Monitoring report form
(Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT	
Title of the project activity	Moldova Biomass Heating in Rural Communities (Project Design Document No. 2)
UNFCCC reference number of the project activity	0160
Version number of the monitoring report	01
Completion date of the monitoring report	14/10/2015
Monitoring period number and duration of this monitoring period	Monitoring period : 02 Duration : 01/05/2012 to 30/06/2015 (first and last days included)
Project participant(s)	• Carbon Finance Unit Moldova • EDP – Energias de Portugal, S.A., The Netherlands • Netherlands' Ministry of Infrastructure and the Environment (IenM), The Netherlands • FUJIFILM Corporation, Japan • Idemitsu Kosan Co., Ltd., Japan • JX Nippon Oil & Energy Corporation, Japan • The Okinawa Electric Power Co., Inc., Japan • Daiwa Securities Co. Ltd. , Japan • Endesa Generacion, S.A., Spain • Gas Natural SDG, S.A, Spain • Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness, Spain • Hidroelectrica del Cantabrico, S.A., Spain • Göteborg Energi AB, Sweden • Government of Italy - Ministry for the Environment, Land and Sea, Italy • Government of Luxembourg - Ministry of the Environment, Luxembourg • Ruukki Metals Oy, Finland • Schweizerische Rückversicherungsgesellschafts AG (Swiss RE), Switzerland • Aalborg Portland A/S, Denmark • Danish Ministry of Climate, Energy and

	Building/Danish Energy Agency, Denmark • Maersk Olie og Gas AS, Denmark • Nordjysk Elhandel A/S, Denmark • DONG Naturgas A/S, Denmark • Kommunalkredit Public Consulting GmbH, Austria • Brussels – Capital Region, Belgium • Kingdom of Belgium - Walloon Region Ministry of the Environment, Belgium • Statkraft Carbon Invest AS, Norway • Statoil ASA, Norway • KfW Bankengruppe, Germany • BASF SE, Germany Bilateral and Multilateral Funds: Community Development Carbon Fund (CDCF) Managing company: International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)
Host Party (ies)	Republic of Moldova
Sectoral scope(s)	Sectoral scope : 1 - Energy industries (renewable / non - renewable sources) Sectoral scope : 3 - Energy demand
Selected methodology(ies)	AMS-II.E. Energy efficiency and fuel switching measures for buildings (version 6 dated 30/09/2005) AMS-III.B. Switching fossil fuels (version 6 dated 30/09/2005)
Selected standardized baseline(s)	Not applicable
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	17,343[1] tCO_2

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 (tCO_2)	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards (tCO_2)
	1,628	10,877

[1] Total estimated CERs as per PDD for 2012 - 15 is 23,124 tCO_2e. Generally, the heating system operates for 7 months a year and therefore, 28 months for 2012 -15. This monitoring period covers only 3 months of operation in 2012, 7 months in 2013, 7 months in 2014 and 4 months in 2015 (total 3+7+7+4 = 21 months). Therefore the estimated CER for monitoring period is (23,124 * 21/28) = 17,343 tCO_2e.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

This project aims at greenhouse gas (GHG) emission reduction as a result of energy efficiency improvements and fuel switching measures for a number of public buildings (kindergartens, schools, vocational schools, hospitals, polyclinics, etc.) located across Moldova. The goal of the project was to generate added value to the Moldova Social Investment Fund (SIF) II Project, through GHG emissions reduction benefits for SIF project participants, by creating incentives. This would encourage further implementation of GHG mitigation measures. Thus, the use of carbon benefits served as a catalyst for implementing clean heat production technologies.

The anthropogenic GHG emission reductions in this project were achieved as a result of:

- Fuel switching from coal and mazut to natural gas
- Energy efficiency improvements of local heating systems (low-efficiency boilers/stoves replacement by modern boilers; strengthening the insulation of external and internal heat and hot water distribution pipelines)
- Implementation of energy conservation measures in buildings (additional insulation of building envelopes and replacement of roofs, windows & doors)

The public buildings included in this project were previously supplied with heat from physically old, technologically outdated stoves/boilers through an extremely deteriorated heat distribution network having a high level of losses, with an overall average heating system efficiency ranging between 40 - 50%. These old stoves/boilers were replaced with efficient coal or natural gas based modern boilers.

This project bundled 65 energy project activities (public buildings). The owners of all public buildings involved in the project were local public authorities and the beneficiaries of Community Development Carbon Fund (CDCF) project, referred as Project Activity (PA) - owners. Taking into account, a need for a consolidated Emission Reduction Purchase Agreement (ERPA) due to prohibitive transaction costs (for 65 small PAs) and that there was no capacity in the country in any agency that is sustainable (for ERPA duration of 10 years), The Carbon Finance Unit (CFU) was created under the Ministry of Ecology and Natural Resources. CFU has the status of an independent legal entity and is empowered to enter into ERPA. The CFU signed the subsidiary agreement with all 65 PAs that stipulates the CFU and PA rights and responsibilities under this project. The project bundling principle in presented in figure 1.

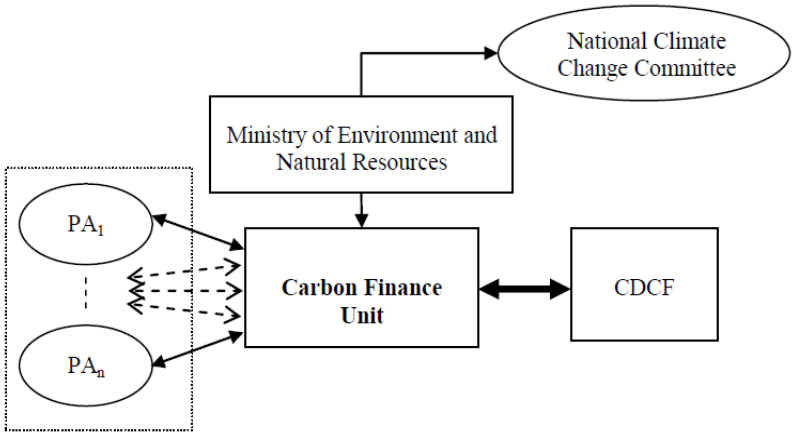

Figure 1: Principle of project bundling

Project activities contribution to sustainable development

Economic: The project led to a decrease in cost per unit of heat production.

Social: The project resulted in the decreased payment burden for the consumed energy resources and increased local employment. Besides, the project improved the living and working conditions within the considered public buildings through:

- Increased availability of heating service for considered buildings
- Normalization of room heating temperature
- Increased duration of heating period
- Making hot water available and affordable in buildings like schools, orphanages, etc.

Environmental:

Conventional coal-burning boiler houses create massive pollution. They represent one of the largest sources of air pollution and GHG gas emissions. Also, heat production is responsible for large amount of Carbon dioxide (CO_2), Sulfur dioxide (SO_2), Nitrogen oxides (NOx), and mercury emissions (Hg). These four pollutants are the major cause of worst environmental problems including acid rain, smog, respiratory illness, mercury contamination and global warming. In this project, coal was substantially substituted by natural gas.

Technological: More advanced technologies for heat production was used in the project.

The PDD was registered on 20/01/2006. As per the revised PDD version 02, the estimated annual average (for the period 2008-2017) emission reduction was 5,781 tCO_2e. The relevant dates of the project activity are provided in table 3 of section B.1 of MR. For detailed description of the installed technology and plant equipment are furnished in section B.1 “Description of implemented registered project activity” of this report.

This is the 2nd monitoring report for the duration of 01/05/2012 and 30/06/2015 (first and last days included). Certified Emission Reductions (CERs) generated during this monitoring period is 12,505 tCO_2e.

A.2. Location of project activity

Host country

The PAs are implemented all over the country. Hence the project boundary is the geographical boundaries of Republic of Moldova.

The geographical reference of Republic of Moldova is:
- Latitude : 45.4939 - 48.4830 ˚N
- Longitude : 26.5879 - 30.1365 ˚E

Region/State/Province

The project covers 65 PAs located in 24 districts (rayons) of Moldova, as follows – Briceni, Cahul, Calarasi, Causeni, Cimislia, Criuleni, Donduseni, Drochia, Edinet, Falesti, Floresti, Hincesti, Ialoveni, Leova, Nisporeni, Ocnita, Orhei, Rezina, Riscani, Singerei, Soldanesti, Soroca, Stefan Voda, Ungheni and in one autonomous region UTA Gagauzia,

City/Town/Community

Alcedar, Badragii Vechi, Baltata, Baraboi, Beleaventi, Berlinti, Bocani, Brinza, Carbalia, Chetrosu, Cioresti, Ciutulesti, Constantinovca, Coteala, Cotiujenii Mici, Cotova, Cotovscoe, Doina, Festelita, Floresti, Frunze, Galaseni, Halahora de Sus, Hlina, Hoginesti, Iargara, Lipnic, Manoilesti, Miresti,

Figure 2: The Map of Moldova Republic: districts involved in the project

Mosana, Musteata, Parcani, Pelenia, Pohorniceni, Poiana, Prepelita, Pruteni, Puhoi, Raculesti, Saharna Noua, Singerei, Singureni, Sociteni, Sofrincani, Soldanesti, Stolniceni, Svetlii, Tareuca, Ulmu, Ursoaia, Valea Pierjii, Varatic, Voinescu, Zaicani, Zaluceni

Table 1. The list of public buildings considered in the project PAs belonging to category II.E. Energy efficiency and fuel switching measures for buildings

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
3	Mayoralty Berlinti	Vitalie Stirbu, Director of General Direction of Education	Berlinti Village, Briceni District	Gymnasium	Briceni
4	Mayoralty Beleaventi	Vitalie Stirbu, Director of General Direction of Education	Beleaventi Village, Briceni District	Lyceum	Briceni
5	Mayoralty Hlina	Vitalie Stirbu, Director of General Direction of Education	Hlina Village, Briceni District	Gymnasium	Briceni
6	Mayoralty Halahora de sus	Vitalie Stirbu, Director of General Direction of Education	Halahora de Sus Village, Briceni District	Gymnasium	Briceni
7	Mayoralty Doina	Carmalac Maria, Director of Gymnasium	Doina Village, Cahul District	Gymnasium "I.L. Caragiale	Cahul

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
8	Mayoralty Doina	Hulub Tatiana, Director of General Direction of Education Cahul	Rumeantev Village, Cahul District	Primary school+kinder garten	Cahul
11	Mayoralty Miresti	Cretu Elena, Director of Gymnasium	Miresti Village, Hincesti District	Gymnasium	Hincesti
17	Mayoralty Mosana	Traci Larisa, Director of Gymnasium	Mosana Village, Donduseni District	Gymnasium	Donduseni
18	Mayoralty Baraboi	Livitchi Aurelia, Director o Lyceum	Baraboi Village, Donduseni District	Lyceum	Donduseni
19	Mayoralty Chetrosu	Surlaru Emilia, Director of Gymnasium	Chetrosu Village, Drochia District	Gymnasium "Bunescu Dumitru"	Drochia
20	Mayoralty Chetrosu	Fortuna Iacob, Director of Lyceum	Chetrosu Village, Drochia District	Lyceum "Victor Cotofana"	Drochia
21	Mayoralty Cotova	Melinte Iurie, Director of General Direction of Education Drochia	Macareuca Village, Drochia District	Primary School	Drochia
27	Mayoralty Badragii Vechi	Mitreniuc Aurelia, Director of General Direction of Education Edinet	Badragii Vechi Village, Edinet District	Gymnasium	Edinet
28	Mayoralty Bocani	Ţurcan Galina, Director of Gymnasium	Bocani Village, Falesti District	Gymnasium	Falesti
29	Mayoralty Pruteni	Clipa Raisa, Director of Gymnasium	Pruteni Village, Falesti District	Gymnasium	Falesti
30	Mayoralty Musteata	Antoci Nadejda, Director of Gymnasium	Musteata Village, Falesti District	Gymnasium	Falesti
31	Mayoralty Zaluceni	Nagrineac Ludmila, Director of General Direction of Education Floresti	Zaluceni Village, Floresti District	Gymnasium	Floresti
32	Mayoralty Ciutulesti	Nagrineac Ludmila, Director of General Direction of Education Floresti	Ion Voda Village, Floresti District	Gymnasium	Floresti
33	Mayoralty Ciutulesti	Nagrineac Ludmila, Director of General Direction of Education Floresti	Sirbesti Village, Floresti District	Gymnasium	Floresti
34	Mayoralty Floresti	Eleonora Rijcov, Director of I.M. "Retelele Termice Floresti"	Floresti Village, Floresti District	Kindergarten Andries	Floresti
35	Mayoralty Voinescu	Gutan Ion, Director of Gymnasium	Voinescu Village, Hincesti District	Gymnasium	Hincesti
36	Mayoralty	Rosioru Vasile, Director of	Sociteni Village,	Gymnasium	Ialoveni

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
	Sociteni	Gymnasium	Ialoveni District		
41	Mayoralty Cioresti	Gheorge Adam, Director of Gymnasium	Vulcanesti Village, Nisporeni District	Gymnasium	Nisporeni
42	Mayoralty Lipnic	Siric L., Mayoralty's Accountant	Lipnic Village, Ocnita District	Community Centre	Ocnita
43	Mayoralty Frunze	Dragomireţchi Ludmila, Director of Primary school	Frunze Village, Ocnita District	Primary School / Kindergarten	Ocnita
45	Mayoralty Saharna Noua	Zugrav Elena, Director of Primary school	Buciusca Village, Rezina District	Primary school - Kindergarten Buciushca	Rezina
47	Mayoralty Galaseni	Bezverhnii Carolina, Director of Gymnasium	Galaseni Village, Riscani District	Gymnasium	Riscani
50	Mayoralty Prepelita	Director of Gymnasium	Prepelita Village, Singerei District	Gymnasium	Singerei
51	Mayoralty Cotiujenii Mici	Rotaru Silvestru, Director of Gymnasium	Cotiujenii Mici Village, Singerei District	Gymnasium	Singerei
52	Mayoralty Cotiujenii Mici	Zamornea Ludmila, Mayor	Cotiujenii Mici Village, Singerei District	Kindergarten	Singerei
54	Mayoralty Poiana	Liliana Ştefîrţă, Director of Gymnasium	Poiana Village, Soldanesti District	Gymnasium	Soldanesti
55	Mayoralty Alcedar	Turcan Galina, Director of Gymnasium	Alcedar Village, Soldanesti District	Gymnasium	Soldanesti
56	Mayoralty Alcedar	Svet Victor, Mayor	Curatura Village, Soldanesti District	Kindergarten (former school)	Soldanesti
58	Mayoralty Parcani	Donos Ghenadie, Director of Donos Ghenadie, Director of General Direction of Education Soroca	Parcani Village, Soroca District	Gymnasium	Soroca
59	Mayoralty Parcani	Donos Ghenadie, Director of General Direction of Education Soroca	Valoave Village, Soroca District	Gymnasium	Soroca
63	Mayoralty Brinza	Gaisan Maria, Director of Lyceum	Brinza Village, Cahul District	Lyceum	Cahul
64	Mayoralty	CLOSED[2]	Carbalia Village,	School	UTA

[2] School was closed in 2010 in the context of National Education Reform

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
	Carbalia		UTA Gagauzia		Gagauzia
65	Mayoralty Carbalia	Kudrova M. I, Mayoralty's Accountant	Carbalia Village, UTA Gagauzia	Kindergarten	UTA Gagauzia
67	Mayoralty Cotovscoe	Cebanov Gheorghi, Director of Gymnasium	Cotovscoe Village, UTA Gagauzia	Gymnasium	UTA Gagauzia
	Total 39 PAs				

Table 2. The list of facilities considered in the project PAs belonging to category III B. Switching fossil fuels

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
1	Mayoralty Coteala	Vitalie Stirbu, Director of General Direction of Education	Coteala Village, Briceni District	Gymnasium	Briceni
2	Mayoralty Coteala	Ilcov Vera, Mayoralty's Accountant	Coteala Village, Briceni District	Kindergarten	Briceni
9	Mayoralty Hoginesti	Maria Postaru, Director of Gymnasium	Hoginesti Village, Calarasi District	Gymnasium	Calarasi
10	Mayoralty Ursoaia	Virtosu Simion, Director of Gymnasium	Ursoaia Village, Causeni District	Gymnasium	Causeni
12	Mayoralty Valea Pierjii	Delinschi Ion, Director of General Direction of Education Cimislia	Valea Pierjii Village, Cimislia District	Primary School / Kindergarten	Cimislia
13	Mayoralty Raculesti	Frunze V., Mayor	Raculesti Village, Criuleni District	Kindergarten (former gymnasium)	Criuleni
14	Mayoralty Raculesti	Frunze V., Mayor	Balasesti Village, Criuleni District	Kindergarten (former school)	Criuleni
16	Mayoralty Baltata	Todoriuc Galina, Director of Gymnasium; Usatii Tatiana, Accountant	Baltata Village, Criuleni District	Gymnasium	Criuleni
22	Mayoralty Pelenia	Postolachi Petru, Director of Lyceum	Pelenia Village, Drochia District	Lyceum	Drochia
23	Mayoralty Sofrincani	Turcinskaia N., Director of Gymnasium	Sofrincani Village, Edinet District	Gymnasium	Edinet
24	Mayoralty Sofrincani	Sipitco Veceslav, Mayor	Sofrincani Village, Edinet District	Kindergarten	Edinet
25	Mayoralty Constantinovca	Iolovat Elena, Director of Gymnasium	Constantinovca Village, Edinet District	Gymnasium	Edinet
26	Mayoralty	Netedu Gabriela, Mayoralty's	Stolniceni Village,	Kindergarten	Edinet

PA No.	Beneficiary	Contact person	Complete address	Location of boiler	District
	Stolniceni	Accountant	Edinet District		
37	Mayoralty Varatic	Carabgjac Sofia, director of Gymnasium	Varatic Village, Ialoveni District	Gymnasium	Ialoveni
38	Mayoralty Ulmu	Ursu Nina, Director of Lyceum	Ulmu Village, Ialoveni District	Gymnasium "Mihai Eminescu"	Ialoveni
39	Mayoralty Puhoi	Maria Soltan, Director of Lyceum	Puhoi Village, Ialoveni District	Lyceum	Ialoveni
40	Mayoralty Iargara	Ivanov Raisa, Director of Lyceum	Iargara Village, Leova District	Lyceum "L.Blaga" (former Russian school)	Leova
44	Mayoralty Pohorniceni	Cojocaru Maria, Mayoralty's Accountant	Pohorniceni Village, Orhei District	Primary School / Kindergarten	Orhei
46	Mayoralty Tareuca	Cuzuioc N., Mayoralty's Accountant	Tareuca Village, Rezina District	Kindergarten	Rezina
48	Mayoralty Singureni	Macovei Alexandra, Director of Gymnasium	Singureni Village, Riscani District	Gymnasium	Riscani
49	Mayoralty Zaicani	Gaidau Ludmila, Director of Lyceum	Zaicani Village, Riscani District	Lyceum "L. Gherman"	Riscani
53	Mayoralty Singerei	Siscanu Ludmila, Director of Lyceum	Singerei Village, Singerei District	Lyceum Olimp (former School nr. 3)	Singerei
57	Mayoralty Soldanesti	Prisacari Elena, Mayoralty's Accountant	Soldanesti Village, Soldanesti District	Kindergarten Andries (former school)	Soldanesti
60	Mayoralty Festelita	Galafton N., Mayoralty's Accountant	Festelita Village, Stefan Voda District	Kindergarten	Stefan Voda
61	Mayoralty Svetlii	Kutari N. I., Mayoralty's Accountant	Alexeevca Village, UTA Gagauzia	Kindergarten "Солнышко"	UTA Gagauzia
62	Mayoralty Manoilesti	Andrusca Sergiu, Director of Gymnasium	Manoilesti Village, Ungheni District	Gymnasium	Ungheni
	Total 26 PAs				

PA 15 and PA 66 were installed with air convector type heating system (natural gas based). Since this is not as per the project technology (boilers), these two PAs were removed from the project as per revised PDD version 02.

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 if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Moldova (host country)	Carbon Finance Unit Moldova	No
The Netherlands	EDP – Energias de Portugal, S.A.	Yes
The Netherlands	Netherlands' Ministry of Infrastructure and the Environment (IenM)	Yes
Japan	FUJIFILM Corporation	No
Japan	Idemitsu Kosan Co., Ltd.	No
Japan	JX Nippon Oil & Energy Corporation	No
Japan	The Okinawa Electric Power Co., Inc.	No
Japan	Daiwa Securities Co. Ltd.	No
Spain	Endesa Generacion, S.A.	Yes
Spain	Gas Natural SDG, S.A.	Yes
Spain	Kingdom of Spain - Ministry of Agriculture, Food and Environment and Ministry of Economy and Competitiveness	Yes
Spain	Hidroelectrica del Cantabrico, S.A.	Yes
Sweden	Göteborg Energi AB	No
Italy	Government of Italy - Ministry for the Environment, Land and Sea	Yes
Luxembourg	Government of Luxembourg - Ministry of the Environment	Yes
Finland	Ruukki Metals Oy	No
Switzerland	Schweizerische Rückversicherungsgesellschafts AG (Swiss RE)	No
Denmark	Aalborg Portland A/S	Yes
Denmark	Danish Ministry of Climate, Energy and Building/Danish Energy Agency	Yes
Denmark	Maersk Olie og Gas AS	Yes
Denmark	Nordjysk Elhandel A/S	Yes
Denmark	DONG Naturgas A/S	Yes
Austria	Kommunalkredit Public Consulting GmbH	Yes
Belgium	Brussels – Capital Region	Yes

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Belgium	Kingdom of Belgium - Walloon Region Ministry of the Environment	Yes
Norway	Statkraft Carbon Invest AS	No
Norway	Statoil ASA	No
Germany	KfW Bankengruppe	No
Germany	BASF SE	No

Bilateral and Multilateral Funds: Community Development Carbon Fund (CDCF) Managing company: International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)

A.4. Reference of applied methodology and standardized baseline

Type of the project activity:

Type II – Energy efficiency improvement projects
Type III – Other project activities

Selected Methodologies:

- AMS-II.E "Energy efficiency and fuel switching measures for buildings" (Version 6 dated 30/09/2005)[3]
- AMS-III.B "Switching fossil fuels"(Version 6 dated 30/09/2005)[4]

A.5. Crediting period of project activity

Crediting period: 10 years and fixed

Crediting period start date as per registered PDD is 01/01/2008. The duration of this monitoring period is between 01/05/2012 to 30/06/2015 (first and last days included).

A.6. Contact information of responsible persons/entities

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Administrator
Carbon Finance Unit
9 Cosmonautilor Str, Office 535
Chisinau
stela.drucioc@cfu.md

[3] http://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_7T2D2036BNUABJY0YXJYVAVSCUY7QL/SSC_II.E.pdf?t=MVZ8bjgybHRvfDAhu5jJ4OjYExNzCSNkuyO4
[4] http://cdm.unfccc.int/filestorage/C/D/M/CDMWF_AM_FBPOT7ZSPMU6JDHRQ5MSV9ZR69IZ5V/SSC_III.B.pdf?t=MUZ8bjgybHUwfDBPUqiTnQBfv8aVu_vbzSf8

The above mentioned responsible person/entity is also a project participant as listed in Appendix 1 of this MR.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

This report is prepared as a single monitoring report for the duration from 01/05/2012 and 30/06/2015 (first and last days included). Major milestones in the project implementation of the PDD are shown below:

Table 3. Timeline of the project implementation

Activity	Date
Signing of first subsidiary agreement with PA	07/09/2005
Signing of last subsidiary agreement with PA	21/12/2007
Completion of final works of first project boiler	24/02/2006
Completion of final works of last project boiler[5]	09/04/2008
Start date of 1st monitoring period	01/01/2008
End date of 1st monitoring period	30/04/2012
Start date of 2nd monitoring period	01/05/2012
End date of 2nd monitoring period	30/06/2015

The energy efficiency measures and boiler replacements were carried out for the heating systems of public buildings such as schools, kindergartens, orphanages, community halls, health centres, etc. The new technologies employed by PAs increased the overall efficiency of the heating systems up to 70-90% resulting in energy savings and consequent reduction in GHG emissions.

The heating plants were operated only during the winter seasons that is from January to April and October to December, every year. All other months (May to September), the heating system was shut down and the regular maintenance works were carried out. Other than these shutdown periods, there were no serious issues/continuous shutdown of heating systems during the monitoring period.

The schematic diagram of typical boiler system installed under the project is provided in figure 3.

The boilers installed were of different types (coal or natural gas) and models (with external or internal burner unit for natural gas boilers) as selected by the beneficiaries as per their building heat requirements. The heating system included one to three boilers in each PA. The cumulative

[5] date when the construction and operation of the complete heating system was verified and approved by SIF or Mayoralty office through final works. Actual installation and operation of boilers shall be 4 -6 months before this date as evidenced by the fuel consumption invoices.

installed capacity of heating system per PA with natural gas boiler ranged from 24 to 600 kW. For coal boiler, it ranged from 29.1 to 176.2 kW.

In few PAs (31, 32, 33. 36, 41, 51, 52, 58, 59), the PAs first replaced their old baseline coal boilers with project coal boilers. After few years, this project coal boiler was replaced with project natural gas boilers. In all these PAs, the emission reduction is calculated from the natural gas boilers for their respective operational duration during this monitoring period.

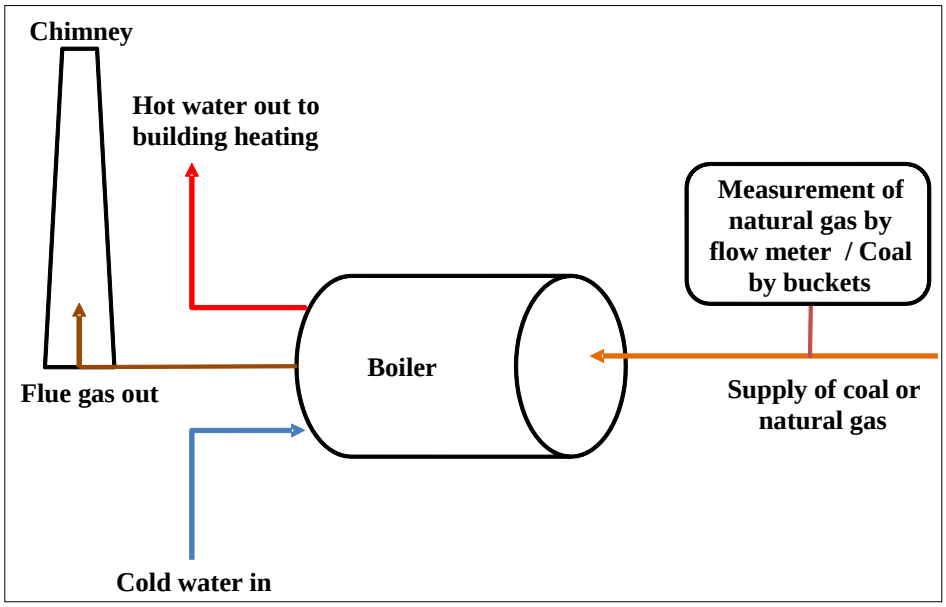

Figure 3: Typical boiler system installation

In case of PAs under methodology AMS-II.E, the energy efficiency improvements of local heating systems such as low-efficiency boiler replacements by modern ones, strengthening the insulation of external & internal heat and hot water distribution pipelines, as well as implementation of energy conservation measures in buildings (additional insulation of building envelopes and replacement of roofs, windows & doors) were carried out.

In case of PAs under methodology AMS-III.B, the fuel switch from coal to natural gas was carried out.

The details of fuel switching, boiler replacements and their capacities are provided in table 4 and table 5.

Table 4: Details of fuel switch and boiler replacements under AMS-II.E

PA No.	Fuel Switch		Boiler type	Total boiler capacity, kW
	Baseline	Project		
3	Coal	Natural gas	RTN E 70	140.00
4	Coal	Natural gas	EN-120	240.00
5	Coal	Natural gas	THERM DUO 50	147.00
6	Coal	Natural gas	ECONCEPT 50 A / THERM DUO 100	150.00
7	Coal	Coal	VIADRUS U 22 C	116.20
8	Coal	Coal	VIADRUS U 22 C	69.80
11	Coal	Coal	VIADRUS U22C	81.40

PA No.	Fuel Switch		Boiler type	Total boiler capacity, kW
	Baseline	Project		
17	Coal	Coal	VIADRUS U 22 C	174.30
18	Coal	Natural gas	Ariston G 55 RI	126.00
19	Coal	Natural gas	RTN E 100 / RTN E 90	190.00
20	Coal	Natural gas	RTN E 100	200.00
21	Coal	Coal	КЧУ-5 Эффект	84.00
27	Coal	Coal	Viadrus U22C	81.40
28	Coal	Coal	VIADRUS U22C	174.30
29	Coal	Coal	КЧМ-5-К	100.00
30	Coal	Coal	КЧМ-5-К / Termoprim	160.00
31	Coal	Natural gas	THERM DUO 50	98.00
32	Coal	Natural gas	SOLARA 32SOUA	64.00
33	Coal	Natural gas	Solara	70.00
34	Coal	Natural gas	RMG Mk.II	200.00
35	Coal	Coal	VIADRUS U 22 C	174.30
36	Coal	Natural gas	THERM DUO 50	98.00
41	Coal	Natural gas	THERM DUO 50	98.00
42	Coal	Natural gas	THERM DUO 50	98.00
43	Coal	Natural gas	THERM DUO 50	147.00
45	Coal	Coal	Viadrus U22C	29.10
47	Coal	Coal	КЧМ-5-К	200.00
50	Coal	Coal	Viadrus U22C	163.10
51	Coal	Natural gas	VIADRUS U22C	93.00
52	Coal	Natural gas	VIADRUS U22C	153.90
54	Coal	Coal	KSTG-60; VIADRUS U 22 C	176.20
55	Coal	Coal	VIADRUS U 22 C	174.2
56	Coal	Coal	VIADRUS U 22 C	46.60
58	Coal	Natural gas	Altair RTN E 100	200.00
59	Coal	Natural gas	THERM DUO 50	98.00
63	Coal	Natural gas	RS Mk.II	340.00
64	Coal	Natural gas	Biase	32.00
65	Coal	Natural gas	Biase	24.00
67	Coal	Natural gas	RTN E 90	180.00

Table 5: Details of fuel switch and boiler replacements under AMS-III.B

PA No.	Fuel Switch		Boiler type	Total boiler capacity, kW
	Old	New		
1	Coal	Natural gas	RTN E 70	140.00

2	Coal	Natural gas	M90B 24S	48.00
9	Coal	Natural gas	RTN 100	200.00
10	Coal	Natural gas	PRESS T	260.00
12	Coal	Natural gas	MaxOpticus c17SPV31MEF	93.00
13	M	Natural gas	RTN E 100	200.00
14	Coal	Natural gas	Taurus	40.00
16	Coal	Natural gas	RTN-E 70	140.00
22	Coal	Natural gas	EN 200	464.00
23	Coal	Natural gas	RTN E 80 / THERM DUO 50	209.00
24	Coal	Natural gas	PICTOR-DUAL	31.00
25	Coal	Natural gas	RTN E 100	200.00
26	Coal	Natural gas	Pictoral Dual	31.00
37	Coal	Natural gas	Bipress 130	270.00
38	Coal	Natural gas	Rivpeterm 96 /Rivpeterm 80	272.00
39	Coal	Natural gas	RS Mk.II	301.00
40	Coal	Natural gas	RS Mk.II	258.00
44	Coal	Natural gas	TERMO DUO 50 / Solara	128.00
46	Coal	Natural gas	Viadrus G-300	600.00
48	Coal	Natural gas	Nova Florida	48.00
49	Coal	Natural gas	Viadrus G 300	378.00
53	Coal	Natural gas	EN-200	500.00
57	Coal	Natural gas	EN-120	279.00
60	Coal	Natural gas	THERM DUO 50	105.00
61	Coal	Natural gas	Habitat-23	48.00
62	Coal	Natural gas	RS Mk.II	302.00

B.2. Post-registration changes

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

Not applicable

B.2.2. Corrections

Not applicable

B.2.3. Changes to start date of crediting period

Not applicable

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

Not applicable

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

After the registration of the project, there were few changes in the registered monitoring plan.

A PRC was carried out and revised PDD version 02 dated 10/10/2014 was approved by UNFCCC on 06/01/2015[6] (PRC reference no: PRC-0160-001). The main changes made to the registered project were as follows:

- Adjustment of monitoring plan w.r.t. deletion of application of methodology AMS-I.C
- List of ex-ante parameters
- Listing of monitoring parameters
- Direct monitoring of fuel use and calculation of building's heat consumption (heat output of boiler and heating system) instead of direct monitoring of both fuel use and output (heat output or electricity generated) as required by AMS-III.B ver 6).

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

After the registration of the project, there were few changes in project design during implementation. A PRC was carried out and PDD version 02 dated 10/10/2014 was approved by UNFCCC on 06/01/2015[7] (PRC reference no: PRC-0160-001). The main changes to the registered project were as follows:

- Removal of proposed PAs under category AMS-I.C. Thermal energy for the user and removal of related proposed 55 PAs under this category resulting in only 65 sites instead of 120 as initially considered
- All references for fuel switch from coal to biomass and natural gas to biomass were removed
- Short description of PAs under AMS II.E and AMS III.B were added
- Annual emission reduction was also revised based on the above changes
- Listing of ex-ante parameters
- Listing of monitoring parameters
- Adjustment of all section w.r.t. above stated changes
- Revision of PDD from VVM to VVS track

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

Not applicable

SECTION C. Description of monitoring system

PA-owners in conformity with the signed subsidiary agreements with CFU installed, operated and maintained the facilities and equipment (data measurement and collection systems) and employed the staff necessary for gathering all such data as required by the monitoring plan.

Procedures for monitoring, measurements and reporting

[6] http://cdm.unfccc.int/PRCContainer/DB/prcp322187081/view
[7] http://cdm.unfccc.int/PRCContainer/DB/prcp322187081/view

For the PAs activities with natural gas consumption, monitoring frequency were in line with fuel flow meter readings. Usually, the natural gas meter readings were recorded monthly by the PA operator and the local gas supplier. The reporting documents for this meter were the monthly invoices, which consisted of the metering period, initial and final meter readings and respective monthly consumptions.

In case of coal boilers, the coal was purchased in bulk one or more times per heating season as per the requirement. At purchase, the coal supplier provided an invoice showing coal amount and purchase price. This coal amount was taken from weighing done using truck scales at the supplier end (outside the project boundary). During the heating season, the daily coal consumption was measured using buckets and recorded in coal register by plant operator. Weight of each bucket of coal was measured once during a heating season using weighing scale. At the end of heating season, the daily coal consumption was added to find the total coal consumption during that period.

At the beginning of every succeeding reporting year, the annual project emissions report was worked out. The annual emission reductions report was printed and signed by the Project-monitor and finally, the Project-manager. The annual report included: overall project performance, emissions reduction and comparison with baseline study estimations, comments concerning monitoring plan indicators, information on monitoring plan main assumptions, calculation methods and changes in the monitoring plan.

The data flow procedure from various PAs to CFU unit is provided in figure 4.

Description of the authority and responsibility of project management

The CFU is responsible for data collection, archiving and reporting. Its specific responsibilities are to:

a) Contact the PA entity and collect metered data as required by the monitoring methodology (the data collection was done through e-mail, fax, phone or on site visit)
b) Verify the collected data quality and integrity, through regular on-site inspections and enter the collected data in the emission calculation workbook
c) Check that calculation of emission reductions to be line with the monitoring methodology requirements and assumptions and keep a separate emission calculation workbook for each year of the crediting period

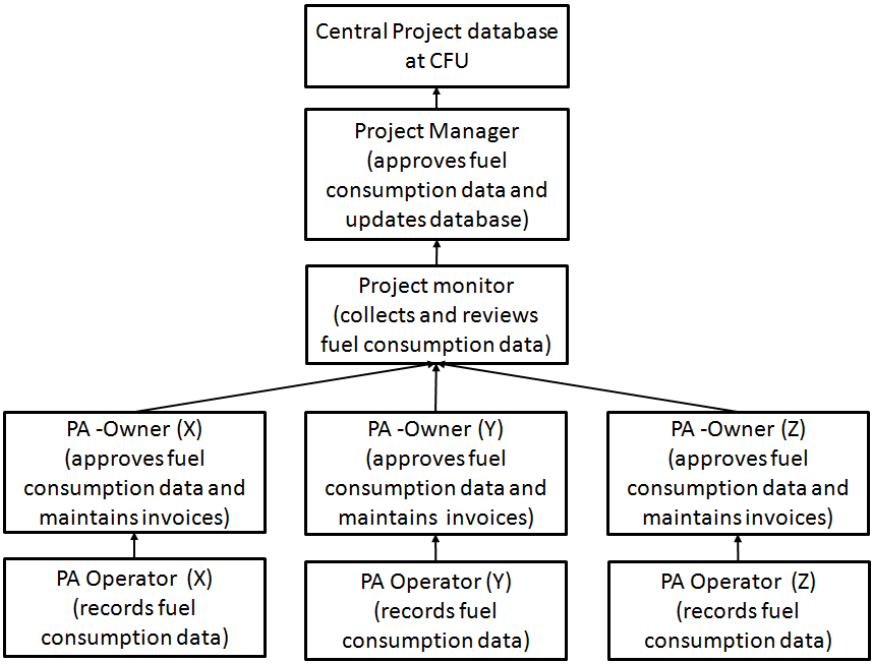

Figure 4: Project data flow diagram

PA-owner is the beneficiary of the SIF II Project. The specific responsibilities of PA-owner are to:

- Appoint the PA-operator
- Arrange for calibration of the natural gas meter and retain evidence of calibration
- Keep the bills for fuel consumption and/or invoices for fuel purchase
- Annually provide copies of fuel bills or invoices for fuel purchase to project-monitor
- Monitor project performances

PA-operator is the person legally designated by the PA-owner, responsible for PA local heating system operation and maintenance. The specific responsibilities of PA-operator are to maintain records of the monthly fuel consumption, calibration of meters, etc. and submit the documents or invoices to PA-owner.

Project manager is the head of the CFU. The specific responsibilities of project manager are to:

- Represent PA-owners for the CDM purposes of this project
- Appoint the project-monitor
- Ensure that the project monitor is duly trained
- Submit monitoring report to DOE
- Take decisions on the distribution of CERs to PAs

Project-monitor is the person designated by the CFU, responsible for collecting the data from PAs, archiving and reporting. The specific responsibilities of project-monitor are to:

- Contact PA-owners monthly and collect the metered fuel consumption and other documented data as required by the monitoring methodology (the data collection would be through e-mail, fax, phone or on site visit)
- Verify the collected data quality/integrity and enter the collected data in the emissions calculation workbook
- Check that calculation of emissions reduction are in line with the monitoring methodology requirements and assumptions
- Assure that data are stored and relevant measures are taken to avoid loss of information
- Inform PA-owners about their emissions reduction performances
- Prepare and submit annual monitoring report to Project-manager
- Keep collected data and elaborated reports available for external audit and verification purposes
- Keep a separate emissions calculation workbook for each year of the crediting period
- Store the saved files with annual emissions workbooks and annual reports on a local computer and CD
- Keep e-mails and faxes concerning monitored data on printed paper
- Keep good records of all mentioned files, reports and original reporting information

<u>Calibration of monitoring equipment</u>

The fuel flow meter to measure the natural gas consumption is the only meter involved in the project. The volume of natural gas consumption was registered by fuel flow meter installed in all PAs. This monitoring equipment was periodically verified and tested according to the Moldovan regulations. After meters verification and testing, for each meter, the authorized laboratory submitted a certificate of: (a) acceptance for operation, or (b) refusal for operation. In case of any failure in meter operation, that meter was repaired and a certificate of reparation and calibration was issued by an authorized entity. If the meter could not be repaired, a new meter was purchased; receipt and technical passport for that meter was obtained. The frequency of calibration

of meters varies from 2 to 5 years based on type of meters installed in respective PAs[8]. Also, in the Law nr.123-XVIII from 23/12/2009 on natural gases, article 51, line 1, it is stipulated that the gas provider and distributor entity is responsible for meters calibrations. Without the regular calibration of gas meters, gas cannot be delivered.

The details of natural gas meter model, serial number and accuracy for each PA using natural gas as fuel is given in table 6.

Table 6: Details of natural gas meters

PA No	Gas meter model	Gas meter serial number(s)	Accuracy (%)
1	BK G16	19326882	1.50
2	BK G4T	3052355	1.50
3	CGR 01	21824216	1.00
4	BK G25	21670631	1.50
5	BK G16	20941699	1.50
6	BK G10T	26180219	1.50
9	BK G16	22488340	1.50
10	BK G25T	24087419	1.50
12	BK G10T	053462	1.50
13	BK G10	22874002	1.50
14	BK G6T	21877052	1.50
16	BK G16	23044981/43005	1.50
18	BK G6T	384243/384072	1.50
19	BK G25	21876069/3436804	1.50
20	BK G16T	23804402	1.50
22	BK G16	20479180/20479188	1.50
23	BK G6T	21412898	1.50
24	BK G6T	21412843	1.50
25	BK G6T	212828365	1.50
26	BK G4T	21160232	1.50
31	BK G10T	24672044	1.50
32	BK G4T	8503881	1.50
33	BK G10T	33024058876	1.50
34	BK G25	21368686	1.50
36	BK G10T	23430020	1.50
37	BK G25	22095674	1.50
38	BK G25	22391233	1.50
39	SG G25	3266246	1.70
40	BK G10T	41283/22307396	1.50

[8] State register of measurement meters for utilisation in Moldova, dated 04/07/2012

41	BK G16	22185404	1.50
42	BK G10T	23201876	1.50
43	BK G16T	23804401	1.50
44	BK G10T	22722668	1.50
46	BK G25T	22391231	1.50
48	BK G6T	21368653	1.50
49	BK G16	22082004/22082005	1.50
51	BK G10T	20177105	1.50
52	BK G16T	25434895	1.50
53	DKZ G40	0022329	1.00
57	BK G25	21368686	1.50
58	BK G16T	25818376	1.50
59	BK G16	22185398/41173	1.50
60	BK G10T	21368626	1.50
61	BK G4T	3055324	1.50
62	BK G25	21824273/2006	1.50
63	BK G40	15128902	1.50
64	BK G25	2311947	1.50
65	BK G4	21368655	1.50
67	BK G25	21824262	1.50

Procedures for possible monitoring data adjustments and uncertainties

The key parameter laid down to the project emissions calculation was the metered/documented fuel consumption. In practise, there were no situations where the sufficient proof for fuel consumption such as meter readings or invoices was not available.

Though PAs carried out the calibration of meters regularly, difficulty was faced in collecting calibration certificate records for the total period from 2012 - 2015. However, it was ensured that one latest calibration certificate was made available for each PA to prove that their meter accuracy was within the limit. For the periods where a calibration certificate was not available, the maximum permissible error values of the instrument were applied to the measured consumption values in calculation of CERs.

Emergency preparedness

All reasonable measures towards emergency preparedness were foreseen under the responsibilities of the project-monitor and the project-manager.

In case of measurement equipment break down, the further natural gas supply can be done through the bypass pipe, with the permission of the gas supplier. The seal on the bypass pipe is removed by the gas supplier in the presence of the PA owner or their staff and a bilateral act in 2 copies for the each party is also signed. Responsibility for the seals installed by the gas supplier lies with the PA owner. The natural gas volume supplied through the bypass pipeline is determined based on the nominal capacity of the equipment and the registered operational time.

During the period of time when the measurement equipment is dismounted for the periodic metrological verification (calibration) or other technical checking, the volume of the natural gas

consumed is determined using the average daily consumption registered during a similar, previous period of time.

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:	$LHV_{PR,\ coal}$
Unit	MJ/kg
Description	Coal net calorific value
Source of data	Standard value for coal products used in Moldova based on Moldavian Standard SM 259:2005
Value(s) applied)	20.725
Choice of data or measurement methods and procedures	Official source
Purpose of data	Calculation of project emissions
Additional comments	Not applicable

Data/parameter:	$EF_{PR,\ coal}$, $EF_{BSL,\ coal}$
Unit	tCO_2/TJ
Description	Coal emission factor
Source of data	Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied)	94.6
Choice of data or measurement methods and procedures	The coal emission factor is taken from IPCC default values since analysis or data are not available from the coal suppliers.
Purpose of data	Calculation of project emissions and baseline emissions
Additional comments	Not applicable

Data/parameter:	$LHV_{PR,gas}$
Unit	MJ/Nm^3

Description	Natural gas net calorific value
Source of data	National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/public/files/Formulare_statistice_2009/Industrie_Energetica/Nr.1_BE_anual.pdf)
Value(s) applied)	33.5
Choice of data or measurement methods and procedures	Official source
Purpose of data	Calculation of project emissions
Additional comments	Not applicable

Data/parameter:	$EF_{PR,gas}$, $EF_{BSL,gas}$
Unit	tCO_2/TJ
Description	Natural gas emission factor
Source of data	Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied)	56.1
Choice of data or measurement methods and procedures	IPCC
Purpose of data	Calculation of project emissions and baseline emissions
Additional comments	Not applicable

Data/parameter:	$EF_{BSL,\ mazut}$
Unit	tCO_2/TJ
Description	Mazut emission factor
Source of data	Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied)	77.3
Choice of data or measurement methods and procedures	IPCC

Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{boiler,BSL,coal}$
Unit	%
Description	Efficiency of existing coal boiler
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	60
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{boiler,BSL,mazut}$
Unit	%
Description	Efficiency of existing mazut boiler
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	76
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{boiler,BSL,gas}$
Unit	%
Description	Efficiency of existing natural gas boiler

Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	88
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{stove,BSL,coal}$
Unit	%
Description	Efficiency of existing coal stove
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	40
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{net,BSL}$
Unit	%
Description	Efficiency of existing external heat network
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	70
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of baseline emissions
Additional comments	Not applicable

Data/parameter:	$\eta_{boiler,PR,coal}$
Unit	%
Description	Efficiency of project coal boiler
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	67
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova, was 75%; this was checked by efficiency testing of a random sample of boilers minus heat losses, which resulted in a mean value of 73.78%, for which the precision at the 90% confidence level is 9.09%, less than 10%. Hence it is considered reasonable and conservative to apply the efficiency value at the lower limit of the 90% confidence interval of the mean value determined by sampling, 67.07%, which is 67% when applied as a rounded number.
Purpose of data	Calculation of project emissions
Additional comments	The boiler efficiency was fixed at ex-ante and value was confirmed through one ex-post survey.

Data/parameter:	$\eta_{boiler,PR,gas}$
Unit	%
Description	Efficiency of project natural gas boiler
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	86.6
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova, was 92%; this was checked by efficiency testing of a random sample of boilers minus heat losses, which resulted in a mean value of 88.53%, for which the precision at the 90% confidence level is 2.2%, less than 10%. Hence it is considered reasonable and conservative to apply the efficiency value at the lower limit of the 90% confidence interval of the mean value determined by sampling, 86.61%, which is 86.6% when applied as a round number.
Purpose of data	Calculation of project emissions
Additional comments	The boiler efficiency was fixed at ex-ante and value was confirmed through one ex-post survey.

Data/parameter:	$\eta_{net,PR}$
Unit	%
Description	Efficiency of project external heat network
Source of data	Expert judgement (Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova)
Value(s) applied)	98
Choice of data or measurement methods and procedures	Value as determined by Prof. Dr. Valentin Arion, Technical University of Moldova
Purpose of data	Calculation of project emissions
Additional comments	Not applicable

D.2. Data and parameters monitored

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

Data/parameter:	$V_{coal,PR}$
Unit	Tons
Description	Coal consumption
Measured/calculated/default	Measured
Source of data	Measurement records
Value(s) of monitored parameter	As shown in ER calculation sheet
Monitoring equipment	No equipment used. (measured using number of buckets)
Measuring/reading/recording frequency:	At least once per heating season

Calculation method (if applicable):	Third-party invoices for coal purchase set a cap on the quantity of coal consumed by a PA per season. One or more times per heating season, the PA purchased coal from the provider. At each purchase, the provider gave an invoice showing coal amount and purchase price. This coal amount was taken from weighing done at truck scales (outside the project boundary). The coal was measured by buckets, for which the approximate carrying capacity of coal in each bucket was known. A representative of the PA owner noted on a coal register how much coal was consumed, on a daily basis, based upon the quantity of buckets used to load the boilers. At the end of the heating season, the total amount the PA owner recorded was compared to the total purchase amount. It was conservative to use the amount the PA owner noted, if it was lower than the total purchase amount. If it was higher, then the total purchase amount was applied.
QA/QC procedures:	Checked against fuel purchasing invoices
Purpose of data:	Calculation of project emissions
Additional comments:	Not applicable

Data/parameter:	$V_{gas,PR}$
Unit	Nm^3
Description	Natural gas consumption
Measured/calculated/default	Measured
Source of data	Measurement records
Value(s) of monitored parameter	As shown in ER calculation sheet
Monitoring equipment	Recorded from fuel meters
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	In the practise, there were no situations where sufficient proof for fuel meter readings was not available. Though PAs carry out the calibration of meters regularly, difficulty was faced in collecting calibration certificate records for the total period from 2012 - 2015. However, it was ensured that one latest calibration certificate was made available for each PA to prove that their meter accuracy is within the limit. For the periods where a calibration certificate was not available, the maximum permissible error values of the instrument were applied to the measured values in calculation of CERs.
QA/QC procedures:	Fuel meters were calibrated in line with national regulation. The meter readings were checked against fuel purchasing invoices, where ever possible
Purpose of data:	Calculation of project emissions

Additional comments:	Not applicable

Data/parameter:	$Q_{boiler,PR}$
Unit	MWh
Description	Boiler heat output
Measured/calculated/default	Calculated
Source of data	Calculation sheet
Value(s) of monitored parameter	As shown in ER calculation sheet
Monitoring equipment	Not applicable
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	Calculated from $V_{fuel,PR}$, LHV_{PR} and $\eta_{boiler,PR}$ as follows: $Q_{boiler,PR} = (V_{fuel,PR} \times LHV_{PR} \times \eta_{boiler,PR}) / 1000$
QA/QC procedures:	Not applicable
Purpose of data:	Calculation of baseline emissions
Additional comments:	Not applicable

D.3. Implementation of sampling plan

Not applicable. There was no sampling involved in the monitoring plan.

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 procedure for calculation of the overall emission calculation in project and baseline activity is shown in figure 5.

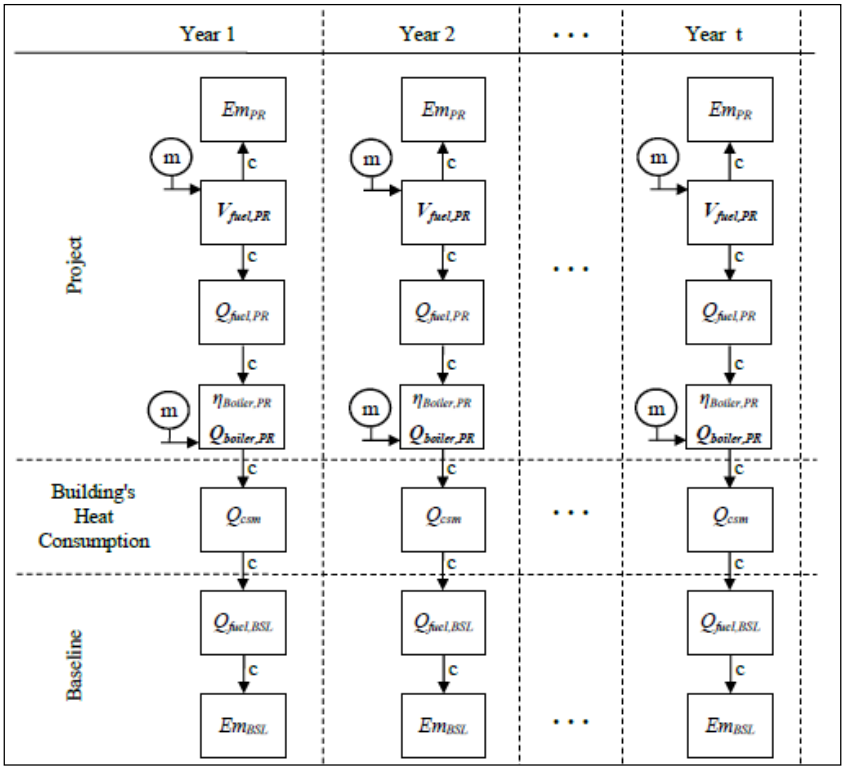

Figure 5: Procedure of calculation of project and baseline emissions

The annual emissions for each PA included in this project, can be determined by applying the formula:

$Em_{BSL} = Q_{fuel,BSL} \times EF_{BSL}$

Where,

Em_{BSL}	=	annual baseline emissions for a given year t, in tCO_{2e}
$Q_{fuel,BSL}$	=	fuel embedded heat of the fuel used in baseline scenario, in TJ
EF_{BSL}	=	emission factor corresponding to the fuel burned in baseline scenario, in tCO_{2e} /TJ

For PA 1, the annual emissions is given as,

Em_{BSL}	=	$Q_{fuel,BSL}$	x	EF_{BSL}
(tCO_{2e})		(TJ)		(tCO_{2e} /TJ)
	=	2.11	x	94.6
	=	199.65		tCO_{2e}

$Q_{fuel,BSL} = Q_{csm} / [\eta_{boiler,BSL} \times \eta_{net,BSL} \times (1 - E_{cons})]$

Where,

Q_{csm} = building heat consumption, in TJ

$\eta_{boiler,BSL}$ = efficiency of existing boiler (%)

$\eta_{net,BSL}$ = efficiency of existing external network, including the building's energy losses, caused by its deterioration(%)

E_{cons} = Effect of energy conservation measures due to efficiency measures carried out in buildings (%)

For PA 1, the fuel embedded heat of the fuel used in baseline scenario is given by,

$Q_{fuel,BSL}$	=	Q_{csm}	/	[$\eta_{boiler,BSL}$	x	$\eta_{net,BSL}$	x	(1 - E_{cons})]
(TJ)		(TJ)		(%)		(%)		(%)
	=	0.886	/	[60%	x	70%	x	(1 – 0%)]
	=	2.11	TJ					

$Q_{csm} = V_{fuel,PR} \times LHV_{PR} \times \eta_{boiler,PR} \times \eta_{net,PR} / 1000$

Where,

$V_{fuel,PR}$ = annual fuel volume burned at a given project activity site, in tons or 1000 Nm^3

LHV_{PR} = low heat value of the fuel burned at a given project activity site, in MJ per ton or 1000 Nm^3

$\eta_{boiler,PR}$ = efficiency of project boiler (%)

$\eta_{net,PR}$ = efficiency of project external network, including the building's energy losses, caused by its deterioration (%)

For PA 1, the building heat consumption is given by,

Q_{csm}	=	$V_{fuel,PR}$	x	LHV_{PR}	x	$\eta_{boiler,PR}$	x	$\eta_{net,PR}$	/	1000
(TJ)		(tons or 1000 Nm^3)		(MJ per ton or 1000Nm^3)		(%)		(%)		
	=	31.18	x	33.5	x	86.6%	x	98%	/	1000
	=	0.886	(TJ)							

Similarly. the calculated baseline emission reductions from all the 65 the project activities as per above equation is provided in ER calculation sheet. The total baseline emissions calculated is:

Em_{BSL} = 18,013 tCO_{2e}

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

Since only one type of fuel at each heating source is used, the annual project CO_2 emissions for each considered PA, at the monitoring stage, is easily determined by applying the following formula:

$Em_{PR} = V_{fuel,PR} \times LHV_{PR} \times EF_{PR} / 1000$

Where,

Em_{PR} = annual project emissions for a given year t, in tCO_{2e}

$V_{fuel,PR}$ = annual fuel volume burned at a given project activity site, in tons or 1000 Nm^3

LHV_{PR} = low heat value of the fuel burned at a given project activity site, in MJ per ton or 1000 Nm^3

EF_{PR} = emission factor corresponding to the fuel burned in project scenario, in tCO_{2e}/TJ

For PA 1, the annual project emissions is given by,

Em_{PR}	=	$V_{fuel,PR}$	x	LHV_{PR}	x	EF_{PR}	/ 1000
(tCO_{2e})		(tons or 1000 Nm^3)		(MJ per ton or 1000 Nm^3)		(tCO_{2e}/TJ)	
	=	31.18	x	33.5	x	56.1	/ 1000
	=	58.59	tCO_{2e}				

Similarly, the calculated project emission reductions from all the 65 the project activities as per above equation is provided in ER calculation sheet. The total project emissions calculated is:

$Em_{PR,}$ = 5,511 tCO_{2e}

E.3. Calculation of leakage

There are no leakage effects foreseen under this project.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	18,016	5,511	0	1,628	10,877	12,505

E.5. 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)	17,343[9]	12,505

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

The CERs generated during the monitoring period is 28 % lesser than the estimated CERs in registered PDD.

- - - - -

[9] for the period from 01/05/2012 to 30/06/2015

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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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