in carbon flows, as regulated environmental services under the law (Art. 8).
- **Forest Policy of the State of Tocantins (**State Law No. 771/1995**)**: Provides guidelines for conserving, utilizing, and restoring forests within the state. This law is further regulated by **State Decree No. 838/1999**, which details the rules for its implementation, and **COEMA/TO Resolution No. 74/2017**, which governs forestry activities in converted areas, mandating forest replacement efforts, and establishing procedures for granting forest credits and implementing sustainable forest management.
- **State System of Nature Protected Areas (State Law No. 1.560/2005, State Law No. 2.476/2011)**: Creates the SEUC, setting forth guidelines and regulations for protecting, conserving, and restoring the environment, including criteria for the creation and oversight of protected areas.
- **Environmental Regularization Program for Rural Properties and Activities (TO-LEGAL, State Law No. 2.476/2011):** Established **TO-LEGAL Program** to facilitate the environmental compliance of rural properties and activities within the state
- **State Forum on Climate Change (*Fórum Estadual de Mudanças Climáticas*, or FEMC/TO,** State Decree No. 3.007/2007): Created to raise awareness and facilitate discussions on public policies for mitigating climate change and conserving biodiversity. This forum, led by **SEMARH**, has been active in deliberating on initiatives related to the **Jurisdictional REDD+ Program**, including studies, commitments, and emissions reduction measures.
- **PPCD (2009-2014)**, **PPDDQ (2015-2020) and PPCDIF (2021-2025)**: The PPDCQ was established by **State Decree No. 3.840/2009**, in compliance with the **National Plan for the Prevention and Control of Deforestation and Burnings in the Legal Amazon (PPCDAM)**. The State Decree mandates quinquennial reviews of the plan, resulting in the PPCD (2009-2014), PPCDQ (2015-2020), and the current **PPCDIF (2021-2025),** which aligns with the crediting period addressed in this registration document.
- **State Plan for Adaptation to Climate Change and Low-Carbon Agriculture in Tocantins (ABC+/TO Plan)**: **State Decree No. 5.000/2014**, established ABC/TO Plan, now superseded by the ABC+/TO Plan.

Mitigation factor 2: Demonstrated interannual variability of less than 15% in annual forest emissions over the prior 5 years used in TREES Reporting

Tocantins cannot claim Mitigation factor 2.

Mitigation factor 3: Demonstrated national reversal mitigation actions, plan or strategy developed in alignment with Cancun Safeguard F

Pursuant to the measures outlined in **Safeguard F**, mitigation actions to address reversals have been planned under the framework of the **Prevention and Control Plan for Deforestation and Forest Fires (PPCDIF)** for 2021-2025. This plan implements measures and tasks across four key areas: i) Prevention, ii) Monitoring, iii) Command and Control, and iv) Forest Fire Fighting.

According to the **PPCDIF Report (2021-2023)**, several measures have been adopted and are currently under implementation:

- **Monitoring:**
  - **Environmental Monitoring through CIGMA**: Tocantins is strengthening its environmental monitoring capabilities by establishing the **Geographic Intelligence Center for Environmental Management (CIGMA)**, created under **SEMARH Ordinance No. 15/2014**. This initiative focuses on maintaining and utilizing various geographic information databases for environmental monitoring. CIGMA's structure includes: (i) A video wall for real-time visualization and analysis of geographic data and thematic maps produced by the Center; and (ii) Comprehensive training for its technical team to ensure effective use of geospatial data for decision-making.
  - **Comprehensive Monitoring via the SCCON Platform**: SEMARH has acquired the **SCCON platform**, which enables detailed monitoring of environmental conditions across all 139 municipalities in Tocantins. This tool supports state managers responsible for environmental policies and informs civil society on monitoring efforts. The results of these monitoring activities are publicly accessible through the Tocantins Monitoring Dashboard. These reports are intended to enhance transparency and provide valuable insights for stakeholders, including government officials and civil society.
- **Command and control:**
  - **Working Group to Combat Deforestation**: The State established a **Working Group to Guide Actions to Combat Deforestation**, formalized through **Joint Ordinance No. 02, dated September 6, 2023**, and extended by **Ordinance No. 25/2024**. This group includes representatives from SEMARH, NATURATINS, Environmental Military Police Battalion (BPMA), the State Public Prosecutors' Office (MPE), and IBAMA. The group is tasked with defining procedures to monitor and combat illegal deforestation in Tocantins. A task force conducted in the latter half of 2023 focused on identifying areas cleared for deforestation between 2019 and 2023, enabling differentiation between legal and illegal deforestation activities
  - **Tocantins Deforestation Monitoring Dashboard:** The implementation of the Tocantins Deforestation Monitoring Dashboard, spearheaded by the State Public Ministry, has enhanced enforcement efforts by providing real-time data, including:

Deforestation authorized by NATURATINS, pasture reform and clearance of conversion areas, alerts from deforestation detection systems, deforestation in legal reserve (RL) areas, areas embargoed by environmental authorities, weekly updates from 2024 onwards, qualifying areas based on their legality.

- **Pact for Zero Illegal Deforestation**: Complementing the PPCDIF actions, the Government of Tocantins established an alliance with agricultural sector representatives through the **Pact for Zero Illegal Deforestation**, signed on **November 23, 2023**. This initiative involves 12 key organizations, including: Federation of Agriculture and Livestock of the State of Tocantins (FAET)/National Rural Learning Service (Senar), Association of Rural Producers of Southwest Tocantins (Aproest), Association for Sustainable Development of Tocantins (ADSTO), Association of Soybean and Corn Producers of the State of Tocantins (Aprosoja/TO), Association of Nelore Breeders of Tocantins (ACNT), Rural Union of Araguaína, Rural Union of Paraíso do Tocantins, Frisian Cooperative, Organization of Brazilian Cooperatives (OCB)/Agroindustrial Cooperative of Tocantins (Coapa), Uniggel Seeds, Agrojem, and Terra Forte Agribusiness Center. The Pact underscores the shared commitment of these organizations to comply with environmental laws and promote sustainable practices in agricultural and economic activities, reinforcing the state's dedication to halting illegal deforestation.

- **Wildfire Supression:** To bolster its capacity to combat forest fires, the State of Tocantins has made significant investments in training and equipping municipal firefighting brigades. These efforts have resulted in the following achievements:

  - **Training and Certification of Brigade Members:** In 2021, a total of 627 brigade members were trained across 103 municipalities, with an additional 2 municipalities renewing certifications for existing brigade members. In 2022, the number of trained firefighters increased significantly, reaching 1,277, with 288 certifications renewed. In 2023, the program successfully trained 572 brigade members, with 388 certifications revalidated.

  - **Formation of Municipal Brigades:** The Civil Defense Operations Command (CODEC) has played a pivotal role in formalizing agreements for municipal brigades. In **2022**, CODEC entered into a **Technical Cooperation Agreement (*Termo de Cooperação Técnica*, or TCT)** with **102 municipalities**, as published in the Official State Gazette (DOE) No. 6.170 on 09/14/2022. In **2023**, an additional agreement was made with **121 municipalities**, as published in the DOE No. 6.404 on 09/01/2023. Some municipalities rehired brigade members who had served in **2021 or 2022**, leveraging their prior certifications, which were still valid. As a result, **717 brigade members were hired by municipalities in 2023.**

- **Equipment Acquisition:** To enhance the operational efficiency of the Military Fire Brigade and municipal brigades, the State procured new equipment as part of the measures outlined in the PPCDIF Report 2021-2023.

13. LEAKAGE

Evaluate the appropriate leakage deduction based on the use of the leakage assessment tool.

Official government data (FREL, 2024) indicate that Tocantins comprises 2.4% of Brazil's national forest area. Considering that the area accounted for the Amazon and Cerrado biomes in Tocantins is less than 25% of the national forest area, it is classified under the high leakage category, and a leakage deduction of 20% is applied to the verified credits.

14. VARIANCES

Summarize any variances from TREES that have been approved by the ART Secretariat and used by the Participant.

Not applicable.

15. REDD+ IMPLEMENTATION PLAN

Provide a Description of the country's REDD+ implementation plan strategy, including a description of how the REDD+ activities contribute to the country's sustainable development goals. If a country does not have stated sustainable development goals, the UN SDGs can be used.

On a national level, to fulfill Brazil's NDC commitments, the action plan for reducing emissions is founded on the **National Policy on Climate Change (PNMC)** along with its sectoral plans. These include the **Sectoral Plan for Mitigation and Adaptation to Climate Change aimed at Consolidating a Low Carbon Emission Economy in Agriculture, the Plan for the Prevention and Control of Deforestation and Fires (PPCDAM and PPCD Cerrado), and the National Policy for Payment for Environmental Services**. These policies collectively serve as instruments to reduce deforestation and forest degradation emissions under the National Strategy for Emission Reduction.

To contribute to national commitments, the measures undertaken by the State of Tocantins have been developed per the **2008 PEMC/TO, the Action Plan for the Prevention and Control of Deforestation and Fires in the State of Tocantins since 2009, the State Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy in**

Agriculture – ABC/TO Plan since 2014, and the PEPSA from 2023, all in alignment with national policies.

The measures to mitigate emissions from deforestation and forest degradation and report the outcomes adhere to the timeline established by the **Plans for the Prevention and Control of Deforestation and Fires**, which are updated every five years. The **PPCDIF 2021-2025** is the current action plan being implemented during the crediting period. These plans and other sectoral plans, state programs, and policies are aligned with a long-term strategy extending to 2040, named **Competitive and Sustainable Tocantins (ESTOCS)**, aiming to achieve low-emission development in Tocantins.

The State has structured its actions around two strategic approaches: (i) Short-term reduction of emissions from deforestation and forest degradation; (ii) Continued reduction of land-use emission reductions over time.

I. Short-term reduction of emissions from deforestation and forest degradation

Intending to achieve short-term reductions in emissions and to meet SDG 13, Tocantins concentrates on curbing illegal deforestation by implementing structured monitoring actions and enhancing institutional capacity and governance in forest management and climate change (PPCDIF 2021-2025 Monitoring Pillar and Command and Control Pillar):

- Improvement of environmental monitoring capacity through the establishment of the Geographic Intelligence Center for Environmental Management **(CIGMA),** the acquisition of high-resolution imagery, and the training of technicians in geospatial analyses of deforestation and forest degradation to track land-use changes, as outlined in the PPCDIF Report 2021-2023.
- The State of Tocantins has established a **Working Group to Guide Actions Against Illegal Deforestation**. This group comprises SEMARH, NATURATINS, the MPE, the BPMA, and IBAMA. This working group is tasked with developing regulations for remote monitoring and guidance of priority areas. The aim is to prepare technical reports, issue infraction notices, and draft embargo orders to hold those responsible for illegal deforestation accountable.
- In addition to the CIGMA, the State uses the MPE's Monitoring Dashboard for deforestation alerts.
- **Pact for Zero Illegal Deforestation in Tocantins**: An alliance between the state government and 12 representatives of the rural economic sector, aiming to align economic development with environmental preservation. The Pact aims to eradicate illegal deforestation by 2030, incorporating not only the engagement of the productive sector in combating illegal deforestation but also commitments to enhance the services provided by the State, including:

- Expediting the review of the Rural Environmental Registries (CARs) and thereby facilitate compliance with the Environmental Regularization Program (PRA)
- Expediting environmental licensing procedures
- Regulation of State Environmental Laws: State Law No. 3.804/2021, outlines procedures for issuing environmental licenses, the Ecological-Economic Zoning, and the State Forest Code.
- Establishing measures to streamline the processes for generating, obtaining, and utilizing Environmental Reserve Quotas (CRA) to enhance the efficiency of compensating Legal Reserve areas in rural properties, as determined by the Forest Code.
- Strengthening environmental agencies to enhance service delivery and ensure effective oversight of administrative proceedings related to infraction notices.
- Entering into agreements with financial institutions to promote sustainable economic growth and, through regulatory guidelines, establish criteria for assessing the environmental compliance of rural properties for credit approval;
- Promoting practices for the sustainable use of land and production technologies by disseminating practices from the Low Carbon Agriculture Program.

- **Increasing the capacity to combat forest fires (PPCDIF 2021-2025**): The PPCDIF's Combat Pillar encompasses awareness campaigns and sensitization efforts regarding the dangers of illegal burnings and forest fires, as well as the establishment of measures to combat burnings and forest fires effectively.
- The Focus on Fire Project (*Projeto Foco no Fogo*): coordinated by SEMARH, this project aims to guide rural property owners on the legal and environmental repercussions of illegal burning and wildfires, emphasizing the risks posed to public health and the environment. This initiative involves municipal visits, engagement with rural producers, and school educational lectures.
- Strengthening the Fire Department: funding for hiring and equipping temporary civilian fire brigade members and procuring materials, equipment, and vehicles to be deployed in Forest Firefighting Operations in the State of Tocantins.

State Committee for the Prevention of Forest Fires and Control of Burnings in Tocantins, whose activities include: holding education and awareness campaigns, promoting the creation and training of civil brigades to combat forest fires at a municipal level, expanding and implementing municipal fire use protocols, cleaning priority areas, promoting irregular burnings and forest fire monitoring, developing Integrated Fire Management (MIF), supervising and combating wildfires and controlling burnings, validating satellite fire hotspot data on-site and repressing illegal use of fire.

II. Maintenance of land-use emission reductions over time

To continuously reduce emissions and establish a foundation for low-emission development, the state allocates REDD+ funds towards implementing the **Tocantins Competitive and Sustainable Strategy (ESTOCS).**

The State has proposed a vision for the future aimed at 2040, outlining objectives and guidelines for designing and implementing actions, plans, programs, and policies to continue reducing emissions. The objectives of this strategy are to enhance productivity on sustainable foundations, promote social inclusion, and preserve the environment to ensure the continuous provision of ecosystem services. This is supported by an infrastructure designed to consolidate a new economic model aimed at achieving the SDGs, specifically SDG 1 (1.4), SDG 2 (2.3, 2.4, 2.a), SDG 6 (6.5, 6.6), SDG 13 (13.2, 13.3, 13b), SDG 15 (15.1, 15.2, 15.5), and SDG 16 (16.7, 16.10).

The state thus integrates the plans, programs, and policies necessary for the transition to a climate and forest-friendly economy, supported by the mobilization of resources from REDD+ to finance this transformation. The goal is to supplement current investments to support overcoming the social and economic challenges faced by those who have historically preserved carbon stocks and foster technological innovation for the transformation of productive activities in rural areas.

While the Competitive and Sustainable Tocantins Strategy (ESTOCS) outlines the action plans for investment, the tactical-level needs and priorities will be determined through a participatory process involving each group of relevant stakeholders, who are beneficiaries of the Tocantins Jurisdictional REDD+ Program. These needs and priorities will be addressed through specific subprograms tailored for each type of beneficiary. Each subprogram will include a set of plans, programs, policies, and other initiatives of interest to the beneficiaries that are not yet covered by existing policies.

Among the policies promoting sustainable and low-emission rural production, aimed at reducing legal deforestation, the following are noteworthy:

- **Sectoral Plan for Climate Change Adaptation and Low Carbon Emission in Tocantins Agriculture (ABC+/TO Plan 2020-2030)**: The ABC+/TO Plan serves as a sectoral instrument for climate change adaptation and low-carbon agricultural development, functioning as a key mechanism for implementing the State Policy on Climate Change. The ABC+/TO Plan encompasses degraded pasture recovery targets, consistent with Forest Code provisions regarding Permanent Preservation Areas and Legal Reserve restoration. The Plan promotes environmentally sustainable agricultural methods, including crop-livestock-forest integration (CLFI), enhancing soil conservation and biodiversity preservation. This approach complements the National Policy for Crop-Livestock-Forest Integration (Federal Law No. 12.805/2013). This integration framework

ensures complementarity between the plan's measures and state forest enforcement and conservation initiatives, under the National Policy for Crop-Livestock-Forest Integration, established under Law No. 12.805/2013.

- **Promotion of Fishing and Aquaculture** as productive land-intensive practices that exert less pressure on forests, through the establishment of the State Department of Fishing and Aquaculture to foster sustainable development within the sector, leveraging the potential of the Tocantins-Araguaia river basins.
- **Boost the capacity of RURALTINS' Technical Assistance and Rural Extension (ATER) services** in integrated fire management, rehabilitation of degraded areas, and value chains of non-timber forest products.

16. CHANGES

Please identify any major changes since the submission of the last TREES Document (TREES Concept or last TREES Registration Document) including changes to Participant or partners, accounting area, and emission reduction and/or removals rights agreements or plans to achieve rights

There have been changes since the State of Tocantins submitted its Concept Note to ART in December 2020. The changes include the following:

- **Participant Information**:
  - **Representative**: from Renato Jayme da Silva to Marcello de Lima Lelis
  - **Email Address**: from chefiagabinete@semades.to.gov.br to gabinete@semarh.to.gov.br
  - **Contact Telephone**: change from +55 (63) 3218-7799 to +55 (63) 98402-9304
- **Program Partners**: the Program has included the Partners below.
  - **Geonoma**: Has been responsible for developing the State's Monitoring, Reporting, and Verification (MRV) methodology and quantifying emission reductions in collaboration with IPAM, overseeing the validation of activity data and the calculation of uncertainty, writing the MRV sections, revising the safeguards sections and the final version of the TREES documentation.
  - **Amazon Environmental Research Institute** (***Instituto de Pesquisa Ambiental da Amazônia* or IPAM**): IPAM has been responsible for developing the MRV methodology for the State and for quantifying emission reductions.
  - **Earth Innovation Institute** (**EII**): A state partner since 2018, EII has assisted the State of Tocantins in meeting TREES requirements. This support includes designing the

State's emission reduction strategy, structuring the benefit-sharing mechanism, shaping the scope of safeguards, advising on consultation and participation processes, finalizing TREES documentation for submission, and writing the Safeguards and general sections of the TREES documentation

- **United Nations Development Programme** (**UNDP**)**/ WayCarbon**: Provided advice to the State on reporting about safeguards compliance and on developing the MRV methodology.
- **Federal University of Tocantins (*Universidade Federal do Tocantins* or UFT)/ Scientific and Technological Support Foundation of Tocantins (*Fundação de Apoio Científico e Tecnológico do Tocantins* or FAPTO):** Operates the Geographic Intelligence Center for Environmental Management (*Centro de Inteligência Geográfica em Gestão do Meio Ambiente,* or CIGMA) in Tocantins, providing environmental monitoring and analysis for the State, including deforestation, forest fires (degradation), hydrometeorological factors, and other areas.
- **Research Support Foundation of the Federal University of Goiás (*Fundação de Apoio à Pesquisa da Universidade Federal de Goiás* or FUNAPE)/ Federal University of Goiás (*Universidade Federal de Goiás* or UFG)/ Laboratory of Image Processing and Geoprocessing (*Laboratório de Processamento de Imagens e Geoprocessamento* or LAPIG):** Validated the activity data used in the State's MRV, such as forest fire scars from MapBiomas Fire and deforestation polygons for the state of Tocantins from PRODES (*Projeto de Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite* or Brazilian Amazon Forest Deforestation Monitoring Project by Satellite), and calculated the associated uncertainty.
- **TOCANTINS CARBON, Specific Purpose Company** (***Tocantins Carbono, Sociedade de Propósito Específico* or TOCAR, SPE):** Responsible for channeling REDD+ financing to support activities essential for developing and operating the Jurisdictional REDD+ Program in the State of Tocantins, under Technical Cooperation Agreement No. 16/2023/GABSEC with SEMARH.
- **TOCANTINS PARTNERSHIPS, State of Tocantins Real Estate Holding, Investment and Partnerships Company** (*Tocantins Parcerias, Companhia Imobiliária de Participações, Investimentos e Parcerias* or *TOPAR*): Collaborates with SEMARH under Technical Cooperation Agreements 06/2022/GABSEC and 02/2024/GABSEC. This partnership provides technical support for managing personnel and assets, streamlining processes to advance strategic State projects, particularly in business development related to environmental assets, carbon credits, environmental services, asset management, and ecosystem restoration and conservation.

- **Reference Period**:
  - from “2011 to 2015” to “2015 to 2019”.
- **Crediting Period**:
  - from “2016 to 2020” to “2020 to 2024”.
- **Total Forest area in accounting area**:
  - from 11,60 million ha (2015) to 11,00 million ha (2020).
- **Percentage of national forest covered by accountable area**:
  - from 2.5% (2015) to approximately 2.38% (2020).

17. REFERENCES[9]

4CN – Quarta Comunicação Nacional. (2020). *Quarta comunicação nacional e relatórios de atualização bienal do Brasil à Convenção-Quadro das Nações Unidas sobre mudança do clima (4CN). Quarto inventário nacional de emissões e remoções antrópicas de gases de efeito estufa. Relatório de referência: Setor de uso da terra, mudança do uso da terra e florestas.* https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/relatorios-de-referencia-setorial

Alencar, A. A., Arruda, V. L., Silva, W. V. D., Conciani, D. E., Costa, D. P., Crusco, N., ... Vélez-Martin, E. (2022). Long-term Landsat-based monthly burned area dataset for the Brazilian biomes using deep learning. *Remote Sensing, 14*(11), 2510. https://doi.org/10.3390/rs14112510

Alencar, A., et al. (2024). *Algorithm Theoretical Basis Document (ATBD) MapBiomas Fire Collection 3.0 Version 1.* https://brasil.mapbiomas.org/wp-content/uploads/sites/4/2024/06/ATBD-MapBiomas-Fogo-Colecao-3-1.pdf

Almeida, C. A. D., Coutinho, A. C., Esquerdo, J. C. D. M., Adami, M., Venturieri, A., Diniz, C. G., ... Gomes, A. R. (2016). High spatial resolution land use and land cover mapping of the Brazilian Legal Amazon in 2008 using Landsat-5/TM and MODIS data. *Acta Amazonica, 46*, 291-302. https://doi.org/10.1590/1809-4392201505504

Almeida, C. A., Maurano, L. E. P., Valeriano, D. M., Câmara, G., Vinhas, L., Motta, M., Gomes, A. R., Monteiro, A. M. V., Souza, A. A. A., Messias, C. G., et al. (2022). *Metodologia utilizada nos sistemas PRODES e DETER – 2ª Edição (Atualizada).* São José dos Campos, SP. http://mtc-m21d.sid.inpe.br/col/sid.inpe.br/mtc-m21d/2022/08.25.11.46/doc/thisInformationItemHomePage.html

Almeida, R. F., Fagg, C. W., Oliveira, M. C., et al. (2014). Mudanças florísticas e estruturais no Cerrado sensu stricto ao longo de 27 anos (1985-2012) na Fazenda Água Limpa, Brasília, DF. *Rodriguésia, 65*, 1-19. https://doi.org/10.1590/S2175-78602014000100001

Aragão, L. E. O. C., et al. (2014). Environmental change and the carbon balance of Amazonian forests. *Biological Reviews, 89*(4), 913-931. https://doi.org/10.1111/brv.12088

ART. (2021). *The REDD+ environmental excellence standard (TREES). Version 2.0.* The Architecture for REDD+ Transactions (ART), Washington, DC. https://www.artredd.org/wp-content/uploads/2021/12/TREES-2.0-August-2021-Clean.pdf

Assis, F. G., Ferreira, L. F., Vinhas, K. R., Maurano, L., Almeida, C., Carvalho, A., Rodrigues, J., Maciel, A., & Camargo, C. (2019). TerraBrasilis: A spatial data analytics

[9] All the articles and documents mentioned in this section are available in Annex 4 “References”.

infrastructure for large-scale thematic mapping. *ISPRS International Journal of Geo-Information, 8*(11), 513. https://doi.org/10.3390/ijgi8110513

Cochran, W. G. (1977). *Sampling techniques*. John Wiley & Sons.Available at: Cochran, W.G. 1963. SamplingTechniques, Wiley, New York. Available at: Sampling techniques : Cochran, William G. (William Gemmell), 1909-1980, author : Free Download, Borrow, and Streaming : Internet Archive.

Coutinho, L. M. (2016). *Biomas brasileiros* (123 p.). Oficina de Textos.

Eiten, G. (1972). The Cerrado vegetation of Brazil. *Botanical Review*, 38, 201-341.

FREL-Brasil. (2024). *Brazil's National Forest Reference Emission Level (FREL) for results-based payments for REDD+ under the United Nations Framework Convention on Climate Change (Modified submission)*. https://redd.unfccc.int/media/brazil-national-frel_modified_v3_clean-13-mar-2024.pdf

Gomes, L., Lenza, E., Maracahipes, L., et al. (2011). Comparações florísticas e estruturais entre duas comunidades lenhosas de Cerrado típico e Cerrado rupestre, Mato Grosso, Brasil. *Acta Botanica Brasilica*, 25(4), 865-875. https://doi.org/10.1590/S0102-33062011000400013

Gomes, L., Maracahipes, L., Reis, S. M., et al. (2016). Dynamics of the woody vegetation of two areas of Cerrado sensu stricto located on different substrates. *Rodriguésia*, 67(4), 859-870. https://doi.org/10.1590/2175-7860201667401

Gomes, L., Miranda, H. S., Soares-Filho, B., Rodrigues, L., Oliveira, U., & Bustamante, M. M. C. (2020). Responses of plant biomass in the Brazilian Savanna to frequent fires. *Frontiers in Forests and Global Change*, 3, 507710. https://doi.org/10.3389/ffgc.2020.507710

Gomes, L., Schüler, J., Silva, C., Alencar, A., Zimbres, B., Arruda, V.,... & Bustamante, M. (2024). Impacts of fire frequency on net CO2 emissions in the Cerrado Savanna vegetation. *Fire*, 7(8), 280. https://doi.org/10.3390/fire7080280

Guild, L. S., Kauffman, J. B., Ellingson, L. J., Cummings, D. L., Castro, E. A., Babbitt, R. E., & Ward, D. E. (1998). Dynamics associated with total aboveground biomass, C, nutrient pools, and biomass burning of primary forest and pasture in Rondônia, Brazil during SCAR-B. *Journal of Geophysical Research: Atmospheres*, 103(D24), 32091-32100. https://doi.org/10.1029/98JD00523

IBGE – Instituto Brasileiro de Geografia e Estatística. (2004). *Mapa de vegetação do Brasil* 1:5.000.000. https://geoftp.ibge.gov.br/informacoes_ambientais/vegetacao/mapas/brasil/vegetacao.pdf

IBGE – Instituto Brasileiro de Geografia e Estatística. (2012). *Manual técnico da vegetação brasileira* (2ª ed., 275 p.). Fundação Instituto Brasileiro de Geografia Estatística.

IBGE – Instituto Brasileiro de Geografia e Estatística. (2022). *Malha municipal digital da divisão político-administrativa brasileira* [GIS file]. https://www.ibge.gov.br/geociencias/organizacao-do-territorio/malhas-territoriais/15774-malhas.html?=&t=acesso-ao-produto

IBGE – Instituto Brasileiro de Geografia e Estatística. (2024). *Biomas e sistema costeiro-marinho do Brasil: Adequação do limite leste do Sistema Costeiro-Marinho à Amazônia Azul* [GIS file]. https://www.ibge.gov.br/geociencias/informacoes-ambientais/vegetacao/15842-biomas.html?=&t=publicacoes

INPE – Instituto Nacional de Pesquisas Espaciais. (2024a). *Coordenação Geral de Observação da Terra: Programa de Monitoramento da Amazônia e demais Biomas – Avisos: Bioma Amazônia*. https://terrabrasilis.dpi.inpe.br/downloads/

INPE – Instituto Nacional de Pesquisas Espaciais. (2024b). *Coordenação Geral de Observação da Terra: Programa de Monitoramento da Amazônia e demais Biomas – Desmatamento*: Amazônia Legal e Cerrado [GIS file]. https://terrabrasilis.dpi.inpe.br/downloads/

IPCC – Intergovernmental Panel on Climate Change. (2006). *IPCC Guidelines for National Greenhouse Gas Inventories* (H. S. Eggleston, L. Buendia, K. Miwa, T. Ngara & K. Tanabe, Eds.). Institute for Global Environmental Strategies. https://www.ipcc-nggip.iges.or.jp/public/2006gl/

IPCC – Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (R. K. Pachauri & L. A. Meyer, Eds.). IPCC. https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

IUSS Working Group WRB. (2015). *World Reference Base for Soil Resources (WRB)*: Sistema universal reconhecido pela International Union of Soil Science (IUSS) e FAO. http://www.fao.org/3/a-i3794e.pdf

Kauffman, J. B., Cummings, D. L., & Ward, D. E. (1994). Relationships of fire, biomass and nutrient dynamics along a vegetation gradient in the Brazilian Cerrado. *Journal of Ecology*, 82(3), 519-531. https://doi.org/10.2307/2261261

Lenza, E., Abadia, A. C., Menegat, H., Lúcio, N. W., Maracahipes-Santos, L., Mews, H. A., Santos, J. O., & Martins, J. (2017). Does fire determine distinct floristic composition of two Cerrado savanna communities on different substrates? *Acta Botanica Brasilica*, 31(2), 250-259. https://doi.org/10.1590/0102-33062016abb0198

Machida, W. S., Gomes, L., Moser, P., et al. (2021). Long term post-fire recovery of woody plants in savannas of central Brazil. *Forest Ecology and Management*, 493, 119255. https://doi.org/10.1016/j.foreco.2021.119255

MapBiomas Fire. (2024). *Projeto MapBiomas – Coleção 3.1 do MapBiomas Fogo* [GIS file]. Retrieved June 20, 2024. https://brasil.mapbiomas.org/colecoes-mapbiomas/

MapBiomas. (2023). *Annual Land Use Land Cover Maps of Brazil – Collection 9* [GIS file]. Retrieved September 9, 2024. https://brasil.mapbiomas.org/colecoes-mapbiomas/

Maracahipes, L., Lenza, E., Marimon, B. S., de Oliveira, E. A., Pinto, J. R. R., & Junior, B. H. M. (2011). Estrutura e composição florística da vegetação lenhosa em Cerrado rupestre na transição Cerrado-Floresta Amazônica, Mato Grosso, Brasil. *Biota Neotropica*, 11(1), 133-141. https://doi.org/10.1590/S1676-06032011000100013

Miranda de, S. C., Bustamante, M., Palace, M., Hagen, S., Keller, M., & Ferreira, L. G. (2014b). Regional variations in biomass distribution in Brazilian Savanna Woodland. *Biotropica*, 46(2), 125-138. https://doi.org/10.1111/btp.12095

Miranda de, S. C., Silva Júnior, M. C., & Carvalho, O. S. (2014a). O efeito da proteção do fogo na estrutura da vegetação lenhosa de uma área de Cerrado sentido restrito no Brasil Central. *Heringeriana*, 7(1), 61-72. https://doi.org/10.17648/heringeriana.v7i1.4

Olofsson, P., Foody, G. M., Herold, M., Stehman, S. V., Woodcock, C. E., & Wulder, M. A. (2014). Good practices for estimating area and assessing accuracy of land change. *Remote Sensing of Environment*, 148, 42-57. https://doi.org/10.1016/j.rse.2014.02.015

Ometto, J. P., Gorgens, E. B., de Souza Pereira, F. R., Sato, L., de Assis, M. L. R., Cantinho, R., ... & Keller, M. (2023). A biomass map of the Brazilian Amazon from multisource remote sensing. *Scientific Data*, 10(1), 668. https://doi.org/10.1038/s41597-023-02575-4

Passos, F. B., Marimon, B. S., Phillips, O. L., Morandi, P. S., das Neves, E. C., Elias, F., Reis, S. M., de Oliveira, B., Feldpausch, T. R., & Júnior, B. H. M. (2018). Savanna turning into forest: Concerted vegetation change at the ecotone between the Amazon and "Cerrado" biomes. *Brazilian Journal of Botany*, 41, 611-619. https://doi.org/10.1007/s40415-018-0470-z

Ratter, J. A., Ribeiro, J. F., & Bridgewater, S. (1997). The Brazilian Cerrado vegetation and threats to its biodiversity. *Annals of Botany*, 80(3), 223-230. https://academic.oup.com/aob/article/80/3/223/2587654

Ribeiro, J. F., & Walter, B. M. T. (2008). As principais fitofisionomias do bioma Cerrado. In S. M. Sano, S. P. de Almeida, & J. F. Ribeiro (Eds.), Cerrado: Ecologia e flora. https://www.webambiente.cnptia.embrapa.br/webambiente/wiki/lib/exe/fetch.php?media=webambiente:ribeirowalter2008.fitofisionomias.pdf

Ribeiro, S. C., Fehrmann, L., Soares, C. P. B., Jacovine, L. A. G., Kleinn, C., & Gaspar, R. d. O. (2011). Above- and belowground biomass in a Brazilian Cerrado. *Forest Ecology and Management*, 262(3), 491-499. https://doi.org/10.1016/j.foreco.2011.04.017

Rios, M. N. d. S., & Sousa-Silva, J. C. (2017). Grupos funcionais em áreas com histórico de queimadas em Cerrado sentido restrito no Distrito Federal. *Pesquisa Florestal Brasileira*, 37, 285. https://doi.org/10.4336/2017.pfb.37.91.1386

Rios, M., Sousa-Silva, J., & Malaquias, J. (2018). Mudanças pós-fogo na florística e estrutura da vegetação arbórea-arbustiva de um Cerrado sentido restrito em Planaltina-DF. *Ciência Florestal*, 28, 469-482. https://doi.org/10.5902/1980509832028

Roitman, I., Bustamante, M. C., Haidar, R. F., Shimbo, J. Z., Abdala, G. C., Eiten, G., Fagg, C. W., Felfili, M. C., Felfli, J. M., Jacobson, T. K. B., Lindoso, G. S., Keller, M., Lenza, E., Miranda, S. C., Pinto, J. R., Rodrigues, A. A., Delitti, W. B. C., Roitman, P., & Sampaio, J. M. (2018). Optimizing biomass estimates of savanna woodland at different spatial scales in the Brazilian Cerrado: Re-evaluating allometric equations and environmental influences. *PloS ONE*, 13(8), e0196742. https://doi.org/10.1371/journal.pone.0196742

Santos dos, A. C., Montenegro, S. d. R., Ferreira, M. C., Barradas, A. C. S., & Schmidt, I. B. (2021). Managing fires in a changing world: Fuel and weather determine fire behavior and safety in the neotropical savannas. *Journal of Environmental Management*, 289, 112508. https://doi.org/10.1016/j.jenvman.2021.112508

Santos, H. G., Jacomine, P. K. T., Anjos, L. H. C., Oliveira, V. A., Oliveira, J. B., Coelho, M. R., Lumbreras, J. F., & Cunha, T. J. F. (2018). *Sistema brasileiro de classificação de solos* (3. ed.). Embrapa Solos.

Sato, M. N., Miranda, H. S., & Maia, J. M. F. (2010). *O fogo e o estrato arbóreo do Cerrado: Efeitos imediatos e a longo prazo*. In H. S. Miranda (Ed.), Efeitos do regime do fogo sobre a estrutura de comunidades de Cerrado: Resultados do Projeto Fogo (pp. 77-91). IBAMA.

SEEG11 – Sistema de Estimativa de Emissões e Remoções de Gases de Efeito Estufa. (2023). *Análise das emissões de gases de efeito estufa e suas implicações para as metas climáticas do Brasil. Observatório do Clima*. https://seeg.eco.br

Simon, M. F., & Pennington, T. (2012). Evidence for adaptation to fire regimes in the tropical savannas of the Brazilian Cerrado. *International Journal of Plant Sciences*, 173(6), 711-723. https://ava.icmbio.gov.br/pluginfile.php/4592/mod_data/content/20335/2012-Evidence_for_adaptation_to_fire_regimes_in_the_Tropical_savannas_of_the_Brazilian_Cerrado.pdf

Stehman, S. V. (2014). Estimating area and map accuracy for stratified random sampling when the strata are different from the map classes. *International Journal of Remote Sensing*, *35*(13), 4923-4939. https://doi.org/10.1080/01431161.2014.930207

TerraClass. (2024). *Projeto TerraClass 2022*. Embrapa Agricultura – Instituto Nacional de Pesquisas Espaciais. https://www.terraclass.gov.br/download-de-dados

Ward, D. E., Susott, R., Kauffman, J. B., Babbitt, R. E., Cummings, D. L., Dias, B., Holben, B. N., Kaufman, Y. J., Rasmussen, R. A., & Setzer, A. W. (1992). Smoke and fire characteristics for Cerrado and deforestation burns in Brazil: BASE-B experiment. *Journal of Geophysical Research*, 97(D13), 14601-14619. https://doi.org/10.1029/92JD01218

WayCarbon. (2024). *Agentes e propulsores do desmatamento e da degradação florestal nos estados da Amazônia Legal Brasileira*. Programa das Nações Unidas para o Desenvolvimento (PNUD).