MONITORING REPORT FORM (CDM-MR) *
Version 02 - in effect as of: 28/01/2012

CONTENTS

MONITORING REPORT
Version number 01 and date 25/05/2011

Moldova Soil Conservation Project
Reference number 1948
Monitoring period number 01 dates (first and last days included (01/10/2002 - 31/12/2011)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

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The description of the project activity to be presented in this section is a brief summary of the detailed description given in the section "B.1 Implementation status of the project activity" below and shall include:

1. **Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;**

The Moldova Soil Conservation Project was implemented to achieve multiple objectives of restoring productivity of degraded lands, enhancing forest product supplies to local communities and promoting actual net GHG removals by sinks.

The project seeks to restore degraded lands through afforestation involving *Quercus robur, Populus alba, Populus nigra* and *Salix sp., Robinia sp.* and associated species. Other objectives of the project are to promote biodiversity improvement, create wood supply for household and rural construction needs. The project adopts renewable 20-year crediting period, which is expected to be extended for further two consecutive 20-year crediting periods, for a total project period of 60 years. The project is expected to generate revenue from the sale of timber and fuelwood from thinning and from the sale of Certified Emission Reductions (CERs) credits.

2. **Brief description of the installed technology and equipments;**

The project area covers degraded lands eligible for undertaking afforetation and reforestation activities in the northern, central and southern regions of the country. Out of a total project area of 20,289.91 ha, the State Forest Agency, Moldsilva owns 40% of land and local councils (384 local councils) own the remaining 60% of land. As per contractual arrangement, Moldsilva is authorized to undertake afforestation/reforestation (A/R) activities on lands owned by local councils and to manage these lands until after the establishment of forest and to transfer them to the local councils for subsequent management.

3. **Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.).**

Project implementation started on 1 October 2002. The 1st monitoring report covers the period from 1 October 2002 to 31 December 2011.

Table 1 presents the area planted under the project during 2002-2009.

Table 1: Area planted under the project

Plantation year	Total planted area (ha)
2002	5 197,39
2003	5 000,45
2004	4 477,61
2005	4 152,17
2006	985,69
2007	48,00
2008	329,60
2009	99,00
Total	20 289,91

A.2. Project Participants

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Indicate if the Party involved wishes to be considered as a project participant (Yes/No)
Republic of Moldova	Moldsilva, State Forest Agency, a public entity of the Republic of Moldova	No
The Netherlands	International Bank for Reconstruction and Development as Trustee of the BioCarbon Fund[1]	Yes
(*) In accordance with the CDM A/R modalities and procedures, at the time of making the CDM-AR-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.3. Location of the project activity:

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The project covers all districts of Republic of Moldova except the eastern territories of Transnistria. The project covers degraded lands eligible for undertaking afforestation and reforestation activities. It covers several categories of degraded lands such as degraded pastures, glades and abandoned arable lands. Project boundaries were established in the field with help of GPS and were verified. The geographic coordinates for each project site (polygon) are recorded and are stored in the project data base together with the site digital photos (Annex 5 to the PDD) and quality assurance and quality control procedures are implemented to conform to the requirements of monitoring methodology.

A.4. Technical description of the project

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The erosion and unsustainable land use practices contribute to loss of soil organic carbon each year and are major factors contributing to about 40-60% loss in soil productivity. The project seeks to restore degraded lands through

[1] On April 1, 2011 all rights and obligations of Prototype Carbon Fund related to the Project have been transferred to the BioCarbon Fund

afforestation/reforestation involving *Quercus robur, Populus alba, Populus nigra* and *Salix sp., Robinia sp.* and associated species. The species for planting are selected based on their suitability to soil and climate and adaptability to the sites. On severely degraded lands, planting activities are implemented with the objective of establishing vegetation with locally adapted (*Acer campestre, Acer tataricum, Ulmus spp., Pyrus communis, Prunus avium, Malus sylvestris, Fraxinus excelsior* etc.) and naturalized (*Robinia pseudoacacia etc.*) species mixed with native species. The long-term experience of forest management in Moldova has shown that *Robinia* is widely adapted to poor sites, on which other species cannot be established through cost effective means. On partially degraded sites, Oak (*Quercus sp.*), Poplar (*Populus alba*, *Populus nigra*) are chosen as lead species. Other broadleaf species and shrubs are planted to improve floral diversity. The project is expected to improve soil conditions and promote regeneration of native species over long-term.

The project activities are undertaken as per the national guidelines on scientific forest management and silvicultural practices implemented by Moldsilva on the degraded lands. The project uses scientific methods in site preparation, integrated soil and water conservation, nursery technologies, improved seed, nursery management, planting, silvicultural operations and environmentally safe management practices.

The activities implemented under the project involved site preparation, nursery stock development, planting, protection, and management of planted areas. The post-planting activities included protection, gap planting, tending, pest management, thinning, fire control, and harvesting. No nitrogenous fertilizers have been used in the project and no biomass burning activities are practiced. However, the project seeks to monitor biomass burning that may occur from natural fires.

As part of the measures to promote improved planting stock, seed collected from rigorously selected plus trees and provenances was used in the production of nursery stock. Standard operational procedures have been followed in collection of improved seed, testing and planting stock development.

To promote favourable conditions for seedling growth weeding was carried at periodic intervals. No fertilization was used either during nursery or during the forest establishment stage.

Tending operations were done to maximize the survival of seedlings in the second and third years. These operations focused on protection, weeding, pest management and fire control implemented as per the recommended guidelines of Moldsilva. To ensure high survival rates during the plantation, gaps were planted in the second and third years.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

The baseline and monitoring methodology applied in the project is "Restoration of degraded lands through afforestation/reforestation" (AR-AM0002), Version 01.

A.6. Registration date of the project activity:

The project was registered with the UNFCCC on 30 January 2009.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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20 years (20yr-00mm) crediting period of the project is from **October 1, 2002** to **September 30, 2022.**

The crediting period of 20 years is renewable twice for a total crediting period of 60 years of the project period.

A.8. Name of responsible person(s)/entity(ies):

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Contact information of the person(s)/entity(ies) responsible for completing the monitoring report form (CDM-MR).
Dr. ing. Dumitru Galupa - PIU Manager, Director FRMI;

ing. Ion Talmaci – PIU Monitoring, Evaluation and Procurement Assistant, Scientific Director, Forest Research and Management Institute (FRMI/ICAS), Chisinau, Republic of Moldova,

Dr. ing. Valeriu Caisin – Chief Forestry Engineer, Scientific Reserve "Codrii", Republic of Moldova.

Address: 69, Calea Iesilor str., Chisinau, Republic of Moldova, tel/fax: +373 22 92-89-57, 92-89-56 email: icaspiu@starnet.md

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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The implementation and operational status of the project as of this monitoring period is in accordance with the latest version of the CDM Validation and Verification Manual (CDM-VVM)[2] and reflect *inter alia*:

1. The starting date of operation of the project activity. For project activities that consist of more than one site, the report shall clearly describe the status of implementation and starting date of operation for each site. For CDM project activities with phased implementation, the report shall indicate the progress of the proposed CDM project activity achieved in each phase.

The starting date of the project activity is 1 October 2002. The project was registered as a CDM A/R project on January, 30, 2009.

Project area and boundaries

Project boundary and total area are identical to the details presented in the PDD. Implementation schedule of the planting was revised taking into account the impact of natural disaster events such as droughts, floods and operational conditions in the field. Severe droughts from 2007-2008, as well as floods during 2008 to 2010 affected the planted area of 1,975.64 ha.

[2] http://cdm.unfccc.int/Reference/Manuals/index.html

Table 2: Area planted by year

Plantation year	Plantation age (yr)	Total planted area (ha)	Project area with plantations (ha)	Project area affected by various natural disasters (ha)
A	B	C	D	E
2002	9	5,197.39	4788.09	409.3
2003	8	5,000.45	4586.55	413.9
2004	7	4,477.61	4087.3	390.31
2005	6	4,152.17	3608.65	543.52
2006	5	985.69	869.98	115.71
2007	4	48.0	48.0	0.0
2008	3	329.6	242.7	86.9
2009	2	99.0	83.0	16.0
Total		20,289.91	18,314.27	1,975.64

Note: Column C from the table presents the total project area distributed by planting years. Column D presents the plantations with the survival rate above 25% and column E – plantation area affected by various natural adverse factors and with poor/no plantation establishment (stratum with ERs zero).

2. The information regarding the actual operation of the project activity during this monitoring period, including information on special events, for example overhaul times, downtimes of equipment, exchange of equipment, etc.

Events in the project area are reported by field personnel/guards within current forest protection procedure of Agency Moldsilva and recorded in the event log. For the project purpose, the information is additionally reported in the "monitoring spreadsheet" in the autumn of each year.

Table 3: Events in the project area

Time	Type of event	Data sources
2002-2009	Areas affected by various unfavorable factors that reduced survival rates of the project in different locations	Forest enterprise/district's records (hazards notifications, ad-hoc commissions' field check, event confirmation, reports, etc), pictures.

The project area of 1975.64 ha (9.7% of project area) has been affected by various natural disasters (droughts, floods etc.) during 2008-2010. From those 880 ha foreseen for replanting, 294 ha were planted in 2011 and 586 ha will be completed in 2012 (Marh-April and October-December). The rest of the 1,095.64 ha (5.4% of project area) will not be restored due to the soil conditions, floods, conflicts with communities/local authorities etc.

3. A brief description of: (i) events or situations that occurred during the monitoring period, which may impact the applicability of the methodology, and (ii) how the issues resulting from these events or situations are being addressed.

N/A

B.2. Revision of the monitoring plan

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The Monitoring Plan has not been revised.

B.3. Request for deviation applied to this monitoring period

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N/A

B.4. Notification or request of approval of changes

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N/A

SECTION C. Description of the monitoring system

Sample frame

The monitoring plan estimates 209 sample plots for vegetation and 131 sample plots for soils. According to the results of forest inventory covering the entire project area (20289.91 ha) 18,314.27 ha (92,3%) of forest crops have the survival rate above 25%, the remain 1,975.64 ha (9,7% of project area) are forest crops affected by various natural disasters (drought, flood etc.) and named conditionally "stratum with ERs zero". The sample size of 213 (permanent monitoring plots (PMP) distributed by 15 strata (table 3) were revised as a result of *ex-post* stratification. The criteria were used for expost stratification are the species, site productivity and survival: main species (*Pinus, Populus, Quercus, Robinia*); site productivity (rich soil humus>2%), poor soil (humus<2%); age (<5 year, >5 year); survival rate category (25,1-50%; >50%).

As part of the ex post stratification, the sample size of 213 PMP (permanent monitoring plots) for biomass, are distributed over 15 strata (table 3). Stratification was based on the following indicators species, site productivity and survival: main species (Pinus, Poplar, Quercus, Robinia); site productivity (moderate soils (humus>2%), poor soils (humus<2%); age (<5 year, >5 year); survival rate category (25,1-50%; >50%). it was decided that if a one stratum holds more than 5% of the total project area, then it will obtain a sample. Given the very uneven representation of the strata in the project and to include some important species such as oak it was decided that some of the samples to be placed in this stratum despite their share in the project is below 5%.

Current project area stratification of standing plantation on 18,314.27 ha, which is the basis for GHG computation, is shown in table 4.

Table 4: ***Planting area breakdown by species, age and survival rate***

Stratum	Stratum Name	Area (ha)	Rounded Plot Quantity
stratum 1	Pinus_PoorSoil_Age>5_Surv>50	4.10	1
stratum 2	Poplar_RichSoil_Age>5_Surv_25,1-50	58.60	1
stratum 3	Poplar_RichSoil_Age>5_Surv_>50	158.98	1
stratum 4	Quercus_PoorSoil_Age>5_Surv_>50	231.58	2
stratum 5	Quercus_RichSoil_Age<5_Surv_>50	61.84	1
stratum 6	Quercus_RichSoil_Age>5_Surv_25,1-50	95.0	1
stratum 7	Quercus_RichSoil_Age>5_Surv_>50	786.36	5
stratum 8	Robinia_PoorSoil_Age<5_Surv_25,1-50	89.20	1
stratum 9	Robinia_PoorSoil_Age<5_Surv_<50	34.90	1
stratum 10	Robinia_PoorSoil_Age>5_Surv_25,1-50	619.79	7
stratum 11	Robinia_PoorSoil_Age>5_Surv_>50	4367.91	45
stratum 12	Robinia_RichSoil_Age<5_Surv>25,1-50	64.50	1
stratum 13	Robinia_RichSoil_Age<5_Surv>_50	127.9	2
stratum 14	Robinia_RichSoil_Age>5_Surv_25,1-50	1530.83	19
stratum 15	Robinia_RichSoil_Age>5_Surv_>50	10,082.78	125
stratum 16	Area affected by various natural disasters	1,975.64	0

	(stratum zero removals)		
TOTAL		20,289.91	***213***

Note: stratum 1: Pinus_PoorSoil_Age>5_Surv>50 include: 0,5 ha din Pinus_PoorSoil_Age<5_Surv>50; 1,9 ha din Pinus_RichSoil_Age>5_Surv>50;

stratum 2: Poplar_RichSoil_Age>5_Surv_25,1-50 include: 7,1 ha Poplar_PoorSoil_Age>5_Surv_>50 and 7,4 ha Poplar_RichSoil_Age<5_Surv_25,1-50;

stratum 4: Quercus_PoorSoil_Age>5_Surv_>50 include: 19,9 ha Quercus_PoorSoil_Age>5_Surv_25,1-50;

stratum 5: Quercus_RichSoil_Age<5_Surv_>50 include: 21 ha Quercus_RichSoil_Age<5_Surv_25,1-50.

For the purpose of sample location within each stratum, plots were ordered following by random numbers generated within strata. Sample plots are allotted according to the random generated number and located using GPS coordinates system.

For these areas, the GHG removals were calculated taking into account: aboveground and belowground biomass and dead organic matter, and soil. The GHG removals by sinks for soil pool were done as per the guidance of Annex 26, EB63 applicable to AR AM0002.

Sampling, field work and laboratory processing, and data processing were conducted as per the Monitoring plan of the PDD.

Monitoring in the field:

The plots are marked by GPS coordinates with wooden poles (one of the corner of permanent monitoring plot (PMP). For the purpose of verification, the measurements were conducted on 213 PMPs. These 213 PMPs were located taking into account the proportion of the area of the strata to the total project area. Permanent monitoring plots are established with an area of 250 m^2 (laturile de 5 X 50 m), which includes nested small sample plots of 50 m^2 within the large plot.

Field team members were trained in the theoretic and practical aspects of forest inventory and measurements. Four teams were organized for conducting measurements. A team is composed from 3 research staff (provided by FRMI and Scientific reserve "Codrii"). Each team has a chief in charge of the survey, collection and recording of data as per the procedures of monitoring.

In the field, plots are located with coordinates of one corner marked with one wooden stake and all measured trees are marked and assigned a unique serial number. The location of the PMP was done as per the followingcriteria:

a) large side of the sample plot was usually located along the rows, and small side - perpendicular to it.
b) If by its corner coordinates of the sample plot were placed at the edge of the plantation, the long side of the PMP was usually directed toward the center of plantation.

Collar diameter (dch) and basal diameter (dbh) were measured to determine aboveground biomass. Collar diameter was measured after the removal of organics from the ground surface. Basal diameter (dbh) was measured where it was possible (when the trees were the heigher than 1,3 m and the diametrewas bigger than 2,5 cm) with the observance of general dendrometry rules. Diameters were measured with callipers in centimeters with a digit after the comma. In the case when there are two or more stems that grow from one root, this detail was recorded in the field worksheets. On slopes diameters were measured only in the upstream. Basal diameter, height and diameter of shrub crown were measured for shrubs. Litter samples also were collected from the sample plots and weighed.

To determine biomass equations, allometric equations with known regression coefficients for the main forest species were used, for forest trees and shrubs species for which regression coefficients are not known - general regression coefficients were used.

Biomass data are recorded on each individual tree (dch and/or dbh), in the field sheets. Original field sheets are stored in the project database.

Once measured and calculated, the biomass from the sample plots is expanded and applied to the entire stratum area.

Biomass sub-samples of litter are placed in sealed plastic bags and labeled (according the labeling instructions contained in the monitoring plan).

All field phases are rechecked on the spot by the "team chief". Tree diameter is re-measured for 10% of trees in the permanent monitoring plot (PMP) by another team or project responsible.

Monitoring equipment

Information on the equipment used for monitoring and measurement in the field is outlined in the Table below.

Table 5: Monitoring equipment

Manufacturer	Name/Type and serial number	Date of calibration	Uncertainty	Remarks
Compass for measuring bearings;	БГ-1, N00650	13.04.2011-		
Metal tapes (20 m) for measuring distances;	Commercial product	13.03.2011 10.10.2011 01.12.2011		
Metal tapes (5 m) for measuring tree height;	Commercial product	13.03.2011 10.10.2011 01.12.2011		
Global Positioning System (GPS) for locating plots;	Garmin	-	4-10 m	
Tree diameter tape for measuring trees;	Standard			
Hyspometer/Clinometers to measure tree height & slope;	Suunto			
Caliper to measure small tree diameters	Commercial product	13.03.2011 10.10.2011 01.12.2011	-	-
Spring scales for weighing destructive biomass samples;	WH	13.03.2011 10.10.2011 01.12.2011		

Calibration procedures:

The hypsometer, clinometers and scales are calibrated prior to use in the field.

In the laboratory

Sub-sample of litter has been collected from each PMP for determination of moisture, based on which total dry mass was calculated. Sub- samples were dried in an oven (105° C) to constant mass to determine dry mass.

Data entry

Data collected on field forms is transferred to spreadsheets and field forms and laboratory records are archived. A

person not involved in the data entry has been used to verify the correctness of data entered in the spreadsheets.

Involvement of third parties:

Determination of C content and of dry matter in litter has been established by an independent party: Research Institute for Soil Science and Agrochemistry, 100, Ialoveni str., mun. Chişinău, (results provided under the contract no 43 as of 24.10.2011).

Database and calculation tool

The BioCarbon Fund has developed a tool for the monitoring of the A/R CDM portfolio – the Simplified Monitoring Afforestation / Reforestation Tool (SMART). The tool comprises several modules for collecting and organizing field data into a database, which are tailored to the specific methodology used by the project. Each module indicates the data parameters that the project needs to measure and record in order to successfully monitor the carbon pools as required by its CDM A/R methodology.

The Project Entity uses excel forms for digitalizing field data. The data for 213 sample plots will be shared with the DOE in smart excel forms.

The BioCarbon Fund is currently developing a web-based platform for data storage and real time data access. The web-based platform is the core of the monitoring system, where users can directly input data and obtain calculations at plot and project levels.

Organization of the project monitoring

The main participants of the process of project implementation are the Agency Moldsilva, the World Bank, local communities, allocated land for afforestation etc. All these units have responsibilities and obligations defined through operating regulations, orders of the Agency Moldsilva, bilateral contracts / agreements and other related documents in force. Responsibilities are stated in Agency Moldsilva General Director order no. 119-P / 2003.

I. The Agency Moldsilva will provide through:

a) Forest Fund, Guard and Protection Department:
- General coordination of implementation activities, project control and monitoring, including the cooperation with other ministries, departments, local public authorities, communities, NGO etc.;
- Approval of plans for carrying out of management of forest areas;
- Provision and distribution of forest products among enterprises;
- Approval of technical support and annual inventory of forest areas;
- Approval of forest management plans on tending activities in newly created forests, final harvest, and works on stands regeneration/continuity;

b) Forestry units (forest enterprises, forestry and hunting enterprises and natural reserves):
- Identification of plots available for planting, signing of agreements with possessors of lands;
- Approval of agreements at territorial cadastre agencies and/or public notary;
- Receive plots for management/provisional use;
- Accomplishment of projects for plantation of forest crops;
- Soil preparation, planting, completion of forest crops;
- Technical support and annual inventory of forest crops;
- Carrying out of tending activities, ensuring protection of forest crops;
- Accounting of expenditures for each plot;
- Coordination of plantation inventory with public local authorities and environmental authorities;
- Transfer of forest crops in canopy closure stage (category of forest), coordination of relevant acts;
- Submission of reports to the Agency Moldsilva, as well as relevant information to PIU.

c) Forest Research and Management Institute (Project Implementation Unit):

- Coordination of project technical and management activities;
- Evidence and mapping of project land parcels using GPS and GIS and establishment of polygons
- Supervision of stipulations observance of planting projects, techniques and technologies;
- Monitoring of carbon stocks, project emissions and ecological and social benefits;
- Verification and inventories of plantations;
- Comparing of data obtained from forestry enterprises and data collected independently;
- Preparation for the verification by third person;
- Elaboration and submission of annual reports to corresponding organizations;
- Technical support forest management (e.g., tending, maintenance, insurance of integrity etc.);
- Organization and development of seminars and trainings within the framework of the project;
- Coordination and collaboration with other projects.

II. The World Bank (Prototype Carbon Fund, BioCarbon Fund):

- Development of the project documentation (Baseline Study, Monitoring Plan, PDD etc.);
- Submission of the project for registration at UNFCCC Secretariat;
- Verification of the project implementation process, including by the hiring of third party;
- Payment of contracted emission reductions.

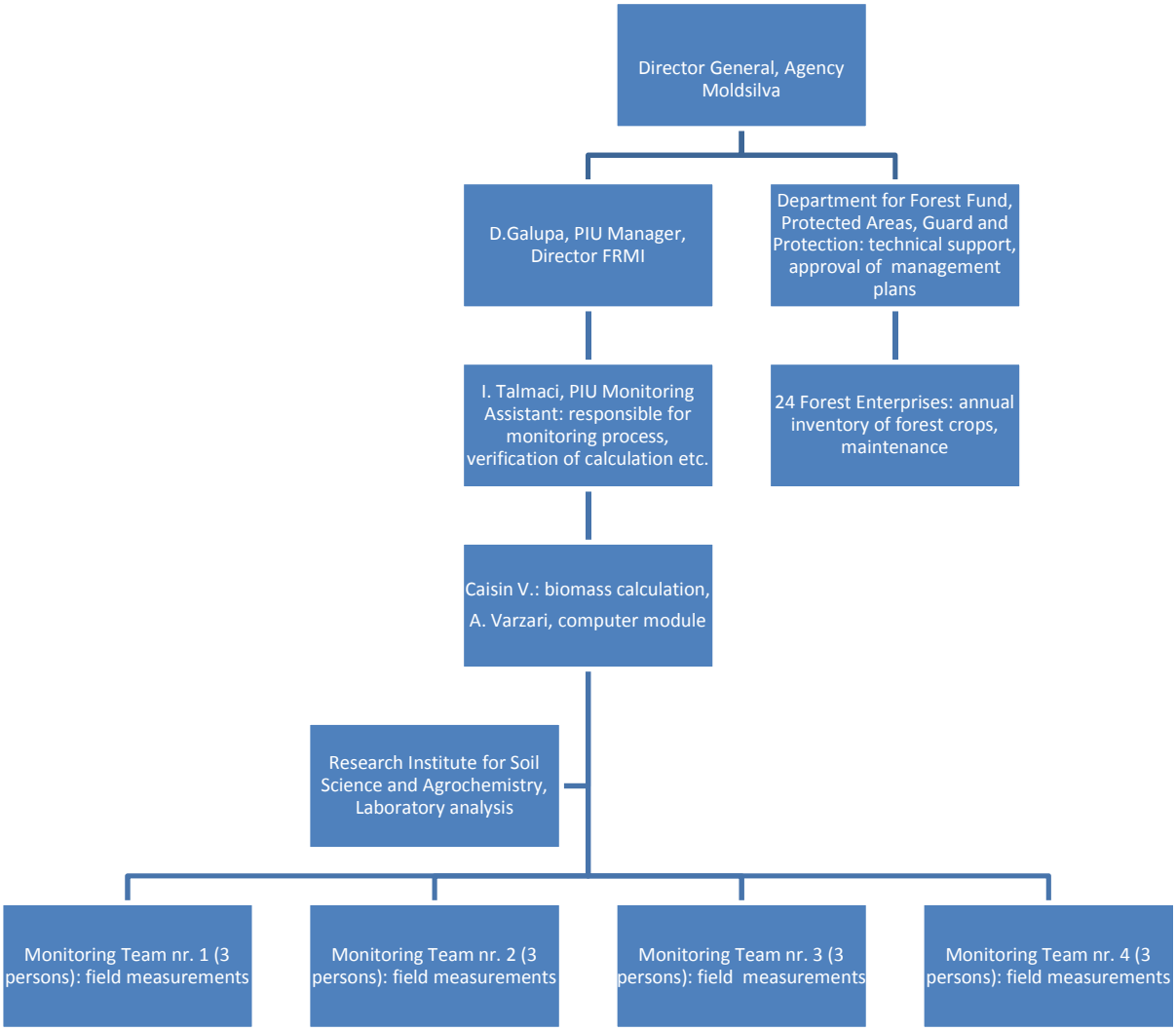
III. Other participants:

a) Communities that allocated lands for the afforestation under MSCP will carry out:
   - Examination of the issue of afforestation of degraded lands at the meetings of local Councils, and other lands with forestry vegetation used for different protective purposes;
   - Creation of commission for selection of lands, consisting of representatives from mayoralties and territorial forestry units etc;
   - Allocation of lands established for afforestation through the Decisions of local Councils, stipulating their use for the following 100 years, used for growing of forestry vegetation;
   - Documentary transmission of identified lands for afforestation;
   - Participation in inventory of forest plantations;
   - Contribution into the implementation of agreements on afforestation, concluded between forestry units and solutions for possible conflicts (e.g., illegal grazing, logging, opening of roads, mines, etc.).

b) Raional cadastre services:
   - Participation in Commission on the selection of lands for afforestation;
   - Preparation of documentation for the allocation of lands for afforestation;
   - Approval of acts of annual inventory of forest plantations;
   - Cadastre accounting of lands;

c) Territory ecological offices:
   - Participation in the inventory of forest plantations;
   - Monitoring of national and local programs on forest use, regeneration, and protection;
   - Supervision of the observance of standards for the use of forest products;
   - Protection of rare and endangered fauna and flora and species from the project sites;
   - Establishment and observance of norms for collection of animals and birds;
   - Analysis of the condition of new created forests.

Roles and responsibilities in monitoring



Training

Traininig activities of the project coeverd design of project, identification of eligible lands, choice of species, regeneration, nursery management, planting, aftercare, monitoring, sampling, sample plot layout, measurement of sample plots etc. are summarized in the table. The documentary evidence of training activities is presented in Annex 1.

Table 6: Trainings implemented as part of project implementation and monitoring

Date & place	Participants	Reporters	Issues discussed
20.04.2002, Chisinau	Chief forest engineers	P. Rotaru, I. Talmaci, E. Griţenco (Moldsilva), D. Galupa (FRMI, PIU)	Data on lands for CDM afforestation project, present and future tasks.
06.06.2002,	Chief forest engineers,	A. Ciobanu, P. Rotaru, I.	Project documentation, progress in

Date & place	Participants	Reporters	Issues discussed
Chisinau	engineers forest fund/ forestry fund	Talmaci (Moldsilva), D. Galupa (FRMI, PIU)	identification and description of plots.
20.06.2003, Chisinau	Chief forest engineers, engineers forest fund/ forestry fund	P. Rotaru, I. Talmaci (Moldsilva); D. Galupa (FRMI, PIU)	Technical aspects related to MSCP (screening of sites in view of exclusion of those that are eligible for CDM projects), species for planting etc.
05.08.2003, Chisinau	Chief forest engineers	P. Rotaru, I. Talmaci (Moldsilva), D. Galupa (FRMI, PIU)	Progress in project implementation, development of documentation etc.
10.10.2003, Străşeni	Chief forest engineers, engineers for forest regeneration	A. Ciobanu, P. Rotaru – (Moldsilva), D. Galupa (FRMI, PIU)	Creation and maintenance of objects of forest seed base, official coordination by cadastre office of land use categories etc.
23.04.2004, Chisinau	Chief forest engineers, engineers for forest regeneration	A. Ciobanu, P. Rotaru, P. Stratulat (Moldsilva), D. Galupa (FRMI, PIU)	Tasks within MSCP, planting, successes etc.
20.05.2004, Chisinau	Training of FRMI staff for sampling soils samples for initial C content in the project soils.	Dr. hb Valerian Cerbari (ICPA „Dimo"; D. Galupa (FRMI, PIU)	Project Monitoring Plan, with relevant annexes.
07.06.2004, Chisinau	Chief forest engineers, representatives from TUV SUD Company,	A. Ciobanu, P. Rotaru (Moldsilva), D. Galupa (FRMI, PIU)	Recommendations, tasks for initial verification within MSCP.
10.12.2004, Chisinau	Chief forest engineers, engineers for forest regeneration	A. Ciobanu, P. Rotaru, P. Stratulat (Moldsilva), D. Galupa (FRMI, PIU)	New requirements for MSCP, documentation, implementation etc.
28.01.2005, Chisinau	Chief forest engineers,	A. Ciobanu, P. Rotaru (Moldsilva), D. Galupa (FRMI, PIU)	Progress in planting, plans for spring time, composition of forest crops etc.
10.06.2005, Chisinau	Chief forest engineers, engineers for forest regeneration	P. Rotaru (Moldsilva), D. Galupa (PIU)	Progress in MSCP implementation, results of spring inventory, composition of forest crops etc.
11.10.2005, Orhei	Directors, Chief forest engineers from all FE	A. Popuşoi, A. Ciobanu, P. Rotaru (Moldsilva), D. Galupa (FRMI, PIU)	Progress in MSCP implementation, increasing of the Project area, biodiversity issues, peculiarities of planting of forest crops in fall 2005 etc.
12.10.2006, Chisinau	Chief engineers, engineers for forest regeneration from all FE	P. Rotaru (Moldsilva), D. Galupa, I. Talmaci (FRMI, PIU)	New forestry projects: progress in presentation of initial documentation, present tasks. Progress in MSCP implementation.
12.06.2009, Chisinau	Chief forest engineers, engineers for forest regeneration form all FE	P. Rotaru (Moldsilva); D. Galupa (FRMI, PIU);	MSCP and MCFDP: implementation progress, current tasks etc.
26.11.2009, Chisinau	Chief forest engineers, engineers for forest regeneration form all FE	P. Rotaru (Moldsilva); dr. D. Galupa (FRMI, PIU);	MSCP and MCFDP: implementation progress, current tasks, results of forest inventory etc.
10.12.2009, Chisinau	Chief forest engineers, engineers for forest regeneration form all FE	P. Rotaru (Moldsilva); dr. D. Galupa (FRMI, PIU);	MSCP and MCFDP: implementation progress, current tasks, presentation of reports etc.
19.02.2010,	Chief forest engineers,	P. Rotaru (Moldsilva); dr. D.	MSCP and MCFDP: implementation

Date & place	Participants	Reporters	Issues discussed
Chisinau	engineers for forest regeneration form all FE	Galupa (FRMI, PIU);	progress, current tasks, condition of forest crops etc.
13.04.2011, Chisinau	Training of FRMI staff for sampling for the determination of C content in biomass in project area.	Dr. D. Galupa, I. Talmaci, (FRMI, PIU); dr. V. Caisin (head of staff for sampling)	Project Monitoring Plan with relevant annexes.
10.10.2011, Chisinau	Training of FRMI staff for sampling for the determination of C content in biomass in project area.	Dr. D. Galupa, I. Talmaci, (FRMI, PIU); dr. V. Caisin (head of staff for sampling)	Project PDD and Monitoring Plan with relevant annexes.
01.12.2011, Chisinau	Training of FRMI staff for verificarea calităţii lucrărilor de monitorizare a proiectului „Conservarea solurilor în Moldova”.	Dr. D. Galupa, I. Talmaci, (FRMI, PIU); dr. V. Caisin (head of staff for sampling)	Project PDD and Monitoring Plan with relevant annexes.

SECTION D. Data and parameters

This section includes parameters used for the calculation of the baseline and actual net GHG removals by sinks, project emissions and leakage as well as other relevant parameters required by the approved methodology and the monitoring plan; and specific information on how data and parameters have been monitored during the monitoring period. Data that is determined once for the crediting period but used after registration of the project activity is included under section D.1.

For ach parameter the following information is providedin the tables below:

1. Value of monitored parameter in the period for the purpose of calculating emission reductions.
2. Description of the equipment used to monitor each parameter, including details on accuracy class, and calibration information (frequency, date of calibration and validity), if applicable as per monitoring plan.
3. Measuring and recording method specifying the measurement and recording frequency.
4. Source of data: logbooks, daily records, surveys, etc.
5. Where relevant, the calculation method of the parameter.
6. The QA/QC procedures applied (if applicable per monitoring plan).
7. Information about appropriate emission factors, IPCC default values and any other reference values that have been used in the calculation of emission reductions.

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors	
(Copy this table for each data and parameter. To report multiple values, a table may be used)	
Data / Parameter:	C_{BSL}
Data unit:	*t CO2e*
Description:	Baseline net greenhouse gas removals by sinks
Source of data used:	PDD, p. 62, Table 24: Baseline net GHG removals by sinks (t CO2e)
Value(s) :	**12,401t CO_2 e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data based on pre-project afforestation used for calculation of baseline net GHG removals by sinks
Additional comment:	Sum of baseline net greenhouse gas removals by sinks for the monitoring period from 2002 to 2011

ID number	
Data / Parameter:	Alpha numeric
Description/unit:	Sample plot ID
Value applied:	
Source of data:	Project and plot map, GIS
Recording frequency	
Justification of choice / Measurement procedures (if any):	Not monitored
Any comment:	

ID number	
Data / Parameter:	*iID*
Description/unit:	Stratum *i*D (1, 2, 3, … *mSP* project scenario (*ex post*) strata)
Value applied:	Alpha numeric
Source of data:	Stand map, GIS
Recording frequency	At stand establishment
Justification of choice / Measurement procedures (if any):	100% /Defined
Any comment:	Each stand has a particular year *t*o be planted under each stratum

ID number	
Data / Parameter:	*IDikt*
Description/unit:	Stand ID
Value applied:	Alpha numeric
Source of data:	Stand map, GIS
Recording frequency	At stand establishment
Justification of choice / Measurement procedures (if any):	100% /Defined
Any comment:	Each stand has a particular year *t*o be planted under each stratum

Data / Parameter:	**Confidence interval**
Data unit:	percent
Description:	Confidence level
Source of data used:	
Value(s) :	95%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	For the purpose of QA/QC of measurement
Additional comment:	Not monitored

Data / Parameter:	**p**
Data unit:	percent

Description:	Desired level of precision
Source of data used:	
Value(s) :	10%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	For the purpose of QA/QC of measurement
Additional comment:	Not monitored

Data / Parameter:	**$BEF_{2,j}$**
Data unit:	Dimensionless
Description:	Biomass expansion factor for species j
Source of data used:	Table 3A.1.8, GPG LULUCF IPCC (2003)
Value(s) :	1.4
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Biomass expansion factor is used to calculate the above ground biomass
Additional comment:	

Data / Parameter:	**Rj**
Data unit:	Dimensionless
Description:	Root-shoot ratio for species *j*
Source of data used:	Sources[3]
Value(s) :	see Table 7
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Root-shoot ratio is used to calculate the below ground biomass
Additional comment:	Root to shoot ratio is calculated according to national and international sources mentioned in footnote

Table 7: Root-shoot ratio for the main species planted under the Project

Age	Main species				
	Robinia III	Robinia IV	Quercus III	Quercus IV	Populus III
Young 1*	0.63	0.67	0.62	0.67	0.50
Young 2*			0.56	0.56	

[3] 1. Giurgiu V., I. Armăsescu S. (1972). Biometria arborilor şi arboretelor din România. Editura Ceres Bucureşti M. S.; (p. 273 and 720; p. 273 and 721).
2. Gosudarstvennyi Komitet SSSR po lesnomu hozeastvu (1987). Normativno-spavochnye materialy dlea taksatstyi lesov Ukrainy I Moldavii. Kiev "Urojai" (Ukrainian and Moldavian Yield Tables), p. 225; p. 259.
3. G.J. Nabuurs, J.F. Garza-Caligaris, M. Kanninen, T. Karjalainen, T. Lapvetelainen, J. Liski, O. Masera, G.M.J. Mohren, A. Pussinen, and M.J.Schelhaas. European Forest Institute. CO2Fix Model Version 2.0.1; Samples.
4. Utkin, A.; Zamolodcikov, D. (1997). Lesovedenie, Nr. 5, Moskova.
5. Giurgiu, V. (1990). Ecuatia de regresie a volumului la arborii forestieri din Romania. Revista Padurilor 105 (3-4):145-150.
6. Kapp, G., Horst, A., Galupa, D., Talmaci, I., Spitoc, L., Horn, L., von Velsen-Zerweck, M., Grigoriev, P. and T. Danii. 2003. Moldova Soil Conservation Project carbon Sequestration and Emission Reductions Study. GFA Terra Systems.
7. Kapp, G., Horst, A., Galupa, D., Talmaci, I., Spitoc, L., Horn, L., von Velsen-Zerweck, M., Grigoriev, P. and T. Danii. 2003. Moldova Soil Conservation Baseline Study. GFA Terra Systems.
8. International Panel on Climate Change (IPCC) GPG for National Greenhouse Gas Inventories, 2003 (Chapter 3 LULUCF; Table 3A.1.8);
9. International Panel on Climate Change (IPCC) 2006 Guidelines for National Greenhouse Gas Inventories. Volume 4 AFOLU (Agriculture, Forestry and Other Land-use). Chapter 4: Forest Land.

Middle age	0.46	0.55	0.49	0.49	0.32
Most mature and mature	0.32	0.33	0.34	0.34	0.25

* Young 1 and Young 2 reffer only to Quercus spp. because of their long rotation age.

Data / Parameter:	**Allometric equation**
Data unit:	Dimensionless
Description:	Allometric equation for species j
Source of data used:	ICAS Moldova/Romania
Value(s) :	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Allometric equation is used for species for which equations are available to calculate the above ground biomass
Additional comment:	

Data / Parameter:	**Dj (Robinia)**
Data unit:	tonnes d.m. m^{-3}
Description:	Basic wood density for species *j* (Robinia)
Source of data used:	Baseline Report for Moldova Soil Conservation Project, 2003
Value(s) :	0,7
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Wood density is used to convert the volume of wood into biomass
Additional comment:	

Data / Parameter:	**Dj (Oak)**
Data unit:	tonnes d.m. m^{-3}
Description:	Basic wood density for species *j* (Oak)
Source of data used:	Osadciev V.G., Ivankov P.T., Sergovschi P.S. et. Al: Spravocinik po derevoobrabotke (dlea tzehov şirpotreba leshozov), Moskva, 1955;
Value(s) :	0,675
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Wood density is used to convert the volume of wood into biomass
Additional comment:	

Data / Parameter:	**Dj (Populous)**
Data unit:	tonnes d.m. m-3
Description:	Basic wood density for species j (Populus)
Source of data used:	Osadciev V.G., Ivankov P.T., Sergovschi P.S. et. Al: Spravocinik po derevoobrabotke (dlea tzehov şirpotreba leshozov), Moskva, 1955;
Value(s) :	0,42
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Wood density is used to convert the volume of wood into biomass
Additional comment:	

Data / Parameter:	Dj (Shrubs)
Data unit:	tonnes d.m. m^{-3}
Description:	Basic wood density for species *j* (Shrubs)
Source of data used:	Osadciev V.G., Ivankov P.T., Sergovschi P.S. et. Al: Spravocinik po derevoobrabotke (dlea tzehov şirpotreba leshozov), Moskva, 1955;
Value(s) :	0,62
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Wood density is used to convert the volume of wood into biomass
Additional comment:	

Data / Parameter:	CFj
Data unit:	tonnes C (tonne d.m.)-1
Description:	Carbon fraction for species *j*
Source of data used:	IPCC (2003)
Value(s) :	0.5 (default)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Carbon fraction default value is used to convert biomass in to carbon stock
Additional comment:	

D.2. Data and parameters monitored	
(Copy this table for each data and parameter. To report multiple values, a table may be used)	
Net GHG Removals by sinks	
Data / Parameter:	**A_i**
Data unit:	Hectares
Description:	Area of stratum i
Measured /Calculated /Default:	Measured
Source of data:	Project
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks, Project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	GIS or/and GPS
Measuring/ Reading/ Recording frequency:	At the start of the project and thereafter at monitoring intervals prior to each verification
Calculation method (if applicable):	
QA/QC procedures applied:	Checked during monitoring period

Data / Parameter:	A
Data unit:	Hectares
Description:	Total size of all strata (A) , e.g the total project area
Measured /Calculated /Default:	Calculated
Source of data:	Project
Value(s) of monitored parameter:	20,289.91
Indicate what the data are used for	Net GHG removals by sinks,

(Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	GIS or/and GPS
Measuring/ Reading/ Recording frequency:	At the start of the project and thereafter at monitoring intervals prior to each verification
Calculation method (if applicable):	
QA/QC procedures applied:	Checked during monitoring period

Data / Parameter:	**A_{ikt}**
Data unit:	Hectares
Description:	Area of stratum i , stand model k, at time t
Measured /Calculated /Default:	Measured/calculated
Source of data:	Project
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks, Project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	GIS or/and GPS
Measuring/ Reading/ Recording frequency:	At the start of the project and adjusted thereafter every 5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Checked during monitoring period

Data / Parameter:	**AP**
Data unit:	**m^2**
Description:	Sample plot area
Measured /Calculated /Default:	Measured
Source of data:	Project
Value(s) of monitored parameter:	250
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	GIS or and GPS, compass
Measuring/ Reading/ Recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Plot location and area checked and verified during monitoring period

Data / Parameter:	**t ID**
Data unit:	**year**

Description:	Age of plantation
Measured /Calculated /Default:	Counted since year of planting
Source of data:	Project
Value(s) of monitored parameter:	years
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Age is verified during monitoring period

Data / Parameter:	**tr ID**
Data unit:	
Description:	No of tree per plot per stratum
Measured /Calculated /Default:	
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	number
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Trees are counted in the plots of each stratum.

Data / Parameter:	**n**
Data unit:	**Number**
Description:	Sample size (total number of sample plots required in the project area) in the project area
Measured /Calculated /Default:	calculated
Source of data:	Project
Value(s) of monitored parameter:	number
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Plot location and area checked and verified during monitoring period

Data / Parameter:	**n*i***
Data unit:	**Number**
Description:	Sample size (total number of sample plots required in the project area) in stratum *i*
Measured /Calculated /Default:	Calculated
Source of data:	Project
Value(s) of monitored parameter:	number
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures applied:	Plot location and area checked and verified during monitoring period

Data / Parameter:	**Latitude/longitude of sample plot location**
Data unit:	**lat/long coordinates**
Description:	Location of sample plots
Measured /Calculated /Default:	Measured
Source of data:	Project and plot maps, GPS, GIS
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	GPS coordinates
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	GPS
Measuring/ Reading/ Recording frequency:	5 years
Calculation method (if applicable):	
QA/QC procedures applied:	Sample plot locations are checked and verified using GPS coordinates

Data / Parameter:	**DBH/collar diameter for shrubs**
Data unit:	**Cm**
Description:	Diameter at breast height of living trees
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	Diameter of trees measured and recorded as part of sample plot measurement
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last	Diameter tape, calliper

calibration, validity)	
Measuring/ Reading/ Recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures applied:	Diameter measurements are randomly checked during monitoring period

Data / Parameter:	**Hj**
Data unit:	**meters**
Description:	Height of species j
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	Height of trees measured and recorded as part of sample plot measurement
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Hypsometer
Measuring/ Reading/ Recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures applied:	Height measurements are randomly checked during monitoring period

Data / Parameter:	**Standing deadwood**
Data unit:	**Tonnes C**
Description:	Standing dead wood of species j
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	Diameter of trees measured and recorded as part of sample plot measurement
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Line intersect method
Measuring/ Reading/ Recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures applied:	Measurements are randomly checked during monitoring period

Data / Parameter:	**Lying deadwood**
Data unit:	**Tonnes C**
Description:	Lying dead wood of species j
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	Diameter of trees measured and recorded as part of sample plot measurement
Indicate what the data are used for (Baseline/ Project/ Leakage	Net GHG removals by sinks

emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Line intersect method
Measuring/ Reading/ Recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures applied:	Measurements are randomly checked during monitoring period

Data / Parameter:	**Litter biomass**
Data unit:	**Tonnes C**
Description:	Carbon stock in litter
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	Wet of litter samples measured in field as part of sample plot measurement and dry weight is recorded in laboratory
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Sample frame and scales to measure litter in the field and equipment to dry it in laboratory
Measuring/ Reading/ Recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures applied:	Measurements are randomly checked during monitoring period

Data / Parameter:	**Soil carbon**
Data unit:	**Tonnes C**
Description:	Soil carbon
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	0.8 tonnes C/ha/year
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Net GHG removals by sinks
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Default value applicable to the methodology AR AM0002 as per Annex 26, EB63
Measuring/ Reading/ Recording frequency:	
Calculation method (if applicable):	
QA/QC procedures applied:	Measurements are randomly checked during monitoring period

Project emissions

Data / Parameter:	**B_{ijt}**

Data unit:	**tonnes d.m. ha-1**
Description:	Average above-ground biomass burnt in natural fire for stratum i , species j , time t
Measured /Calculated /Default:	Measured
Source of data:	Sample plot measurement
Value(s) of monitored parameter:	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emissions
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Before burning
Calculation method (if applicable):	BEF method
QA/QC procedures applied:	Biomass measurement is checked and verified during monitoring period

SECTION E. Emission reductions calculation

E.1. GHG removals by sink calculation

>>

This section shall include all formulae used and description to calculate the baseline emissions applying actual values. A table may be used and included in this monitoring report or include references to spreadsheet.

Baseline net GHG removals by sinks

The baseline net GHG removals are not monitored. Therefore, the table below presents the values presented in the PDD at project registration.

Table 8. Baseline net GHG removals by sinks

Year	Annual estimation of baseline net anthropogenic GHG removals by sinks in tones of CO_2 e
2002	0
2003	-440
2004	-195
2005	182
2006	649
2007	1,060
2008	1,681
2009	2,372
2010	3,136
2011	3,956
Total estimated baseline net GHG removals by sinks (tones of CO_2 e)	12,401
Total number of crediting years	**9**

Annual average over the crediting period of estimated baseline net GHG removals by sinks (tones of CO_2 e)	**1378.9**

Actual net GHG removals by sinks

Summary of the calculations of the actual net GHG removals by sinks based on the measurements of sample plots are to be provided as the annex 2 to monitoring report. **Tree biomass**

Individual tree biomass (dry matter, C content) is computed with site-specific and specie-specific allometric equations, established by ICAS/Romania and applicable also for the conditions of the Republic of Moldova (see Table 9).

Changes in the carbon stocks of above-ground biomass

The changes in the *ex post* actual carbon stocks of above-ground biomass are calculated from the inventory and measurement data collected at the end of the monitong period.

$$\Delta C_{AB,ijk,t} = (C_{AB,m_2,ijk} - C_{AB,m_1,ijk}) / T_B \quad \textbf{(M.6)}$$

$$C_{AB,m,ijk} = A_{m,ijk} \bullet MC_{AB\_m,ijk} \quad \textbf{(M.7)}$$

where:

$\Delta C_{AB,ijk}$	Average annual changes in carbon stock of above-ground biomass for stratum *i* sub-stratum *j* species *k* in t C yr^{-1} in year *t*
$C_{AB,m2,ijk}$	Carbon stock of above-ground biomass for stratum *i* sub-stratum *j* species *k* calculated at monitoring event m_2 in t C
$C_{AB,m1,ijk,t}$	Carbon stock of above-ground biomass for stratum *i* sub-stratum *j* species *k* calculated at monitoring event m_1 in t C
$A_{m,ijk}$	Area of stratum *i* sub-stratum *j* species *k* at monitor event *m* in ha
$MC_{AB,m,ijk}$	Average carbon stock of above-ground biomass for stratum *i* sub-stratum *j* species *k* at monitoring event *m* in t C ha^{-1}
T_B	Time in years between monitoring events m_2 and m_1 of the biomass monitoring

The average carbon stock of above-ground biomass is the sum of changes in the tree and the non-tree components.

$$MC_{AB,m,ijk} = MC_{AB\_Tree_{m,ijk}} + MC_{AB\_NTree\_Shrub_{m,ijk}} \quad \textbf{(M.8)}$$

where:

$MC_{AB\_Tree,m,ijk}$	Average carbon stock of aboveground tree biomass in stratum *i* sub-stratum *j* species *k* at monitoring event *m* in t C ha^{-1}
$MC_{AB\_NTree\_Shrub,m,ijk}$	Average annual change in carbon stock of aboveground non-tree shrub component in stratum *i* sub-stratum *j* species *k* at monitoring event *m* in t C ha^{-1}

The average carbon stock of tree and shrub for each stratum was calculated by averaging across the plots in a stratum or sub-stratum as outlined below.

$$MC_{AB\_Tree,m,ijk} = \frac{\sum_{p=1}^{P_{ijk}} C_{AB\_Tree,m,ijk,p}}{P_{ijk}} \quad \textbf{(M.9)}$$

$$MC_{AB\_NTree\_Shrub,m,ijk} = \frac{\sum_{p=1}^{P_{ijk}} C_{AB\_NTree\_Shrub,m,ijk,p}}{P_{ijk}} \quad \textbf{(M.10)}$$

Note: The subscripts *ij* refers to the strata and sub-strata (stands) of planted tree species.

where:

$C_{AB\_Tree,m,ijk,p}$	Plot level above-ground tree carbon stock in stratum *i* substratum *j* species *k* at monitoring event *m* in t C ha^{-1}
$MC_{AB\_NTree\_Shrub,m,ijk,p}$	Plot level above-ground non-tree shrub carbon stock in stratum *i* substratum *j* species *k* at monitoring event *m* in t C ha^{-1}
p	Plot number in stratum *i*, substratum *j* species *k*
P_{ijk}	Number of plots in stratum *i* substratum *j* species *k*

The carbon stock of per tree above-ground biomass was estimated by relating the biomass to DBH and height using selected allometric equations applied to the tree measurements and multiplying the carbon fraction of tree biomass.

$$C_{AB\_Tree_k} = f(DBH_k, H_k) \bullet CF_k \quad \textbf{(M.11)}$$

where:

$C_{AB\_Tree_k}$	Carbon stock of above-ground tree biomass of species *k* in t.d.m. ha^{-1}
$f(DBH_k, H_k)$	Allometric equation linking merchantable volume to the mean diameter at breast height (*DBH*) in meters and tree height (*H*) meters

The above-ground biomass carbon per plot on a per area basis was calculated by summing the biomass carbon per tree within each plot and multiplying with the plot expansion factor which is proportional to the area of the measurement plot and then divided by 1,000 to convert from kg to tonnes.

$$C_{AB\_Tree,m,ijk,p} = \frac{\left(\sum_{tr=1}^{TR} C_{AB,Tree,m,ijk} \cdot XF\right)}{1000} \quad \textbf{(M.12)}$$

$$XF = \frac{10{,}000}{A_p} \quad \textbf{(M.13)}$$

where:

$C_{AB\_Tree,m,ijk,p}$	Plot level above-ground tree carbon stock of stratum *i* sub-stratum *j* species *k* plot *p* at monitoring event *m* in t C ha^{-1}
XF	Expansion factor to represent the per plot value to per hectare value

A_p	Plot area in m^2
tr	Tree (TR = total number of trees in the plot)

The average carbon stock of tree biomass for each stratum was calculated by averaging across the plots in a stratum as represented in the equation M.9.

Non-tree shrub biomass (C_{AB_NTree})

The parameters of height and diameter shall be measured to estimate the shrub biomass. The allometric equations for shrubs used diameter at base (*DB*), shrub height (*H*), crown area (*CA*) and the number of stems (*N*).

$$C_{AB\_NTree\_Shrub_{ijk,p}} = f_k(DB, H, CA, N) \bullet CF_{Shrub} \quad \textbf{(M.15)}$$

Note: ij refer to the shrubs present in the stratum and substratum (stand) of planted tree species.

where:

$C_{AB\_NTree\_Shrub,m,ijk,p}$	Carbon stock of above-ground shrub biomass for tree stratum *i* sub-stratum *j* species *k* plot *p* at monitoring event *m* in t $C.ha^{-1}$
$f_k(DB, H, CA, N)$	Allometric equation linking above-ground biomass (d.m. ha^{-1}) of shrubs to diameter at base (*DB*), shrub height (*H*), crown area (*CA*) and number of stems per hectare (*N*)
CF_{Shrub}	Carbon fraction of the above ground shrub biomass; dimensionless

Table 9. Allometric equations for tree biomass[4]

Item	Type of relation	Format of equations			
Tree dry biomass	Allometric equations (site-specific, specie- specific). equations are valid for trees in plantations under 6 years	$M=e^a * X^b * CF$ where, M is the dependent variable (biomass); X is the independent variable (Dbh, Dch, H); a, b are the regression coefficients and CF is the correction factor. After logarithmical transformation into linear, implemented in Excel as: ln M = ln a + b ln D where M = ABGTB aboveground total biomass (g), or Roots for calculated species *e* – the base of natural logarithm a – scaling factor of the equation b – scaling exponent of the equations D - Dch - Collar diameter (mm), Dbh – Breast diameter (cm) CF- correction coefficient (computed base don standard error of the estimate)			
			ln a	b	CF
		Eleagnus angustifolia ABGTB (dch)	-3.9276	3.1470	1.1009
		Eleagnus angustifolia FOLIAGE (dch)	-4.8907	2.9989	1.7612
		Eleagnus angustifolia ROOTS (dch)	-3.3168	2.5595	1.1882
		Eleagnus angustifolia ABGTB (dbh)	4.9209	2.7844	1.1604
		Eleagnus angustifolia FOLIAGE (dbh)	2.3242	4.0248	1.7648
		Eleagnus angustifolia ROOTS (dbh)	3.9099	2.2295	1.2238
		Fraxinus excelsior ABGTB (dch)	-2.6559	2.7697	1.1669
		Fraxinus excelsior FOLIAGE (dch)	-2.6256	2.3452	1.0839
		Fraxinus excelsior ROOTS (dch)	-0.7746	1.8574	1.2696
		Fraxinus excelsior ABGTB (dbh)	4.0043	3.0495	1.2045
		Fraxinus excelsior FOLIAGE (dch)	3.2891	2.3576	1.1137
		Fraxinus excelsior ROOTS (dch)	3.5168	2.1242	1.2564
		Gledicia triacantos ABGTB (dch)	-2.9685	2.7390	1.1117
		Gledicia triacantos FOLIAGE (dch)	-2.8521	2.1436	1.1623

[4] Allometric biomass equations for young broadleaved trees in plantations in Romania, V. Blujdea, R. Pilli, I. Dutca, L. Ciuvat, I.V. Abrudan. Forest Ecology and Management. http://www.elsevier.com/locate/foreco

Item	Type of relation	Format of equations			
		Gledicia triacantos ROOTS(dch)	-2.5047	2.4291	1.2293
		Gledicia triacantos ABGTB (dbh)	4.6960	1.7067	1.0856
		Gledicia triacantos FOLIAGE (dbh)	3.4109	1.1769	1.0536
		Gledicia triacantos ROOTS(dbh)	4.4138	1.3856	1.1345
		Populus alba ABGTB	-1.2947	2.1367	1.1188
		Populus alba FOLIAGE (dch)	-2.6067	2.0100	1.3794
		Populus alba ROOTS (dch)	-0.8599	1.6970	1.1471
		Populus alba ABGTB (dbh)	4.3886	2.1848	1.2183
		Populus alba FOLIAGE (dbh)	2.6844	2.0337	1.4730
		Populus alba ROOTS (dbh)	3.5877	1.6989	1.2044
		Querqus sp. ABGTB (dch)	-1.5672	2.1580	1.0808
		Querqus sp. FOLIAGE (dch)	-1.6938	1.7455	1.200
		Querqus sp. ROOTS (dch)	0.1197	1.5019	1.0850
		Robinia pseudoacacia ABGTB (dch)	-2.2535	2.5887	1.0245
		Robinia pseudoacacia FOLIAGE(dch)	1.2123	1.1215	1.1485
		Robinia pseudoacacia ROOTS (dch)	-1.1378	1.9850	1.0526
		Robinia pseudoacacia ABGTB (dbh)	4.3827	2.4631	1.0310
		Robinia pseudoacacia FOLIAGE(dbh)	4.1438	1.0185	1.1796
		Robinia pseudoacacia ROOTS (dch)	3.6264	2.0413	1.0538
		Salix alba ABGTB (dch)	-5.3386	3.2297	1.0994
		Salix alba FOLIAGE (dch)	-10.4773	3.9467	1.7796
		Salix alba ROOTS (dch)	-4.7489	2.8426	1.2161
		Rosa canina ABGTB (dch)	-2.8316	2.4364	1.2853
		Rosa canina FOLIAGE (dch)	4.0938	2.3632	1.3238
		Rosa canina ROOTS (dch)	3.5988	2.4928	1.6582
		Other species	-2.6761	2.6494	1.1401

Item	Type of relation	Format of equations			
		ABGTB (dch)			
		Other species FOLIAGE (dch)	-1.0248	1.6702	1.1401
		Other species ROOTS (dch)	-1.8654	2.0900	1.1636
		Other species ABGTB (dbh)	4.4414	2.3666	1.1979
		Other species FOLIAGE (dbh)	3.4111	1.4866	1.4209
		Other species ROOTS (dbh)	3.7327	1.8965	1.1955

Calculation of aboveground biomass

Steps in calculation of above ground tree biomass as follows.

- Basal diameter was individually recorded for each tree species on each PMP in the field sheets;
- Number of trees for each species for each PMP (N) were counted;
- Biomass of individual trees by species in the PMP was calculated using allometric equations;
- Biomass on each species calculated based on number of trees and biomass of individual trees of a species in the PMP;
- Total aboveground tree biomass on PMP was calculated;
- Aboveground tree biomass is expanded from the area of PMP (50 m^2) to 1 ha by multiplying with a factor of 10^4.
- Biomass transformation from (g DM) to (to DM) was multiplied by a factor of 10^6. To transform DM to C) the biomass on ha was multiplied by 0.5 (to convert dry matter to carbon content) and then multiplied by 44/12 to transform C content in CO^2 removal.

Below-ground biomass (C_{BB})

The below-ground biomass pool is estimated from the above-ground biomass using the root-to-shoot ratio. The carbon stock of below-ground biomass is calculated as a product of above-ground biomass of tree and shrub components and the root-shoot ratio of the species in the respective components.

$$C_{BB,m,ijk} = A_{m,ijk} \bullet MC_{BB,m,ijk} \quad \textbf{(M.16)}$$

$$MC_{BB,m_{ijk}} = A_{m,ijk}[MC_{AB\_Tree_{m,ijk}} \bullet R_{T,jk} + MC_{AB\_NTree\_Shrub_{m,ijk}} \bullet R_S] \quad \text{(M.17)}$$

where:

$A_{m,ijk}$ Area of stratum *i* sub-stratum *j* species *k* at monitoring time *m* in ha

$MC_{BB,m,ijk}$ Average carbon stock of below ground biomass for stratum *i* sub-stratum *j* tree species *k* at monitor time *m* in t C ha^{-1}

$R_{T,\,jk}$	Root-shoot ratio for tree species *k* age class *j*; dimensionless
R_S	Root-shoot ratio for shrub; dimensionless

The average annual carbon stock change in the below-ground biomass is estimated from the data on carbon stock measurement at two monitoring intervals.

$$\Delta C_{BB,ijk,t} = (C_{BB,m_2,ijk} - C_{BB,m_1,ijk}) / T_B \quad \text{(M.18)}$$

where:

$C_{BB,ijk,t}$	Average annual carbon stock change in the below-ground biomass in stratum *i* sub-stratum *j* species *k* in t C. yr^{-1} in year *t*
$C_{BB,m2,ijk}$	Carbon stock of the below-ground biomass for stratum *i* sub-stratum *j* species *k* calculated at monitoring event m_2 in t C
$C_{BB,m1,ijk}$	Carbon stock of the below-ground biomass for stratum *i* sub-stratum *j* species *k* calculated at monitoring event m_1 in t C
T_B	Time in years between monitoring events m_2 and m_1 of the biomass monitoring

Scaling up of carbon stock to strata and project levels

Based on project stratification on species and age of the plantations the biomass amount on 1 ha was scaled up to the corresponding homogenous area occupied by that strata and then summed up to the total area shown below. This calculation represents aboveground and below ground tree biomass.

Table 10. Scaling of tree biomass up to project strata

Stratum Name	Area (ha)	Average biomass (kg DM/ha)	Total biomass on strata (kg DM/ha)	Total biomass on strata (tDM)	Total carbon on strata (tC)	Actual net GHG removals by biomass on strata (t CO_2e)
Pinus_PoorSoil_Age>5_Surv>50	4.10	26087.60	106959.16	103.482	53.48	196.09
Poplar_RichSoil_Age>5_Surv_25,1-50	58.60	222.80	13056.08	13.056	6.53	23.94
Poplar_RichSoil_Age>5_Surv_>50	158.98	1457.72	231748.05	231.748	115.87	424.87
Quercus_PoorSoil_Age>5_Surv_>50	231.58	48319.04	11189722.50	2745.613	5594.86	20514.49
Quercus_RichSoil_Age<5_Surv_>50	61.84	2403.20	148613.89	148.614	74.31	272.46
Quercus_RichSoil_Age>5_Surv_25,1-50	95.0	5153.92	489622.21	489.622	244.81	897.64
Quercus_RichSoil_Age>5_Surv_>50	786.36	5140.80	4042519.49	3098.887	2021.26	7411.29
Robinia_PoorSoil_Age<5_Surv_25,1-50	89.20	800.92	71442.35	71.442	35.72	130.98
Robinia_PoorSoil_Age<5_Surv_<50	34.90	1546.61	53976.62	53.977	26.99	98.96

Stratum Name	Area (ha)	Average biomass (kg DM/ha)	Total biomass on strata (kg DM/ha)	Total biomass on strata (tDM)	Total carbon on strata (tC)	Actual net GHG removals by biomass on strata (t CO_2e)
Robinia_PoorSoil_Age>5_Surv_25,1-50	619.79	1424.66	882987.03	810.251	441.49	1618.81
Robinia_PoorSoil_Age>5_Surv_>50	4367.91	21812.83	95276456.94	93181.780	47638.23	174673.50
Robinia_RichSoil_Age<5_Surv>25,1-50	64.50	863.39	55688.60	55.689	27.84	102.10
Robinia_RichSoil_Age<5_Surv>_50	127.9	24190.43	3093955.58	2452.227	1546.98	5672.25
Robinia_RichSoil_Age>5_Surv_25,1-50	1530.83	13958.22	21367662.44	17362.272	10683.83	39174.05
Robinia_RichSoil_Age>5_Surv_>50	10082.78	23845.60	240429971.29	237385.199	120214.99	440788.28
Area affected by various natural disasters (stratum zero removals)	1,975.64	0	0	**0**	**0**	**0**
TOTAL	**20,289.91**	**-**	**377454382.23**	**358203.858**	**188727.19**	**691999.70**

Note: DM – dry mass

Litter

Because of the first monitoring event, due to the young age of trees, dead wood was not found. Litter was be sampled using a fixed-area sampling frame of 0.30 m^2, placed four times at random locations within a monitoring plot (5m X 50m). At each location, all litter (leaves, fruits, small wood, etc.) that falls inside the frame was collected and oven dried (80^o C) to a constant weight to determine dry mass. The fresh weight of the total sample was recorded in the field, and a sub-sample taken for moisture content determination, from which the total dry matter was calculated.

$$C_{L_{m,ijk}} = A_{ijk} \bullet C_{L\_wet_{m,ijk}} \bullet (1 - MP_L) \bullet (1/a_{ijk}) \bullet (1/100) \quad \textbf{(M.23)}$$

where:

$C_{L,m,ijk}$ Carbon in dry litter biomass at monitor time *m* in t·C

$C_{L\_wet,m,ijk}$ Carbon in wet litter biomass at monitoring time *m* in g·m^{-2}

MP_L Weight fraction of moisture of litter biomass (0 to 1) [(wet weight – dry weight)/wet weight], dimensionless

a_{ijk} Area of sampling frame in m^2

The average annual change in the carbon stock of litter from the data at two monitoring intervals shall be calculated. .

$$\Delta C_{L,m_{ijk},t} = [(C_{L_{m_2,ijk}} - C_{L_{m_1,ijk}}) / T_L] \bullet CF_L \quad \textbf{(M.24)}$$

where:

$\Delta C_{L,m,ijk,t}$ Average annual change in the biomass of litter in stratum *i* sub-stratum *j* species *k* at monitoring event *m* in t C yr^{-1}

$C_{L,m2,ijk}$ Carbon stock of litter in stratum *i* sub-stratum *j* species *k* at monitoring event m_2 in t C

$C_{L,m1,ijk}$ Change in the biomass of litter in stratum *i* sub-stratum *j* species *k* at monitoring event m_1 in t C

T_L Monitoring interval for litter $T_L=m_2-m_1$ in years

CF_L Carbon fraction of litter; dimensionless

Table 11. Scaling up of litter calculation to project strata:

Stratum Name	Area (ha)	Average litter biomass (kg DM/ha)	Total litter biomass on strata (kg DM/ha)	Total litter biomass on strata (tDM)	Total carbon on strata (tC)	Actual net GHG removals by litter biomass on strata (t CO2e)
Pinus_PoorSoil_Age>5_Surv>50	4.10	4408,60	18075,27	18,075	9,038	33,138
Poplar_RichSoil_Age>5_Surv_25,1-50	58.60	2688,17	157526,88	157,527	78,763	288,799
Poplar_RichSoil_Age>5_Surv_>50	158.98	537,63	85473,12	85,473	42,737	156,701
Quercus_PoorSoil_Age>5_Surv_>50	231.58	2877,20	666302,97	666,303	333,151	1221,555
Quercus_RichSoil_Age<5_Surv_>50	61.84	1935,48	119690,32	119,690	59,845	219,432
Quercus_RichSoil_Age>5_Surv_25,1-50	95.0	3870,97	367741,94	367,742	183,871	674,194
Quercus_RichSoil_Age>5_Surv_>50	786.36	2551,46	2006367,95	2006,368	1003,184	3678,341
Robinia_PoorSoil_Age<5_Surv_25,1-50	89.20	3225,81	287741,94	287,742	143,871	527,527
Robinia_PoorSoil_Age<5_Surv_<50	34.90	2043,01	71301,08	71,301	35,651	130,719
Robinia_PoorSoil_Age>5_Surv_25,1-50	619.79	2945,22	1825419,60	1825,420	912,710	3346,603
Robinia_PoorSoil_Age>5_Surv_>50	4367.91	5305,43	23173625,57	23173,626	11586,813	42484,980
Robinia_RichSoil_Age<5_Surv>25,1-50	64.50	4193,55	270483,87	270,484	135,242	495,887
Robinia_RichSoil_Age<5_Surv>_50	127.9	8916,94	1140476,05	1140,476	570,238	2090,873
Robinia_RichSoil_Age>5_Surv_25,1-50	1530.83	4732,20	7244187,32	7244,187	3622,094	13281,010
Robinia_RichSoil_Age>5_Surv_>50	10082.78	4842,90	48829919,11	48829,919	24414,960	89521,518
Area affected by various natural disasters (stratum zero removals)	1,975.64	-	-	-	-	-
TOTAL	**20,289.91**	-	86264332,97	86264,33	43132,17	158151,28

Soil Carbon

The rate of change in SOC stock in project scenario is reached is estimated as per the latest version of *AR AM Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities* as follows.

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * fI_{N,i}$$ AR Tool (1)

Where:

$SOC_{INITIAL,I}$ = SOC stock at the beginning of the A/R CDM project activity in stratum *i* of the areas of land; t C ha^{-1}

$SOC_{REF,i}$ = Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation. normally forest) by climate region and soil type applicable to stratum *i* of the areas of land;

t C ha^{-1}

$f_{LU,i}$ = Relative stock change factor for baseline land-use in stratum i; the land use factor of grassland is adopted as the as the lands under the baseline are degraded lands and pastures. As per A/R Methodological Tool - .Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities.Table 6, Annex 12, EB60, land use factor of 1.0 is applied.

$f_{MG,i}$ = Relative stock change for management regime, dimensionless; as per **A**/R Methodological Tool - .Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities**,**Table 6, Annex 12, EB60, management factor of 0.7 for severely degraded lands is applied.

$f_{FI,i}$ = Relative stock change factor for inputs the baseline, dimensionless;No inputs are used in the baseline, therefore as per Table 6, the input factor of 1.0 is applied

i = *1, 2, 3, .* strata of project; dimensionless

As per the paragraph 8, of the tool, the values of $SOC_{REF,I}$; fLU,i, fMG,i, and fI,i, adopted from Table 3 and Table 6. The climatic regime applicable to the project is the moist cold temeperate and soils of the project are chernozems. Therefore, SOC_{REF} stock for mineral soil corresponding to moist cold temeperate climate regime and high activity clay (HAC) in Table 3 has been adopted.

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * fI_{N,i}$$

$SOC_{INITITIAL,I}$ = 95 *1.0 * 0.7 * 1.0

= 66.5 t C ha^{-1}

For each stratum of the areas of land which is subjected to soil disturbance attributable to project activity over and above the area disturbed in the baseline, is less than 10% of the area of the stratum, therefore, as per the paragraph 9 of the tool, soil carbon loss is assumed to be zero.

$SOC_{loss,I}$ = 0 AR Tool (3)

$SOC_{loss,I}$ = Loss of SOC caused by soil disturbance attributable the A/R CDM project activity, in stratum *i* of the areas of land; t C ha-1

i = *1, 2, 3, .* strata of project; dimensionless

The rate of change in SOC stock in project scenario until the steady-state SOC content is reached is estimated as follows:

$dSOC_{t,i} = 0$ for t < t prep,I AR Tool (4)

$$dSOC_{t,i} = \frac{SOC_{LOSS,i}}{1year} \quad \text{for t = t prep,I} \qquad \text{AR Tool (5)}$$

$$dSOC_{t,i} = \frac{SOC_{REF,i} - (SOC_{INITIAL,i} - SOC_{LOSS,i})}{20} \quad \text{for t prep i} < t \leq \text{t prep,I +20} \qquad \text{AR Tool (6)}$$

Where,

dSOC, = rate of change in SOC stock in stratum i of the areas of land in year t. t C $ha^{-1}yr^{-1}$

t *PREP,i* = The year in which first soil disturbance takes place in stratum *i* of the areas of land

$SOC_{LOSS\,i}$ = Loss of SOC caused by soil disturbance attributable the A/R CDM project activity in stratum *i* of the areas of land; t C ha-1

SOC_{REF} = Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation . normally forest) by climate region and soil type applicable to stratum *i* of the areas of land; t C ha-1

$SOC_{INITIALi}$ = SOC stock at the beginning of the A/R CDM project activity in stratum *i* of the areas of land; t C ha-1

i = *1, 2, 3*, . strata of areas of land; dimensionless

t = *1, 2, 3,* . years elapsed since the start of the A/R CDM project activity

$$dSOC_{t,i} = \frac{95 - (66.5 - 0)}{20} = 1.425$$

As per the tool, value of the rate of change of SOC stock is not accounted as more than 0.8 t C ha-1 yr-1,i.e.,

$$If\ dSOC > 0.8\,t\,C\,ha^{-1}\,yr^{-1};\ then\ \ dSOC = 0.8\,t\,C\,ha^{-1}\ yr^{-1} \qquad \text{AR Tool (7)}$$

As project $dSOC_{t,i} = 1.425 > 0.8$; dSOC = 0.8 t C ha^{-1} yr^{-1} has been adopted for the project

The change in SOC stock for all the strata of the areas of land, in year *t*, is calculated as:

$$dSOC_{t,i} = \frac{44}{12} * \sum_{i} Ai * dSOC_{t,i} * 1year \qquad \text{AR Tool (8)}$$

where:

$\Delta\ SOCi,t$ = Change in SOC stock in areas of land meeting the applicability conditions of this tool, in year *t*; t CO2-e

Ai = The area of stratum *i* of the areas of land; ha

dSOC t i = The rate of change in SOC stocks in stratum *i* of the areas of land; t C ha-1 yr-1

i = *1, 2, 3,* . strata of areas of land; dimensionless

Stratum no.	Stratum Name	Aria (ha)	dSOCt,i (t C ha-1 yr-1)	Mean monitoring period (yrs)	SOCi removals, tC	SOCi removals tCO2e
1	Pinus_PoorSoil_Age>5_Surv>50	4,10	0,80	6,61	21,68	79,50
2	Poplar_RichSoil_Age>5_Surv_25,1-50	58,60	0,80	7,65	358,63	1 314,98
3	Poplar_RichSoil_Age>5_Surv_>50	158,98	0,80	8,38	1 065,80	3 907,94
4	Quercus_PoorSoil_Age>5_Surv_>50	231,58	0,80	7,87	1 458,03	5 346,10
5	Quercus_RichSoil_Age<5_Surv_>50	61,84	0,80	3,20	158,31	580,47
6	Quercus_RichSoil_Age>5_Surv_25,1-50	95,00	0,80	7,62	579,12	2 123,44
7	Quercus_RichSoil_Age>5_Surv_>50	786,36	0,80	7,54	4 743,32	17 392,19
8	Robinia_PoorSoil_Age<5_Surv_25,1-50	89,20	0,80	3,00	214,08	784,96
9	Robinia_PoorSoil_Age<5_Surv_<50	34,90	0,80	3,00	83,76	307,12
10	Robinia_PoorSoil_Age>5_Surv_25,1-50	619,79	0,80	7,59	3 763,36	13 799,00
11	Robinia_PoorSoil_Age>5_Surv_>50	4 367,91	0,80	7,85	27 430,47	100 578,41
12	Robinia_RichSoil_Age<5_Surv>25,1-50	64,50	0,80	2,64	136,22	499,49
13	Robinia_RichSoil_Age<5_Surv>_50	127,90	0,80	2,91	297,75	1 091,75
14	Robinia_RichSoil_Age>5_Surv_25,1-50	1 530,83	0,80	7,07	8 658,37	31 747,37
15	Robinia_RichSoil_Age>5_Surv_>50	10 082,78	0,80	7,36	59 367,41	217 680,50
16	Area affected by various natural disasters (stratum zero removals)	1 975,64	0,00	0,00	0,00	0,00
TOTAL		**20 289,91**	**-**	**-**	**108 336,33**	**397 233,23**

Actual GHG removals by sinks

The verifiable changes in the *ex post* carbon stocks are calculated by applying the stock change method to the data collected at the end of first monitoring period

$$\Delta C_{ijk,t} = [\Delta C_{ABijk,t} + \Delta C_{BBijk,t} + \Delta C_{DWijk,t} + \Delta C_{Lijk,t} + \Delta C_{SOC\,ijk,t}] \bullet [44/12] \quad \text{(M.5)}$$

where:

$\Delta C_{,ijk,t}$	Verifiable annual changes in the carbon stock of pools for stratum *i* sub-stratum *j* species *k* in t CO_2-eq yr^{-1} in year *t*
$\Delta C_{AB,ijk,t}$	Verifiable annual changes in the carbon stock of aboveground biomass for stratum *i* sub-stratum *j* species *k* in t C yr^{-1} in year *t*
$\Delta C_{BB,ijk,t}$	Average annual changes in the carbon stock of belowground biomass for stratum *i* sub-stratum *j* species *k* in t C yr^{-1} in year *t*
$\Delta C_{DW,ijk,t}$	Average annual changes in the carbon stock of deadwood for stratum *i* sub-stratum *j* species *k* in t C yr^{-1} in year *t (considered zero in the project)*
$\Delta C_{L,ijk,t}$	Average annual changes in the carbon stock of litter for stratum *i* sub-stratum *j* species *k* in t C yr^{-1} in year *t*
$\Delta C_{SOC,ijk,t}$	Average annual changes in the carbon stock of soil organic matter for stratum *i* substratum *j* species *k* in t C yr^{-1} in year *t*
44/12	Ratio of molecular weights of carbon and $CO_{2;}$ dimensionless

Accumulation of carbon in biomass(aboveground and belowground), litter and soil pools

The verifiable changes in the *ex post* carbon stocks accumulated in biomass (aboveground and belowground), litter and soil pools was summed up and final CO_2 removal was obtained:

- accumulation in biomass: - 691,999.7 tCO2e;
- accumulation in litter: -158,151.28 tCO2e;
- accumulation in soil: - -397,233.23 tCO2e;

- **Total accumulation in the project at the end of first monitoring period: - -1,247,384.21 tCO2e;**
-

E.2. Project emissions calculation

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As per the methodology AR-AM0002, three categories of emissions, i.e., emissions from fossil fuels, emissions

from the loss of non-tree biomass, emissions associated with biomass burning and emissions from fertilizer application are examined for the project context.

Emissions from of decrease in carbon stock in living biomass of existing non-tree vegetation

The degraded lands contain small quantities of non-tree herbaceous vegetation. As per Annex 26, EB 63, asscounting of project emissions from the loss/decrease in herbaceous non-tree vegetation are considered zero.

Emissions from biomass burning

There is no biomass burning in the project, therefore, these emissions are not relevant for the project context.

Emissions from burning fossil fuels for site and soil preparation

As per Annex 26, EB63, estimation and accounting of emissions from burning of fossil fuel within the project boundary is not required. Consequently, these emissions are considered zero. The project does not use nitrogenous fertilizers. Therefore, these emissions are not relevant for the project. Moreover, as per Annex 26, EB63, monitoring of emissions from nitrogenous fertilizers is not required.

E.3. Leakage calculation

>>

As per Annex 26, EB63, the estimation and accounting of emissions from burning of fossil fuel, outside the project boundary is not required. Consequently, the project is not subject to leakage emissions

E.4. Emission reductions calculation / table

>>

This section shall include the formulae used to calculate the emission reductions and the total of the emission reductions achieved during the monitoring period.
Total baseline emissions (from 2002 to 2011):
Total project emissions: 0
Total leakage: 0
Total emission reductions:

$$\Delta C_{ACTUAL,t} = \sum_i \sum_j \sum_k \left[\Delta C_{ijk,t} - GHG_{E,t} \right] \quad \textbf{(M.42)}$$

where:

$\Delta C_{ACTUAL,t}$	Actual net greenhouse gas removals by sinks in t CO_2-eq yr^{-1} for year *t*
$\Delta C_{, ijk,t}$	Average annual change in carbon pools for stratum *i* sub-stratum *j* species *k* in t CO_2 yr^{-1} for year *t*
$GHG_{E,t}$	GHG emissions by sources within the project boundary as a result of the implementation of an A/R CDM project activity in t CO_2-eq yr^{-1} for year *t*
t	Year 1 to the end of crediting period
i	Stratum
j	Substratum (age class)
k	Species

Table 15: Summary of the emissions reductions during the monitoring period:

Activity	**Removal (-) / Emission (+) (t CO2e)**
GHG Removals (CO2e)	
Biomass	- 691,999.7
Litter	- 158,151,28
Accumulation in soil	-397,233.23
Project emissions (CO2*e*)	**0**
Leakage	**0**
Baseline emissions:	**+12,401**
CO_2e Net Project removal	**-1,247,384,21**

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

>>

This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD.

* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

Table 17: Net anthropogenic GHG removals by sinks estimated *ex ante* in the registered CDM A/R PDD for the monitoring period

Summary of results obtained in Sections C.7, D.1, and D.2				
Year	**Estimation of baseline net GHG removals by sinks (tones of CO_2 e)**	**Estimation of actual net GHG removals by sinks (tones of CO_2e)**	**Estimation of leakage (tones of CO_2 e)**	**Estimation of net anthropogenic GHG removals by sinks (tones of CO_2 e)**
2002	0	-13310	115	-13425
2003	0	-5649	115	-5764
2004	0	14479	115	14364
2005	182	44854	115	44558
2006	649	88683	298	87736
2007	1060	115785	290	114435
2008	1681	146247	291	144274
2009	2372	170648	267	168009
2010	3136	197852	154	194562
2011	3956	227889	521	223412
Total (tonnes of CO_2 e)	**13,036**	**987,478**	**2,281**	**972,161**

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**- 972,161**	**-1,247,384,21**

E.6. Remarks on difference from estimated value in the PDD

>>

Please provide an explanation of the cause of any **increase** in the actual emission reductions achieved during the current monitoring period (e.g. higher water availability, higher load plant factor, etc), including all information (i.e. data and/or parameters) that is different from that stated in the registered CDM-PDD.

To be completed

Annex 1. Some documentary evidence of training of monitoring teams (is atached as separate documents)

Annex2. Tree biomass (is attached as separate document)

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History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Guideline, Form **Business Function**: Issuance		