Monitoring report form
(Version 05.1)

MONITORING REPORT		
Title of the project activity	Moldova Soil Conservation Project	
UNFCCC reference number of the project activity	1948	
Version number of the monitoring report	01	
Completion date of the monitoring report	01/05/2017	
Monitoring period number and duration of this monitoring period	2nd monitoring period, 01 January 2012-31 December 2016	
Project participant(s)	Agency Moldsilva, a public entity of the Republic of Moldova International Bank for Reconstruction and Development as Trustee of the BioCarbon Fund	
Host Party	Republic of Moldova	
Sectoral scope(s)	Sectoral scope – 14	
Selected methodology(ies)	Applied methodology - "Restoration of degraded lands through afforestation/reforestation" (AR-AM0002), Version 01	
Selected standardized baseline(s)	-	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	2,350,983	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	1,112,665	1,043,018

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>> 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.

The project area covers degraded lands eligible for undertaking afforestation and reforestation activities in the northern, central and southern regions of the country. Out of a total project area of 20,289.91 ha, 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.

A.2. Location of project activity

>> Republic of Moldova is situated in the South-eastern Europe between $45^0$28' – $48^0$30' Northern latitude and $26^0$30' – $30^0$05' Eastern longitude. The project has been implemented in all districts of Republic of Moldova except the eastern territories of Transnistria, and it covers several categories of degraded lands such as degraded pastures, glades and abandoned arable lands eligible for undertaking afforestation and reforestation activities. Project boundaries were geographically delineated. The geographic coordinates for each project site (polygon) are recorded and are stored in the project database together with the digital photos of the sites. Quality assurance and quality control procedures implemented as part of project monitoring conform to the requirements of monitoring methodology.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
Party A (host) Republic of Moldova	Private entity A Public entity A – Agency Moldsilva International Bank for Reconstruction and Development as trustee of the BioCarbon Fund	No

A.4. Reference of applied methodology and standardized baseline

>> The baseline and monitoring methodology applied in the project is "Restoration of degraded lands through afforestation/reforestation" (AR-AM0002), Version 01. This methodology uses the "Tool for the demonstration and assessment of additionality for afforestation and reforestation CDM

project activities[1] " and "Procedures to define the eligibility of lands for afforestation and reforestation project activities"[2].

The project also complies with the "Guidelines on application of specified versions of A/R CDM methodologies in verification of registered A/R CDM project activities (version 01.0) (EB 63, Annex 26)"[3]; and "Guidelines on accounting of specified types of changes in A/R CDM project activities from the description in registered project design documents (version 01.0) (EB66, Annex 24)" .

Finally, the project is in line with the tool for "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities", EB 65, Annex 28.

A.5. Crediting period of project activity

>>20 years (20yr-00mm) crediting period, 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.6. Contact information of responsible persons/entities

>> Dr. ing. Dumitru Galupa - PIU Manager, Director Forest Research and Management Institute (FRMI);
ing. Ion Talmaci – PIU Monitoring and Evaluation Assistant, Technical Director, FRMI
Address: 69, Calea Iesilor str., Chisinau, Republic of Moldova, tel/fax: +373 22 92-89-57, 92-89-59
email: icaspiu@starnet.md

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>> Project boundary and total area are identical to the details presented in the PDD. Planting activities under MSCP have been completed in 2009.

During the first monitoring event covering the period from October 1, 2002 to December 31, 2011 it was found that the area of 1,975.6 ha (9,7% of the project area) was affected by various types of natural disasters (drought, flood etc.) and different human illegal activities (illegal logging and grazing etc.). More than 800 ha of this area have been replanted /restored. Remained 1,132.1 ha are qualified as "lost crops" and are considered as a separate stratum with "zero emission reductions".

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

>> No temporary deviations from registered monitoring plan or applied methodology are recorded

[1] Throughout this document, "A/R additionality tool" refers to the document approved by the Executive Board of the CDM and is available at http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html

[2] http://cdm.unfccc.int/EB/022/eb22_repan16.pdf

[3] http://cdm.unfccc.int/Reference/Guidclarif/ar/methAR_guid30.pdf

B.2.2. Corrections

>> There were no corrections made during the monitoring period.

B.2.3. Changes to start date of crediting period

>> There is no change of the start date of crediting period.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

>> No inclusions are made in the Monitoring Plan after registration.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>> No permanent changes from registered monitoring plan or applied methodology are recorded.

B.2.6. Changes to project design of registered project activity

>> No changes to project design of registered project activity are recorded.

B.2.7. Types of changes specific to afforestation or reforestation project activity

>> As per the "Guidelines on accounting of specified types of changes in A/R CDM project activities from the description in registered project design documents" (Version 02.0) (Annex 24, EB 66), the changes in species composition, planting schedule and reduction in project area have not impacted the baseline scenario and additionality of the project. Therefore, as per the paragraph 6 of the "Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document" (EB 48, annex 66) and the "Guidelines on accounting of specified types of changes in A/R CDM project activities from the description in registered project design documents" (Version 02.0) (Annex 24, EB66), these changes are identified as minor in nature, and are to be confirmed by the designated operational entity at the verification without the need for submitting a notification or a request for approval, as listed in table B.2.6.1 below.

Table B.2.6.1: Types of changes from the description in the registered PDD as outlined in the guidelines (Annex 24, EB66) and their applicability to the implemented project

No.	Types of changes from the project description in the PDD of an A/R CDM project activity	Applicability to the project
a)	Changes in year-wise areas planted, possibly resulting in a part of the project area not being planted;	No, there were no changes in the year-wise area planted.
b)	Changes in species composition, if the changes are demonstrated at verification to be consistent with the baseline identification and additionality demonstration made at the validation stage;	No, changes in species composition and stand models did not occur in the project implementation.
c)	Changes in stocking density, if the changes are demonstrated at verification to be consistent with the baseline identification and additionality demonstration made at the validation stage;	No, there was no change in the stocking density.

No.	Types of changes from the project description in the PDD of an A/R CDM project activity	Applicability to the project
d)	Changes in timing and choice of silvicultural operations;	No, there have been no changes in the timing and choice of silvicultural operation.
e)	Changes in timing of harvest occurring before the third verification;	No, there are no changes in the timing of harvest anticipated prior to third verification.
f)	Changes related to collection of non-timber forest products;	No.
g)	Changes in tree/shrubs propagation method;	No
h)	Changes in post-harvest re-planting/regeneration methods;	Not applicable as planted areas are not harvested
i)	Changes in technology employed;	No
j)	Changes in inputs (e.g. fertilizers, certified seeds, watering);	No
k)	Changes in stratification for sampling;	Yes, ex post stratification has been implemented taking into account site conditions, planting time, growth rates of species and other location specific factors.
l)	Changes in type of sample plots (e.g. temporary, permanent, point-sampling);	No
m)	Changes in number of sample plots and their allocation to strata;	Yes, as a follow up to ex post stratification, the calculation of number sample plots and their allocation has been revised.
n)	Changes in the project boundary (limited to reduction in project area), if the changes are demonstrated at verification to be consistent with the baseline identification and additionality demonstration made at the validation stage;	No, changes in project boundary have not occurred. The project boundary at the verification is consistent with that at the baseline identification and additionality demonstration at the validation stage.
o)	Changes in quality assurance/quality control (QA/QC) procedures, where it can be demonstrated that the changed QA/QC procedures are used by the National Forest Inventory or were applied in another registered A/R CDM project activity;	No, there are no changes in quality assurance/quality control procedures.
p)	Changes in parameters, equations, or methods used in tree biomass estimation, if the applicability of the changed parameters, equations, or methods is demonstrated at verification using the "Tool for demonstration of applicability of allometric equations and volume equations in A/R CDM project activities" when available, or if the changed parameters, equations, or methods do not result in a decrease in precision of the estimate of tree biomass;	The project has adopted allometric equations specific to the project area. Some of these allometric equations are based on DCH instead of DBH (please refer to Calculation Sheet, worksheet "Standard Values" for list of allomteric equations by species using DBH or DCH). The parameters, equations or methods used in the biomass estimation are in line with the "Tool for demonstration of applicability of allometric equations and volume equations in A/R CDM project activities". The parameters, equations or methods do not result in the decrease in the precision of the estimate of tree biomass.

No.	Types of changes from the project description in the PDD of an A/R CDM project activity	Applicability to the project
q)	Changes from provisions regarding shifting of pre-project activities, if the related emissions are estimated at verification using the tool "Changes from provisions regarding shifting of pre-project activities, if the related emissions are estimated at verification using the tool "Estimation of the increase in greenhouse gas (GHG) emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity". and are accounted for as leakage;	Not Applicable
r)	Changes in use of fire in site preparation, if the related emissions are estimated at verification using the tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" and are accounted for as project emissions;	Not Applicable
s)	Changes in extent of soil disturbance in site preparation, if the related emissions are estimated at verification using Equation (2) of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" and are accounted for as project emissions;	Yes
t)	Changes in methods of estimation of changes in any carbon pool, if the method applied at verification uses the latest version of the relevant approved tool and the applicability conditions of the methodology applied are consistent with the applicability conditions of the tool.	No, there are no changes in the methods of estimation of changes in carbon pools.

As per the "Guidelines on application of specified versions of A/R CDM methodologies in verification of registered A/R CDM project activities" (Version 01.1) (EB68, Annex31 [4], several early versions of methodologies applied in registered A/R CDM project activities contain requirements that were withdrawn during revisions/improvements of these methodologies. The guidelines (EB68, Annex31) allow a registered A/R CDM project activity to apply, at the time of verification, the improvements in the methodology that occurred after the date of registration of the project activity. The applicability of these guidelines to the implemented project is listed in table B.2.6.2.below.

Table B.2.6.2: Applicability of guidelines to the implemented project

Requirement	Guidelines	Applicability to the project
Monitoring of data and parameters	(i) Only data and parameters obtained from field measurement are required to be	Yes, data and parameters required to be monitored in

4 http://cdm.unfccc.int/filestorage/4/4/29ZGXIPMWLUC7QY5R43NABH0SDK68T.pdf/eb68_repan31.pdf?t=STF8bW1mZXlsfDAw0p3_9jqbQ9-Du-NC78K1

Requirement	Guidelines	Applicability to the project
	monitored; (ii) Monitoring is not required for data, parameters, or variables appearing as intermediate values in calculation steps and those taken from existing sources (e.g. published literature)	the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" were measured
Sampling design, sample plot lay-out, and marking of permanent sample plots	(i) Use of temporary sample plots; (ii) Random lay-out of sample plots; (iii) A maximum allowable relative margin of error of the mean, for estimation of aboveground tree biomass, of ± 10% at 90% confidence level shall be allowed.	Yes, 90% confidence level was applied
Accounting for uncertainty	Requirements related to uncertainty assessment, uncertainty analysis, methods of combining uncertainties, and uncertainty in expert judgment are superfluous and compliance with these requirements shall not be enforced.	Uncertainty analysis was not conducted as per these guidelines
Field measurement of soil organic carbon	(i) Instead of field measurement of soil organic carbon, the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" shall be used for areas which meet the applicability conditions of the tool; or (ii) The value of change in soil organic carbon shall be set to zero. Consequently, monitoring of data and parameters related to estimation of changes in soil organic carbon shall not be required.	Yes, "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" was used for estimation of changes in soil organic carbon pool.
Clearance or burning of herbaceous vegetation	(i) Changes in carbon stocks resulting from clearance of herbaceous vegetation shall be set to zero; (ii) Emissions resulting from clearance or burning of herbaceous vegetation shall be set to zero. Consequently, monitoring of data and parameters related to (i) and (ii) above shall not be required.	Yes, loss of carbon in living herbaceous vegetation was not accounted for.
Estimation of emissions of nitrous oxide from use of fertilizers	Estimation and accounting of emissions of nitrous oxide from use of fertilizers shall not be required. Consequently, monitoring of data and parameters related to the above-mentioned emissions shall not be required.	The project did not use nitrogenous fertilizers. Therefore, emissions of nitrous oxide from use of fertilizers were not required to be monitored.
Burning of fossil fuel	Estimation and accounting of emissions from burning of fossil fuel, both within and outside the project boundary, shall not be required. Consequently, monitoring of data and parameters related to the above mentioned emissions shall not be required.	Yes, emissions from burning of fossil fuel, both within and outside the project boundary were not monitored and accounted for.

SECTION C. Description of monitoring system

>> **Organization of the project monitoring**

The entities in the implementation of the project 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 regeneration of stands;

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 monitoring of forest crops;
- Carrying out of tending activities, ensuring protection of forest crops;
- Accounting of expenditures for each plot;
- Coordination of plantation inventory with local public and environmental authorities;
- Transfer of forest crops in canopy closure stage of forest;
- Submission of reports to the Agency Moldsilva and to the PIU.

c) Forest Research and Management Institute (Project Implementation Unit):
- Coordination of project technical and management activities;
- Mapping of project land parcels using GPS and GIS and establishment of polygons
- Supervision of planting activities and technologies;
- Monitoring of carbon stocks, project emissions and ecological and social benefits;
- Monitoring and inventory of plantations;
- Comparison of data obtained from forestry enterprises and data collected independently;
- Preparation of monitoring report for initiating verification of the project by a designated operational entity;
- Preparation and submission of annual progress reports;
- Technical support on forest management (e.g., tending, maintenance, protection etc.);
- Organization of trainings within the framework of the project;
- Coordination and collaboration with other projects.

II. The World Bank (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 a designated operational entity;
- Payment of contracted emission reductions.

III. Other participants:

a) Communities that allocated lands for the afforestation under MCFDP will carry out:
   - Review of afforestation activities at the meetings of local Councils;
   - Constitution of commission for selection of lands, consisting of representatives from mayoralties and territorial forestry units etc.;
   - Decisions of local councils, that stipulate the use of such lands for growing forestry vegetation for the following 100 years;
   - Reporting of identified lands for afforestation;
   - Participation in inventory of forest plantations;
   - Contribution to the implementation of agreements on afforestation, concluded between forestry units and resolution of conflicts (e.g., illegal grazing, logging, opening of roads, mines, etc.).

b) Raional cadastre services:
   - Participation in selection of lands for afforestation;
   - Preparation of documentation for allocation of lands for afforestation;
   - Approval of annual monitoring 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 on the project sites;
   - Analysis of the condition of new created forests.

Roles and responsibilities in monitoring

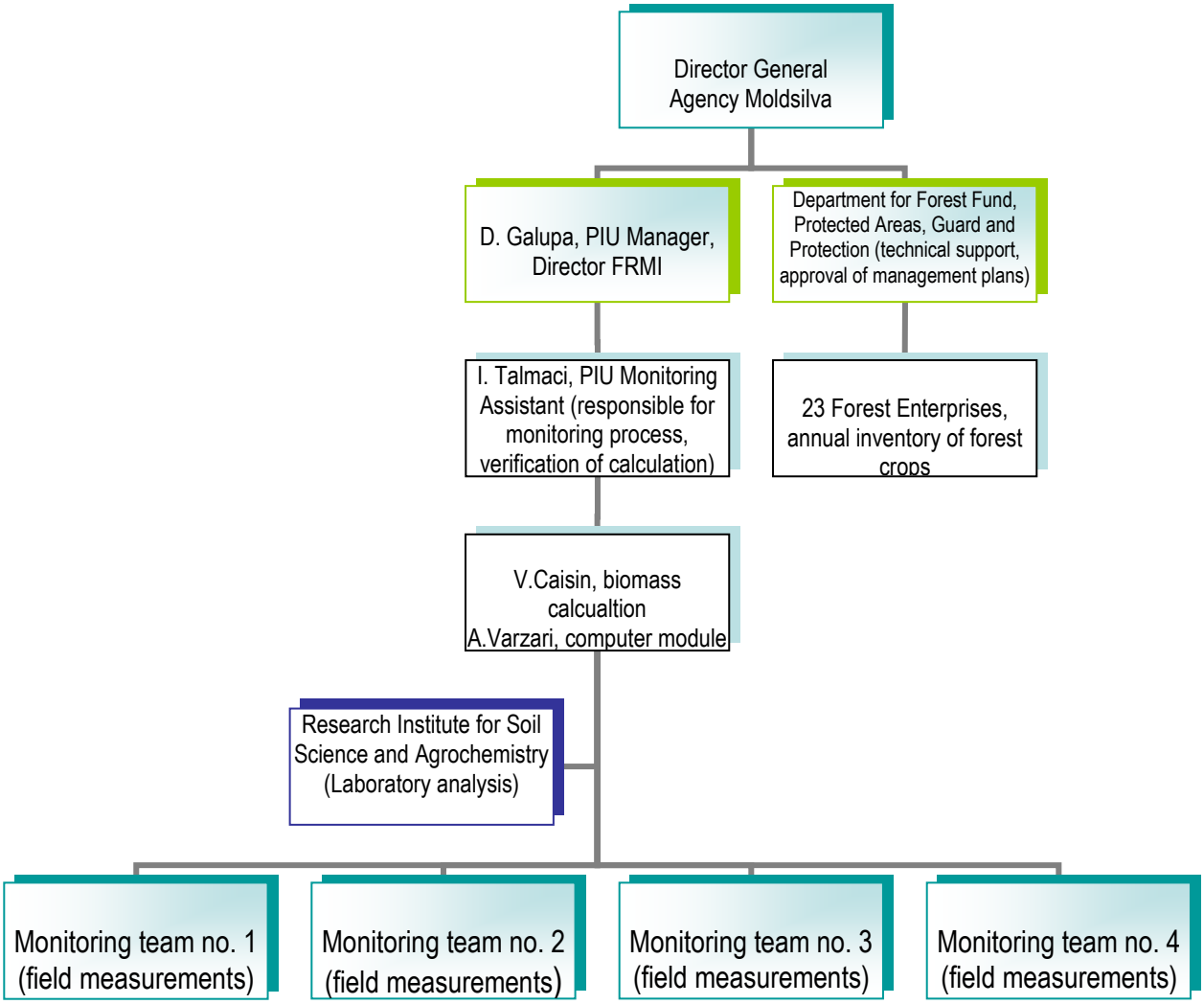

Figure 4. Diagram demonstrating roles and responsibilities at different levels in monitoring

Training

For the monitoring purpose, a group of specialists, mainly forestry engineers, have been trained in carrying out of field measurements specifically to CDM A/R project activity, filling the spread sheets, data entry etc.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter)

Data/parameter:	C_{BSL}
Unit	*t CO2-e*
Description	Baseline net greenhouse gas removals by sinks
Source of data	PDD, p. 59, Table 24: Baseline net GHG removals by sinks (t CO2e)
Value(s) applied)	46,182 tCO_{2e}
Choice of data or measurement methods and procedures	

Purpose of data	Data based on pre-project afforestation used for calculation of baseline net GHG removals by sinks
Additional comments	Sum of baseline net greenhouse gas removals by sinks for the period from 2002 to 2016

Data/parameter:	
Unit	Alpha numeric
Description	Sample plot ID
Source of data	Project and plot map, GIS
Value(s) applied)	1-213
Choice of data or measurement methods and procedures	
Purpose of data	Identification of each sample plot
Additional comments	

Data/parameter:	*iID*
Unit	Alpha numeric
Description	Stratum *i*D (1, 2, 3, … *mSP* project scenario (*ex post*) strata)
Source of data	Stand map, GIS
Value(s) applied)	1-16
Choice of data or measurement methods and procedures	100% /Defined according to the Table C.1 of the present MR
Purpose of data	
Additional comments	Each stand has a particular year to be planted under each stratum

Data/parameter:	*IDikt*
Unit	Alpha numeric
Description	Stand ID
Source of data	Stand map, GIS
Value(s) applied)	1- 21,994
Choice of data or measurement methods and procedures	100% /Defined as per planting distance
Purpose of data	
Additional comments	Each stand has a particular year to be planted under each stratum

Data/parameter:	Confidence interval
Unit	Percent
Description	Confidence level
Source of data	
Value(s) applied)	95% / 90%
Choice of data or measurement methods and procedures	

Purpose of data	For the purpose of QA/QC of measurement, 95% was used as conservative approach
Additional comments	

Data/parameter:	p
Unit	Percent
Description	Desired level of precision
Source of data	
Value(s) applied)	10%
Choice of data or measurement methods and procedures	
Purpose of data	For the purpose of QA/QC of measurement, 95% was used as conservative approach
Additional comments	

Data/parameter:	EF_{CH4}
Unit	t CH_4 (t C)$^{-1}$
Description	Emission factor for CH_4
Source of data	IPCC 1996
Value(s) applied)	0.012
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	GWP_{CH4}
Unit	Dimensionless
Description	Global Warming Potential for CH_4
Source of data	Annex 3, EB69[5]
Value(s) applied)	25
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	EF_{N2O}
Unit	
Description	Emission factor for N_2O
Source of data	IPCC 1996

5 http://cdm.unfccc.int/filestorage/h/u/N207JC1ZTP6D8G5R3F4UKSAYWMOLBI.pdf/eb69_repan03.pdf?t=eVZ8b211czBlfDB2uXvFwIWkqg3OAH3rtn-x

Value(s) applied)	0.0007
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	GWP_{N2O}
Unit	Dimensionless
Description	Global Warming Potential for N_2O
Source of data	Annex 3, EB69[6]
Value(s) applied)	298
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	12/44
Unit	Dimensionless
Description	Ratio of molecular weights of carbon and CO_2
Source of data	Universal constant
Value(s) applied)	12/44
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	16/12
Unit	Dimensionless
Description	Ratio of molecular weights of CH_4 and carbon
Source of data	Universal constant
Value(s) applied)	16/12
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	44/28
Unit	Dimensionless
Description	Ratio of molecular weights of N_2O and nitrogen

6 http://cdm.unfccc.int/filestorage/h/u/N207JC1ZTP6D8G5R3F4UKSAYWMOLBI.pdf/eb69_repan03.pdf?t=eVZ8b211czBlfDB2uXvFwIWkqg3OAH3rtn-x

Source of data	Universal constant
Value(s) applied)	44/28
Choice of data or measurement methods and procedures	
Purpose of data	Calculation of project non-CO_2 emissions
Additional comments	

Data/parameter:	Allometric equation*
Unit	Dimensionless
Description	Allometric equation for species j
Source of data	V.Blujdea, R. Pilli, I.Dutca, I.Ciuvat, I.V.Abrudan: Allometric biomass equations for young broadleaved trees in plantations in Romania., Forest Ecology and Management (2011), doi: 10.1016/j.foreco.2011.09.042
Value(s) applied)	See Table E.2.2.1 of the present MR
Choice of data or measurement methods and procedures	
Purpose of data	Allometric equation is used for species for which equations are available to calculate the above ground biomass
Additional comments	DBH was used in the calculation when the diameter of stem at breast height was more than 10 cm and/or collar diameter was more than 12 cm. DCH was used in the calculation for shrubs and trees with a high less than 1.5 m and/or with diameter at breast height less than 10 cm.

Note *- The allometric equations used in this project activity have been published in the well-known forestry journal Forest Ecology and Management (2011). As per the tool EB 65 Annex 28 "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" one out of three criteria must be fulfilled to show appropriateness of the allometric equation used.

(a) The equation is used in the national forest inventory, or the national GHG inventory, of the host Party:

The allometric equations used for this project have been developed by the Ministry of Research and Education of Romania for use in a Joint Implementation AR project. They have since been published in a peer reviewed article in the Journal of Forest Ecology and Management in 2011[7]. Since this publication, these equations are the best locally available equations to estimate biomass growth. Going forward, these allometric equations will therefore be used in Eastern European countries with similar edapho-climatic conditions as Romania for UNFCCC related projects and initiatives. These allometric equations are therefore applicable for this project.

(b) The equation has been used in commercial forestry sector of the host Party for ten years or more;

As these allometric equations have been developed specifically for young plantations as the ones planted in Romania and in this project, they will not be applied to commercial timber operations.

(c) The equation was derived from a data set of at least 30 sample trees, and the value of coefficient of determination (R^2) obtained was not less than 0.85.

In order to develop these allometric equations for a total of ten different species (either based on DCH or DBH), 45 trees have been used. The value of coefficient of determination (R^2) obtained was higher than 0.85, the average R^2 obtained for DCH was 0.9321 and for DBHDBH was 0.9074.

[7], [10] V.Blujdea, R. Pilli, I.Dutca, I.Ciuvat, I.V.Abrudan: Allometric biomass equations for young broadleaved trees in plantations in Romania, Forest Ecology and Management (2011), doi:10.1016/j.foreco.2011.09.042

It can therefore be concluded that this applicability criterion is fulfilled and that it is appropriate to apply the proposed allometric equations for the ex-post calculation of the GHG removals by sinks from this project.

Data/parameter:	CFj
Unit	tonnes C (tonne d.m.)-1
Description	Carbon fraction for species *j (for biomass)*
Source of data	IPCC (2003) GPG LULUCF
Value(s) applied)	0.5
Choice of data or measurement methods and procedures	Default
Purpose of data	Carbon fraction default value is used to convert biomass in to carbon stock
Additional comments	

Data/parameter:	CFj
Unit	tonnes C (tonne d.m.)-1
Description	Carbon fraction for species *j (for roots)*
Source of data	IPCC (2003) GPG LULUCF
Value(s) applied)	0.48
Choice of data or measurement methods and procedures	Default
Purpose of data	Carbon fraction default value is used to convert biomass in to carbon stock
Additional comments	

Data/parameter:	CF_L
Unit	tonnes C (tonne d.m.)-1
Description	Carbon fraction for litter
Source of data	AR AM0002 Version 01 methodology
Value(s) applied)	0.370
Choice of data or measurement methods and procedures	Default
Purpose of data	Carbon fraction default value is used to convert biomass in to carbon stock
Additional comments	

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

Data/parameter:	A_i
Unit	Hectares
Description	Area of stratum i
Measured/calculated/default	Measured
Source of data	Project, Land use and Cadastre Office, GIS
Value(s) of monitored parameter	See calculation sheet worksheet 02.5 Stratification
Monitoring equipment	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:	Checked during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	A
Unit	Hectares
Description	Total area of all strata (A), e.g. the total project area
Measured/calculated/default	Calculated
Source of data	Project, Land use and Cadastre Office, GIS
Value(s) of monitored parameter	20,289.91
Monitoring equipment	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:	Checked during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	A_{ikt}
Unit	Hectares
Description	Area of stratum i, stand model k, at time t
Measured/calculated/default	Measured/calculated
Source of data	Project, Land use and Cadastre Office, forest enterprises
Value(s) of monitored parameter	See Annex 2 of this monitoring report.
Monitoring equipment	GIS or/and GPS
Measuring/reading/recording frequency:	At the start of the project and adjusted thereafter every 5-year
Calculation method (if applicable):	Calculation of actual net GHG removals by sinks
QA/QC procedures:	Checked during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	AP
Unit	m^2
Description	Sample plot area
Measured/calculated/default	Measured
Source of data	Monitoring measurement
Value(s) of monitored parameter	250
Monitoring equipment	GIS or and GPS, compass, tape
Measuring/reading/recording frequency:	5-year

Calculation method (if applicable):	
QA/QC procedures:	Plot location and area checked and verified during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	t ID
Unit	year
Description	Age of plantation
Measured/calculated/default	Counted since year of planting
Source of data	act of technical reception from forest enterprises
Value(s) of monitored parameter	0-14
Monitoring equipment	
Measuring/reading/recording frequency:	5-year
Calculation method (if applicable):	Planted in 2002 means 14 years, planted in 2003 means 13 years etc.
QA/QC procedures:	Age is verified during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	tr ID
Unit	
Description	No of tree on plot
Measured/calculated/default	
Source of data	Sample plot measurement
Value(s) of monitored parameter	See Calculation of tCO2e spread sheet
Monitoring equipment	
Measuring/reading/recording frequency:	5-year
Calculation method (if applicable):	Trees are counted in the plots of each stratum.
QA/QC procedures:	10% re-measurements have been carried out.
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	n
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	PDD and re-stratification
Value(s) of monitored parameter	213
Monitoring equipment	
Measuring/reading/recording frequency:	5-year

Calculation method (if applicable):	
QA/QC procedures:	To check the sample size changes after ex post-stratification.
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	n_i
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	PDD and ex post-stratification
Value(s) of monitored parameter	see Table C.1. from the present MR
Monitoring equipment	
Measuring/reading/recording frequency:	5-year
Calculation method (if applicable):	
QA/QC procedures:	To check for the change sin sample size changes after ex post stratification
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Latitude/longitude of sample plot location
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	GPS coordinates – see Shape files
Monitoring equipment	Garmin Oregon 450 GPS/Garmin GPS MAP 64s (for geographical positioning with accuracy of up to 3 m)
Measuring/reading/recording frequency:	5 years
Calculation method (if applicable):	
QA/QC procedures:	Sample plot locations are checked and verified using GPS coordinates
Purpose of data:	
Additional comments:	

Data/parameter:	DBH/
Unit	cm
Description	Diameter at breast height of living trees. It was measured for trees when the diameter of stem at breast height was more than 10 cm and/or collar diameter was more than 12 cm.
Measured/calculated/default	Measured
Source of data	Sample plot measurement
Value(s) of monitored parameter	See calculation of tCO_2e spread sheet

Monitoring equipment	Caliper, calibrated to ensure the correctness of measurements.
Measuring/reading/recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures:	Diameter measurements are randomly checked during monitoring period.
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	DCH/collar diameter for shrubs
Unit	cm
Description	Diameter at collar height for shrubs and trees with a height less than 1.5 m and/or with diameter at breast height less than 10 cm.
Measured/calculated/default	Measured
Source of data	Sample plot measurement
Value(s) of monitored parameter	See calculation of tCO_2e spread sheet
Monitoring equipment	Caliper, calibrated to ensure the correctness of measurements.
Measuring/reading/recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures:	Diameter measurements (10%) are randomly checked during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Species j
Unit	
Description	Tree species j in the sample plot
Measured/calculated/default	Determination
Source of data	Afforestation projects from forest enterprises
Value(s) of monitored parameter	Sc – *Robinia pseudoacacia* St – *Quercus* spp. Pl – *Populus* spp. Pin – *Pinus* spp.
Monitoring equipment	
Measuring/reading/recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures:	10% of PSPs have been randomly re-measured.
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Standing deadwood
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	N/A
Monitoring equipment	
Measuring/reading/recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures:	Measurements are randomly checked (10%) during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Lying deadwood
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	N/A
Monitoring equipment	Lying dead wood within the sample plots is sampled using the line intersect method (Harmon and Sexton, 1996). Two 50 meter length lines are established bisecting each plot along a random bearing, and the diameters of lying dead wood (≥ 5 cm diameter) intersecting the lines are measured at the point of intersection.
Measuring/reading/recording frequency:	5 year
Calculation method (if applicable):	
QA/QC procedures:	Measurements are randomly checked during monitoring period
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Litter (wet litter biomass)
Unit	g
Description	Wet weight of the litter sample
Measured/calculated/default	Measured
Source of data	Sample plot measurement
Value(s) of monitored parameter	See calculation of tCO_2e spread sheet
Monitoring equipment	Sample frame (the square of 0,3 m^2) 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:	Measurements are randomly checked (10%)
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Data/parameter:	Soil carbon
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
Monitoring equipment	"Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (version 01.1.0) was used and default soil carbon sequestration value referenced in the tool and applicable to the methodology AR-AM0002 as per the "Guidelines on application of specified versions of A/R CDM methodologies in verification of registered A/R CDM project activities" (version 01.0) (Annex 26, EB63).
Measuring/reading/recording frequency:	20 year
Calculation method (if applicable):	
QA/QC procedures:	Data used in the calculations using the tool are checked
Purpose of data:	Calculation of actual net GHG removals by sinks
Additional comments:	

Project emissions

Data/parameter:	B_{ijt}
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	Reports from forest enterprises
Value(s) of monitored parameter	See calculation of tCO_2e spread sheet
Monitoring equipment	
Measuring/reading/recording frequency:	After each event
Calculation method (if applicable):	Allometric equations
QA/QC procedures:	Biomass measurement is checked and verified during monitoring period
Purpose of data:	Calculation of project non-CO_2 emissions
Additional comments:	

D.3. Implementation of sampling plan

>> **Sample frame**

Out of the total project area (20,289.91 ha), 1,132.81 ha (5.6% of the project area) has been affected natural disasters (drought, flood etc.) and is consequently designated as a separate stratum with zero GHG removals.

Current project stratification, which is the basis for GHG calculation is shown in the Table C.1.

Table C.1: Planting area breakdown by species, age and survival rate

Stratum	Stratum Name	Area, ha	Rounded PSP Quantity
stratum 1	Pinus_PoorSoil_Age>10_Surv>50	4.1	1
stratum 2	Poplar_RichSoil_Age<10_Surv_25.1-50	44.6	1
stratum 3	Poplar_RichSoil_Age>10_Surv_>50	296.13	1
stratum 4	Quercus_PoorSoil_Age>10_Surv_>50	221.38	2
stratum 5	Quercus_RichSoil_Age<10_Surv_>50	121.24	1
stratum 6	Quercus_RichSoil_Age>10_Surv_25.1-50	35.6	1
stratum 7	Quercus_RichSoil_Age>10_Surv_>50	882.66	5
stratum 8	Robinia_PoorSoil_Age<10_Surv_25.1-50	59.6	1
stratum 9	Robinia_PoorSoil_Age<10_Surv_>50	351.4	4
stratum 10	Robinia_PoorSoil_Age>10_Surv_25.1-50	258.4	3
stratum 11	Robinia_PoorSoil_Age>10_Surv_>50	4,643.28	46
stratum 12	Robinia_RichSoil_Age<10_Surv>25.1-50	117.58	2
stratum 13	Robinia_RichSoil_Age<10_Surv>_50	617.65	8
stratum 14	Robinia_RichSoil_Age>10_Surv_25.1-50	1,078.09	13
stratum 15	Robinia_RichSoil_Age>10_Surv_>50	10,425.39	124
stratum 16	Zero emission reductions	1,132.81	0
TOTAL		20,289.91	213

Monitoring in the field:

The plots were marked by GPS coordinates with wooden poles (one of the corner of permanent monitoring plot (PSP)). For the purpose of verification, the measurements were conducted on 213 PSPs. These 213 PSPs were located taking into account the proportion of the area of the strata to the total project area. Permanent monitoring plots were established with an area of 250 m^2 (sides of 5 X 50 m), which includes nested small sample plots of 50 m^2 (5x10 m) within the large plot.

The following scheme demonstrates the monitoring points of field measurements.

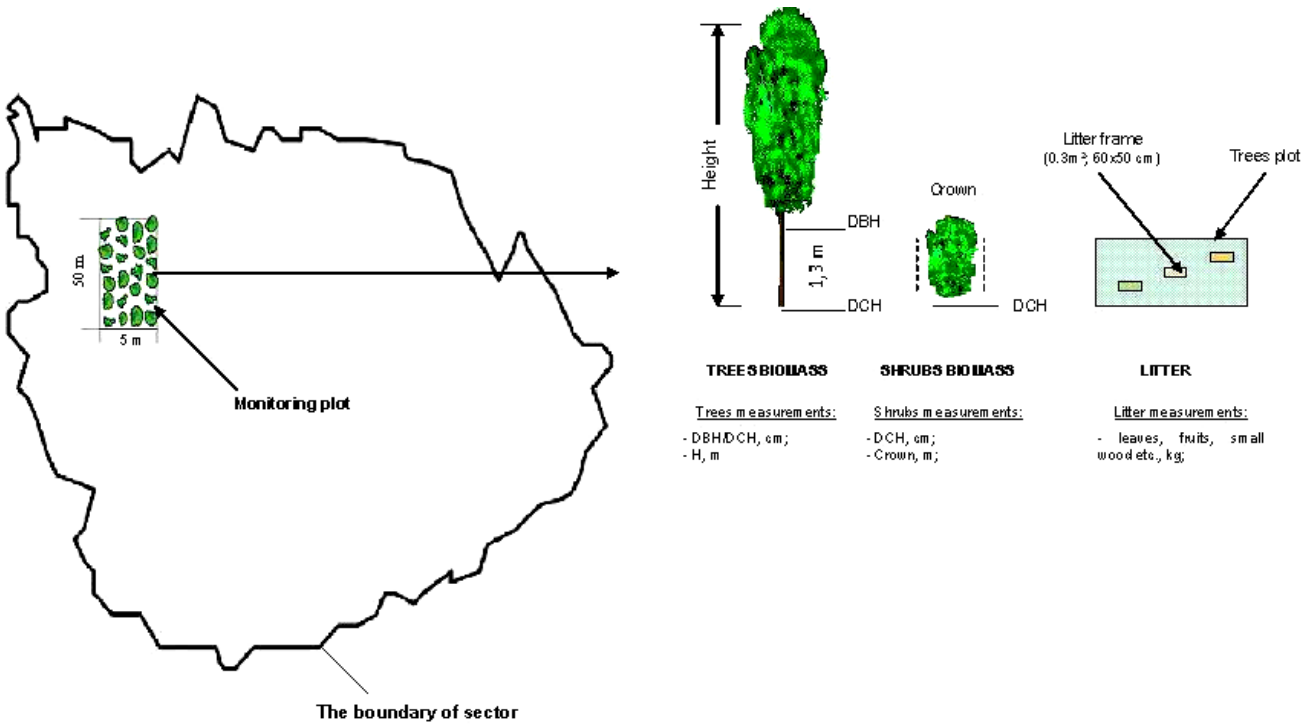

Fig.1. Scheme of the project monitoring points.

Field team members were trained in the theoretic and practical aspects of forest inventory and measurements. Four teams were organized for conducting measurements.

Collar diameter (DCH) and diameter at breast height (DBH) were measured to determine aboveground biomass. Collar diameter was measured close to the ground surface. DBH was measured when the trees were the higher than 1.3 m and the diameter was 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 cases of two or more stems 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 in small plots (5 m x 10 m) that are located within large plots.

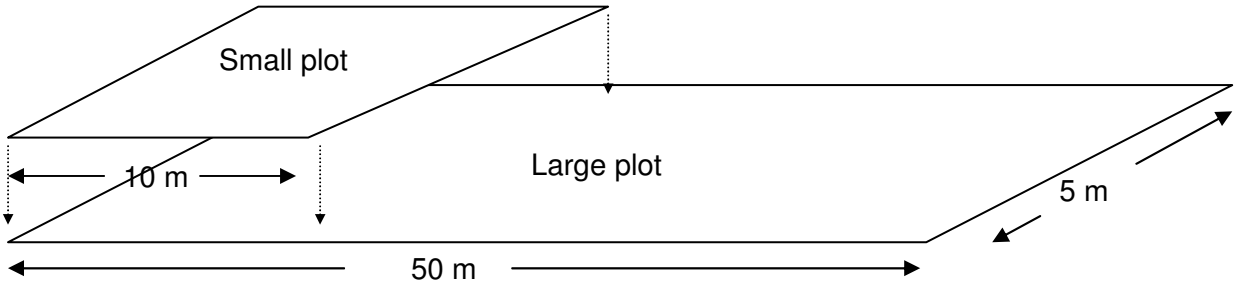

Figure 2. Scheme of nested plots

Litter (all dead organic material on top of mineral soil) samples were collected from the sample plots. One diagonal line was laid from one corner of the sample plot to another, and it was divided into 4 equal parts. On the intersection of short segments, the frame (50 cm x 60 cm) was placed (3 times).

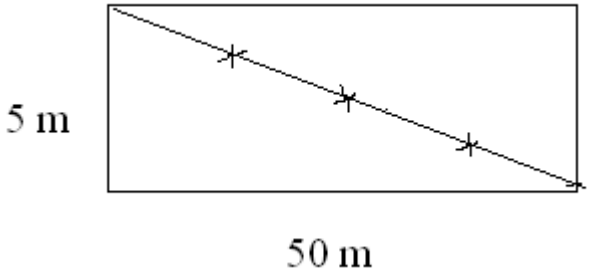

Figure 3. Placement of frame for the litter sampling (indicated as x)

All the litter inside the frame was collected and weighed. Then three litter samples were mixed on a rubber sheet and a subsample of approx. 100-150 g was taken for moisture content determination in laboratory.

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

Biomass data were 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 was expanded and applied to the entire stratum area.

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

The “team chief” rechecked all field phases on the spot. Tree diameter was re-measured for 10% of trees in the permanent monitoring plot (PSP).

Monitoring equipment

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

Table C.2. Monitoring equipment

Manufacturer	Name/Type and serial number	Date of calibration	Uncertainty	Remarks
Metal tapes (30 m) for measuring distances.	Commercial product	03.10.2016 28.10.2016 22.11.2016		
Metal tapes (5 m) for measuring tree height.	Commercial product	03.10.2016 28.10.2016 22.11.2016		
Global Positioning System (GPS) for locating plots.	Garmin MAP 64s	-	4-10 m 3-10	Calibrated prior to every field use
Global Positioning System (GPS) for locating plots.	Garmin Oregon 450/600	-	3-10	Calibrated prior to every field use
Tree diameter tape for measuring trees.	Standard			N/A
Caliper to measure tree diameters.	Commercial product	03.10.2016 28.10.2016 22.11.2016	-	-
Caliper to measure small tree	Commercial	03.10.2016	-	-

Manufacturer	Name/Type and serial number	Date of calibration	Uncertainty	Remarks
diameters.	product	28.10.2016 22.11.2016		
Spring scales for weighing destructive biomass samples.	WH	03.10.2016 28.10.2016 22.11.2016	-	-

Calibration procedures

The GPS, caliper and scales are calibrated prior to every use in the field for monitoring and verification purposes. These instruments were calibrated using standard forest management and inventory operating procedures of Moldsilva.

In the laboratory

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

Data entry

Data collected on field forms was transferred to spread sheets and field forms and laboratory records were archived. A person not involved in the data entry was used to verify the correctness of data entered in the spread sheets comparing the spread sheets with the field sheets. In addition, a second spot check was performed by the BioCarbon Fund team in order to compare the data entered into CO_2 calculation spread sheet and field sheets.

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

The data collected and stored in the monitoring system was used to conduct emissions and removals calculation at stratum and project levels.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or 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 E.1: 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	0
2004	0

Year	Annual estimation of baseline net anthropogenic GHG removals by sinks in tones of CO_2 e
2005	182
2006	649
2007	1,060
2008	1,681
2009	2,372
2010	3,136
2011	3,956
2012	4,825
2013	5,722
2014	6,629
2015	7,536
2016	8,434
Total estimated baseline net GHG removals by sinks (tones of CO_2 e)	46,182
Total number of crediting years	14
Annual average over the crediting period of estimated baseline net GHG removals by sinks (tones of CO_2 e)	3,298.71

E.2. Calculation of project emissions or actual net GHG removals by sinks

>> **E.2.1.Calculation of project emissions:**

As per the methodology AR-AM0002 v.01, the project 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 were estimated for the project.

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, accounting of project emissions from the loss/decrease in herbaceous non-tree vegetation is considered zero.

Emissions from biomass burning

Emissions from natural fires were calculated according to the approved AR-AM002 v.01 methodology. The steps followed in assessing the GHG emissions from biomass burn include: Step 1: The area affected by fires is measured and recorded.

Step 2: The amount of non-CO_2 emissions was estimated prior to the estimation of non-CO_2 emissions.

$$E_{BiomassBum,CO_2} = A_{BiomassBum,i} \bullet B_{AB\_NTree,i} \bullet CE \bullet CF_{NTree} \bullet 44/12 \quad \text{(M.35)}$$

where:

$A_{BiomassBum,i}$ Area of biomass burn in stratum *i* in ha yr^{-1}

$B_{AB\_Ntree,i}$ Average stock in aboveground biomass for stratum *i* prior to burn in $t.d.m.ha^{-1}$

CE	Combustion efficiency, dimensionless, IPCC default=0,5
CF_{NTree}	Carbon fraction of dry biomass, dimensionless

Step 3. The methane (CH4) from biomass burn:

$$E_{BiomassBum,CH_4} = E_{BiomassBum,CO_2} \bullet GWP_{CH4} \bullet EF_{CH4} \bullet 12/44 \bullet 16/12 \quad \text{(M.36)}$$

where:

$E_{BiomassBum,CH4}$	CH_4 emission from biomass burning in slash and burn in t CO_2eq yr^{-1}
GWP_{CH4}	Global warming potential for CH4 (IPCC default=25)
EF_{CH4}	Emission factor for CH4, tCH4 (t C)$^{-1}$ (IPCCC default emission ratio for CH_4 = 0.012)
12/44	Ratio of molecular weights of carbon and CO_2, dimensionless
16/12	Ratio of molecular weights of CH_4 and carbon, dimensionless

Step 4: Sum of all non-CO2 emissions from biomass burning.

$$E_{NON-CO2\_BiomassBum} = E_{BiomassBum,CH4} \quad \text{(M.37)}$$

where:

$E_{Non-CO2,BiomassBum}$	Increase in non-CO2 emissions as a result of biomass burning in slash and burn in t CO_2eq yr^{-1}

Table E.2.1.1: Scaling up of non-CO_2 emission calculation to project strata

Stratum	Description	Area, ha	Burned Area, ha	CH4 emissions	N2O emissions	Sum of non-CO2 emissions from biomass burning, (tCO2e)
1	Pinus_PoorSoil_Age>10_Surv>50	4.10	0.00	0.00	0.00	0.00
2	Poplar_RichSoil_Age<10_Surv_25,1-50	44.60	0.00	0.00	0.00	0.00
3	Poplar_RichSoil_Age>10_Surv_>50	296.13	0.00	0.00	0.00	0.00
4	Quercus_PoorSoil_Age>10_Surv_>50	221.38	0.00	0.00	0.00	0.00
5	Quercus_RichSoil_Age<10_Surv_>50	121.24	0.00	0.00	0.00	0.00
6	Quercus_RichSoil_Age>10_Surv_25,1-50	35.60	0.00	0.00	0.00	0.00
7	Quercus_RichSoil_Age>10_Surv_>50	882.66	18.90	55.36	4.54	59.90
8	Robinia_PoorSoil_Age<10_Surv_25,1-50	59.60	13.00	5.73	0.47	6.20
9	Robinia_PoorSoil_Age<10_Surv_>50	351.40	0.00	0.00	0.00	0.00
10	Robinia_PoorSoil_Age>10_Surv_25,1-50	258.40	0.00	0.00	0.00	0.00
11	Robinia_PoorSoil_Age>10_Surv_>50	4,643.28	24.40	91.08	7.46	98.54
12	Robinia_RichSoil_Age<10_Surv>25,1-50	117.58	12.50	20.13	1.65	21.78
13	Robinia_RichSoil_Age<10_Surv>_50	617.65	0.00	0.00	0.00	0.00
14	Robinia_RichSoil_Age>10_Surv_25,1-50	1,078.09	20.10	53.63	4.40	58.03
15	Robinia_RichSoil_Age>10_Surv_>50	10,425.39	124.58	525.75	43.09	568.83
16	Zero emission reductions	1,132.81	0.00	0.00	0.00	0.00
TOTAL		**20,289.91**	**213.48**	**751.68**	**61.60**	**813.28**

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.2.2. 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 provided as the annex 2 to the 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 which are applicable to the conditions of the Republic of Moldova (see Table E.2.2.1).

Changes in the carbon stocks of above-ground biomass

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

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

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

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.

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

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.

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

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

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.

$$C_{AB\_Tree_k} = f(DBH_k, H_k) \bullet CF_k \quad \text{(M.12)}$$

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.

$$C_{AB\_Tree,m,ijk,p} = \frac{\left(\sum_{tr=1}^{TR} C_{AB,Tree,m,ijk} \cdot XF\right)}{1000} \quad \text{(M.13)}$$

$$XF = \frac{10{,}000}{A_p} \quad \text{(M.14)}$$

where:

C_{AB_Tree,m,k,p_k}	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 and shrub for each stratum was calculated by averaging across the plots in a stratum or sub-stratum as outlined below.

Non-tree shrub biomass (C_{AB_NTree})

The parameters of height and diameter were 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*).

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

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 E.2.2.1. Allometric equations for tree biomass[8]

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)

[8] 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			
		CF) correction coefficient (computed based on standard error of the estimate)			
			ln a	b	CF
		Eleagnus angustifolia ABGTB (dch)	-3.9276	3.1470	1.1009
		Eleagnus angustifolia ROOTS (dch)	-3.3168	2.5595	1.1882
		Eleagnus angustifolia ABGTB (dbh)	4.9209	2.7844	1.1604
		Eleagnus angustifolia ROOTS (dbh)	3.9099	2.2295	1.2238
		Fraxinus excelsior ABGTB (dch)	-2.6559	2.7697	1.1669
		Fraxinus excelsior ROOTS (dch)	-0.7746	1.8574	1.2696
		Fraxinus excelsior ABGTB (dbh)	4.0043	3.0495	1.2045
		Fraxinus excelsior ROOTS (dch)	3.5168	2.1242	1.2564
		Gledicia triacantos ABGTB (dch)	-2.9685	2.7390	1.1117
		Gledicia triacantos ROOTS(dch)	-2.5047	2.4291	1.2293
		Gledicia triacantos ABGTB (dbh)	4.6960	1.7067	1.0856
		Gledicia triacantos ROOTS(dbh)	4.4138	1.3856	1.1345
		Populus alba ABGTB	-1.2947	2.1367	1.1188
		Populus alba ROOTS (dch)	-0.8599	1.6970	1.1471
		Populus alba ABGTB (dbh)	4.3886	2.1848	1.2183
		Populus alba ROOTS (dbh)	3.5877	1.6989	1.2044
		Querqus sp. ABGTB (dch)	-1.5672	2.1580	1.0808
		Querqus sp. ROOTS (dch)	0.1197	1.5019	1.0850
		Robinia pseudoacacia ABGTB (dch)	-2.2535	2.5887	1.0245
		Robinia pseudoacacia ROOTS (dch)	-1.1378	1.9850	1.0526
		Robinia pseudoacacia ABGTB (dbh)	4.3827	2.4631	1.0310
		Robinia pseudoacacia ROOTS (dch)	3.6264	2.0413	1.0538
		Salix alba ABGTB (dch)	-5.3386	3.2297	1.0994
		Salix alba ROOTS (dch)	-4.7489	2.8426	1.2161
		Other species ABGTB (dch)	-2.6761	2.6494	1.1401
		Other species ROOTS (dch)	-1.8654	2.0900	1.1636
		Other species ABGTB (dbh)	4.4414	2.3666	1.1979
		Other species ROOTS (dbh)	3.7327	1.8965	1.1955

Calculation of aboveground biomass

Steps in calculation of above ground tree biomass are as follows.

- Basal diameter was individually recorded for each tree species on each PSP in the field sheets;
- Numbers of trees for each species for each PSP (N) were counted;
- Biomass of individual trees by species in the PSP was calculated using allometric equations;
- Biomass of each species calculated based on number of trees and biomass of individual trees of a species in the PSP;
- Total aboveground tree biomass on PSP was calculated;
- Aboveground tree biomass is expanded from the area of PSP (50 m^2) to one 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 was estimated from the above-ground biomass using the root-to-shoot ratio. The carbon stock of below-ground biomass was 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.

$$C_{BB,m,ijk} = A_{m,ijk} \bullet MC_{BB,m,ijk} \quad \text{(M.18)}$$

$$MC_{BB,m,ijk} = A_{m,ijk}[MC_{AB\_Tree,m,ijk} \bullet R_{T,jk} + MC_{AB\_NTree\_Shrub,m,ijk} \bullet R_S] \quad \text{(M.19)}$$

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 tC 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 was estimated from the data on carbon stock measurement at two monitoring intervals.

$$\Delta C_{BB,ijk,t} = (C_{BB,m_2,ijk} - C_{BB,m_1,ijk}) / T_B \quad \text{(M.20)}$$

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 tC

$C_{BB,m1,ijk}$ Carbon stock of the below-ground biomass for stratum *i* sub-stratum *j* species *k* calculated at monitoring event m_1 in tC

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

Biomass calculated on one ha was scaled up to the corresponding homogenous area of strata and then summed up to the total area shown below. This calculation represents aboveground and below ground tree biomass.

Table E.2.2.2. Scaling of tree biomass up to project strata

Stratum	Description	Area, ha	Average biomass (t d.m. ha-1)	Total biomass on strata (t d.m.)	Total Carbon on strata (t C)	Actual net GHG removals in biomass (t CO_2e)
1	Pinus_PoorSoil_Age>10_Surv>50	4.1	69.72	285.84	142.92	524.04
2	Poplar_RichSoil_Age<10_Surv_25,1-50	44.6	62.24	2,775.81	1,387.90	5,088.98
3	Poplar_RichSoil_Age>10_Surv_>50	296.13	95.93	28,408.10	14,204.05	52,081.52
4	Quercus_PoorSoil_Age>10_Surv_>50	221.38	47.42	10,497.93	5,248.96	19,246.20
5	Quercus_RichSoil_Age<10_Surv_>50	121.24	10.53	1,277.11	638.56	2,341.38
6	Quercus_RichSoil_Age>10_Surv_25,1-50	35.6	8.93	317.88	158.94	582.78
7	Quercus_RichSoil_Age>10_Surv_>50	882.66	36.46	32,182.20	16,091.10	59,000.70
8	Robinia_PoorSoil_Age<10_Surv_25,1-50	59.6	5.55	330.89	165.45	606.64
9	Robinia_PoorSoil_Age<10_Surv_>50	351.4	16.32	5,734.25	2,867.12	10,512.79
10	Robinia_PoorSoil_Age>10_Surv_25,1-50	258.4	15.48	4,001.27	2,000.64	7,335.67
11	Robinia_PoorSoil_Age>10_Surv_>50	4,643.28	44.86	208,297.84	104,148,92	381,879.37
12	Robinia_RichSoil_Age<10_Surv>25,1-50	117.58	19.57	2,300.90	1,150.45	4,218.32
13	Robinia_RichSoil_Age<10_Surv>_50	617.65	26.13	16,137.29	8,068.64	29,585.03
14	Robinia_RichSoil_Age>10_Surv_25,1-50	1,078.09	32.05	34,553.99	17,276.99	63,348.98
15	Robinia_RichSoil_Age>10_Surv_>50	10,425.39	50.66	528,144.08	264,072.04	96,8264.15
16	Zero emission reductions	1,132.81	0.00	0.00	0.00	0.00
TOTAL		**20,289.91**	**541.85**	**875,245.38**	**437,622.69**	**1,604,616.52**

Litter

Due to the young age of trees, dead wood was not found in this monitoring period. Litter was sampled using a fixed-area sampling frame of 0.30 $m^{2.}$ One diagonal line was laid from one corner of the sample plot to another, measured and divided into 4 equal sides. On the intersection of short segments the frame was placed (3 times). At each location, all litter (leaves, fruits, small wood, etc.) that fell inside the frame was collected and oven dried (105° 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.

$$C_{L_{m,ijk}} = A_{ijk} \bullet C_{L\_wet_{m,ijk}} \bullet (1 - MP_L) \bullet (1/a_{ijk}) \bullet (1/100) \quad \text{(M.25)}$$

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 waswas calculated.

$$\Delta C_{L,m_{ijk},t} = [(C_{L_{m_2,ijk}} - C_{L_{m_1,ijk}}) / T_L] \bullet CF_L \quad \text{(M.26)}$$

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 tC yr^{-1}

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

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

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

CF_L Carbon fraction of litter; dimensionless

Carbon fraction in litter is 0.37 according to IPCC (2003) Default values Table 3.2.1. Updated Default for Litter Carbon Stocks (tonnes c ha-1) and Transition Period (Years) Source: Siltanen et al., 1997; and Smith and Heath, 2002; Tremblay et al., 2002; and Vogt et al.,1996, converted from mass to carbon by multiplying by conversion factor of 0.37 (Smith and Heath, 2002).

Table E.2.2.3 Scaling up of litter calculation to project strata

Stratum	Description	Area, ha	Average biomass (t d.m. ha-1)	Total biomass on strata (t d.m.)	Total Carbon on strata (t C)	Actual net GHG removals in biomass (t CO_2e)
1	Pinus_PoorSoil_Age>10_Surv>50	4.1	10.58	43.38	21.69	79.53
2	Poplar_RichSoil_Age<10_Surv_25,1-50	44.6	10.89	485.82	242.91	890.67
3	Poplar_RichSoil_Age>10_Surv_>50	296.13	9.48	2,807.03	1,403.51	5,146.21
4	Quercus_PoorSoil_Age>10_Surv_>50	221.38	11.57	2,560.91	1,280.45	4,695.00
5	Quercus_RichSoil_Age<10_Surv_>50	121.24	3.94	477.21	238.60	874.88
6	Quercus_RichSoil_Age>10_Surv_25,1-50	35.6	9.35	332.89	166.44	610.30
7	Quercus_RichSoil_Age>10_Surv_>50	882.66	5.91	5,219.08	2,609.54	9,568.31
8	Robinia_PoorSoil_Age<10_Surv_25,1-50	59.6	5.76	343.37	171.69	629.52
9	Robinia_PoorSoil_Age<10_Surv_>50	351.4	6.62	2,324.78	1,162.39	4,262.10
10	Robinia_PoorSoil_Age>10_Surv_25,1-50	258.4	3.74	967.60	483.80	1,773.92
11	Robinia_PoorSoil_Age>10_Surv_>50	4,643.28	8.67	40,254.60	20,127.30	73,800.10
12	Robinia_RichSoil_Age<10_Surv>25,1-50	117.58	5.68	667.37	333.69	1,223.51
13	Robinia_RichSoil_Age<10_Surv>_50	617.65	11.11	6,863.41	3,431.70	12,582.91
14	Robinia_RichSoil_Age>10_Surv_25,1-50	1,078.09	8.27	8,913.74	4,456.87	16,341.86
15	Robinia_RichSoil_Age>10_Surv_>50	10,425.39	8.63	89,952.85	44,976.42	164,913.55
16	Zero emission reductions	1,132.81	0.00	0.00	0.00	0.00
TOTAL		**20,289.91**	**120.19**	**162,214.02**	**81,107.01**	**297,392.36**

Soil Carbon

The rate of change in SOC stock in project scenario was estimated as per the latest version of *A/R Methodological Tool - Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities*, version 01.1.0 (EB 60 Annex 12).

The project complies with all the applicability conditions of the tool as described below.

(a) The areas of land to which this tool is applied:

(i) Do not fall into wetland category: None of the project areas fall in the category wetlands.

- The areas of the project do not fall into the category of wetland. This has been confirmed by the information from cadastre and field visits conducted during project design, implementation, and site visits during validation and verification.

(ii) Do not contain organic soils as defined in Annex A: glossary of the IPCC GPG LULUCF 2003:

- The soils of the project are chernozems[9]. These soils are not organic soils and comply with the requirements 1 and 2 of the glossary of IPCC GPG LULUCF 2003 as outlined below.
- The surface horizon can extend from 20 cm thick to a depth of more than 2 metres in well-developed chernozems.
- Chernozem surface soils contain between 5 and 15 percent of mild humus with a high proportion of humic acids and a C/N-ratio of around 10.

(iii) Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2;

- The project soils are not subjected to land management practices and input applications listed in Table 1 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities"(Version 01.1.0) as the project lands are not croplands but are degraded lands that are not in cultivation; and the practices outlined in Table 2 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0) do not apply to the project lands as they severely degraded and are not actively managed with inputs.

(b) The A/R CDM project activity meets the following conditions:

(i) Litter remains on site and is not removed in the A/R CDM project activity;

- Litter is accumulated throughout the period of forest establishment and growth and remains undisturbed in the project area during entire rotation period of the forest.

(ii) Soil disturbance attributable to the A/R CDM project activity is:

• In accordance with appropriate soil conservation practices, e.g. follows the land contours;

- Soil disturbance from site preparation in the project activity is as per the land management and soil conservation practices implemented by Moldsilva under the land and forest management policies of Moldova.

• Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years.

- There is a limited soil disturbance from site preparation in the project activity and the site disturbance is not repeated within 30 year period. The repeat of site preparation activity in the project is expected to occur after 31 years at the end of the rotation period in some areas planted under *Robinia sp*. Therefore site disturbance is not expected to take place during 30 years, i.e., until the end of the crediting period of the project.

[9] http://www.fao.org/DOCREP/003/Y1899E/y1899e11.htm#P54_7290

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i}$$ 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 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, the management factor of 0.7 for severely degraded lands is applied.
$f_{IN,i}$	Relative stock change factor for baseline inputs in stratum *i* of the areas of land; dimensionless. No inputs are used in the baseline, therefore 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, the input factor of 1.0 is applied.
i	= 1, 2, 3, … strata of project, dimensionless

As per paragraph 8 of the tool, the values $SOC_{REF,1}$, $f_{LU,i}$, $f_{MG,i}$, and $f_{IN,i}$ are taken from the Table 3 and Table 6. The climate regime applicable to the project is cold temperate dry as per the IPCC climate zones[10] and soils of the project are chernozems[11]. Therefore, SOC_{REF} stock for mineral soil corresponding to moist cold temperate moist climate regime and high activity clay (HAC) in Table 3 has been adopted.

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{lu,i} * f_{MG,i} * f_{IN,i}$$

$$SOC_{INITIAL,i} = 95 * 1.0 * 0.7 * 1.0$$

= 66.5 t C ha^{-1}

[10] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_03_Ch3_Representation.pdf

Approved spreadsheet to facilitate the calculation of changes in soil organic carbon showing IPCC major climate zones, Annex to A/R Methodological Tool - *Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities*

[11] First National Communication of the Republic of Moldova, Ministry of Environment and Territorial Development, Chisinau and Programa osvoienia degradirovannyh zemeli I povyshenia plodorodia pochv, Chisinau, Pontos, 2005 (Program for the development of degraded sites and increasing of soil fertility, developed by the Academy of Sciences of Moldova, Ministry of Agriculture, Agency and Land relation and Cadastre, Research Institute for Soil Science and Agrochemistry)

For each stratum, which is subjected to soil disturbance attributable to project activity over and above the area disturbed in the baseline, is greater than 10% of the area of the stratum, therefore, as per the paragraph 9 of the tool, equation 2 of A/R Methodological Tool is applied to assess the soil carbon loss.

$$SOC_{loss,i} = SOC_{INITIAL,i} * 0.1$$ AR Tool (2)

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

i = 1, 2, 3, … strata of the project, dimensionless

$$SOC_{loss,i} = 66.5 * 0.1$$

$$SOC_{loss,i} = 6.65$$

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)

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

$$dSOC_{t,i} = \frac{SOC_{REF,i} - (SOC_{INITIAL,i} - SOC_{LOSS,i})}{20}$$ for t prep i < t ≤ t prep,I +20 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
$SOC_{REF,i}$	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}
$SOC_{INITIAL,i}$	SOC stock at the beginning of the A/R CDM project activity in stratum *i* of the areas of land; t C ha^{-1}
i	= 1, 2, 3, … strata of project, dimensionless
t	= 1, 2, 3, … years elapsed since the start of the A/R CDM project activity

$$dSOC_{t,i} = \frac{95 - (66.5 - 6.65)}{20} = 1.0925$$

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 $ha^{-1}yr^{-1}$ AR Tool (7)

As project dSOC $_{t,i}$= 0.925 > 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:

$$dSOC_{i,t} = \frac{44}{12} * \sum_{i} Ai * dSOC_{i.t} * 1year$$

AR Tool (8)

where:

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

A_i = 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 project, dimensionless

Table E.2.2.4.: Scaling up of SOC calculation to project strata

Stratum	Description	Area, ha	Sum of Area Disturbed (ha)	Percent of disturbed area per strata (%)	Carbon per ha per strata (tC ha-1 t, i)	Carbon per strata (tC t,i)	Emission Reductions per stratum (tCO_2e)
1	Pinus_PoorSoil_Age>10_Surv>50	4.1	2.27	55.34	4.55	18.66	68.40
2	Poplar_RichSoil_Age<10_Surv_25,1-50	44.6	6.50	14.57	4.55	202.93	744.08
3	Poplar_RichSoil_Age>10_Surv_>50	296.13	69.27	23.39	4.55	1,347.39	4,940.44
4	Quercus_PoorSoil_Age>10_Surv_>50	221.38	149.70	67.62	4.55	1,007.28	3,693.36
5	Quercus_RichSoil_Age<10_Surv_>50	121.24	61.39	50.63	0.55	66.68	244.50
6	Quercus_RichSoil_Age>10_Surv_25,1-50	35.6	18.03	50.64	4.55	161.98	593.93
7	Quercus_RichSoil_Age>10_Surv_>50	882.66	542.45	61.46	4.55	4,016.10	14,725.71
8	Robinia_PoorSoil_Age<10_Surv_25,1-50	59.6	11.15	18.71	0.55	32.78	120.19
9	Robinia_PoorSoil_Age<10_Surv_>50	351.4	109.32	31.11	0.55	193.27	708.66
10	Robinia_PoorSoil_Age>10_Surv_25,1-50	258.4	118.18	45.73	4.55	1,175.72	4,310.97
11	Robinia_PoorSoil_Age>10_Surv_>50	4,643.28	1,851.55	39.88	4.55	21,126.92	77,465.39
12	Robinia_RichSoil_Age<10_Surv>25,1-50	117.58	31.75	27.00	-0.25	-29.40	-107.78
13	Robinia_RichSoil_Age<10_Surv>_50	617.65	207.78	33.64	0.55	339.71	1,245.59
14	Robinia_RichSoil_Age>10_Surv_25,1-50	1,078.09	434.14	40.27	4.55	4,905.31	17,986.13
15	Robinia_RichSoil_Age>10_Surv_>50	10,425.39	4,738.32	45.45	4.55	47,435.52	173,930.26
16	Zero emission reductions	1,132.81	367.93	32.48	0.00		
TOTAL		**20,289.91**	**8,719.71**	**-**	**-**	**82,000.86**	**300,669.82**

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

GHG removals by sinks 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 were summed up to calculate the actual GHG removals by sinks:

- GHG removals by sinks in biomass: 1,604,616.52tCO_2e;
- GHG removals by sinks in litter: 297,392.36 tCO_2e;
- GHG removals by sinks in soil organic carbon: 300,669.82 tCO_2e;

Emissions from biomass burning (non-CO2 emissions from natural fires): 813.28 tCO_2e;

Baseline net GHG removals by sinks: 46,182.00 tCO2e;

Actual GHG removals by sinks in the project: 2,155,683.43tCO_2e;

Actual GHG rounded down removals by sinks in the project: 2,155,683tCO_2e;

E.3. Calculation of leakage

>>
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.

Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	GHG emission reductions or net GHG removals by sinks (tCO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	46,182.00	2,155,683	-	1,112,665	1,043,018	2,155,683

E.4. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	2,350,983	2,155,683

E.5. Remarks on difference from estimated value in registered PDD

>> There is decrease in actual values reached during the monitoring period in comparison to the values assessed in ex-ante calculation of the registered CDM PDD of about 8.31%. This can be explained by the following.

According to the A/R Methodological Tool - *Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities,* a penalty of 10% is to be applied to the areas of the project strata subjected to more than 10% of soil disturbance attributable to project activity over and above the area disturbed in the baseline. Therefore, as per the paragraph 9 of the tool (equation 2 of A/R Methodological Tool), the calculations of GHG removals by sinks from soil pool were adjusted for the loss of soil organic carbon due to soil disturbance.

Actual calculations are based on field measurement of aboveground tree biomass and litter. Taking into consideration that forest growth is influenced by many factors (temperature, precipitations, slope, soil, site preparation etc.), and the influence of these factors cannot be assessed during ex-ante estimation.

The calculated net anthropogenic GHG removals by sinks are lower than the *ex-ante* estimates of the registered confirms the conservative approach adopted in the ex post calculations of GHG removals by sinks from the project.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☐ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Forest Research and Management Institute
Street/P.O. Box	69, Calea Iesilor str.
Building	
City	Chisinau
State/region	
Postcode	MD 2069
Country	Republic of Moldova
Telephone	+373-22593351
Fax	+373-22593351
E-mail	icaspiu@starnet.md
Website	www.icas.com.md
Contact person	
Title	PIU Monitoring and Evaluation Assistant
Salutation	Mr.
Last name	Talmaci
Middle name	
First name	Ion
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2. List of Plots

Polygon ID	Area (ha)
111131	3.8
111132	17.6
111133	4.8
111134	9
111135	3
111136	2.5
111137	3
111138	2.6
111139	14.5
1111118	11.1
1111220	3.5
1111221	15.9
1111223	5.2
1111224	10
1111225	9
1111226	17.3
1111227	15.4
1111229	28.1
1111230	22.8
1111231	4.9
1111233	2.6
1111234	36.4
1111235	24.4
1111236	4.4
1111237	3.5
1111238	10
1111240	3
1111310	8.7
1111311	59.2
1111312	36
1111313	10
1111314	9
1111315	5
1111316	7
1111317	5
1111319	9
1111322	34.6
1111328	10.9
1111339	8.6
1111341	13.3
1111342	5.5
1111343	3.6
1111344	7
1111346	14.3
1111347	5.8
1111348	2.5
1111349	17.6
1818193	1.1
1818194	2.27
1818195	2.1
1818198	23.83
1818199	5.84
1818551	3.3
1818552	10
1818553	30
1818554	20
1818565	1.5
1818571	10
1818579	13
1818583	10
1818588	4.7
3031331	15.9
3031332	1.4
3031333	3.4
3031334	18.8
3031335	9.8
3031336	6.9
3031337	3.6
3031339	3.2
3031342	22.5
3031343	13.1
3031344	7.4
3031345	9.7
3031346	9.2
3031347	4.4
3031348	3
3031349	30
3031350	50.6
3031351	12.1
3031352	4.5
3031353	21
3033340	4.3
3034355	18
3034356	2.5
3034357	6.9
3035358	14.4
3035359	8.7
3035360	11
3035361	0.1
3035362	1.7
3035363	2
3035364	9
3036354	4.7
5051798	2.8
5051799	5.5
5051800	4.7
5051801	8.5
5051802	7.5
5051803	3
5051804	11
5051805	22.5
5051807	12.5
5051808	1.5
5051809	1.5
5051810	6.1
5051811	12.4
5051813	14.52
5051814	13.5
5051815	2.1
5051816	11
5051833	3
5051836	37
5051840	24
5051841	3.6
5051842	1.4
5051844	17.4
5051845	8
5051846	2
5051847	16
5051848	11.4
5051849	8.6
5051850	16
5051851	20
5051852	10
5051853	13.2
5051854	3
5051855	3.8
5051856	9.2
5051857	3.5
5051858	11.2
5051859	3.8
5051860	14.3
5051861	7.4
5051862	4.3
5052827	39.5
5052828	7
5052829	8
5054837	5.3
5054839	14.9
5055818	12.5
5055819	10.5
5055820	24.9
5055821	19
5055822	5
6061764	3.8
6061765	19
6061766	1.9
6061768	20.5
6061769	14
6061770	10
6061771	8
6061772	2.3
6061773	1.9
6061774	1.5
6061775	15.2
6061777	62
6061778	39.4
6061781	4.4
6061782	5
6061783	20.4
6061784	6.3
6061785	2.5
6061786	17
6061787	59.2
6061788	1.5
6061789	1.5
6061790	3.5
6061791	13

Polygon ID	Area (ha)
6061792	42
6061794	30
6061795	7.5
6061796	5.9
6061797	3
7071616	38
7071617	22
7071618	41.6
7071619	3.7
7071620	69.2
7071621	1.2
7071623	0.7
7071625	0.7
7071626	0.7
7071627	7.1
7071628	0.2
7071629	1
7071630	1
7071631	11
7071632	3
7071633	0.5
7071634	1.1
7071636	39.3
7071637	1.1
7071638	0.3
7071639	28.7
7071640	3.2
7071641	2
7071642	2.2
7071643	10.5
7071644	4.3
7071645	2.2
7071646	3.6
7071647	4.9
7071648	1.8
7071649	1.1
7071652	16.6
7072480	0.1
7072481	0.3
7072482	0.6
7072484	20
7072485	2.6
7072486	1.7
7072487	3.1
7072488	2
7072489	5.1
7072491	0.2
7072492	0.7
7072493	0.8
7072494	1
7072495	11.8
7072496	0.5
7072497	3.9
7072499	8
7072501	2.3
7072502	3.7
7072504	0.9
7072505	2.7
7072506	6.3

Polygon ID	Area (ha)
7072508	21
7072509	7.5
7072510	16.7
7072511	30.7
7072512	0.6
7072513	4.5
7072514	15.5
7072516	4.83
7072517	0.8
7072518	2.2
7072519	1.8
7072520	1.6
7072521	7.2
7072522	1.3
7072523	5.6
7072525	1.2
7072527	0.3
7072528	0.3
7072529	0.6
7072533	0.9
7073451	9.8
7073453	0.9
7073455	6
7073456	5.8
7073457	1.7
7073458	2.3
7073459	6.6
7073462	12
7073464	3
7073467	2
7073468	2.5
7073469	59
7073470	3.6
7073472	0.6
7073473	2
7073474	1.2
7073475	5.8
7073476	0.4
7073477	1.2
7073478	0.6
7073534	8.5
7073536	37
7073538	5.6
7073540	0.4
7073542	1
7073546	83.2
7073547	3.4
7073548	2.6
7073549	9.5
7073550	8.6
7073553	3
7073554	39.7
7073555	8.9
7073556	5
7073558	1.9
7073559	1
7073560	0.7
7073561	4.5
7073562	2

Polygon ID	Area (ha)
7073563	31.2
7074564	1.6
7074565	1.2
7074567	1.8
7074569	1
7074570	0.4
7074571	3.9
7074573	0.2
7074574	0.5
7074575	0.6
7074576	0.8
7074577	1
7074578	1.8
7074579	0.6
7074581	0.4
7074582	7.8
7074583	1.3
7074584	1.3
7074586	0.6
7074587	0.3
7074588	1.5
7074589	1.2
7074590	0.7
7074591	2.7
7074592	0.5
7074593	1.8
7074594	3.3
7074595	1.2
7074596	6.5
7074597	1
7074598	5
7074599	3.5
7074600	2
7074601	2
7074602	1.2
7074603	5.4
7074604	8.8
7074605	11.8
7074606	8.5
7074607	3.6
7074608	1.7
7074609	7.4
7074611	2.5
7074612	9
7074613	0.9
7074614	0.6
7074615	13.4
7074653	1.6
7074654	7.5
7074655	5.2
7074656	1.2
7074658	0.7
7074661	0.3
7074663	1.5
7074665	0.5
7074666	7.5
7074669	2.7
7074670	1.1
7074672	1.2

Polygon ID	Area (ha)
7074677	5.1
7074678	0.8
7074679	1
7074681	4.5
7074682	8.9
7074683	10
7074684	7.8
7074685	5.2
7074686	1.3
7074687	10.7
7074688	5.4
7074689	7.3
7074690	0.7
7074691	0.6
8081398	6.5
8081399	7.5
8081400	10
8081403	2.19
8082405	12.47
8082406	5.5
8082407	5
8082408	1.3
8082409	13
8082411	32.63
8082412	17.5
8082414	1.3
8084391	4.77
8084392	5.53
8084393	5.7
8084394	3.3
8084395	4.28
8084397	1.2
8085366	21.05
8085367	44.03
8085368	1.1
8085369	9
8085370	25.21
8085371	3.2
8085372	2.5
8085373	3.23
8085374	25.5
8085375	8.69
8085376	12.6
8085377	1.2
8085378	4
8085379	5.5
8085380	9.6
8085381	1.5
8085382	1.6
8085384	2.5
8085385	18.36
8085386	18.9
8085388	4
8085389	11
8085390	4.4
8086419	13.7
8086420	4.2
8086421	28.53
8086422	9.29

Polygon ID	Area (ha)
8086423	48.4
8086424	11.2
8086425	1.1
8086426	73
8086428	4.7
8086429	38.5
8086430	24.8
8086431	7.5
8086432	10.1
8086433	6
8086434	6.1
8087416	2
8087417	24.48
8087418	2.9
10101441	12.5
10102442	5.5
10102443	3.5
10102444	5
10102445	2.9
10102446	16.4
10102447	6.5
10102448	12.5
10102449	23.1
10103450	11.3
10111097	16.2
10111098	9.7
10111101	23.7
10111102	11.8
10111103	8.6
10111104	5
10111105	3.8
10111106	1.2
10111107	1.8
10111108	1.3
10111111	4.4
10111112	1.3
10121099	62.1
10121100	13.9
10131109	7.7
10131110	1.6
10131113	1
10131114	7.3
12121257	3.94
12121258	8.4
12121692	7.6
12121693	15.6
12121694	1.7
12121695	1.5
12121696	1.1
12121697	5.57
12121698	4
12121699	2.16
12121700	2.3
12121701	1.84
12121702	5.7
12121703	1.1
12121705	1.6
12121706	2.1
12121707	7.66

Polygon ID	Area (ha)
12121708	6.56
12121709	5
12121710	57.6
12121711	10
12121718	1.1
12121720	5.31
12121721	1.45
12121722	10.12
12121725	1.42
12121726	7.48
12121727	1.9
12121728	2.7
12121729	2.5
12121730	1.1
12121731	2.3
12121732	2.7
12121734	10.5
12121735	26.76
12121736	11.92
12121737	5.89
12121738	18.96
12121739	10.8
12121740	23.5
12121744	9.3
12121746	5.5
12121747	1.1
12121748	2.4
12121749	3
12121750	16.8
12121751	19.4
12121756	7.24
12121757	17.7
12121758	2
12121761	1.1
12121763	2.9
13131387	1.9
15151980	1.4
15151984	6
15151985	2.8
15151986	3.8
15151988	8.8
15151989	3.8
15151990	4.1
15151991	11.4
15151992	4.5
15151993	11.1
15151994	25.8
15151995	14.8
15151996	4.4
15151997	21.9
15151998	8
15151999	2
15153916	17.3
15153917	26.3
15153918	6.4
15153919	9.6
15153921	7
15153922	4.8
15153923	2.9

Polygon ID	Area (ha)
15153924	3.9
15153925	1.7
15153926	2.7
15153927	22
15153929	35.6
15153931	29.8
15153932	20.8
15153955	1.9
15153956	32.4
15153957	12.3
15153959	4.8
15153960	6.8
15154933	9.32
15154934	33.32
15154935	9
15154936	1
15154937	3.4
15154938	2.8
15154939	1.5
15154940	1.5
15154941	3.1
15154942	7.1
15154943	2.8
15154944	1.7
15154945	7.1
15154946	2.2
15154947	2.1
15154948	1.9
15154949	1.6
15154950	3.7
15154951	2
15154952	10.6
15154954	2.6
15155961	6.7
15155962	21.5
15155963	17
15155964	1.7
15155965	94
15155966	26
15155967	20
15155968	11.3
15155969	10
15155970	7.9
15155973	2.7
15155974	1.5
15155975	5.3
15155976	30.5
15155977	9.2
16161902	23.4
16161904	8.5
16161905	3.5
16161913	11
16161914	60
16162893	14.7
16162894	2.4
16162895	11
16162896	11.2
16162897	3
16162898	18.1

Polygon ID	Area (ha)
16162899	3.5
16162900	2.5
16162901	2.2
16162910	1.6
16162911	16
16162912	12
16162915	14
18181100	9.05
18181101	4.5
18181102	24.82
18181103	15.55
18181104	1.42
18181105	37.36
18181106	0.5
18181107	1.5
18181108	5.1
18181109	1.1
18181111	1.7
18181112	2.9
18181115	10.8
18181116	11
18181117	5.1
18181118	23.5
18181119	2.5
18181120	2
18182123	7.4
18182125	25.2
18182127	3.9
18182132	8.8
18182136	1.4
18182137	1.3
18182138	10.8
18182139	5.1
18182140	4
18183166	4.2
18183167	2.5
18183168	12.1
18183169	1.4
18183170	2.7
18183174	6
18183177	1.4
18183179	37.34
18183180	31.86
18183181	6.75
18183182	5.08
18183184	7.6
18183185	2
18183186	5
18183188	3.95
18183189	6.4
18183190	7.2
18183191	3.8
18183192	4.4
18183193	2.5
18183194	9.65
18183195	2
18183197	10.5
18183198	2.9
18183199	2.1

Polygon ID	Area (ha)
18184141	1.7
18184142	2.8
18184144	3.3
18184145	6
18184146	2.6
18184147	2.5
18184154	9
18184155	1.7
18184156	13.6
18184157	2
18184158	27
18184159	5
18184160	14
18184161	17
18184162	5
18184164	9
18184165	3
20201259	15
20201260	30
20201261	21
20201262	82
20201264	39
20201265	3.5
20201268	10
20201269	115.6
20201270	8
20201271	9.5
20201272	25
20201273	23
20201275	10
20201276	10
20201284	1.5
20201285	2.1
20201286	14
20201287	1
20201288	3
20201291	3.7
20201292	3.3
20201299	13.1
20201300	14
20201301	1
20202230	1
20202231	2.9
20202232	5.4
20202233	14.9
20202242	5.9
20202243	0.5
20202244	1.5
20202246	10.7
20202249	2
20202251	4
20202252	2.3
20202253	6
20202256	10
20203303	14.1
20203304	8
20203306	14.7
20203307	7.7
20203308	11.8

Polygon ID	Area (ha)
20203309	5.7
20203310	4.7
20203311	12.4
20203312	5
20203314	12
20203315	17
20203317	11
20203318	3.5
20203321	8
20203328	1.6
20203329	2.2
20203330	2.2
20204200	69
20204201	16
20204203	11
20204205	50
20204207	6
20204211	33
20204212	10
20204213	13
20204214	30
20204217	6
20204218	28
20204219	13
20204220	35
20204221	23
20204223	110
20204226	96
20204227	2.9
20211069	8
20211071	7
20211072	8
20211073	64
20211079	38.67
20211086	51.5
20221088	20.6
20231080	60.4
20231081	14.3
20231082	105.9
20231083	18.2
20231084	8
20231085	7.3
20231087	32.2
20231095	29.7
20231096	4.6
20231554	30.5
20241074	6
20241075	24
20241076	14
20241077	12
20241078	11.23
21210889	29.8
21210890	28.71
21210891	10
21210892	22.5
22221877	0.3
22221878	0.7
22221879	1.3
22221882	0.7

Polygon ID	Area (ha)
22223873	1.2
22223874	0.3
22223875	3
22224863	25.5
22224864	24.5
22224865	8
22224866	1.8
22224867	1.2
22224868	1
22224870	1.1
22225871	8
30311522	25.7
30311523	10.4
30311524	26
30311525	13.2
30311587	2.6
30341584	5
30341585	19
30341586	30
40411063	9
40411064	18
40411065	57.5
40411066	47.8
40411067	25
50521577	8.4
50541578	36.1
70710247	10.3
70710253	20
70710255	16.2
70710257	34
70710259	24.1
70710263	41.6
70710265	69.1
70710268	1.1
70710269	1
70710271	1
70711575	3.2
70721500	4
70721501	6
70721502	7
70721503	7
70721504	36
70721506	3
70721507	8.5
70721508	6
70721509	10
70721510	22.1
70721511	20
70721512	8.2
70721513	5.4
70721516	3.5
70721518	1.9
70721519	1
70721520	7.5
70721521	2
70721576	6
90911417	24
90911418	13
90911419	1.8

Polygon ID	Area (ha)
90911420	10.5
90911421	2.5
90911422	1.5
90911425	25
90911427	7.1
90911431	14.2
90911432	5.6
90911433	19
90911436	10
90911437	6
90911438	41
90911445	30
90911446	17
90911459	21
90911460	5.4
90911461	57.9
90911466	8.4
90911467	4.7
90911469	5
90911470	64.7
90911472	3.1
90911473	3
90911547	3
90911548	13.7
90921412	24
90921413	1.2
90921414	5
90921415	17
90921416	10.5
90921424	120
90921426	50
90921544	3.5
90921553	3.9
90931439	2.8
90931440	8.8
90931441	7
90931442	1.6
90931443	2.5
90931448	1
90931449	1.7
90931450	1.4
90931451	10
90931452	5
90931453	1
90931454	2
90931458	5.1
90931463	1.4
90941447	1.3
90941457	5.5
90941463	1.4
90941468	2
101031474	3.1
101031475	32.9
101031476	8.8
101031477	5.3
101031478	6.9
121211479	30.5
121211480	2.17
121211481	12.4

Polygon ID	Area (ha)
121211482	1.2
121211483	1.15
121211484	11.01
121211485	12.08
121211486	6.4
121211487	36.92
121211488	2.85
121211489	20.8
121211490	2.7
121211491	0.8
121211570	8
131311115	6.94
131311116	12.1
131311117	10
131311118	28.3
131311119	11.5
131311120	13.3
131311121	15.8
131311122	5.3
131311123	16.8
131311124	13
131311125	28.4
131311126	1.8
131311127	14
131311128	4
131311131	6.4
131311132	8
131311133	15.8
131311134	15
131311135	5
131311136	6.4
131311137	7
131311138	13.9
131311139	4.1
131311140	4.7
131311141	4.8
131311142	4.1
131311143	7.3
131311144	1.4
131311145	2.8
131311146	3.8
131311147	2.7
131311148	2.9
131311149	7
131311150	6.6
131311151	15.2
131311152	2
131311153	3.9
131321129	3
131321130	2.5
141411311	26
141411313	10
141411314	2
141411315	1.8
141411316	17.6
141411317	4.7
141411318	3.9
141411319	1.6
141411320	3

Polygon ID	Area (ha)
141411324	4.87
141411325	1.5
141411326	16
141411327	9.5
141411328	16
141411329	14.6
141411330	19.2
141411331	15.8
141411333	5.79
141411335	4.2
141411336	4.2
141411337	2.7
141411338	8.7
141411339	6
141411340	5.64
141411341	15.7
141411342	5.6
141411343	1.5
141411344	1
141411345	3
141411346	14
141411347	9.75
141411348	2.5
141411349	8.22
141411351	1.8
141411352	1.9
141411353	22.62
141411354	1
141411555	6
141421383	41
141421384	1.2
141421385	1.2
141421386	22.6
141421387	10
141421388	23.1
141421390	6.5
141421391	8.5
141421392	1.1
141421393	16.8
141421394	30
141421395	33.3
141421396	8.2
141421397	8.8
141421398	21.2
141421400	6.1
141421402	3
141421403	6
141421404	1.8
141421405	3
141421406	2.6
141421407	4.4
141421408	2.1
141421409	10.4
141421410	19
141431355	2.9
141431356	3
141431357	10
141431358	8.2
141431359	5.7

Polygon ID	Area (ha)
141431360	1.1
141431361	3
141431362	9.2
141431363	6.4
141431364	4.4
141431365	7.5
141431366	8.4
141431367	2.8
141431368	5.5
141431369	15.67
141431370	16.88
141431371	15.1
141431372	12.5
141431373	3.3
141431374	5.8
141431376	4
141431377	5
141431378	7.6
141431379	9.2
141431380	15
141431381	14
141431382	9.3
151510192	3.8
151510194	1.4
151510196	7.6
151510198	2.6
151511000	9
151511001	1
151511002	1.3
151511003	0.5
151511004	14
151511005	16.8
151511006	20.2
151511007	7.7
151511008	13.3
151511009	1.1
151511010	4.9
151511011	3.3
151511012	1.1
151511013	2.5
151511014	11.66
151511015	5.8
151511016	13.84
151511017	6.2
151511018	10.44
151511019	12.54
151511020	18.4
151511021	25.6
151511022	23.68
151511023	1.4
151511024	2.1
151511025	4.7
151511026	2.2
151511027	9.9
151511028	28.3
151511029	22.4
151511528	2.8
151511529	1.6
151520202	12.4

Polygon ID	Area (ha)
151520210	16
151520229	3
151521030	18.1
151521031	31.7
151521032	1.2
151521035	0.7
151521036	1.2
151521037	1.1
151521038	2.3
151521039	1.4
151521040	5.6
151521041	28.1
151521042	3.8
151521043	17.5
151521044	3.5
151521045	1.8
151521046	0.5
151521048	58.3
151521050	73.1
151521052	38
151521053	28.6
151521054	8.7
151521056	3.1
151521057	2.6
151521058	77.8
151521060	2.2
151521061	2.7
151521530	1.2
151521531	1
151521532	1.3
151530203	25.5
151530205	34.5
151530207	2.3
151530212	12.4
151530216	10
151531534	3.1
151531535	3.8
151531536	42.5
151531537	20
151531538	0.9
151531573	12.6
151531574	12
151541533	5
151541539	27
151541540	11.3
151541572	9.2
151550208	28.8
151550209	9.5
151550217	40
151550218	28
151550219	10.5
151550221	19
151550222	3
151550224	16.5
161621541	9.5
161621542	2.5
161621543	4
161621581	4
161621582	12

Polygon ID	Area (ha)
161621583	6
171711487	7
171711488	5
181810105	7.61
181821556	17.4
181830094	47.26
181831565	8.66
181831566	10.17
181831567	11.29
181840110	34.8
181841558	3.2
181841559	19
181841560	3.5
181841562	4
181841563	6.3
181841564	1.4
181850101	3
181851595	2
191910409	30
191910412	12
191911267	24.3
191911268	5.6
191911270	5.3
191911274	6.3
191911275	14
191911277	3.6
191911278	5.7
191911279	4.1
191911280	7.7
191911281	10.4
191911282	4.1
191911283	6.2
191911285	17.7
191911286	3.7
191911287	12
191911288	23
191911289	1.5
191911290	18.9
191911291	7
191911293	18.7
191911294	17.1
191911298	5.4
191911300	5.9
191911301	6.5
191911302	3.1
191911303	56.9
191911304	22.3
191911305	8.5
191911306	8.6
191911307	42.8
191911308	73.9
191911309	8.1
191920415	3
191920416	36
191920417	4
191920418	3.3
191920419	9.8
191920420	13.47
191920421	11.4

Polygon ID	Area (ha)
191920422	4
191920423	19.3
191921157	14
191921158	25.3
191921159	30
191921160	8.2
191921163	11.4
191921164	24
191921165	7
191921166	3
191921167	21
191921168	8.8
191921169	6.7
191921170	8.8
191921175	11
191921176	3.8
191921588	65
191921589	4
191930230	10.7
191930231	3
191930244	11.8
191930395	26
191930396	10
191930397	6
191930398	4
191930399	12.8
191930400	31.9
191930401	20
191931237	65.2
191931238	3.3
191931239	2.9
191931242	9.7
191931243	26.1
191931244	8.3
191931245	21.8
191931248	27
191931249	60
191931251	30
191931252	10.8
191931255	57.1
191931256	6.8
191931259	11
191940425	5
191941154	3.5
191941155	4
191941156	7.7
191950234	10
191950241	15.8
191950403	144.42
191950406	3
191951182	5
191951185	25
191951186	32.9
191951187	19.8
191951188	6
191951196	11.1
191951198	16.5
191951200	10.2
191951201	17

Polygon ID	Area (ha)
191951203	42.2
191951208	4
191951214	5
191951216	3.5
191951217	9.9
191951218	12.6
191951221	20
191951233	25.8
191951580	2.5
191960428	3.7
191960429	2.6
191960430	3.7
191960431	12.02
191961261	23.6
191961262	14
191961263	6.5
191961264	9.6
191961265	21.4
191961266	25
191961579	40
191961590	2.36
191961591	5.76
191961592	19
191961593	9.74
202010170	11
202010172	160.4
202011489	6
202011490	16
202011492	31
202030151	3
202030154	10
202030171	7.8
202030174	10.8
202030175	3.9
202040157	3
202040158	1
202040159	2.3
202040161	4.3
202040164	23
202040166	5
202041494	28
222211549	1.9
222211550	1
222211551	1.6
222211552	1.6
232310121	14.43
n010110031	10.62
n010110036	4.5
n010110038	10.45
n010110039	3
n010110040	2.55
n010110047	1
n010110048	6.52
n010120029	21.45
n010120032	16.08
n010120033	8
n010120043	18.43
n010120044	5.54
n010120045	1.75

Polygon ID	Area (ha)
n010120049	9
n010130030	62
n010130034	27.02
n010130035	16.48
n010130037	16.87
n010130041	5.38
n010130042	0.46
n010130046	0.6
n020220180	4.3
n020220186	35
n020230187	20.9
n020230189	24.36
n020230190	15.6
n020240181	10.73
n020240182	6
n020240183	18
n020240184	25
n020240188	60
n020240191	14
n020250181	30
n020250185	18
n030310469	29.5
n030310472	4.4
n030310473	1.8
n030330442	50.9
n030330443	5.1
n030330444	2.7
n030330445	3.6
n030340562	3
n030340563	19.2
n030340564	44.05
n030340565	7
n030340566	8
n030340567	12
n030340568	10
n030340569	10
n030340570	10
n030340572	10
n030350465	8.4
n030350466	9
n030350467	9.2
n030350468	7
n030360434	2
n030360435	2.09
n030360436	8.2
n030360437	7.4
n030360438	4
n030360439	12.8
n030360440	8.5
n040410364	25
n040410366	20
n040410367	9.6
n040410368	13.5
n040410369	22
n040410372	38.6
n040410373	7.8
n040420360	18
n040420371	16
n040430361	23

Polygon ID	Area (ha)
n040430362	8
n040430363	20
n040430365	10
n040430370	18
n040430374	9.6
n040430375	23
n050510050	19
n050510062	6.4
n050520055	30
n050520060	30
n050530053	6.5
n050530054	5
n050530061	13
n050530071	16
n050530072	13.2
n050540058	15
n050540059	8
n050540064	4
n050540065	7
n050540066	3
n050540067	12
n050550057	3.9
n050550070	7.1
n050550073	3.8
n050550074	18.2
n050560051	14
n050560052	8
n050560056	6.3
n050560063	9
n050560068	9.6
n050560069	6.6
n060610351	9
n060610352	5.2
n060610357	4.8
n060610358	9.1
n060620353	11.5
n060620355	15.1
n060620356	2.5
n060620359	13
n060630349	8
n060630350	44
n060630354	9
n070710246	5
n070710248	2.6
n070710249	9.6
n070710250	3
n070710251	1.3
n070710252	3.7
n070710254	3.3
n070710256	34
n070710258	16.8
n070710259	82.6
n070710260	18
n070710261	12.7
n070710262	34
n070710264	101.4
n070710266	17
n070710267	1.1
n070710272	5

Polygon ID	Area (ha)
n070710273	4
n070710274	5
n070710275	5
n070710276	6.1
n070710278	62
n070710279	2.2
n070710280	3.8
n070710284	13.2
n070740281	1.5
n070740282	0.8
n070740283	1.1
n070740285	2.9
n090910085	40
n090910088	26
n090910089	6.2
n090910090	3.8
n090910380	14
n090910381	19
n090910382	20.7
n090910383	11
n090910384	77
n090910385	15
n090910387	36
n090910388	3
n090910389	3
n090910390	5.2
n090920080	43.8
n090920082	72
n090920083	6.8
n090920391	19.6
n090920392	34
n090940081	19.9
n090940084	5.8
n090940091	20
n090940092	29.5
n090940393	44
n101010008	22
n101020004	4
n101020005	5.3
n101020006	15.2
n101020007	10
n101020009	20.8
n101020010	11
n101030001	15
n101030002	20
n101040003	6
n111110446	7
n111110447	2
n111110448	6
n111110450	9.5
n111110451	17.2
n111110452	14.8
n111110453	9
n111110454	2.5
n111110455	27.5
n111110456	5
n111110457	7
n111110458	1.2
n111110459	3.8

Polygon ID	Area (ha)
n111110460	5.5
n111110461	16.5
n111110462	10.1
n111110463	4
n111110464	8.9
n111110474	10.6
n111110476	17.6
n111110477	13.5
n111110478	7.2
n111110479	4.8
n111110480	6.9
n111110481	2
n111110482	27
n111110483	9.1
n111110484	21.8
n111110485	2.6
n111110486	2.5
n111110487	5
n111110488	5.6
n111110490	10.8
n111110491	10.4
n111110492	12
n111110493	6
n121210336	1.8
n121210337	7.1
n121210338	16.22
n121210339	7.21
n121210340	17.5
n121210341	9
n121210342	8.24
n121210343	22.1
n121210344	64.82
n121210345	1.4
n121210346	1.63
n121210347	3
n121210348	10.1
n131310075	10
n131310079	23.7
n131330076	5
n131330077	8
n131330078	10
n141400510	2
n141410496	5
n141410497	31.09
n141410498	5.86
n141410499	5
n141410506	5.48
n141410507	2.5
n141410508	9.07
n141410509	24
n141410511	5.3
n141410512	5.2
n141410513	2.4
n141410515	1.02
n141410517	4
n141410518	5.96
n141410519	21.77
n141410520	7.52
n141410521	2.08

Polygon ID	Area (ha)
n141410522	4.5
n141410523	3.5
n141410524	4
n141410525	14
n141410526	10
n141410527	1.6
n141410528	1.1
n141410529	3.2
n141410530	6.3
n141410539	4.5
n141410540	3.4
n141410541	9.8
n141410542	2.6
n141410543	1.5
n141410544	1.3
n141410545	15
n141410547	10
n141410548	5.5
n141410549	8.5
n141410550	8.5
n141410554	6.3
n141410560	7.5
n141410561	1.5
n141420500	8.52
n141420501	12
n141420502	5.98
n141420503	14.97
n141420504	10.37
n141420505	20.49
n141420537	5.5
n141420538	6.84
n141420555	54.43
n141420557	14.85
n141420558	4.94
n141430494	13.2
n141430495	28.7
n141430532	3.3
n141430533	1.1
n141430534	2
n141430535	1.3
n141430536	1.8
n141430546	4
n141430551	4.6
n141430552	5.3
n141430553	17.74
n141430556	13.64
n141430559	4
n151510195	4.5
n151510197	8.5
n151520199	45
n151520201	36.7
n151520210	47.4
n151530206	4.2
n151530213	8
n151530214	18
n151530215	5
n151550223	28
n151550225	33.5
n151550226	6

Polygon ID	Area (ha)
n151550227	12.5
n151550228	13
n161610286	2.6
n161610287	3
n161610288	13.8
n161610289	2.5
n161610290	1.4
n161610291	16
n161610292	10.3
n161610293	14
n161610294	7
n161610295	3.3
n161610296	7
n161610297	40
n161610298	13
n161610299	13.8
n161610300	1.7
n161610301	3.5
n161610302	0.5
n161610303	8
n161610304	4
n161610305	3.8
n161610306	2.8
n161610307	5.6
n161610308	1.2
n161610309	5.3
n161610310	0.9
n161610311	2
n161610312	13
n161610313	1.6
n161610314	10
n161610315	13
n161610316	2.6
n161610317	1.7
n161610318	7
n161610319	23
n161610320	4.1
n161610321	4.1
n161610322	18
n161610323	9.33
n161610324	22
n161610325	29
n161610326	6.9
n161610327	24.1
n161610328	9
n161610329	2.4
n161610330	6.8
n161610331	7
n161610332	4.8
n161610333	4
n161610334	2.6
n161610335	4.2

Polygon ID	Area (ha)
n181810095	2.43
n181810097	4.9
n181810098	5.45
n181810099	0.74
n181810104	2.1
n181810108	6.77
n181810109	8
n181820092	2.5
n181820093	1
n181820096	3.4
n181820100	18.3
n181830094	60.29
n181840110	1.7
n181850101	22
n181850102	9
n181850103	19
n181850111	19
n191910407	13
n191910410	34.6
n191910411	5.4
n191910413	15.8
n191920424	30
n191930242	10.8
n191930243	14
n191930402	120
n191940427	15
n191950238	30
n191950240	20.8
n191950405	31
n191950406	3.7
n202010142	8
n202010144	5.5
n202010145	3
n202010146	3
n202010149	7
n202010179	1.4
n202030150	4.4
n202030152	5
n202030153	15.9
n202030165	38
n202030178	4.2
n202040160	0.3
n202040162	2.4
n202040163	7
n202040167	36
n202040168	50
n202040169	47
n202040177	19
n212100011	7
n212100012	2.15
n212100013	10.13
n212100014	20.65

Polygon ID	Area (ha)
n212100015	14.24
n212100016	1.3
n212100017	0.65
n212100018	12.3
n212100019	13
n212100020	5.15
n212100021	7
n212100022	2
n212100023	7.08
n212100024	11
n212100025	9
n212100026	2
n212100027	1.3
n212100028	1
n222210376	18
n222210377	27
n222210378	10
n222210379	11.9
n232310112	20
n232310113	22.8
n232310116	32
n232310120	4.4
n232310122	7.68
n232310139	9
n232320123	16.35
n232320124	6
n232320125	1.87
n232320126	2.1
n232320130	3.9
n232320131	2.5
n232320132	10
n232320136	9
n232320137	15
n232320138	9.28
n232320140	9.7
n232330114	35
n232330115	53
n232330117	8.5
n232330118	16.9
n232330119	3.2
n232330127	16.7
n232330128	2.6
n232330129	4.7
n232330133	4.62
n232330134	6.38
n232330135	4
n232330141	2.4
Total	**20289.91**

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Document information

Version	*Date*	*Description*
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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