**Final evaluation of the project**

***“Moldova Energy and Biomass Project (MEBP)”***

**Report**

**Submitted to UNDP Moldova**

7 December 2014

Disclaimer

*Please note that the analysis and recommendations of this report do not necessarily reflect the views of the United Nations Development Programme, its Executive Board or the United Nations Member States. This publication reflects the views of its authors.*

Acknowledgements

*The authors wish to thank UNDP Moldova and the MEBP Project Team for the assistance and information provided during this mid-term review.*

# LIST OF ACRONYMS

ANRE National Agency for Energy Regulation

PB Project Board

PM Project Manager

CHP combined heat-power (a.k.a. co-generation)

CO Country Office

CSO civil society organization

DoA Description of Activities (of the Project Extension 2014-2017)

EBRD European Bank for Reconstruction and Development

EE energy efficiency

IEA International Energy Agency

EEA Energy Efficiency Agency

EEF Energy Efficiency Fund

ENPI European Neighbourhood and Partnership Instrument

EoI expression of interest

EU European Union

EUD Delegation of the European Union

EUR Euro

GEF Global Environment Facility

GJ gigajoules (= billion Joule)

GWh Gigawatt-hour (= billion watt-hours)

Ktoe kiloton of oil equivalent (= 41.86 million MJ)

kW kilowatt (= thousand Watt)

kWh kilowatt-hour (= 3.6 MJ)

LPA Local public authority

LPG liquid propane gas

MEBP Moldova Energy and Biomass Project

MJ megajoule (= million Joule)

MDL Moldovian Leu (EUR 1 = MDL 18.3; 1/10-07/11/14)

MoE Ministry of Economy

MoEnv Ministry of Environment

MoSEFF Moldovan Sustainable Energy Financing Facility

MoREFF Moldovan Residential Energy Efficiency Facility

MoRDC Ministry of Regional Development and Construction

n.a. not available or not applicable

NBS National Bureau of Statistics

NGO non-governmental organization

PJ petajoule (= billion MJ)

PMT Project Management Team

PPP public-private partnership

ProDoc project document

PV photovoltaic

RE renewable energy

RES renewable energy sources

RFP request for proposals

SWH solar water heater

TJ terajoule (= million MJ)

ToR Terms of reference

UN United Nations

UNDAF United Nations Development Assistance Framework

UNDP United Nations Development Programme

UNECE UN Economic Commission for Europe

UNFCCC UN Framework Convention on Climate Change

VAT value-added tax

WB World Bank

yr year

# Table of contents

[LIST OF ACRONYMS 3](#_Toc405731897)

[Table of contents 4](#_Toc405731898)

[List of boxes 5](#_Toc405731899)

[1. EXECUTIVE SUMMARY 7](#_Toc405731901)

[2. introduction 11](#_Toc405731902)

[2.1 Development context 11](#_Toc405731903)

[2.2 Project objective and description 11](#_Toc405731904)

[2.3 Main stakeholders: summary list 12](#_Toc405731905)

[2.4 Purpose of the final evaluation and methodology 14](#_Toc405731906)

[3. Findings 17](#_Toc405731907)

[3.1 Results: achievements of outputs 17](#_Toc405731908)

[3.1.1 Output 1: Municipal biomass heating and fuel supply markets established 17](#_Toc405731909)

[3.1.2 Output 2: Foundations laid for establishment of efficient household heating, industrial co-generation and biomass briquetting markets 25](#_Toc405731910)

[3.1.3 Output 3: Capacity built for growth of biomass markets at regional and local levels in Moldova 27](#_Toc405731911)

[3.1.4 Output 4: Opportunities and benefits of biomass energy for Moldova are well known, visibility of project results is promoted 31](#_Toc405731912)

[3.1.5 Conclusions on results in terms of achievement of outputs 34](#_Toc405731913)

[3.2 Project implementation and efficiency 35](#_Toc405731914)

[3.2.1 Project setup 35](#_Toc405731915)

[3.2.2 Partnerships and stakeholder engagement 36](#_Toc405731916)

[3.2.3 Adaptive management and work planning 37](#_Toc405731917)

[3.2.4 Project budget and realized expenditures 38](#_Toc405731918)

[3.2.5 Reporting and communications; monitoring & evaluation; role of UNDP 39](#_Toc405731919)

[3.2.6 Conclusions regarding project implementation and efficiency 40](#_Toc405731920)

[3.3 Design and relevance 41](#_Toc405731921)

[3.3.1 Relevance and ownership 41](#_Toc405731922)

[3.3.2 Design and results framework 42](#_Toc405731923)

[3.4 Impacts and sustainability 43](#_Toc405731924)

[3.4.1 Results in terms of achievements of outcomes and objectives; impacts 43](#_Toc405731925)

[3.4.2 Sustainability and replication 46](#_Toc405731926)

[3.4.3 Proposed MEBP successor project 2014-2017 49](#_Toc405731927)

[4. Conclusions and recommendations 51](#_Toc405731928)

[4.1 Conclusions 51](#_Toc405731929)

[4.2 Recommendations 52](#_Toc405731930)

[4.3 Lessons learned 53](#_Toc405731931)

[Annex A. Terms of reference 54](#_Toc405731932)

[Annex B. mission agenda 61](#_Toc405731933)

[Annex C. Documents reviewed 62](#_Toc405731934)

[Annex D. background information and sector context 63](#_Toc405731935)

[D.1 Energy in Moldova 63](#_Toc405731936)

[D.2 Renewable energy and biomass energy 64](#_Toc405731937)

[D.3 UNDP and EU programme in Moldova 68](#_Toc405731938)

[D.4 MEDP Project 2014-2017, Description of the Action (DoA) 69](#_Toc405731939)

[D.5 Overview of standards for solid biomass fuels 74](#_Toc405731940)

[Annex E. About the evaluatorS 76](#_Toc405731941)

[Annex F.consultant code of conduct form 77](#_Toc405731942)

# List of boxes

[Box 1 List of main stakeholders involved in biomass for heating in Moldova 12](#_Toc405732041)

[Box 2 Evaluation criteria and questions 15](#_Toc405732042)

[Box 3 Overview of outputs, activity results and progress indicators 18](#_Toc405732043)

[Box 4 Project organization structure (from ProDoc) 36](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732044)

[Box 5 Overview of planned and realized expenditures (2011-2014) per project output 38](#_Toc405732045)

[Box 6 Overview of planned and realized expenditures (2011-2014) per budget category 39](#_Toc405732046)

[Box 7 Suggestions for improved progress indicators in the results framework 42](#_Toc405732047)

[Box 8 Description and cost of biomass fuel and biomass-fired boilers 44](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732048)

[Box 9 Example of project results and impacts: Boghiceni 45](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732049)

[Box 10 Activities on empowerment of women 46](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732050)

[Box 10 Assessment of sustainability of project results 46](#_Toc405732051)

[Box 13 Potential of arable crop residues (left) and forest biomass (right) 64](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732052)

[Box 14 Power and heat market opportunities for biomass in Moldova 65](file:///D:\Jan\country%20and%20info\current\Moldova\Moldova%20MEBP%20FinEval%20v3.docx#_Toc405732053)

[Box 12 Description of activities and targets of the proposed succesor phase (2014-2017) 69](#_Toc405732054)

# MAP



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Source: United Nations Cartographic Section

# EXECUTIVE SUMMARY

**Brief description of the project**

The Republic of Moldova is highly dependent on energy imports. Over 95% of Moldova’s energy needs are ensured through imports. The Government has committed itself to reform the energy sector by increasing the energy security of the country, while addressing environmental sustainability issues. Studies show that one widely available renewable of energy is formed by residues and waste from agriculture, in particular straw waste, form Moldova's renewable energy source with a large short- to medium-term potential. Traditionally, biomass use has mainly been confined to rural residential heating in the form of firewood and unprocessed agricultural residues, such a straw, in inefficient stoves.

To address this issue, the project “Moldova Energy and Biomass Project”, hereafter referred to as MEBP, has been implemented with a EUR 14.56 million budget by the United Nations Development Programme (UNDP) with the European Union (EU) as the main donor. The Project Document (ProDoc) mentions that the overall objective of the project is to “contribute to a more secure, competitive and sustainable energy production in the Republic of Moldova through a targeted support to the most viable and readily available local source of renewable energy, namely biomass from agricultural wastes”. The project purpose is “to increase the use of renewable energy technology significantly through fuel switching and energy efficiency”.

This objective and purpose are to be achieved by the realization of four inter-related outputs (work packages) and activities:

* Output 1, “Municipal biomass heating and fuel supply markets established” (work package 1) aims to improve municipal heating of public buildings in rural areas and establish related fuel supply markets
* Output 2, “Foundations laid for establishment of efficient household heating, industrial cogeneration and biomass briquetting markets” (work package 2) focusses on three emerging technology options for biomass energy in Moldova, which will be assessed, developed, and piloted
* Output 3, “Capacity for growth of biomass markets at regional and local levels is built in Moldova” (work package 3) aims to ensure that the benefits of biomass energy demonstrated and deployed under outputs 1 and 2 are delivered in a lasting and long-term way and that local capacities for further replication is ensured
* Output 4, “”Opportunities and benefits of biomass energy for Moldova are well known locally, and visibility of project results promoted” (work package 4) will facilitate widespread dissemination on the general and specific advantages and impacts of using biomass energy in Moldova

**Context and purpose of the evaluation**

The project is scheduled to end by December 2014. As per UNDP guidelines, a final evaluation needs to be carried out by one or more independent consultants. This report summarizes the findings of the final evaluation conducted during October-November 2014. The overall objectives of evaluation are to assess the achievement of project results, help identify and critically analyse the relevance of the project activities as well as the effectiveness of the implementation. The evaluation examines whether the activities, outputs and objectives outlined in project document have been achieved, and underlying factors affecting either positively or negatively the implementation of the project, draw lessons and make forward-looking recommendations for improvement of the sustainability of benefits obtained from the project.

**Main findings and conclusions**

Considering that there were only few concentrated biomass energy activities in Moldova prior to the MEBP, the evaluation observes that the Project has made an impact on raising awareness, knowledge and interest in biomass energy development in Moldova. The evaluation judges the overall rating of the project to be ‘satisfactory’, as it has achieved most of the targets (defined in 2010 during project formulation) and has laid a foundation for further development of the bioenergy market.

*Results*

The project has achieved the followingoutputs:

* Various new businesses have been launched during the project’s implementation period. There are now more than 100 companies that produce modern solid biofuels (i.e. briquettes or pellets made out of agricultural residues, such as straw of sunflower seeds) on the market; about 30 assemblers/importers of boilers and equipment that can burn biomass; while various agricultural entrepreneurs produce the required agricultural produce and residues. Almost 400 jobs have been created associated with this improvement bioenergy fuel supply activities by companies.
* New biomass fuel quality standards and a new regulation on their implementation should ensure that the solid biofuels meet standards;
* Over 140 biomass heating systems have been installed in municipal institutions in 127 rural communities (e.g. at schools, kindergartens, community centres, public offices), using straw and modern solid biofuels; the community have been actively engaged in a unique participatory community mobilization approach;
* Some 450 households have signed up for installation and financing of briquette/pellet-fired boilers;
* The local public authorities, public institution managers, operators of heating systems and local businesspeople have acquired knowledge and skills in producing and using biomass energy, by means of targeted trainings, seminars, workshops and making available guidebooks and guidelines on selected bioenergy topics;
* The population, local public authorities, private sector, and the civil society have been informed about the opportunities and benefits of renewable energy source deployment; and awareness has been raised amongst a wide range of segments amongst public and private sector decision-makers, educational sector stakeholders, civil society organizations and, last but not least, the public at large.

*Design and relevance*

The project fits well in the framework of policies and strategies of the Government of Moldova, related to the adoption of the treaty with the Energy Community and overall development strategy of Moldova, which emphasizes the need for energy security, environmental protection and sustainable energy. The design of the Project was based on the fact that only few activities had been implemented in developing biomass as a source of modern solid fuels and low level of awareness existed amongst key stakeholders on the benefits of biomass and business opportunities. Considering Project progress to date and taking into account what can reasonably be achieved in a four-year period, the design of the Project has been appropriate to support catalytic activities for biomass energy development and to instil public and private stakeholder confidence on biomass energy.

*Implementation and management approach*

The implementation approach of the Project has been highly strategic in close collaborative working relationships with national-level government institutions (in particular the project partner, Ministry of Economy, other line ministries and the Energy Efficiency Agency) and in participatory manner with regional and local administrative authorities and in close cooperation with stakeholders from private sector (suppliers of biofuels and of heating equipment), funding facilities, universities and educational institutions and NGOs.

MEBP successfully applied an adaptive management approach, including accessibility, flexibility and quick adaptation to the emerging needs and changing circumstances of the local market and national partners. All risks and issues were regularly and properly assessed and followed by specific and well targeted measures developed to prevent implementation failures in constant communications with the stakeholders involved. Regarding budget, the project has been implemented in a cost-effective way, also in view of the fact that some activity results have exceeded planned targets. The disbursements has generally been in line with implementation progress of the project’s activities, while also disbursements do not deviate much from the original 2011 budget.

*Impacts*

Considering that there only few concentrated biomass energy activities in Moldova prior to the MEBP, we can observe that the Project has made an impact on raising awareness, knowledge and interest in biomass energy development in Moldova. The project had visible impact on the involved communities, local biofuel producers and biomass burning technologies’ installers which clearly highlights the project’s extraordinary role in the development and strengthening of local biomass fuel market in Moldova

The main result in terms of impacts is that the Project indeed has helped the Moldovan counterparts to lay a strong foundation for the development of modern solid biofuels in an important and visible way. The project’s effectiveness is based on its full alignment with the national energy policy and sustainable energy strategies, as well as on strong commitment and ownership of the national implementing partners of the produced outcomes.

*Sustainability*

The future impact will be largely based on the sustainability of the results of the project. Sustainability can be defined as the likelihood of continuation of results and benefits after the project ends. The Evaluators have the opinion that sustainability for the project’s outputs and objective is likely, although some moderate risks and issues remain. Given the project’s success in terms of results achieved, a new project has been proposed to UNDP and the EU Delegation, basically extending and expanding the project’s activities until 2017. If approved, this successor MEBP project will help to address these risks and remaining issues and further ensure project sustainability

**Recommendations**

Based on issues discussed in the previous Chapters and sections, this section presents a number of recommendations.

*1) Implement the proposed successor MEBP project (2014-2017)*

The Evaluators welcome this successor Project as a means to address remaining issues regarding sustainability and competitiveness of solid biomass fuel. The success shown by MEBP so far is indicative for potentially good outcomes of the successor phase as well. Our first recommendation is therefore for the EU Delegation to endorse and fund the new project (again to be implemented by UNDP) in accordance with the outputs and activities as described in its draft project document “Description of the Action”.

*2) Additional recommendations:*

Some suggestions for activities to follow up (or to be incorporated in the proposed successor Project) are given below:

a) With the Ministry of Education, explore options to expand topics on sustainable energy (renewable energy and energy efficiency) to higher grades (to help orient students in their choice of future professions towards the end of their secondary education.

b) In the end-user awareness, communication and information disseminations, stronger links could be made with messages on ‘energy efficiency’. Cost of fuel consumption cannot only be lowered by using cheaper alternatives, but also by energy use improvements, such as energy efficient windows, efficient use of hot water and good insulation of building walls and roofs as well as of heat ducts and pipes.

c) Towards the end (in 2017), the successor MEBP project would benefit from undertaking an ‘end-of-project’ assessment of status, remaining barriers and gaps and recommendation for post-project actions. This assessment should integrate the results of the various studies and assessments undertaken in the period 2011-2017 and give a concise but short overview of the market status solid fuels for heating and cogeneration:

* Briquetting/pelleting (raw materials quality and price developments, state of technology, costs of technology and pricing of biomass fuels, financial cost (with and w/o subsidy), analysis of legal, financial risks and recommendations for action); update info and studies as needed on agricultural production, biofuel availability and costs;
* Assessment of market opportunities for biomass heating in productive sectors (e.g. in local agro-processing and food processing; greenhouses; as well as wood processing enterprises; own biofuel production), covering aspects as energy needs, technology and size, initial and lifecycle costs as well as perceptions and awareness of biomass fuel end-users); Current and potential demand for solid biomass fuels (in residential, public buildings as well as productive sectors);
* Assess the role of subsidy instruments in view of future sustainability and the future role of existing and potential financial blending facilities, incentives and risk guarantee schemes;
* Analysis of remaining gaps and barriers (if any) with recommendations for post-project action (for policy makers; financial institutions; private sector entities);
* Summary of main results, approaches followed, costs-benefits and lessons learned regarding implementation of biomass technology in Moldova (not only success stories of the results, but to-the-point information on how it was done and why MEBP made a difference).

**Lessons learnt**

Some lesson learnt are regarding results and performance are:

* There is often a strong resistance to using biomass fuels which is often regarded by end users as well as decision-makers at national and local level as ‘not modern’ and not perceived as a good alternative due negative perceptions on cost, availability, reliability and quality of the fuel. In this context, businesspeople do not easily see the opportunity to have a viable business operation of producing biofuels or installing, operating and servicing biomass-based heating systems. End-users will not purchase biomass fuels that are not readily available at a competitive price, while these fuels cannot be made available because producers cannot find the markets to absorb their product. This is a problem of the ‘hen and the egg’, which needs to be addressed in an integrated way working at demand and supply at the same time in a pro-active attitude with mobilization of stakeholders and beneficiaries, ample public awareness raising and stakeholder capacity strengthening activities, ensuring consistent quality of the biomass fuels, as well as mobilization financial resources.
* Such a pro-active attitude, mobilization of resources, creation of working groups, and proper setting of priorities has proven to be an essential element in identifying the optimal strategy for the project implementation. In this regard, the flexibility and adaptability demonstrated by the project team, national stakeholders and development partners proved to be an important ingredient of the project success and impacts;
* Continuous dialogue with the national stakeholders (national, local and regional authorities; community-based organizations; private sector) and development partners has been an efficient tool to drive the project into the right direction. For example in 2012, based on the recommendations provided during meetings of the Project Board, the approach in implementing project activities such as focus of technology (from straw used in stoves towards densified biofuels used in biomass boilers), promoting local production of biomass boilers, piloting pelletization technologies, piloting co-generation was changed to more market competition modalities. Similarly, the household system subsidy program was regularly revised and adjusted to the purchasing power of the target group;
* Ample public awareness-raising activities are required prior to, and during, the project launch activities in the regions in order to contribute to a wider understanding of the benefits of the biomass energy sources by potential beneficiary communities. In general, the communication and awareness-raising activities, combined with comprehensive training modules contributed to a better understanding and knowledge of the biomass-based heating by the general public.

# introduction

## Development context

The Republic of Moldova is highly dependent on energy imports. Over 95% of Moldova’s energy needs are ensured through imports. The Government has committed itself to reform the energy sector by increasing the energy security of the country, attracting investments in infrastructure, and participating in an energy market based on equitability principles and mutual advantages. Various studies[[1]](#footnote-1) mention that Moldova has a great potential to produce energy from renewable sources, which at the present time has not yet been harnessed. These studies mention that an abundantly available renewable resource is formed by residues and waste from agriculture, in particular wheat straw waste, with large short- to medium-term potential. More information on the energy sector in general and biomass resources is given in Annex D.

## Project objective and description

The Moldova Energy and Biomass Project (MEBP) started officially in January 2011 with a EUR 14.56 million budget with the purpose to significantly increase the use of renewable energy technology through fuel switching and energy efficiency. The project primarily focuses on improving heating comfort levels in rural public sector buildings including schools and community centres by using readily available agricultural wastes supplied from local agricultural enterprises and solid biofuel producers. The project is also stimulating local markets for improved household heating; and biomass-based briquetting/pelleting, piloting industrial cogeneration; as well as raising local capacity in the biomass sector, and promoting the benefits of biomass energy and the project. With a planned duration of 4 year, the project is funded by the European Union (EU; EUR 14 million) and the United Nations Development Programme (UNDP; EUR 0.56 million) and executed by UNDP with the Ministry of Economy as ‘implementing partner’. Ending in 2014, a successor MEDP project has been proposed to UNDP and EU that would extend and expand activities initiated in the current project.

The **overall objective** of the project is to “contribute to a more secure, competitive and sustainable energy production in the Republic of Moldova through a targeted support to the most viable and readily available local source of renewable energy, namely biomass from agricultural wastes”. The **project purpose** is “to increase the use of renewable energy technology significantly through fuel switching and energy efficiency”.

The Project Document (ProDoc) mentions the following four inter-related **outputs (work packages)** and activities:

* + Output 1: Municipal biomass heating and fuel supply markets established (work package 1) aims to improve municipal heating of public buildings in rural areas and establish related fuel supply markets. Under this output:
    - 130 thermal heating systems primarily burning straw are planned installed totalling about 35 MW (average installed capacity of approx. 300 kWh) for the provision of heating for public buildings in rural communities in Moldova (*Activity 1.1*);
    - Supporting this, market mechanisms will be used to support the involvement of local fuel suppliers to prepare, store and supply the fuel needed for the installed heating plants (*Activity 1.2*);
    - Very focused low-cost actions on policy, regulation, and contracting to support the market environment will make a third activity under output 1 (*Activity 1.3*).
  + Output 2: Foundations laid for establishment of efficient household heating, industrial cogeneration and biomass briquetting markets (work package 2) focusses on three emerging technology options for biomass energy in Moldova, which will be assessed, developed, and piloted.
    - Activity 2.1 focusses on domestic heating in rural areas, addressing the need for improved efficiency of heating and possibly cooking;
    - Activity 2.2 support the deployment of industrial co-generation based on feedstock from agro-industry, and;
    - Activity 2.3 plans to pilot and demonstrate biomass briquetting.
  + Output 3: Capacity for growth of biomass markets at regional and local levels is built in Moldova (work package 3) aims to ensure that the benefits of biomass energy demonstrated and deployed under outputs 1 and 2 are delivered in a lasting and long-term way and that local capacities for further replication is ensured. For each stakeholder type to be reached under output 3, the first step will be the development of training materials, to be placed in the public domain. These materials, to be updated and improved each year, will provide an accessible repository of key information, and will be used either in the training to be delivered under outputs 1 & 2 or in sub-activities under output 3. The stakeholders to be targeted include: municipal management including mayors, civil servants, and teachers; straw-fired boiler operators; fuel suppliers; and school children.
  + Output 4: The opportunities and benefits of biomass energy for Moldova are well known locally, and visibility of project results promoted (work package 4) will facilitate widespread dissemination on the general and specific advantages and impacts of using biomass energy in Moldova. During the inception phase of the project, a communication and visibility plan will be elaborated and agreed between the EU Delegation and UNDP in promotion of the visibility of project results and positive impacts of the partnership.

## Main stakeholders: summary list

The following Box gives an overview of important project partners and/or other stakeholders:

Box 1 List of main stakeholders involved in biomass for heating in Moldova

|  |  |
| --- | --- |
| **Stakeholder** | **Description** |
| **Government** |  |
| Ministry of Economy | The project implementing partner, the Ministry of Economy, develops and implements energy policy and legislation in Moldova. The Ministry is also responsible for developing the necessary frameworks for renewable energy and energy efficiency. |
| Ministry of Environment | The Ministry focuses on the environmental aspects of energy use. From environmental sustainability point of view, it promotes renewable energy and energy efficiency, also as a means to reduce greenhouse gas emissions. |
| Ministry of Regional Development and Construction  Local public authorities (LPA) | The Ministry ensures the quality of constructions in terms of security against all types of risk factors - natural, technological and anthropogenic - as well as in terms of economic and technological efficiency (low consumption of materials, energy, labour to achieve and exploit objectives); and ensures development monitoring and implementation of the National Regional Development Strategy and National Plan of Spatial Planning. LPAs have competences in the area of building and construction regulations, in the area of heating and cooling as well as in the area of evaluation of the gas network infrastructure. LPAs are encouraged to include heating & cooling from renewable energy in the planning of local infrastructure |
| Ministry of Education | The Ministry is a key partner in the project’s initiatives regarding incorporating themes on sustainable energy in secondary school programmes as well as vocational training institutes. |
| Ministry of Agriculture and Food Industry | Regarding energy, the Ministry is a key partner related to the production of agricultural products (of which the residues and waste left after harvesting can be used for fuel use or), or in future, for the production of dedicated energy crops) as well as mechanization of agricultural production (e.g. straw baling equipment). |
| Energy Efficiency Agency (EEA) | Established in 2010 under the aegis of the Ministry of Economy, EEA is the administrative body in the field of energy and energy efficiency. EEA also provides information to the public and develops the framework for energy-relevant regulations and certification schemes. |
| National Agency for Energy Regulation (ANRE) | As of 1997, ANRE is the state body designed to regulate the energy sector. On renewable energy, ANRE issues licenses to produce electricity and heat from renewable sources, for biogas production to be delivered within the networks of gas and for the production of liquid biofuels. |
| National Standardization Institute (NSI) | While the Ministry of Economy establishes the standardization policy, the NSI is responsible for standardization and conformity assessment to ensure quality assurance and competitiveness of domestic products and consumer protection. NSI assists in the development on standards (in case of the MEDP project, on biofuel quality), provides services and training to companies for their products to meet national and international standards. |
| **Funding facilities** |  |
| Energy Efficiency Fund (EEF) | In accordance with the Law on Renewable Energy, the EEF was created in 2012, and focuses focused on the identification, evaluation and financing of energy efficiency and renewable energy projects. During 2013-2020, the EUR 10 million fund provides sustainable energy project developers with grants, loans, guarantees and technical advice. |
| EBRD[[2]](#footnote-2) - Moldovan Sustainable Energy Financing Facility (MoSEFF) | MoSEFF provides a credit line of EUR 22 million combined with a 5-20% grant component for lending to Moldovan companies through EBRD’s partner banks in order to support energy efficiency and renewable energy investments in Moldova |
| EBRD – Moldovian Residential Energy Efficiency Facility (MoREEF) | MoREEF provides a credit line of EUR 35 million combined with 20%, 30%, 35% grant components for on lending to Moldovan companies through EBRD’s partner banks in order to support energy efficiency and RE investments in the residential sector of Moldova. |
| **Other** |  |
| Academies of Sciences; Technical University; Agriculture State University | These institutes have scientific and technological capacity for developing and implementing renewable energy and energy efficiency projects, although up to now basically as pilot projects, conducting research and gathering databases on renewable energy sources |
| Chamber of Commerce | The Chamber of Commerce is an important partner in promoting and implementing project initiatives targeting the private sector and in establishing business contacts both on the right and the left bank of the Dniester |
| Consumer Protection Agency | The Consumer Protection Agency deals with issues such as safety of consumer products, liability of producers and sellers and business-to-consumer practices. The Agency will become an increasingly important partner in promoting biomass fuel quality. |

## Purpose of the final evaluation and methodology

The duration of the project is 4 years and is scheduled to end by December 2014. As per UNDP guidelines, a final evaluation needs to be carried out by one or more independent consultants, ‘independent’ meaning not previously involved in the project’s design, management or implementation of activities. The consultants Johannes (Jan) Van den Akker (Netherlands) and Pavel Gavrilita (Moldova) were selected in consultation with the project team and contracted by UNDP Moldova to carry out the evaluation assignment. They are referred to in this report as ‘the Evaluators’ or ‘Evaluation Team’.

Objective of the evaluation

The **purpose** of this final evaluation is[[3]](#footnote-3) to “review the progress made by the project in fulfilling its agreed objectives through the planned activities and to assess the efficiency and effectiveness with which resources have been used to generate results and achieve project objectives with special emphasis on impact and sustainability”.

The **overall objective** of evaluation are to assess the achievement of project results, help identify and critically analyse the relevance of the project activities, as well as, the effectiveness of the implementation. The comprehensive evaluation examines whether the activities, outputs and objectives outlined in project document have been achieved, and underlying factors affecting either positively or negatively the implementation of the project, draw lessons and make forward-looking recommendations for improvement of the sustainability of benefits obtained from the project.

The Terms of Reference (ToR) further indicate that the UNDP Country Office of Moldova (hereinafter referred to as UNDP CO) accordingly will make use of the exercise as a learning opportunity for the office and key partners and stakeholders, as inclusively and practically possible. In particular, the findings and recommendations generated by the evaluation should inform the implementation and targeting of activities planned for the next stage of the project (planned for October 2014 – September 2017).

Methodology

The evaluation has been based using the following *sources of data* and *data collection tools* to answer the evaluation questions:

* Review of reference materials and websites; such as and UNDP Moldova country programming[[4]](#footnote-4); as well as materials from donors (EU); official documents from Government; stakeholder publications;
* Desk review of relevant project(-related) documents; such as project document and amendments; inception report; progress reports; donor (EU)-specific reports; budget and expenditures (ATLAS) and technical reports as well as the draft document of the new project “MEBP, 2014-2017, Description of the Action”;
* Missions to Moldova. A first one-week visit to take place from to have briefing and debriefing sessions and discussions (including gathering the information on what the partners have achieved with regard to the outcome and what strategies they have used) with management and program staff of UNDP Country; donors (notably EU Delegation); and Government and public institution partners together with field visits to selected project sites and discussions with project beneficiaries, private sector and NGOs.

The Evaluation Team has drawn up a table of *main evaluation criteria and questions* that need to be answered to determine and assess project results, and to identify where the information is expected to come from (e.g. documents, interviews and field visits).

This evaluation covers the five major UNDP criteria of:

1. Results: achievements of project outputs, outcome and longer-term (foreseen and unforeseen) impacts;

2. Effectiveness: extent to which an objective has been achieved;

3. Efficiency: extent to which results have been delivered with least cost resources possible (also referred to as cost-effectiveness);

4. Relevance: extent to which the project is suited to local and national development priorities and strategies; Extent to which the project is in line with the strategic priorities under which it was funded (in this case of UNDP and EU);

5. Sustainability: likely ability of the project’s intervention to continue to deliver benefits for an extended period after project completion.

To these criteria ‘quality of design’ has been added by the Evaluators. The evaluation questions cover all the evaluation questions suggested in the Terms of Reference (see Annex A). The list of evaluation criteria and questions is presented below in the Box below, in which the main questions are linked with the various sections and subsections of this report so that the reader can easily trace these throughout the report.

Box 2 Evaluation criteria and questions

| **Corresponding Chapter and section of the report** | **Main questions and evaluation scope (ToR)** |
| --- | --- |
| 3. Findings   * Results * Achievement of outputs and activity results | * Progress towards achievement of results? Were the outputs achieved? * Were key methodologies and approaches that facilitate the success of the project and delivery of necessary outputs appropriate? * What are the factors that affected either positively or negatively the accomplishment of the outputs? |
| * Implementation and efficiency   + Strategic partnerships and stakeholder engagement   + Project management and administration   + Budget and expenditures | * What contribution has been made by UNDP and implementing partners to the progress towards the implementation of activities and achievement of the output and outcome? How appropriate were the inputs? Were the inputs sufficient to achieve the results? How cost effective they were? * What were the partnerships formed? What was the role of UNDP? How did the partnership contribute to the achievement of the outcome? What was the level of stakeholders’ participation? |
| * Design and relevance * Appropriateness and relevance * Quality of design and results framework | * Was the project well-placed and integrated within the national government development strategies and donor programmes? * Was the project logical framework well designed? * Were the outputs (project components) relevant to the overall project outcome? |
| * Impacts and sustainability   + Achievement of outcomes; impacts   + Sustainability and replicability | * To what degree did the project contribute to the development of sustainable energy production market in the country? * To what extent are the MEBP project results sustainable, taking into consideration the existing capacity, structures and political context in the country? |
| 4. Conclusions, recommendations and lessons learned   * Conclusions on achievements of the project’s objective; effectiveness * Lessons learned * Recommendations | * What and how much progress has been made towards the achievement of the outcome (including contributing factors and constraints)? * Distinguish the substantive design issues from the key implementation and/or management capacities and issues including the timeliness of outputs, the degree of stakeholders and partners’ involvement in the completion of outputs, and how processes were managed/ carried out. * Lessons learned in addressing issues relating to relevance, performance and success * Recommendations for potential follow-up interventions, how feasible the follow-up actions would be, what alternatives can be identified and/or what components can be added to it, what knowledge products could be developed. |

The review of documents provides the basic facts and information for developing a first draft evaluation report, while the mission is needed to verify the basic facts, get missing data and to learn opinions of respondents to help interpret the facts. The individual interviews with key informants were based on open discussion to allow respondents express what they feel as main issues, followed by more specific questions on the issues mentioned. The list of evaluation questions presented in Box 1 were used as a checklist to raise relevant questions and issues during the interviews that correspond to the level and type of involvement of the interviewee or the organization visited.

Regarding the *data analysis and methods for analysis,* the documents listed in Annex C were analysed. The notes of the interviews with key informants were used to verify facts and information presented in reports and documents and helped to formulate the conclusions and recommendations. Missions of 1-2 week’s duration have the limitation of potentially getting a snapshot impression only. Nonetheless, the Evaluators feel that this mix of data collection and analysis tools has yielded viable answers to the evaluation/review questions within the limits of budget resources for the review and time availability.

This review has been conducted in accordance with the principles outlined in the United Nations Evaluation Group ‘Ethical Guidelines for Evaluation’ (see Annex G) and follows UNDP materials on evaluation[[5]](#footnote-5). Although not a GEF[[6]](#footnote-6)-supported project, it also takes into account evaluation concepts presented in the new UNDP guidelines on mid-term reviews (UNDP, 2014)[[7]](#footnote-7) and final evaluations[[8]](#footnote-8), such as assessment of sustainability considering risks that are likely to affect the continuation of project outcomes.

# Findings

This chapter presents an overview of the evaluation findings in three general areas, project results, project formulation and project implementation. The findings are based around the evaluation criteria and questions, (as given in Box 1) so that the reader can make a link with what was asked and what was found.

## Results: achievements of outputs

On the following pages, Box 3 provides an overview of results in terms of achievement of the project outputs and activity results against a set of progress indicators. The table provides the value and description of the indicators at various points in time, i.e. baseline value (2011), the planned end-of-project target (end of 2014) as well as the actual situation (Q4 2014). Box 3 follows the descriptions of indicators presented in the Project Document (ProDoc; see its section V, Monitoring and evaluation framework). The description of values of status description of indicators is taken from the ProDoc, the various progress reports (see Annex C) as well as the draft document of the new project “MEDP, Project Extension 2014-2017, Description of the Action” (section IV. Results and resources framework).

While Box 3 presents a qualitative overview in terms of targets planned and achieved, the main text in the Sections 3.1.1 to 3.1.4 gives a more narrative description of the achievements of the project. For a discussion on results in terms outcomes achieved and impacts, the reader is referred to Section 3.4.1.

### Output 1: Municipal biomass heating and fuel supply markets established

The activities under the output 1 aim to improve municipal heating of public buildings in rural areas and establish related fuel supply markets. The Project Document mentions in **Activity 1.1 “Heating systems in public buildings installed”**: 130 thermal systems running on biomass energy, with an average capacity of about 35 MW (or average capacity of thermal power 300 kW) planned to be installed in public building in rural communities 141 thermal heating systems have been installed, in 127 villages in 36 districts in schools, kindergartens, community centres and other public buildings. It is further detailed that this will be accompanied by training and awareness raising amongst local public authorities and managers of institutions where the biomass heating systems were placed to acquire knowledge and skills on proper management of biomass heating systems in their communities, on ensuring energy efficiency, conducting fuel procurement tenders, contracting and setting sustainable partnerships with the private sector.

*Community mobilization and project selection approach*

In support of this activity, a mechanism to ensure the development of local market for biomass boilers in rural communities and to strengthen the business environment for biomass fuel production was designed and implemented. This mechanism has consisted of the following steps:

*1) Promotion, awareness and community needs assessment*

For this purpose the MEBP was promoted and launched in all districts of the country (a process which was completed by mid-2013), by means of organizing seminars that were attended by 1,556 persons representatives of local and district public authorities, NGOs, local press, etc. As a result of these promotional activities at district level, 233 localities did submitted expressions of interests (EoIs) to MEBP for installation of biomass heating systems in public institutions.

Box 3 Overview of outputs, activity results and progress indicators

| **Indicator** | **Baseline** | **Status June/Sept 2014**  **(various reports)** | **End-of-Project target** |
| --- | --- | --- | --- |
| **OUTPUT 1: Municipal biomass heating and fuel supply markets established** | | | |
| *Activity 1.1 Heating systems in public buildings installed (Activity Result 1)* | | | |
| 1. Heating systems installed  * Number * Capacity * Annual energy  1. Jobs created in target communities[[9]](#footnote-9) | Isolated demonstration projects have been undertaken | a) 141 heating systems installed (producing about 300 TJ)   * in 127 villages in 32districts and UTA Gagauz Yeri * 86 schools, 49 kindergartens, 4 community centres, 3 mayor offices, 1 vocational school, 1 dormitory, benefitting 90,389 persons * Local awareness and promotion; community needs assessments and energy audits in buildings   b) 363 new jobs created in the sector with project support in 2011-2013  *Note, selection methodology:*   * Promotion in districts of Moldova (seminars, press, etc.) * Community analysis and capacity analysis; pre-selection of project initiatives through EoI (292 EoIs) * Complex technical and social appraisal of project proposals; * Energy performance assessment and participatory appraisal of LPA and local Project Committee proposals (136 communities) * Approval of biomass projects for investment by Project Selection Committee | a) 130 heating systems installed (35 MW or 300 kW on average) providing 280 TJ  b) 260 jobs created |
| *Activity 1.2 Fuel cycle facilitated through leasing/hire-purchase mechanism for local fuel (Activity result 2)* | | | |
| 1. Leased fuel supply systems  * System capacity | Only limited demo projects with few number of companies | c) Results:   * 16 briquetting/pelleting equipment units leased (revolving fund managed by EEA) as well as bailing equipment (19) (revolving fund managed by 2KR); * Publications:   + Guidelines for briquettes producers   *Impact:*   * More than 80-100 briquette and pellets producers in operation in Moldova now (see “List of pellets and briquettes producers, ”) and about 30 assemblers/producers of biomass-based boilers and equipment | c) The ProDoc does not give a specific number, while the doc ‘Extension 2014-2017’ mentions a number of 130 leased fuel supply systems. The adjusted targets, as provided to the Evaluators is 35 units (25 2KR and 10 AEE). Please note that the revolving funds will continue to operate after project closure. |
| *Activity 1.3 Market environment enhanced to support quality, efficiency and effectiveness (Activity Result 3)* | | | |
| 1. Progress in addressing barriers as evaluated by the project board[[10]](#footnote-10) |  | d) Progress:   * 37 EU-based fuel quality standards (see “List of Standards’) * 1 technical regulation on biomass fuel quality adopted (mandatory for all fuel suppliers, briquettes, pellets; Dec 2013) | d) No target value has been provided |
| **OUTPUT 2: Foundations laid for establishment of efficient household heating, industrial cogeneration and biomass briquetting markets** | | | |
| *Activity 2.1 Market solutions for high efficiency affordable rural biomass household heating identified and piloted (Activity result 4)* | | | |
| 1. Annual increase of 50% in requests for information 2. Deployment of systems:  * Number of domestic systems on a semi-commercial basis  1. Jobs created[[11]](#footnote-11) | No improved heating systems locally produced, no biomass cogeneration, limited briquette production | e) No clear data were made available  f) Systems:  612 household biomass boilers financed (through MEBP’s incentive mechanism) and installed  g) 10 jobs created in selected partner companies  *Publications:*   * “Estimation of the energy potential of biomass from agricultural crops at regional and rayon levels for 2009-2010” * “Market Survey on Affordable Rural Biomass Household Heating Solutions” | e) Increase in requests of 50% in year 1, year 2 and in 2014  f) At least 600 domestic systems installed (original target: 500)  g) 25 jobs created |
| *Activity 2.2 Industrial cogeneration using biomass fuel demonstrated (Activity Result 5)* | | | |
| 1. Installation of at least one cogeneration plant |  | g) Study on potential of biomass cogeneration technologies (in progress) | h) One cogeneration (a.k.a. CHP, combined heat-power) plant |
| *Activity 2.3 Market solutions for biomass-heat supply services in public buildings (Activity Result 6):* | | | |
| 1. Successful operation of commercial briquette enterprise[[12]](#footnote-12) |  | h) One pilot activity on public-private partnerships (PPP) for biomass heating services in public buildings (Green Farm LLC; construction in Leova district). See study “PPP establishment for biomass-based heat supply services in Leova District public buildings” | i) One briquetting plant |
| **OUTPUT 3: Capacity built for growth of biomass markets at regional and local levels** | | | |
| *Activity 3.1 Capacity of municipal leaders to manage biomass systems enhanced (Activity Result 7)* | | | |
| 1. Number of municipal leaders trained[[13]](#footnote-13) |  | j) Results reported:   * 518 LPA representatives and institution managers trained on basic technical, operational and managerial skills for good operation, maintenance and ‘effective management of biomass heating systems at community level’ * For preparation of the 127 villages (see Activity 1.1):   + 1,754 people (LPA, local entrepreneurs, NGOs) trained on ‘community and local resource mobilization’   + 1,592 people (LPA, project committees, managers and staff of public institutions on ‘project management and implementation’ * 1,277 key actors in 118 communities in 25 districts required skills on ‘project sustainability and participatory M&E’ | j) 150 municipal leaders trained |
| *Activity 3.2 Training materials developed for sound operation of straw-fired boilers (Activity Result 8)* | | | |
| 1. Positive feedback from municipal leaders (who will use their materials to inform their dealings with operators) during training events[[14]](#footnote-14) |  | k) Training and education materials and approaches developed and applied in training given to firms in activity 1.1:   * “Guidebook for Biomass Boiler Operators” and “8-step roadmap for Effective Biomass Heating” elaborated and distributed in 118 communities * Related to activity 1.1:   + Training of 376 operators in the 127 beneficiary communities   + 118 training at boiler plants by design-build companies | k) No value has been included |
| *Activity 3.3 Training materials developed for commercial fuel suppliers (Activity Result 9)* | | | |
| 1. Number of fuel suppliers trained |  | l) 456 potential and active biomass fuel suppliers participated in trainings, workshops and roundtable discussions | l) 150 fuel suppliers trained |
| *Activity 3.4 Community understanding and acceptance of biomass energy enhanced through school educational program (Activity Result 10)* | | | |
| 1. Number of children participating in awareness activities |  | m) Results:   * Materials elaborated, such ‘Educational brochure’, ‘Teacher’s Guide on RE and EE” * 19,000 pupils from 352 schools (incl. 6000 from the 127 MEBP communities of activity 1.1) participated in educational activities on RE and EE; 200 children participated in ‘summer camps’ * Training of 254 school teachers and principals (at 127 schools; activity 1.1) * Inclusion of curriculum on ‘RES” as optional in upper grades (up to grade IX) | m) 9,000 children |
| **OUTPUT 4: Opportunities and benefits of biomass energy for Moldova are well known, visibility of project results is promoted** | | | |
| *Activity 4.1 Media campaign (Activity Result 11)*  *Activity 4.2 Annual national awards (Activity Result 12)*  *Activity 4.3 Communication and visibility of project results (Activity Result 13)* | | | |
| 1. Enquiries to the PMT increasing annually (in %) 2. Media references to project objective in positive light, awards and/or project impacts increase by 50% annually 3. Evaluation surveys show that the awards are valued and indicate positive intention to take actions 4. Media references to awards increase 50% annually |  | n) 300 requests of information about project activities during 2013; About 450 in Jan-Jun 2014 (from entrepreneurs, managers, NGOs, local authorities etc.) by e-mail, phone, letters  o) n/a  p) Moldova Eco-Energetica is 90% high & very high appreciated    *Campaign and materials:*   * Website [www.biomasa.md](http://www.biomasa.md), updated on weekly basis, also promoted on Facebook and UNDP website * Dissemination of about 300 media materials (TV, radio, press releases, YouTube) coinciding with 42 public and media events (exhibitions, festivals and events (e.g. Sustainable Energy Week); 83 news and press releases on project results, 12 video and audio spots and video-graphics on bioenergy; and 23 media field trips at project locations * Publications:   + Stories about the project in UNDP publications;   + Project Newsletter (18)   + Calendar, fact sheets (baling, briquetting, subsidy HH program); leaflets * Moldova Eco-Energetica Award; support provided and now under ownership of MoE and EEA; “Moldova Eco-Energetica Magazine” | o) Enquiries have increased by 50% in yr2, yr3 and yr4  p) Media references have increased by 50% in yr2, yr3 and yr4  q) Surveys indicate 90% ‘high’ and ‘very high’ |

The Project Selection Committee[[15]](#footnote-15) selected 225 communities, based on specific pre-defined criteria throughout a staged, competitive and transparent process, for assessing local initiatives and awareness activities:

* Awareness and promotion activities were organized at local level in all those 225 selected villages, consisting of meetings with representatives from the mayor’s office, local councils, managers of public institutions, entrepreneurs and other active community people. Each community selected a “Community project committee”, consisting of about 6-8 persons. These meetings helped to ensure transparency regarding the institutions that were connected to biomass heating system. A total of 7,725 community’s members attended these meetings and participated in the decision making process.
* Analysis of needs and capacities to implement a biomass-based heating project in public institutions in the 225 selected localities, i.e. appraisal of the current potential of the community to switch to renewable energy sources, local contribution, and the possibilities of the community to provide the institution with the necessary biomass fuel, project sustainability, and other relevant information. The study served as a baseline for project cost estimate. Moreover, it helped to determine the local contribution to the project implementation. This analysis allowed the Project Selection Committee to have a clear picture of the technical condition of the buildings and allowed to exclude those without suitable conditions for installation of biomass heating systems[[16]](#footnote-16).

*2) Energy performance and final participatory appraisal of buildings*

* In the 136 communities selected, energy auditing experts were hired to the energy performance assessment, including the calculation of boilers capacity against the technical condition of the building and recommendations for the improvement of energy efficiency of the building;
* Local public authorities and Project Committees from the pre-selected localities organized final project assessment meetings with the participation of community representatives. About 5,075 representatives of LPAs, community stakeholders and other community members got involved in the final evaluation of projects and decision making process on approval of projects for the investment stage (including assessments of community institutional capacity, need for energy efficiency improvement, availability of biomass fuel dry storage capacity in the community, environmental aspects, project cost estimate and operational capacity and training needs);
* Following the final assessments of the project appraisal reports organized by communities and MEBP experts, the Projects Selection Committee approved 128 communities for the investment stage (the last meeting of the Committee was held in July 2013).

*3) Design and construction*

In parallel with the community engagement and investment identification, activities on installation of biomass heating systems were carried out. The procurement of the installation works followed the ‘Design-Build’ approach. The specific of the selected procurement approach is that the owner holds one single contract with a Design-Build entity (consortium) which has to do the technical design and also perform the construction works, while in the traditional Design-Bid-Build approach separate contracts are concluded with the designer and the construction company.

The procurement was additionally streamlined by setting a shortlist of pre-qualified Design-Build entities (consortia) among which Limited International Competitions would be conducted. The shortlist was established following the evaluation of a number of qualification and eligibility criteria that would not need to be re-evaluated during the Invitations to Bid (ITBs)[[17]](#footnote-17).

An experienced consultant was hired to provide the following:

* Training for MEBP project staff and UNDP CO on processes in ‘design-build’ procurement;
* Determine selection procedures for pre-qualification and Limited International Competitions;
* Evaluation of Design-Build contractors according the evaluation criteria and selection of at least five Design-Build entities (consortia) in the shortlist and to be on-call to advise on evaluation criteria, wording of ITBs etc., and support the first tranche of projects on an advisory basis.

In the ITBs, the shortlisted design-build contractors could provide their offers. Based on life-cycle cost considerations, the best-value proposals were selected and contracted. Contracts were then signed with the design-build contractor. Regarding implementation, the contracts specifically include training of the local operators by the contractor, with the e local authority and community Project Committee doing the overall management, with MEBP project engineering staff responsible for monitoring of quality and supervision of the works.

Given the fact of little familiarity with the biomass heating technologies in Moldova, and also due to tight project schedule, it was opted at the onset of the Project for the Design-Build approach to procurement provided the following specific advantages:

* + Single point of responsibility - the “technology risk” is transferred entirely to the contractor which assumes overall responsibility for the quality of design as well as quality and compliance of construction works;
  + Time constrains and resource allocation – in case of Design-Build approach selection of contractors is done in one single competition, while for the traditional Design-Bid-Build approach two separate competitions would be conducted, first for contracting the designer and second for selection of the construction company. Moreover, the overall time necessary for completion of design and construction works in the traditional approach is significantly longer since the tender for construction could only be launched after the design is completed and approved by relevant authorities, a process that itself takes usually around 4-5 months. The Design-Build contracts the construction works could be carried out by the contractor in parallel with the design elaboration thus significantly reducing the total amount of time. On the other hand, the Design-Build procurement approach is about 10-15% more expensive than the ‘Design-Bid-Build’ approach.

*Achievements*

Up to date (01 Dec 2014), 127 projects have been approved for the investment stage, of which 118 have been completed, and another 9 projects are at the implementation stage. The 127 projects consist of biomass heating systems (with an installed capacity of an estimated 30.6 MW) in 144 public institutions, including 86 schools, 49 kindergartens, 4 community centres, 3 mayor’s offices, 1 vocational school and 1 dormitory. As a result of these 127 projects, it is reported in the progress reports that 90,389 people have benefited from improved thermal comfort, including 26,865 children, 4,761 of public employees and 58,763 parents and other population groups in total[[18]](#footnote-18). MEDP has sought equal participation of men and women in all decision making processes in communities associated with the implementation of biomass projects.

As a result of installation of biomass-based heating system and assuming a capacity utilization factor of 30%[[19]](#footnote-19), it will be possible to produce energy of approximately 80.4 GWh (= 290 TJ). The Project’s contribution to the biomass heating systems has been a total of EUR 12,299,885. The major part of costs related to the installation of biomass-fired heating systems has been covered by the Project (covering design, assembly of the heating equipment, connection to power and water supply networks, renovation of the heat supply station, building and testing). The community contribution has included construction materials, labour, energy conservation measures in the building, contracting of the operator and technicians and biomass storage and is estimated, in-kind and in cash, is estimated at EUR 1,571,433.

Of the systems, 15% was straw-based and 85% was based on briquettes or pellets as fuel. This reflects a change in focus of the project, originally on straw bales as raw material, and shifting to the use of pellets and briquettes from agricultural residues (straw and other) as fuels of preference; as a response to the observation during project implementation of a rapidly growing market development of supply and demand for modern solid biofuels.

Installation of the biomass-based heating systems has been accompanied by training and awareness raising of local public authorities and managers (of institutions where the biomass heating systems were to be placed) to acquire knowledge and skills on proper management of biomass heating systems in their communities, on ensuring energy efficiency, conducting fuel procurement tenders, contracting and setting sustainable partnerships with the private sector.

The activities undertaken under this component have been implemented based on the participatory mechanism and approach, as described above. This approach contributed to the community mobilization and sustainable local development. Most of the activities were implemented in close cooperation with decision- making actors at the local level with a strong participation of community’s members, district and national stakeholders at all stages of preparation and implementation of community projects, strongly ensuring local ‘ownership’. This has contributed to the mobilization of the population and local sources, overseeing the implementation of local initiatives, sustainability and transparency projects at community level.

**Activity1.2 “Fuel cycle facilitated through leasing/hire-purchase mechanisms for local fuel suppliers”** foresees fostering the development of the private sector market for contractors willing to supply fuels (in particular for the heating biomass-fired plants installed in public institutions) with financial support from the MEBP. The ProDoc mention that with seed money from the project a revolving fund is to be set up which can provide loans to partner companies to purchase straw gathering and baling equipment as well as briquetting equipment. Prospective partner companies are provided an interest-free four-year contract to be paid back in instalments with a 20% down-payment, 20% at the end of the first year and 30% during the following years. Payments are to be exempt of VAT, custom duties and commissions or fees.

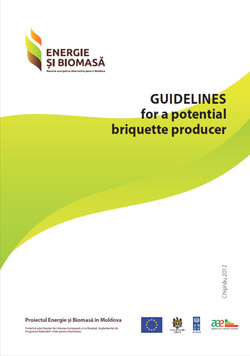
*Achievements*

To operate the revolving funds, an agreement was made between the Ministry of Economy and two partner/service providers:

* 2KR – Project Implementation Unit[[20]](#footnote-20); subcontracted to sell straw baling and handling equipment;
* Energy Efficiency Agency, subcontracted to sell the briquetting and pelletizing equipment.

PIU 2KR procured and put into operation a cumulative number of 19 baling equipment sets. EEA completed the procedure for reception of 16 briquetting equipment units, which have been put into operation. The procedure for another round has been completed with four winning beneficiaries. The funds spent by the project to support the lease-hire system has been USD 500,000 for straw baling equipment and USD 500,000 on briquetting/pelleting equipment.

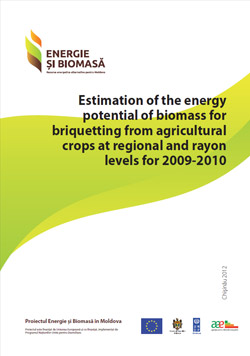
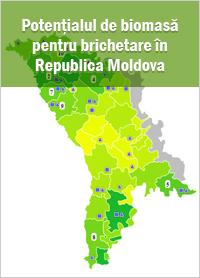
As mentioned in the ProDoc, **activity 1.3 “Market environment enhanced to support quality, efficiency, and effectiveness”** addresses issues in policy, legislation and bylaw development to facilitate the local biomass markets, by involved relevant government stakeholders as well as private sector (biomass producers and buyers) to address barriers and adopt best EU practice.

[](http://www.biomasa.md/data/1010/file_1578_0.pdf)The quality of fuels has become an issue. While at the conception of the Project only a few biofuel producers were in place, currently over 100 companies are operational that produce biofuels such as briquettes and pellets[[21]](#footnote-21). The quality of their products have not always been uniform or meeting fuel quality standards and end-users’ expectations and the Project’s activities in Activity 1.3 have focussed on this issue.

*Achievements*

* Meetings and round tables were organized on improvement of the legal framework regulating the biomass fuel market;
* Support was provided for the formulation of standards on biomass fuels. This has resulted, in close collaboration with the n close collaboration with the National Institute for Standardisation, in 37 EU-based fuel quality standards (that have been adopted since 2012; listed in Annex D.5) and a technical regulation on biomass fuel quality which requires all local producers to put certain physical and chemical characteristics to be labelled on briquettes and pellets (approved in Dec 2013);
* Background analysis and guidelines, such as the “Guidelines for Briquettes Producers”

### Output 2: Foundations laid for establishment of efficient household heating, industrial co-generation and biomass briquetting markets

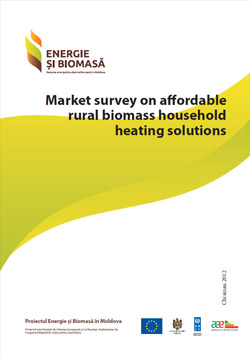
[](http://www.biomasa.md/data/1010/file_168_0.pdf)**[](http://www.biomasa.md/potentialul-energetic-din-biomasa-total-pe-rm/)**

The project aims to support the establishment of commercial business processing biomass derived from agricultural waste or residues providing quality fuels for households, public buildings and commercial establishments. In order to have an idea of the order of magnitude of fuel supply, a study was conducted during the first stage to estimate [the energy potential of biomass for briquetting from agricultural crops, at regional and rayon levels](http://www.biomasa.md/data/1010/file_168_0.pdf). The study has been used as a reference as well while identifying beneficiaries of the project.

One such beneficiaries are households, which are the focus group of **Activity 2.1 “Market solutions for high efficiency affordable rural biomass household heating identified and piloted”.** The ProDoc mentions that the activity aims at stimulating the market for high efficiency biomass heating systems suitable for rural areas with a target of at least 500 energy efficient biomass heating systems (using briquette or pellet-fired boilers) installed in individual household or small businesses by the end of the project.

*Achievements*

The following sub-activities were implemented:

* Information and outreach, by means of support to promotional activities of partners with the purpose of expanding consumers’ knowledge and understanding of efficient biomass domestic heating and opportunities and by means of publications and other communication activities (as part of Output 4). Also, several promotional activities were organized to support local biomass boiler producers.
* Review of available technologies for efficient household heating, looking at technology performance, fuel requirements, features (cooking, baking, central heating, or hot water), costs and market research on consumer needs and attitudes. The results of this assessment are summarized in the publication “Market Survey on Affordable Rural Biomass Household Heating Solutions”;
* Another sub-activity involved tested the efficiency of three different types of boilers (briquette-fired, pellet-fired and combined), to see which method established itself as the best for the local market. During the 2012-13 [](http://www.biomasa.md/data/1010/file_1607_0.pdf)heating season the main performance indicators of the three selected boilers were monitored in terms of quantity of generated heat, quantity of fuel used, work autonomy, and additional factors.
* The Project has aimed at stimulating this nascent market by providing a small subsidy to households up to a level that market volume (e.g. a production of 5,000 a year) would bring sufficient economics of scale to have a sustainable market. The Project has financed 612 household small boilers and that have been installed after approving the contracts. The large number of requests for registering in the Program is due to the promotion activities carried out within the given period, but also the considerable amount of subsidy provided (on equipment to households or as a production incentive for boiler producers).

Total cost of this activity was EUR 819,852, of which EUR 2,693 was spent on promotional activities, EUR 795,600 on supporting the small boilers (implying a subsidy of EUR 1300 on average per system[[22]](#footnote-22)) and USD 21,559 for EEA’s administration cost. The Project team has been monitoring market developments to know results and extract lessons learned that were used in adaptive management. For example, the focus in the Project has shifted from stoves (using straw) at the onset, towards using modern solid fuels (briquettes and pellets) in small boilers for space heating.

There have been developments in Moldova regarding energy pricing and various policies trying to create an enabling environment for independent power producers to feed power into the grid, such as the Law of Renewable Energy (2007) and various ANRE Resolutions. For background information on energy in Moldova the reader is referred to Annex D of this report. Co-generation (combined heat and power) from biomass is an opportunity for grid feed-in the Project has wanted to support. As part of **activity 2.2 “Industrial cogeneration using biomass fuel demonstrated”** the project has supported:

* Study on market opportunities and analysis on market barriers (policy and regulatory; availability and costs of technology; finance; awareness and capacity), based on which recommendations for investment strategies are made;
* Technology demonstration of at least one CHP unit using biomass form agricultural waste or residues. A tender was launched jointly with the Energy Efficiency Agency with a call for proposals to identify a suitable agro-industrial demo project. The Project evaluated the expressions of interest and proposals with the final decision made by the Project Board. Five companies participated in the tender and as result IM Sudzuker Moldova SA (a sugar producing company) has been selected for grant funding. The grant funding will be used to cover feasibility studies, engineering design and partial support of investment cost.

For the **activity 2.3 “Market solutions for briquetting/pelleting piloted”** the Project Document mentions the goal of establishing at least one commercial briquette business using biomass from agricultural waste or by-products from agro-industrial processes. The expected impact resulting from the implementation of biomass processing is the possibility to enhance energy safety of rural communities throughout the country, to foster the development of enterprises for processing locally available biomass, and to set up sustainable partnerships, that contribute to the economic development of villages and regions.

*Achievements*

With various briquette producers operating, the Project has shifted attention from merely supporting one or more producers to how production can be successfully linked with provision of heating services. The Project has supported a public-private partnership (PPP), which would demonstrate the viability and feasibility for private enterprises as producers of fuel out of the local raw material to provide biomass-based heating services in public buildings. A competition was launched for Local Governments working together with a local contractor. In the PPP heat delivery service model, the private partner delivers heat generated from biomass fuel and is paid by the rayon council per unit of energy (tariff based), while the private counterpart has the right to manage and use the equipment within the PPP. Through financial support extended by MEBP, the selected beneficiary will be able to cover part of the investment costs incurred for the procurement of the biomass processing equipment, with the remaining part covered by the beneficiary.

Green Farm LLC, the winning company of the PPP contract, initiated the construction works of the biomass heating systems at the related institutions from Leova district[[23]](#footnote-23). The works are expected to be finalized in time at the beginning of the heating season.

### Output 3: Capacity built for growth of biomass markets at regional and local levels in Moldova

The ProDoc mentions that output 3 aims to ensure that the benefits of biomass energy demonstrated and deployed under outputs 1 and 2 are delivered in a lasting and long-term way and that local capacity for further replication is ensured. The stakeholders targeted include: a) municipal management including mayors, civil servants, and local teachers; b) straw-fired boiler operators; c) fuel suppliers; and d) school children. For each stakeholder group, the following steps are followed:

* Development of training materials, to be placed in the public domain, to be updated on a regular basis;
* Implement training and awareness raising activities;
* Monitoring of the impact of the capacity development.

*General achievement*

Given the novelty of biomass-based heating in Moldova, MEBP staff members and team of experts, designed and delivered comprehensive training packages. Linked with Outputs 1 and 2, the project provided coaching and advice to community stakeholders along the entire project cycle. The spectrum of activities ranged from the participatory identification of public buildings to be heated with biomass, to mobilising people and resources in target communities; conducting joint energy audits of proposed public buildings; preparing project proposals and budgets and ensuring proper operation on a daily basis and long-term sustainability of installed biomass systems.

**Activity 3.1 “Capacity of municipal leaders to manage biomass systems enhanced”** focuses on local public authorities, managers of public institutions and local civil servants (such as teachers) to acquire knowledge and skills on proper management of biomass heating systems in their communities (maintenance routines, optimum system operation avoiding overheating and underheating, performance monitoring) as well as sound management of fuel supplies, storage and contracts (conducting fuel procurement tenders, contracting and setting sustainable partnerships with the private sector).

*Achievements*

Related to the Activities 1.1 and 1.2, trainings for municipal leaders was organized as well as ‘on-the-job’ training of authorities on fuel supply. Completed by 2014 were:

* Training on Effective Management of Biomass Heating Systems at Community Level (as part of activity 1.1, 518 LPA representatives and managers of institutions from all those 127 beneficiary communities of MEBP benefited);
* Training on Community and Local Resources Mobilization with 1754 people participating from the 138 communities participating in Activity 1.1 (LPA representatives, project committee members, local entrepreneurs, local NGOs). Topics covered: collection of local resources/funds (the community contribution) for project implementation, establishment of local partnerships, participatory evaluation of project proposal
* Training on Project Management and Implementation (1,592 persons – LPA members, project committee members, managers and technical staff of beneficiary public institutions from the 127 communities selected to have heating systems supported; Activity 1.1). Topics covered: ensuring the local contribution; monitoring the project implementation; providing the institution with biofuel (straw bales, briquettes, pellets); and ensuring project transparency throughout implementation.
* Training on Project Sustainability and Participatory Monitoring and Evaluation (organized in 14 communities from 6 beneficiary districts of the project). During these trainings, the people responsible for ensuring project sustainability within the community define a number of quantitative and qualitative indicators to monitor the performance of the implemented project as well as a sustainability plan;
* In order to facilitate the assimilation of new technologies at the community level and their efficient usage for the administration of biomass heating systems, MEDP organised specialised training to increase the knowledge and skills of community key actors in the following areas, e.g. on
  + normative and institutional framework;
  + assessment of biomass potential;
  + technology of pellet, briquette, and straw-bale production and the quality-price correlation;
  + establishment and management of relationships with biofuel suppliers;
  + planning of procurement of fuel for the community biomass-fired boiler plants;
  + socio-economic impacts at the local level;
  + establishment of public-private partnerships at the local level; and
  + opportunities and techniques to attract investments at the community level.

The initial design of the training activities was based on the idea of providing communities with all the types of skills, knowledge and abilities necessary to efficiently implement and manage a biomass heating system. The training activities demonstrated their effectiveness and efficiency, as proven by the results achieved, i.e. all planned public biomass heating systems (see Output 1) were timely and duly installed and operating with no delays and interruptions. One can conclude that the selected methodology of transferring skills and knowledge to the communities’ representatives contributed to the sustainability of the project activities and ensured the community ownership.

A very significant results of the trainings is that the communities, with the support of the project team and experts, elaborated and implemented a local-tailored development plan on resource mobilization for the implementation of the biomass heating projects. The long-lasting impact of this approach is that the communities not only learned about advantages of the use of biomass energy, but also changed their behaviour in this regard. After the installation phase, communities took full responsibility for the management, operation and maintenance of heating systems. In this regard, a series of trainings were offered to the biomass boilers operators in the recipient communities as will be detailed below.

The **“Training materials developed for sound operation of straw-fired boilers” (Activity 3.2)** has supplemented the training given by design-build firms for biomass boiler operators (activity 1.1).

[](http://www.biomasa.md/data/935/file_2334_0.pdf)Trainings were organized at 118 finalized boiler plants, with a total of 354 operators acquiring the critical set of skills and knowledge needed for proper operation of boiler plants (e.g. starting/stopping the boiler plant, fuel upload and correct dosage, verification of fuel quality, labour security and fire safety rules, monitoring the system parameters, boiler cleaning and ash removal, prevention and/or removal of defects, actions in case of accidents, technical servicing and conscientious use of systems, etc.).

Introductory trainings for biomass-fired boiler operators before the installation of boiler plants were completed in 2013, in which 376 operators from all those 127 beneficiary communities of the project obtained a set of key skills and knowledge covering the sound operation of biomass-fired boilers, labour safety and fire-prevention measures, and efficient maintenance of the systems.

The ‘Guide for Biomass Boiler Operators’ has provided a resource on the operation and maintenance of straw-fired boilers. These have also been provided to municipal leaders as part of activity 3.1. A “Roadmap for Effective Biomass Heating” was distributed in 118 beneficiary communities.

[](http://www.biomasa.md/data/935/file_2497_0.jpg)[](http://www.biomasa.md/data/935/file_2498_0.jpg)

**Activity 3.3 (“Training materials developed for commercial fuel suppliers”)** aims at enhancing the knowledge and capacity of commercial fuel suppliers basically for self-study and cover opportunities and risks relating to biofuel production and marketing information on business opportunities, benefits, and risk, necessary machinery (mechanization of straw gathering process from cereals/grains; agricultural straw-baling machinery; organizing the process of gathering, storing and marketing of straw-bales; technology and machinery for biomass-based pellet production and briquetting); fuel quality control; financial issues and return on investment; as well as creation of a generic business plan.

*Achievements*

The Project has developed a “Practical Guide for Biofuel Suppliers” to serve as guidance for those entrepreneurs who are interested in launching their business in the area of biofuel (briquettes, pellets, straw-bales) production and marketing.

[](http://www.biomasa.md/data/935/file_2813_0.pdf)

Biomass energy is generally seen as ‘informal’, associated with poor village life, not modern, and associated with dirty, polluting, and labour-intensive practices. **Activity 3.4 “Community understanding and acceptance of biomass energy enhanced through school educational program”** therefore was designed to bring about a change in these attitudes by providing information on modern biomass energy, focusing on the youngest members of the society as one of the best way to have long-lasting changes in perceptions.

*Achievements*

To this end, an educational initiative dedicated to renewables and energy efficiency was launched in schools. Sub-activities included:

* Stakeholder dialogue and partnerships with local NGOs;
* [](http://www.biomasa.md/data/935/file_2371_0.pdf)Teacher awareness raising and training in schools that are receiving straw-fired boilers. Approximately 254 teachers and school principals from 127 schools participating in the program, benefited from certified trainings
* Translation and adaptation of school educational and methodology materials already available including incorporation of local information on the practical benefits and opportunities of biomass energy in schools in Moldova.

An educational brochure “Renewable Energy Sources” was piloted as well as a Teachers’ Guide on Renewable Energy and Energy Efficiency. The optional subject “Renewable Energy Sources” has been included in the curriculum for pupils of upper grades (VII and VIII). The idea emerged to supplement the existing educational brochure in 2014 with an extended didactic support of 240 pages, representing a significant revision and detailing of the topics described in the original educational brochure of 2012 (26 pages).

This Educational Initiative covers all schools from the recipient communities of the Project, with the intention to involve school students and teachers in interactive and practical activities dealing with the promotion of alternative energy sources and energy efficiency practices. For example, students and teachers build samples of installations based on renewable energy, take part in debates on a variety of topics relating to alternative power and energy efficiency, carry out study-visits to biomass-fired boiler plants and prepare practical papers and topic researches to be shared with their colleagues, parents, community decision-makers, etc. The most active school students have the opportunity to take part in topic-related Summer Camps where they can deepen their knowledge on sustainable power and energy efficiency. The first Summer Camp with an eco-energy specificity was organized in June 2012. Also, a Mascot named ENERGEL was devised for this campaign, as a partner and friend of school students and young people in the process of exploration of eco-energy and rational energy consumption.

As part of ensuring the sustainability of educational activities on renewable and efficient use of energy, the Ministry of Education addressed a memo to educational departments in all 33 districts (including ATU Gagauz Yeri) with the recommendation to make use of the educational brochure “Renewable Energy Sources” and the Teachers’ Guide for the courses on Environmental Education, Nature and Habitat, Education for community development, as well as for the works of environmental and natural sciences school clubs. As a result, an additional 225 schools with over 13,000 pupils of 7th and 8th grades throughout Moldova joined the educational initiative and received copies of the Educational Brochure and Teacher’s Guide. By the end of the second quarter of 2014, about 19,000 pupils from 352 schools (6,000 pupils from 127 schools located in the MEBP beneficiary communities, and 13,000 pupils from 225 schools outside MEBP) had participated in the educational activities dedicated to renewables and energy efficiency. Approximately 200 children from communities covered by MEBP did participate in the two Summer Camps “Energel” (June 2014 and July 2013).

**Energel**

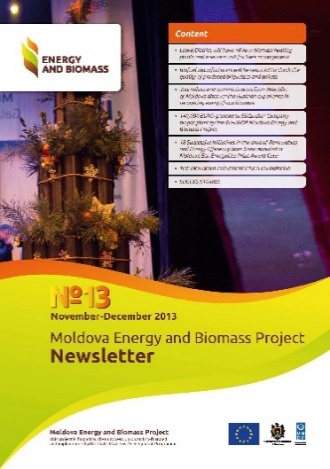
In order to ensure the sustainability of the knowledge products developed for local and district authorities in the field of biomass-based energy production and energy efficiency measures, MEBP and EEA approached the Academy of Public Administration (APA), the institution officially assigned by the Government of Moldova to train central and local level authorities, to uptake and integrate these as part of their training activities. The educational course was piloted by the APA in 2012 with a group of 18 mayors and district level authorities and by the end of 2014 had expanded to about 110 district and community-level authorities.

### Output 4: Opportunities and benefits of biomass energy for Moldova are well known, visibility of project results is promoted

This output of the Project intends to facilitate widespread dissemination on the general and specific advantages and impacts of using biomass energy in Moldova, to raise awareness on the potential of renewable energy in general and promote the visibility of the partnerships and the impact of the various project activities by means of national and local press, TV, radio and other relevant information sources.

The *achievements* are described below.

Newsletters have been produced on a regular basis to project beneficiaries and mass media. The project has developed a dedicated biomass-for-energy website [www.biomasa.md](http://www.biomasa.md)[[24]](#footnote-24) that is regularly updated with updated on a weekly basis with news, new communication materials produced in video or print format as well as information about the project and project materials. Information on the web is accessible in Romanian and English, while the electronic newsletters are also available in Russian.

[](http://www.biomasa.md/data/942/file_118_0.pdf) [](http://www.biomasa.md/data/942/file_1321_0.pdf) [](http://www.biomasa.md/data/942/file_2205_0.pdf) [](http://www.biomasa.md/data/942/file_2455_0.pdf)

 [](http://www.biomasa.md/data/942/file_2644_0.pdf) [](http://www.biomasa.md/data/942/file_1795_0.pdf) [](http://www.biomasa.md/data/942/file_120_0.pdf)

Under **Activity 4.1** a **“Media campaign”** has been developed to provide information to the local press, TV, radio and on social media (Facebook, YouTube) on the benefits of biomass for energy and renewable energy and energy efficiency in particular. Various media materials have been disseminated, including stories about project activities (e.g. on the household subsidy component). Video and audio spots can be accessed through YouTube. The Program was also promoted within a number of big events with the participation of local public administration authorities, and other key stakeholders from energy sector. The project has participated in events such as the Europe Days and European Sustainable Energy Week through interactive activities and live shows on renewable energy production.

As a result of direct communication actions such as public events, thematic discussions, awareness raising meetings, community mobilisation actions etc. and outreach communication activities (press releases, newsletters, video&audio spots etc.) about 2,000 media materials (TV, radio, newspapers, news agencies and thorugh Web portals) about the opportunities and benefits of biomass energy for Moldova, and project results/activities have been disseminated. In total, around 2 million persons were reached and informed via the media campaign actions.

Innovative campaign elements include the biomass-fired boilers caravan and participation thereof in exhibitions. The purpose has been for people to see how a biomass boiler is functioning, the types of boilers produced and assembled in Moldova:

* **[](http://www.biomasa.md/photo-en/ph_29-06-2014/)** SMS texting information campaign promoting the Household and Microenterprises Subsidy Program (Activity 2.1): thousands of people from all the regions received in 3 days information about the increase of subsidy share. As a result, in less than a month, more than 500 of persons submitted requests to finance their purchase of biomass boilers;
* The “Sun Dai Fest”is an open air festival of Eco-technologies and innovations with concertd of live music powered by solar energy. Thousands of festival participants watched “live” operation of renewable energy technologies (wind turbines, solar collectors, photovoltaic panels, geothermal pumps and biomass boilers). Also, young people – advocates of “eco energy” - presented their innovations designed to generate clean energy, cut down energy consumption and, thus, lowering power bills.

The project has been reported and made visible outside Moldova. In 2012 and 2013 the Project accomplishments were disseminated in the publication “Empowering Lives. Building Resilience” of the Regional UNDP Office for Europe and CIS countries, which incorporates the success stories of UNDP projects in Europe and Central Asia. A story on a female beneficiary in the household subsidy component (Activity 2.1) was published on International Women’s Day at the UNDP website[[25]](#footnote-25). Gender results are also reported in a blog on the UNDP Teamworks platform[[26]](#footnote-26).

Also under this activity, a study visit for journalists to an EU country with advance experience in using renewable sources, in particular biomass, for energy production was carried out. In December 2013, 13 journalists and communication experts from the Moldova learned the experience of Austria in using renewable energy. The journalists and communication experts visited locations/projects successful in using and producing biomass energy, and had meetings with mass media institutions, NGOs active in the sector and representatives of the Austrian Agency for Energetics. The purpose of the visit was to learn more about the experience of Austria in using biomass energy and other renewable energy sources, as well as the experience of mass media in organizing campaigns for renewable energy promotion and their impact on public opinion[[27]](#footnote-27). During 5 days, the journalists visited enterprises producing solid biofuel, companies producing biomass fired boilers and localities massively using energy produced from renewable sources.

Mass-media have been regularly monitored. For example, within the period January-June 2014, over 150 mass-media materials (TV reports and programs, radio news, articles in newspapers, news for the web portal and news agencies) about the opportunities and benefits of biomass energy for Moldova and project results/activities were disseminated.

In **Activity 4.2 “Annual national awards”** the Project has instigated and thereafter supported, in partnership with EEA and the Ministry of Economy (MoE), the organization of the annual Eco-Energetica Moldova Competition, for example, by making suggestions on the regulations of the Competition (e.g. establishing a Secretariat responsible the Competition’s administration and organization; re-titling award categories on heating and power production within the Bioenergy Category; setting rules for submission and evaluation of participants). In close partnership with MoE and EEA, a national-wide competition to award the successful projects on using and promoting ‘renewable energy and energy efficiency’ was initiated and implemented by the project. The involvement of national partners from the very beginning in every phase of the competition ensured that they have assumed ownership of the activity. This is also evidenced by its financing, i.e. MEBP provided financial coverage for the organization of competition & award ceremony on a sliding scale: 2011 - 100%, 2012 - 80%, 2013 - 60%, 2014 - 30%). The rest of the budget was covered by EEA funds, the donor community and private sponsors.

Media references to MEE are reported by the Project team as at least 165 times (2011: 30, 2012: 50, 2013: 85, with 2014 to be known after 5 December). Related to the event is the publication of the “Moldova Eco-Energetica Magazine”, an EEA initiative (i.e. not funded by the Project but from EEA funds) in 2013 and now in 2014. The 2014 edition contains success stories of the Competition 2013 finalists, information about activities of the key actors in energy sector, as well as news on the national competition Moldova Eco-Energetica 2014.

To give some insight in how the event is organized, a summary description below is given on the organization of and participation in the Award Ceremony:

* *Competition:*
* The “Regulation, Evaluation Criteria, Selection Procedures and Application Guidelines” including Award Categories, for the Moldova Eco-Energetica Awards were developed by the project as a result of consultations with national partners and relevant stakeholders in working groups with field experts.
* Based on the Regulation, a Coordination Board of Moldova Eco-Energetica was established consisting of 11 members representing the line ministries, local authorities, civil society, academia and donors.
* Four evaluation panels were established consisting of 16 experts to review the submitted applications in two stage selection process (desk evaluation and field visit verification) and propose the winners to Coordination Board.
* 3 editions of the competition have been organized, in which 125 projects enrolled
* Media campaigns promoted the competition;

*Award Ceremony:*

The competition was launched in December 2011 during a festive event, where a number of local successful projects selected by a group of experts in the sustainable energy area were showcased and awarded. Up to now, three editions of Moldova Eco-Energetica Award Ceremony were conducted (the fourth to be organized on 5 December 2014).

Over 1000 invitees, including top officials, ministers, ambassadors, as well as representatives from the private sector, academia and civil society, have participated to the Ceremony in previous years. Again, 1000 people are expected to participate in the 2014 Award ceremony

In the 2012 and 2013 Moldova Eco-Energetica Award Ceremonies, 34 successful projects were awarded and 13 are to be awarded at 5 December 2014. Also, 47 trophies and 47 success stories were produced.

As part of **Activity 4.3 “Communication and visibility of project results”** mass-media and public opinion were regularly informed about all important events, activities, and accomplishments in the project by distributing news and press releases to national and regional mass-media, and posted on the UNDP web page, social networks, UN Magazine, EU cooperation news, Energy Efficiency Newsletter (IDIS Viitorul), etc. All communication materials were in line with the Joint Visibility Guidelines for EC-UN actions.

A registry of information requests has been updated regularly. In the period March 2011-October 2014, over 2,000 persons, mainly agricultural entrepreneurs, local public authorities, managers of public institutions from rural areas, and NGOs requested information from the project team via e-mail, telephone, letters, and visits to the project office on project activities.

### Conclusions on results in terms of achievement of outputs

**Evaluation questions (see Box 2)**

|  |
| --- |
| * Progress towards achievement of results? Were the outputs achieved? * Were key methodologies and approaches that facilitate the success of the project and delivery of necessary outputs appropriate? * What are the factors that affected either positively or negatively the accomplishment of the outputs? |

As described in detail in the previous Sections 3.1.1 to 3.1.4, the Project has achieved most of its intended outputs and activity results, including demonstrating solid biomass fuel supply (briquette and pellet production) and demand-side projects (public buildings and households), strengthening institutional and human resource capacity to support the development of biomass energy projects in Moldova (notably standards and regulations on biomass fuel quality; training of biomass boiler operators, local decision-makers and fuel supplying companies) as well as setting up of a revolving fund to finance biomass energy projects and raising awareness amongst the public at large on biomass energy projects in Moldova.

The project has attempted to encourage the market for solid biomass fuels by addressing issues along the bioenergy production chain, from gathering the agricultural raw materials (e.g. straw baling), to processing into densified fuel (such as briquettes and pellets and quality of fuels), to the operation of the biomass-burning equipment (e.g. biomass boilers) to the prospective end user of the energy service (e.g. efficient and effective use of heat generated).



The Project’s intervention rightly address issues along the supply chain of biomass heating simultaneously. Examples of project interventions, mentioned in the previous sections of this report, are:

* Study on biomass residues potential in various districts;
* Support (information and training; revolving funds) given to producers of biofuels (e.g. pellets or briquettes from straw or sunflower residues) as well as on improving fuel quality (e.g. standards and regulations).
* Support given to boiler heating system operators and managers (information, guidelines)
* Support provided to end users in the public sector as well as private sector (information, training; awareness creation).

The market for densified biomass fuels has developed more rapidly than was anticipated during project conceptualization. This factor has induced changes in the Project’s focus away from straw-bales biomass to briquettes and pellets. To give an example, , with almost 65 operating producing briquettes in 2012 and over 100 in 2014, the need for supporting a briquette production facility became obsolete and the Project Board recommended expanding activity 2.3 into a PPP approach with pelletizing as technology of biomass processing. For more on influencing factors, the reader is also referred to Section 3.2.3 on adaptive management.

## Project implementation and efficiency

This Section describes the project management setup (section 3.2.1) as well as the Evaluator team’s observations on stakeholder relations, project management, implementation and budget control.

### Project setup

The project management arrangements are shown in the diagram in Box 6 on the next page (following description in the Project Document). The project has been implemented under the National Implementation Mechanism (NIM) with the Ministry of Economy as national implementing partner in line with UNDP rules and procedures. UNDP Moldova supports the Project in the **project assurance** role by carrying out objective and independent project oversight and monitoring functions.

A **Project Board (PB)** has managed the Project at the highest decision-making level and has been responsible for making management decisions for a project when guidance is required by the Project Manager, including recommendation for UNDP/Implementing Partner approval of project plans and revisions. The Project Board has been made up of a representative of each of the following entities:

* Ministry of Economy (MoE), Senior Executive and chairing the Project Board[[28]](#footnote-28)
* Ministry of Agriculture and Food Industry (MoAFI)
* Ministry of Environment (MoEnv)
* Ministry of Regional Development and Construction (MoRDC);
* Ministry of Finance,
* Energy Efficiency Agency (EEA)
* State Chancellery;
* UNDP,
* EU Delegation to Moldova (the primary donor),
* Congress of Local Authorities of Moldova (CALM);
* and one representative of civil society

The **Project Management Team (PMT)** has been established, and staffed with a Project Manager (PM), a team of project officers in the fields of finance, procurement and contract management, community mobilization, business development, engineering, and media and training[[29]](#footnote-29).

An **Advisory Committee** was established to facilitate effective and quality implementation and coordination of the project. With the Project Board the main decision making body of the project, the Advisory Group is a representative group reflecting the broader range of key stakeholders of the project. It has been made up of representatives from UNDP and the EU Delegation, technical specialists representing the other project board members, as well as representatives of the Ministry of Education and Ministry of Construction and Regional Development, Energy Efficiency Agency, Energy Efficiency Fund, Academia, civil society, agricultural producers associations, Regional Development Agencies and representatives of district councils and Local Public Authorities, representatives of donors active in the sector, and other relevant programs. The Group has met if required, but usually on a quarterly basis just before the quarterly meetings of the Project Board.

**PM team**

**Project Board**

**Senior Beneficiaries**

MoAFI, MoEnv, EE Agency; MoF, MoRDC, St. Chancellery, CALM and civil society representative

**Project Assurance**

UNDP Moldova

**Project Support**

Admin. & Finance Associate (1)

Project Assistant (1)

**National staff**

Community mobilization officer (2); Engineer (1);   
Business Development Officer (1); Procurement and contract management officer (1); Communication Officer (1) and Training specialist officer (1)

**Project Manager**

**Short-term experts**

Design-build advisor (Int)

Technical experts (Loc + Int)

Trainers (Loc + Int)

Others as required

**Advisory Committee**

Incl. EEAgency, EEFund, MoCRD, MoEd, Academia, Civil Society, Regional Development Agencies, LPA representatives, Agricultural, Bio-fuel and Boiler Producers Associations, Donor Organizations (WB, EBRD, others)

**Executive**

Chair: MoE

**Senior Supplier**

EU Delegation

UNDP

Box 4 Project organization structure (from ProDoc)

In addition to these original management arrangements (described in the ProDoc), a **Project Selection Committee** was set up to ensure transparency in the biomass heating community projects evaluation and selection process (see Output 1) and to ensure efficient coordination of project with complementary programmes, projects and national policies. It included representatives of the Ministry of Economy (MoE), Energy Efficiency Agency (EEA), Ministry of Constructions and Regional Development (MoCRD), Ministry of Agriculture and Food Industry (MAFI); Energy Efficiency Fund (EEF); Delegation of the European Union to the Republic of Moldova; UNDP Moldova and of the MEBP Project Management Team.

### Partnerships and stakeholder engagement

In Moldova, the Ministries of Economy, Environment and Agriculture and Food Industry, as well as university departments, research institutes and NGOs are or have been involved in research and implementation of biomass-related projects in general.These organizations have shown enthusiasm and a willingness to cooperate with the MEBP bioenergy project.

The National Agency for Energy Efficiency (EEA) has been the main implementation partner and the Project beneficiary. In the Evaluators’ view, the Project has interacted well with a large number of stakeholders, such as central and local authorities, academic and education institutions, line ministries and state agencies, civil society organizations, private sector and the country population, as evidenced by the list of entities participating in the Project Board, Advisory Committee and the Project Selection Committee.

From the onset, the project team has established good relationships with such national partners as MoE, EEA, MoAFI, ,Ministry of Environment, Ministry of Education, Academy of Public Administration, Institute of Continuous Formation, Institute of Energy and other stakeholders, which ensured a large involvement of local partners in the process of day-to-day project implementation. Implementation approaches to the Project have been conducted in a participatory manner based on close collaborative working relationships between the Project team, national stakeholders, local authorities and managers of public buildings, providers of biomass fuel and boiler assemblers/producers as has been detailed in the description of achievements in Section 3.1.

Regarding beneficiaries, the Evaluation Team met a number of the project beneficiaries during the field visit of the mission that seemed to be well content with the biomass heating systems installed. Project involvement in these districts has provided beneficiary communities with reliable sources hot water and heating using locally available (straw and or briquettes/pellets) as fuel.

### Adaptive management and work planning

The MEBP team has shown accessibility and flexibility in managing of the project and was responsive to the requests of the local partners (mentioned in the previous section). As result, local partners have been strongly committed to the project. Together with the project’s adaptive management, this has formed a key ingredient for its success and allowed it to stay relevant and effective in a rapidly changing environment and emerging market.

Some examples of ‘adaptive management’ are given below:

* Initially the project was targeting straw in the form of straw bales[[30]](#footnote-30). However, it quickly adapted the type of biomass technologies to be supported to reflect the emerging market of solid biofuels and changed demand from beneficiaries, namely for more advanced solid biomass fuels (briquettes and pellets);
* The initial idea of Activity 2.3 (Activity result 6) is presented in the ProDoc as ‘supporting the creation of at least one commercial briquette business’. With already 65 companies producing biomass briquettes by the end of 2012, this concept was changed into a PPP (public-private partnership) approach for biomass-based heating services with higher replication potential and with focusing on pelletizing instead of briquettes (as a more advanced biomass processing technology; see Annex D);
* The lease/-hire purchase Activity 1.2 (Activity result 2) initially foresaw the establishment of a revolving fund for straw baling equipment only with 2KR as partner. With an eye on the rapidly evolving market, the activity was quickly expanded to briquetting and pelleting equipment (including getting the EEA on board as a new partner) and more in-depth assessments on the potential of biomass briquetting (as we described in Section 3.1.2);
* In the household boiler component (Activity 2.1), the project very quickly reacted to the demand and preference of the beneficiaries in terms of the approach applied, implying a shift away from stoves to household-size biomass boilers;
* The project also realized the need to raise awareness of potential beneficiaries in a hands-on and accessible manner, and as such implemented innovative approaches like the SMS campaign and a mobile caravan of boilers;
* For some activities the capacity development component (Output 3) changed its approach from merely providing training materials to a much more comprehensive capacity development approach linked with strengthening the capacity of stakeholder and partners needed to be able to implement certain project activities (e.g. training of municipal leaders, managers and representatives, Activity Result 1; boiler operators, Activity result 8; fuel suppliers, Activity Result 9);
* A number of commercial and awareness raising activities have been added during project implementation. For example, the Sun-Dai Fest was instigated to raise awareness among the younger generation in a very innovative and attractive manner (see section 3.1.4 in this report);
* With more and more biofuel producers in the country, the quality of briquettes and pellets has become an issue. In the absence of a quality testing laboratory, the project quickly reacted and produced a video and leaflets explaining in very simple but effective ways how to test the quality of biofuels.

### Project budget and realized expenditures

An overview of the performance of the project in terms actual expenditures per main project output and main type of assistance is given in the table of Box 5 below.

Box 5 Overview of planned and realized expenditures (2011-2014) per project output



It should be noted that detailed financial management or disbursement issues are not the subject of the final evaluation as such, as the project has a separate financial auditing process. This Section focusses on the progress in expenditures vs. planned budget in relation with the progress in implementation of activities. Box 6 on the next page gives an overview of the project budget and expenditures per main budget category. Data presented in the Boxes 5 and 6 are based on the financial info provided by the Project team.

It follows from these tables that disbursements has generally been in line with implementation progress of the project’s activities, while also disbursements do not deviate much from the project budget (compared with the original 2011 budget and subsequent budget revisions). It should be noted that in Activity 1.1 the beneficiary communities have also contributed in-kind and in cash to have biomass heating systems installed (see Section 4.1.1) and this should be actually be considered as additional co-financing. In general, the expenditures have been line with the activities these were programmed for in the Project Document and subsequent Annual Work Plans.

Project management cost (the cost of project staff, vehicles, office equipment and other office cost; see Box 6) were budgeted at EUR 1.13 million (or 8% of the total direct project cost of EUR 13.64 million). Also, expenditures have followed this share (7% of total disbursements of EUR 12.40 million).

Box 6 Overview of planned and realized expenditures (2011-2014) per budget category



### Reporting and communications; monitoring & evaluation; role of UNDP

The PMT has produced **regular progress technical and financial reports** as well as Annual Work Plan. Assessment and impact logs have been used to monitor the impact of various activities. Reporting in implementation progress and results has been adequate (progress reports, MEBP website, project publications and PR materials).

These together provide a picture of the project’s accomplishments up to date. However, some of these reports are not accessible to the public at large (such as the progress reports), or reports present results at a certain point in time, or technical studies and documents focus on a particular component only. As we Evaluators can attest as ‘outsiders’, it is easy to get lost in the details of these reports and it takes time to get a grasp of the project’s impacts that go far beyond reported number of pilots implemented, amount of press releases, number of trainings organized, etc. Also given its high profile of the project and now nearing its point of closure, the project would benefit from an ‘easy-to-read’ publication that would summarize the achievements in all components in an integrated manner, and not only presenting ‘what was done and achieved’ but ‘how it was done’.

**Communications** to the media and stakeholders are described in detail in Section 3.1.4 and have been part of the communication, visibility and media engagement strategy formulated at the onset of the Project and has been successfully implemented during the course of the project.

Several activities of the project (both revolving funds, household subsidy scheme, co-generation pilot, etc.) were directly implemented by national partners (so called responsible parties), applying the UN’s Harmonized Approach to Cash Transfers (**HACT**). The HACT approach was launched in 2005 and applied by the UN agencies involved (including UNDP) in their country programs[[31]](#footnote-31). It aims to reduce transaction costs pertaining to the country programmes of the agencies by simplifying and harmonizing rules and procedures, strengthen the capacity of implementing partners to effectively manage resources, and help manage risks related to the management of funds and increase overall effectiveness. UNDP deserves significant credit for implementing this new HACT approach in this project and reportedly has contributed to building capacities of national counterparts as part of project implementation and ensure national ownership.

The 2011 Project Document contains a reasonably detailed **monitoring and evaluation** (M&E) plan. Main reporting tool have been the project progress reports as well as reporting to the EU Delegation (listed in Annex C) and these provide the necessary information on project progress and issues. Regarding the results framework, we observe that some indicators do only partially monitor an activity, as we will discuss in the next section 3.3 on project design. In addition, there were changes in focus of certain activities (as described in section 3.2.2 on adaptive management) and these changes have not led to retrofitting the indicators of the results framework. In general, we feel therefore that the logical results framework (logframe) actually underreports the achievements. Only when combining the logframe with the various project reports and other info does a fuller picture of the project’s achievements emerge.

### Conclusions regarding project implementation and efficiency

**Evaluation questions (see Box 2)**

|  |
| --- |
| * What contribution has been made by UNDP and implementing partners to the progress towards the implementation of activities and achievement of the output and outcome? How appropriate were the inputs? Were the inputs sufficient to achieve the results? How cost effective they were? * What were the partnerships formed? What was the role of UNDP? How did the partnership contribute to the achievement of the outcome? What was the level of stakeholders’ participation? |

In general, most activities have been implemented in a timely manner (as discussed in Section 3.1) and with the budget resources allocated). In some activities, spending has been less than planned (see for example activity result 2.1), while in other outputs more activities were added than the ones originally planned for. It should also be noted that in some activities, the achievements that exceed the target originally planned (as described in the Sections 3.1 and 3.2.3) which leads the Evaluation Team to conclude that the budget was utilized as intended and in a cost-effective manner. In conclusion, considering the achievements the cost-effectiveness (efficiency) of the Project has been more than adequate, while the project inputs have been utilized in an efficient manner.

Review of the project’s progress reports and also discussions with the stakeholders during the mission reveal quite satisfactory supervision and backstopping by efforts by UNDP Moldova. The implementation approaches by the Project have been conducted in a participatory manner based on close collaborative working relationships between the Project team, national stakeholders, local authorities and managers of public buildings, providers of biomass fuel and boiler assemblers/producers.

## Design and relevance

**Evaluation questions (see Box 2)**

|  |
| --- |
| * Was the project well-placed and integrated within the national government development strategies and donor programmes? * Were the outputs (project components) relevant to the overall project outcome? * Was the project logical framework well designed? |

### Relevance and ownership

Bioenergy has been facing many barriers to its more widespread application:

* Lack of awareness of government officials at national and local level; and the general public on the benefits of biomass as an energy resources offering fuel savings and business opportunities;
* Lack of working examples of the use of modern solid biomass fuels (such briquettes and pellets);
* Lack of businesses to provide sustained biomass fuel supplies;
* Lack of capacity and skills to install, manage and operate biomass-based boilers and heating systems.

Prior to the MEBP initiative, there were a few concentrated activities to develop biomass-for-energy:

* Detailed analysis of the availability and potential of alternative energy in Moldova began with a study financed under the Austrian Global Environment Consultant Trust Fund, which resulted in “Renewable Energy (Biomass) Sector Study, Potential Use of Renewable Energy (Biomass) in Moldova”(2002); Cooperation with the Biomass Centre in Kiev resulted in further analysis and building energy audits and the proposal “Financing energy efficiency and fuel switching measures for buildings in rural areas”;
* The World Bank, with a GEF grant of USD 972,920, implemented ‘Renewable Energy from Agricultural Wastes’ during 2005-2008. The GEF project established eleven demonstration pilot installations in eight locations with an installed capacity of 2.72MW, using straw as an energy source. The heat plants used were based on proven Danish designs, supplying heat to public buildings in rural communities. The biomass fuel cycle was mainly supported by the provision of straw balers supplied through the 2KR[[32]](#footnote-32), followed by a further demonstration installation (300 kW), financed by JICA and implemented by the 2KR implementation unit.

In recent years, the Moldovan government has adopted a number of policies and strategies, related to the adoption of the treaty with the Energy Community and overall Development Strategy of Moldova, which emphasizes the need for energy security, environmental protection and sustainable energy. Important strategies and plans mention the increased use of renewable energy sources, in particular agricultural residues and waste, in general considered to an abundantly available renewable resource (see Annex D for more details):

* Law on Renewable Energy Sources (2007)
* Law on Energy Efficiency (2010)
* Energy Strategy of the Republic of Moldova until 2030
* National Renewable Energy Action Plan of the Republic of Moldova for 2013-202
* National Programme for Energy Efficiency 2010-2020

Project results have been attained with strong drivenness of the Moldovan authorities, not only at national but also at local level, as further evidenced by:

* Management of the revolving funds for biomass handling and biofuel processing equipment of Activity 1.2 by 2KR and EEA;
* Elaboration and approval of standards for briquettes and pellets and corresponding Government regulations (see Annex D.5 for a list of standards);
* Active participation of local public authorities (LPAs) in the PPP pilot of Activity 2.3 as well as the participation in the selection, installation and monitoring of public building heating systems (Activity 1.1) as well as related trainings (such a training on mobilization of community and local resources; training on monitoring and participatory evaluation and the training on implementation and management at community level.

Based on the above, the Evaluation Team has the opinion that the project results have been attained with strong ownership and drivenness of the Moldovan government and stakeholders to a significant extent.

### Design and results framework

Considering the project progress to date and taking into account what can reasonably be achieved in a 4-year period, the design of the Project has been appropriate to support catalytic activities for biomass energy development and to instill public and private stakeholder confidence on biomass energy. The successes to date in promoting biomass heating systems in residential and public sector has led to request to extend and expand the technical assistance activities of MEBP in a new successor project (as we will discuss in Section 4.3).

Box 7 Suggestions for improved progress indicators in the results framework

|  |  |
| --- | --- |
| **Activity Result indicators**  **(as given in the Project Document)** | **Alternative indicators**  **(suggested by the Evaluators)** |
| d) Progress in addressing barriers as evaluated by the project board | d1) Number of fuel quality standards and number of regulations |
| i) Successful operation of commercial briquette enterprise | i) Number of PPP for biomass supply and heating services implemented |
| j) Number of municipal leaders trained | j1) Number of municipalities or public institutions whose leaders/representatives trained  j2) Number of people trained  j3) Number of trainings organized |
| k) Positive feedback from municipal leaders (who will use their materials to inform their dealings with operators) during training events | k1) Number of staff (operators, managers) of boiler heating systems trained;  k2) Number of trainings organized  k3) % of participants expressing satisfaction with the training  k4) Number of training materials and/or guidebooks elaborated |
| m) Number of children participating in awareness activities | m1) Number of children participating in awareness activities  m2) Number of school teachers trained |
|  | r) Status of publications and media and communication campaign:  1. Status of project website; number of visitors to website;  2. Number of media materials disseminated  3. Number of Newsletters published and other number of other materials (PR materials; stories in third-party publications)  4. Number of Eco-Energetica events organized |

|  |  |
| --- | --- |
| **Outcome-level** | A) Jobs created (at outcome level rather than being put at activity results level, as in Indicators b) and g) of outputs 1 and 2; see Box 3)  B) Number of enterprises created (fuel supply and/or biomass-based heating services)  C) Amount of solid fuels (briquettes, pellets) produced annually and burnt in biomass based heating systems   * Direct (in project-supported facilities) * Indirect: estimate of national level figures of B) and C) |

The design of the Project has been based on the fact that only few activities had been implemented in developing biomass as a source of modern solid fuels. As such, there was little consistent information on the use of biomass for heating with a low level of awareness amongst key stakeholders on the benefits of biomass and business opportunities in the sector. During project implementation, it turned out that the market for briquettes had been growing faster than previously assumed, there were changes in focus of certain activities (as described in Section 3.2.2 on adaptive management).

These changes have not led to retrofitting the indicators of the results framework. Also, some indicators chosen in the (original logical framework) do only partially monitor an activity. In general, we feel therefore that the logical results framework (logframe) actually underreports the achievements. Thus, the logframe would have been benefitted from some additional indicators (at the formulation stage) or re-adjusted indicators (reflecting changes during implementation). We have indicated this in Box 7.

Regarding outcome, an obvious indicator (being an energy project) would be a summary indicator on the amounts of solid biofuel produced and actually used by the beneficiaries (for public buildings as well as in households and small businesses, linked with the Activities 1.1, 1.2 and 2.1 of the Project). These indicators could be extended to the national level to capture possible indirect effects. Estimates of the solid biofuel production and consumption at national level (by gathering sales data, surveys) would give insight in the current status of the solid biofuels in comparison with the status in 2010/11. Although maybe difficult to estimate, the national level of solid biofuel production and consumption could say something on the indirect impact of the projects through replication of biomass heating projects, increased awareness, institutional strengthening etc. on the development of the biofuel market in Moldova.

## Impacts and sustainability

**Evaluation questions (see Box 2)**

|  |
| --- |
| * To what degree did the project contribute to the development of sustainable energy production market in the country? * To what extent are the MEBP project results sustainable, taking into consideration the existing capacity, structures and political context in the country? |

### Results in terms of achievements of outcomes and objectives; impacts

The project results and resources framework (logical framework) refers to two outcomes in the UNDP country program (see Annex D.4), namely ‘number of new job created’ and ‘number of small business increased’. The latest reporting on progress[[33]](#footnote-33) mentions that in Output 1, some 363 new jobs were created during 2011-2014 linked with the Project’ support as compared with 260 given as the target value by the end of the project. Linked with Output 2, 10 jobs were created over 2011-2013, mentioning 25 as the end-of-project target value.

Box 8 Description and cost of biomass fuel and biomass-fired boilers

An important aspect concerning the acquisition of biomass-based heating systems is their cost compared to other heating systems. The following table compares heating in boilers using briquettes or pellets with using boilers fired with natural gas.



*Notes:*

*Other cost,* includes the cost of pipes, radiators and other components of in-house infrastructure

Cost estimates of boilers have been provided by the MEDP Team.

It can be seen from above table that the price of biomass-based heating is competitive with heating using natural gas, given the set of assumptions on fuel prices. At the given tariff, district heating would cost EUR 26,150 and EUR 3,306 for the public building and household/small company cases respectively. However, district heating is only available in the main cities Chisinau and Balti. In fact, the system to generate enough revenue for rehabilitation and capital investments has led to an absence of preventive maintenance and investments, leading to an inefficient and deteriorating heating system (World Bank, 2014).

**Examples of biomass-based heating systems**

(photos taken from “Market survey on affordable rural biomass household heating solutions” (2012)

These new jobs have been, for example, boiler operators, educators in kindergartens, and technical staff for biofuel production) including 112 in public institutions.

The installation of biomass boilers and the provided to the production facilities of densified biomass fuels (briquettes and pellets) has drawn interest to biomass business opportunities amongst suppliers and assemblers/producers of biomass-based heating systems. There are now (2014) more than 100 briquettes and pellets producers on the market[[34]](#footnote-34) and about 30 assemblers/importers of boilers and equipment that can burn biomass. This positive dynamic development was possible also due to the support of MEBP granted through the revolving funds (Activity 2.1) established to offer local entrepreneurs advantageous conditions for launching and/or extending businesses in the field.

Considering that there only few concentrated biomass energy activities in Moldova prior to the MEBP, we can observe that the Project has made an impact on raising awareness, knowledge and interest in biomass energy development in Moldova. The Evaluators feel that the government stakeholders (at national and local level) have been highly supportive of Project assistance to improve energy security and environmental conditions and creating local employment. The Project is also having a positive impact on raising awareness amongst education sector stakeholders in Moldova on the benefits on biomass energy projects.

The purpose was to increase the use of renewable energy technology. The Project has aimed at contributing to a more secure, competitive and sustainable energy production in Moldova through targeted support to the most viable and readily available local source of renewable energy, which is biomass from agricultural wastes. As Evaluators we have the view, based on our discussions on the results achieved (outputs, outcomes) that the Project indeed has helped the Moldovan counterparts to lay a strong foundation for the development of modern solid biofuels in an important and visible way. The next section will discuss on the sustainability of these results and achievements.

Box 9 Example of project results and impacts: Boghiceni

Boghiceni village is a community in Hincesti rayon with about 3,000 inhabitants and an infrastructure which includes several public service institutions. Most of them need to be renovated and heated in order to ensure indoor thermal comfort. For biomass heating, the community did select (by means of the participatory process described in section 3.1.1), the local gymnasium, where 275 pupils are studying and 50 are employed persons. From all the above mentioned public institutions, the gymnasium was the prior institution for ensuring thermal comfort, in order to perform the educational process. At the moment of project initialization, the gymnasium was heated by a thermal station that used coal. As the thermal station was obsolete and located too far from the gymnasium, the fuel consumption was too high and the expenditures exceeded planned amounts. Often, the boiler equipment broke down, leaving the school without heating. Pupils and teachers got sick of respiratory illnesses too often, and in some cases the educational process was interrupted.

The local public authority and the administration of the gymnasium were willing to engage into this project on the heating with biomass of the gymnasium and contributed to the development of partnership with local business for production and use of own energy sources from agricultural waste, and obtain savings for the local budget.

The community managed to implement successfully the project on gymnasium heating with biomass (briquettes/pellets) and is using this fuel since 2012, already the third heating season. Even in the first heating season the institution obtained savings to the budget of MDL 120 thousands The institutions’ administration is responsible for the investment made, and ensures annually boilers’ equipment functioning and procurement of the necessary fuels. Meanwhile, as a result of the project implementation, “Biosolar Energ” LLS has launched a production line of pellets from waste obtained after grain harvest, that enables the gymnasium to purchase fuel produced in the locality. This company has created 7 new jobs.

### Sustainability and replication

Replicability

An interesting result obtained in Component 1 is the expanded use of biomass fuel in the institutions outside the MEBP project. This result was possible due to capacity development of the community members in renewable energy, experience in local resource mobilization, acquired experience in managing biomass boilers and developing local partnerships in order to improve working conditions in public institutions. An example confirming the replication potential of the project is the successful history of s. Boghiceni in the Hânceşti rayon (described in Box 9). One year after the implementation of the biomass heating project, obtaining benefits, especially savings to institutional budget, the community didn’t stop and went further and expanded the use of biomass. The local public administration has installed biomass boilers in the local kindergarten by own sources of MDL 300,000 and with the support of the state budget (through the rayon council of Hincesti)".

Box 10 Activities on empowerment of women

The MEBP has been trying to integrate the gender dimension into its activities. Some examples are listed below:

* Integrating gender dimension in the eligibility criteria of the Household Boiler Subsidy Program (activity 2.1), by stressing that “single women/mothers will have a priority in the selection process”;
* Including the success story of Ludmila Abramciuc - beneficiary of the Briquetting/pelleting Equipment Leasing Program in the *UNDP global campaign dedicated to the International Women’s Day*. The success story was published by the New York Office of UNDP, on the corporate webpage of the organization at: <http://www.undp.org/content/undp/en/home/ourwork/womenempowerment/successstories/women-fuel-success-in-moldova.html?cq_ck=1393963529358>
* Submitting the application for participation in the Gender Knowledge Forum. One example is the case of biomass fuel production business managed by Ludmila Abramciuc.
* Publication of a blog regarding the gender results of the Energy and Biomass Project on the UNDP Teamworks platform. <https://undp.unteamworks.org/node/447820>

Sustainability

The future impact will be largely based on the sustainability of the results of the project. Sustainability can be defined as the likelihood of continuation of results and benefits after the project ends. Consequently, the assessment of sustainability considers risks that are likely to affect the continuation of the project outputs. Box 11 presents an assessment that at which specific project results (per output) are considered at risk of not being sustainable; and ends with looking at which factors in the external environment may influence sustainability, notably costs of biofuels versus price developments of the fossil fuel alternatives.

**Box 11 Assessment of sustainability of project results**

|  |  |
| --- | --- |
| **Output** | **Assessment of sustainability** |
| Municipal biomass heating  *Risk:*   * Local municipalities show limited enthusiasm; * Corruption could undermine results * Lack of culture of participation | *Institutional and technical capacity*  The community mobilization approach applied for the implementation of Output 1 ensures that ownership was created from the outset and the required capacities are built to ensure the sustainability of the project and the investment. With the project’s guidance each community/project sites elaborated a sustainability plan together with training on implementation of the plan and project management. Projects in public buildings were selected in a participatory and transparent manner (as described in detail in Section 3.1.1 of this report). The process of fuel supply in the regions has been continuously monitored by project team, surprise visits organized to communities and recommendations to beneficiaries have been timely made. As a result of the monitoring process, most of the institutions are timely provided with biomass fuel; have at their disposal trained personnel to operate the biomass heating systems; thermal plants are technically prepared by the start of the heating season. Most of the beneficiary institutions improved their energy efficiency mechanisms and renovated their indoor heating systems.  The beneficiary institutions received technical assistance and information from MEBP consultants regarding fuel producers in Moldova, ways of assessing the quality of fuel, maintenance of heating equipment and other relevant aspects. The Academy of Public Administration (APA) - the institution officially assigned to train central and local level authorities, to uptake and integrate biomass-based energy these as part of their training activities. The course was piloted in 2012, and by Dec 2014 around 110 representatives from district and community level authorities has received training.  *Financial*  District councils, local authorities and managers of the beneficiary institutions have invested financial resources worth MDL 28.3 million (approx. USD 1.6 million alongside the project’s contribution of USD 12.3 million) in public building heating systems (activity 1.1). However, in the longer run the municipalities and district would have to purchase the equipment themselves from the state budget. There are some encouraging signs (see the part on “replication” in the main text). The Project appears to have catalysed biomass boiler installation, but a commitment would be needed for budgetary allocations to install biomass-based heating as first choice of option, also in the absence of external funding, such as MEDP’s. To mitigate annual budget restraint risks, the project has sought to promote multi-year fuel supply contracts, such as the PPP for fuel supply and heating service. One PPP has been identified (in Leova district). For MEBP support, but it should be noted that 12 rayons have expressed interest to establish a PPP in collaboration with a local entrepreneur.  *Socio-political*  In principle, there has been strong local community and political support for biomass-based heating systems. There is always a longer-term risk that, faced with budget restraints, public procurement will favour systems with low initial investment but higher lifecycle cost over low-cost investments. |
| Biomass-based household heating  *Risk:*   * Negative view by the general public and stakeholders on using biomass as fuel | *Institutional and capacity*  The project has raised awareness at local level as part of the municipal biomass heating activities and the general awareness creation component. Given the interest shown by EEA as well as local authorities it can be assumed that awareness creation will be sustained.  *Financial*  High perceived cost of biomass-based heating combined with insufficient purchasing power may lead to a lower-than-expected purchase and installation of these systems. The project has tried to address the low purchasing power issue in households and micro-enterprises by the household subsidy program of Activity 2.1. However, this raises questions on the attractiveness of biomass heating system in the future for households with the applications for new households closed at project’s end. This risk is reduced by existing facilities for supporting ‘green investments’ exist, such as the MoREEF facility. Also, the analysis of Box 10 shows that, while initial cost of the boiler is higher, in general briquettes and pellets are competitive on a lifecycle basis with boilers fired by gas, so even without subsidy biofuel application could be beneficial for many end-users.  *Awareness*  The ProDoc mentions resistance of the public to accept biomass fuel as an alternative energy source. After a slow start, demand for household systems in activity 2.1 started to significantly increase towards the end of 2014. This indicates a potential for further upscaling of household system initiative. In the longer run, communication and training activities need to be continued by other agencies (EEA, NGOs, educational) emphasize the advantage producing energy (power and heat) out of biomass, continuing the MEDP’s educational program and general awareness raising activities/ |
| Production and supply of modern solid biofuels  *Risks:*   * Examples of poor biomass fuel quality produced in Moldova discourage end-users fuel for heating; * Average cost of biomass fuels and heating systems is higher than fossil fuel alternatives | *Technical capacity*  The number of companies involved in production of densified biofuels (briquettes and pellets) has grown significantly to over 100. On competitiveness vis-à-vis fossil fuel, the reader is referred to Box 11. Prices of fuels can be variable. The market of compacted biomass (briquettes, pellets) will depend on the price at which the biofuels can be sold; if too low, it will not yield an attractive return on investment in the densification equipment for biofuel suppliers; if too high, customers will leave the biofuels for the cheaper alternatives if available in the form of fuel oil, coal or natural gas and will not invest in adaptions in their heating systems to accommodate the biomass-based fuels. The project has made an important effort in creating a competitive market for biomass fuel supply; for the near future, we can assume that the more the market expands (with various Moldovan suppliers of biofuels and burning equipment), the likelier solid biomass fuel prices will stabilize or even decline. Given this interest by local investors in developing the biofuel market in apparent response to increased market demand, the growth of biofuels market is likely to be sustained.  *Finance*  The seed capital allocated by the project will continue to leverage private investment and remain an asset for the sector. During project implementation the capacities of the partner institutions where built (including all operational manuals and procedures) allowing for a smooth continuation and effective management of the Revolving Fund after the project ends.  *Institutional:*  Examples of poor biomass fuel quality in the past have discouraged users into using the fuel for heating. This risk has been lowered considerably with approval of standards and the approval by end 2013 of the mandatory regulation for solid biomass fuels. |
| Awareness creation and technical capacity  *Risk:*   * Local capacity for delivery and financial operations; * Negative view by the general public and stakeholders on using biomass as fuel | *Awareness and capacity*  At local level, the risk is that the enthusiasm shown by local municipalities and villages to adopt heating by straw, briquettes or pellets after the support of the project has ended, especially if the people trained (managers, administrators, operators) will over time be replaced by local councillors and staff that have not been exposed to the project’s awareness creation activities. On the other hand, the Project has done great efforts in engaging as much as stakeholders as possible at the local level from the beginning of the project. Local authorities have been provided with the full set of training and orientation materials required for hiring and training future boiler operators; these will help to explain the responsibilities and roles of biomass boiler operators, as well as advantages in operating biomass-burning boilers  Regarding the educational programme, the Ministry of Education addressed a memo to educational departments in all 33 districts (including ATU Gagauz Yeri) to make use of the educational brochure “Renewable Energy Sources” and the Teachers’ Guide for the courses on Environmental Education, Nature and Habitat, Education. Consequently, and additional 225 schools (in the initial design of this activity were 127 schools were targeted) joined the educational initiative. The subject “Renewable Energy Sources” was introduced in the list of optional courses for 5th to 9th grade students (Ministerial Order no. 679 from 07.07.2013 on “Activity plan for primary, secondary and high-school education for the period 2013 – 2014”. Regarding awareness creation, the Moldova Eco-Energetica is an excellent example of how this activity by its approach (supported by the Project, but managed by the national partners) to ensure sustainability. |
| Government  *Risk:*   * Ongoing support from the national government for bioenergy is low; * Political instability may affect the efficiency of the project implementation | *Socio-political and institutional*  Political instability may affect the efficiency of the project implementation with respect to cooperation with municipalities, and a supportive policy environment for renewables. The current support from the national government for renewable energy and energy efficiency may change on the longer term if energy security electricity and gas imports) improves. We consider this risk as low, given the closer integration of Moldova in EU programmes, such as the Energy Community, the country is likely to have sustainable energy objectives in its strategies and plans both on the short and longer term. The MEBP intervention in renewable energy sector has good sustainability prospects also because of the policy and regulatory framework put in place (see Annex D for a short overview). |
| External factors  *Risk:*   * Prices of fossil fuels fall, while cost of biofuels and end-use equipment rise; * Weather risks affect the availability of residues | In principle, straw and other agricultural residues are abundantly available in Moldova. Droughts and bad harvests may impact the quantity and price of raw materials. However, requirements of agricultural residues for energy are much less than national availability, so this risk is considered low. Another risk is that the high share of natural gas s in Moldova’s energy supply; more security in gas supply and lower gas prices in the future could result in a lower level of interest amongst potential biomass fuel users. |

The summary conclusions we have is that sustainability for the project’s outputs and objective is likely, although some moderate risks and issues remain. Given the project’s success, a new project has been proposed to UNDP and the EU Delegation, basically extending and expanding the project’s activities until 2017. The successor project will help to address these risks and remaining issues and further ensure project sustainability. This will be discussed further in the next section.

### Proposed MEBP successor project 2014-2017

A draft document “Description of the Action (DoA) of the Project Extension (2014-2017)” of MEDP has been presented to the Delegation of the EU, the main donor, and to UNDP. A detailed description of the logical framework with progress indicators is given in Annex D.4. The project objective and the four interrelated outputs remain the same in the proposed successor project, but some activities were added while the focus of some activities has changed to be able to remaining gaps and needs:

* *Geographical focus.*

MEBP’s focus up to now has been on rural areas and communities. However, during project implementation a strong level of interest of small towns was noticed to install biomass-based heating systems within selected public buildings. Support will extended to small and medium-sized towns. Second, the project will expand to areas not previously covered, i.e. the Transnistria region[[35]](#footnote-35), ATU Gagauzia[[36]](#footnote-36) and Taraclia district. The well-tested and comprehensive community mobilization approach and capacity development for municipal leaders, building managers, boiler operators and fuel supplies will continue in the newly identified towns and target regions

* *Technology focus.*
* While commercial briquette production is already well established, pelleting techniques are still only scarcely applied in solid biomass production. The successor Project will focus on creating a well-informed market both on consumer and the producer side, e.g. through the development of comprehensive web platform connecting producers with clients, systematically monitoring price developments and providing information to business on latest technologies and business opportunities.
* On the demand-side more focus will be on *integrated* solutions, i.e. extending space heating solutions to hot water supply and energy efficiency measures. For example, the biomass heating systems could be expanded with heat exchangers and accumulation tanks to provide for hot water, while also the boilers could be combined with solar hot water systems for hot water supply;
* *Fuel quality*

With the fast-developing solid biofuels market, the Project has addressed the increased need for quality assurance based on standards regulating quality requirements for different types of biofuels. A crucial next step is operationalizing the technical regulation by ensuring enforcement and compliance with the new standards. MEDP will support a quality control and certification mechanism has to be put in place, requiring an authorized body (quality control centre) skilled and equipped to test locally produced solid biofuels;

* *Demand and technology delivery models*
* Apart from continuing stimulating demand from the public sector and private households, the successor Project will increasingly focus on the commercial sector as consumer of solid biofuels;
* The viability of PPPs as a market-based model to provide heating services to the public sector will be further demonstrated addressing the gap of limited practical understanding of the PPP mechanism. Also, the PPP approach also responds to another identified gap, namely the limited availability of maintenance and operations support and specialised consultancy services in the regions;
* With respect to the latter, more emphasis will be placed on building the managerial capacities of biofuel producers and technology providers to ensure their continued competitiveness under changing market conditions. Specific attention has to be given to the need for continuous training of boiler operators.

# Conclusions and recommendations

## Conclusions

**Evaluation questions (see Box 2)**

|  |
| --- |
| * What and how much progress has been made towards the achievement of the outcome (including contributing factors and constraints)? Distinguish the substantive design issues from the key implementation and/or management capacities and issues including the timeliness of outputs, the degree of stakeholders and partners’ involvement in the completion of outputs, and how processes were managed/ carried out |

The overall conclusion of the team of Evaluators is that the Moldova Energy and Biomass Project (MEBP) has been quite instrumental in putting biomass-for-energy on the agenda in Moldova, especially given the fact that were only few concentrated biomass energy activities prior to 2010:

* Design: the project is timely and relevant given the formulation of renewable energy and energy efficiency laws and regulations with achievement targets for the year 2020 and in view of Moldova’s accession to the Energy Community. The project document is well written and the results framework (logframe) clear in its outputs and activities, although the framework could have benefitted from better progress indicators;
* Implementation: the project has been implemented according to plan in the four-year period within the budget available in close cooperation with the various stakeholders at the national level (government, chamber of commerce, universities, NGOs) as well as the local level (LPAs and local institutions, local companies);
* Results: most of the results as planned in the project documents have been obtained in all the four main outputs of the project. The activity on cogeneration has met slower progress, but in many activities the project has achieved more results than planned.

The Project has formed a strong base for the further development of markets for solid biomass fuels (straw and densified biomass) and has made an impact on raising awareness, dissemination knowledge and know-how and generating interest amongst a broad range stakeholders (local public sector, individual households, biomass fuel suppliers, boilers assemblers/importers, education sector and national government institutions). Training materials and courses have been developed and the capacity of municipal leaders, biomass suppliers and operators of heating systems strengthened, while the project has extensively promoted the benefits of biomass-for-energy and of sustainable energy use and supply in general by media and communication campaigns, has developed good resource materials and has achieved the incorporating of biomass (and renewable energy in general) as a genuine topic in school curricula.

In general, the Evaluation Team concludes that the project has made substantial progress towards the achievement of outcomes and the objective in a highly satisfactory way.

## Recommendations

**Final evaluation questions (see Box 2)**

|  |
| --- |
| * Recommendations for potential follow-up interventions, how feasible the follow-up actions would be, what alternatives can be identified and/or what components can be added to it, what knowledge products could be developed. |

Based on issues discussed in the previous Chapters and sections, this section presents a number of recommendations.

*1) Implement the proposed successor MEBP project (2014-2017)*

The Evaluators welcome this successor Project as a means to address the remaining issues regarding sustainability and competitiveness of solid biomass fuel (mentioned in section 3.4.2). The success shown by MEBP so far is indicative for potential good outcomes of the successor phase as well. Our first recommendation is therefore for the European Union (EU) to endorse and fund the new project (again to be implemented by UNDP) in accordance with the outputs and activities as described in the draft document “Description of the Action” (see Annex D.4)

*2) Additional recommendations:*

Some suggestions for activities to follow up (and to be incorporated in the proposed successor Project) are given below:

a) Activity 3.4: With the Ministry of Education, explore options to expand the thematic area of sustainable energy (‘RE and EE’) to higher grades (to help orient students in their choice of future professions towards the end of their secondary education.

b) In the end-user awareness, communication and information disseminations, stronger links could be made with messages on ‘energy efficiency’. Cost of fuel consumption cannot only be lowered by using cheaper alternatives, but also by energy use improvements, such as energy efficient windows, efficient use of hot water and good insulation of building walls and roofs as well as of heat ducts and pipes.

c) Towards the end (in 2017), the successor MEBP would benefit from undertaking an ‘end-of-project’ assessment of status, remaining barriers and gaps and recommendation for post-project actions. This assessment should integrate the results of the various studies and assessments undertaken in the period 2011-2017 and give a concise but short overview of the market status solid fuels for heating and cogeneration:

* Briquetting/pelleting (raw materials quality and price developments, state of technology, costs of technology and pricing of biomass fuels, financial cost (with and w/o subsidy), analysis of legal, financial risks and recommendations for action); update info and studies as needed on agricultural production, biofuel availability and costs
* Assessment of market opportunities for biomass heating in productive sectors (e.g. in local agro-processing and food processing; greenhouses; as well as wood processing enterprises; own biofuel production), covering aspects as energy needs, technology and size, initial and lifecycle costs as well as perceptions and awareness of biomass fuel end-users); Current and potential demand for solid biomass fuels (in residential, public buildings as well as productive sectors);
* Assess the role of subsidy instruments in view of future sustainability and the future role of existing and potential financial blending facilities, incentives and risk guarantee schemes;
* Analysis of remaining gaps and barriers (if any) with recommendations for post-project action (for policy makers; financial institutions; private sector entities);
* Summary of main results, approaches followed, costs-benefits and lessons learned regarding implementation of biomass technology in Moldova (not only success stories of the results, but to-the-point information on how it was done and why MEBP made a difference).

## Lessons learned

**Evaluation questions (see Box 2)**

|  |
| --- |
| * Lessons learned in addressing issues relating to relevance, performance and success |

* There is often a strong resistance to using biomass fuels which is often regarded by end users as well as decision-makers at national and local level as ‘not modern’ and not perceived as a good alternative due negative perceptions on cost, availability, reliability and quality of the fuel. In this context, businesspeople do not easily see the opportunity to have a viable business operation of producing biofuels or installing, operating and servicing biomass-based heating systems. End-users will not purchase biomass fuels that are not readily available at a competitive price, while these fuels cannot be made available because producers cannot find the markets to absorb their product. A problem of the ‘hen and the egg’, which needs to be addressed in an integrated way working at demand and supply at the same time in a pro-active attitude with mobilization of stakeholders and beneficiaries, ample public awareness raising and stakeholder capacity strengthening activities, ensuring consistent quality of the biomass fuels, as well as mobilization financial resources.
* Such a pro-active attitude, mobilization of resources, creation of working groups, and proper setting of priorities has proven to be an essential element in identifying the optimal strategy for the project implementation. In this regard, the flexibility and adaptability demonstrated by the project team, national stakeholders and development partners proved to be an important ingredient of the project success and impacts;
* Continuous dialogue with the national stakeholders (national, local and regional authorities; community-based organizations; private sector) and development partners has been an efficient tool to drive the project into the right direction. For example in 2012, based on the recommendations provided during meetings of the Project Board, the approach in implementing project activities such as focus of technology (from straw used in stoves towards densified biofuels used in biomass boilers), promoting local production of biomass boilers, piloting pelletization technologies, piloting co-generation was changed to more market competition modalities. Similarly, the household system subsidy program was regularly revised and adjusted to the purchasing power of the target group;
* Ample public awareness-raising activities are required prior to, and during, the project launch activities in the regions in order to contribute to a wider understanding of the benefits of the biomass energy sources by potential beneficiary communities. In general, the communication and awareness-raising activities, combined with comprehensive training modules contributed to a better understanding and knowledge of the biomass-based heating by the general public.

1. Terms of reference
2. **BACKGROUND**

The Republic of Moldova is highly dependent on energy imports. Over 95% of Moldova’s energy needs are ensured through imports. The dependency on the external sources of energy has led to a constant rise in price for energy and to accumulation of large debts for external provider. The energy sector is a key sector for the economy of the Republic of Moldova, being vital for the successful implementation of the national economic development program.

The Government has committed itself to reform the energy sector by increasing the energy security of the country, attracting investments in infrastructure, and participating in an energy market based on equitability principles and mutual advantages. The Republic of Moldova has a great potential to produce energy from renewable sources, which at the present time has not yet been harnessed. Studies show that one of the most secure and easy to access alternative sources of energy is straw and other agricultural wastes, called biomass. In particular, wheat straw waste is the Republic of Moldova's renewable energy source with the biggest short- to medium-term potential.

The Moldova Energy and Biomass Project (MEBP) is a 4 years, 14.56 M EUR project that started in January 2011 with the purpose to significantly increase the use of renewable energy technology through fuel switching and energy efficiency. The project primarily focuses on improving heating comfort levels in rural public sector buildings including schools and community centers by using readily available agricultural wastes supplied from local agricultural enterprises and solid biofuel producers. The project is also stimulating local markets for improved household heating; piloting industrial cogeneration, and biomass-based briquetting/pelleting, as well as raising local capacity in the biomass sector, and promoting the benefits of biomass energy and the project.

**Brief description of the project to be evaluated**

The overall objective of the project is to contribute to a more secure, competitive and sustainable energy production in the Republic of Moldova through a targeted support to the most viable and readily available local source of renewable energy, namely biomass from agricultural wastes.

The project consists of four inter-related outputs as follows:

*Output 1:* ***Municipal biomass heating and fuel supply markets established****.*

Activities under the output 1 aim to improve municipal heating of public buildings in rural areas and establish related fuel supply markets. Under this output, about 130 thermal heating systems primarily burning straw and other types of agricultural wastes for the provision of heating for public buildings in rural communities in Moldova (activity 1.1) were built. Supporting this, market mechanisms were used to support the involvement of local fuel suppliers to prepare, store and supply the fuel needed for the installed heating plants (activity 1.2). Very focused low-cost actions on policy, regulation, and contracting to support the market environment are making a third, minor output under this component (activity 1.3).

*Output 2:* ***Foundations laid for establishment of efficient household heating, industrial cogeneration and biomass briquetting markets****.*

Under this output three emerging technology options for biomass energy in Moldova, are to be assessed, developed, and piloted. Activity 2.1 focuses on domestic heating in rural areas, addressing the need for improved efficiency of heating and possibly cooking. Activity 2.2 has to support the deployment of industrial co- generation based on feed stocks from agri-industry. Activity 2.3 pilots and demonstrates biomass briquetting.

*Output 3:* ***Capacity for growth of biomass markets at regional and local levels is built in Moldova***

Output 3 aims to ensure that the benefits of biomass energy demonstrated and deployed under outputs 1 and 2 are delivered in a lasting and long-term way and that local capacities for further replication are ensured. For each stakeholder type to be reached under output 3, the first step was the development of training materials, to be placed in the public domain. These materials, updated and improved each year, provide an accessible repository of key information, and are used either in the training to be delivered under outputs 1 & 2 or in sub- activities under output 3. The stakeholders targeted include: municipal management including mayors, civil servants, and teachers; boiler operators; fuel suppliers; and school children as detailed below. Given the significant budget support and cooperation between the EC (and other donors), and the national authorities in the energy sector, including in policy and legislation for renewable energy, this project is not seeking to address renewable energy policy and related capacities directly, apart from the very specific and targeted activities that have been described under Activity 1.3 above.

*Output 4:* ***The opportunities and benefits of biomass energy for Moldova are well known locally, and visibility of project results promoted***

Output 4 facilitates widespread dissemination on the general and specific advantages and impacts of using biomass energy in Moldova and promotes the visibility of the partnership and impact of the action. Under activity 4.1 a media campaign is implemented at national and local levels focusing on raising awareness on benefits and best practices related to the use of renewable energy. An annually organized National Awards on Renewable Energy and Energy Efficiency, under activity 4.2., rewards the most active and valuable promoters and beneficiaries of energy produced from renewable sources and encourages new initiatives on renewable energy and energy efficiency. It operates on an annual basis during the project lifetime, and afterwards will be taken over by the designated Government institutions, under high-level patronage, and with the support of external sponsors. Special emphasis is put on continuously communicating and giving publicity to the results obtained within the project, and on promoting the impact of joint actions of Government of the RM – UNDP - EU and national/ local partners.

1. **PURPOSE OF THE EVALUATION**

The purpose of the Evaluation is to review the progress made by the project in fulfilling its agreed objectives through the planned activities and to assess the efficiency and effectiveness with which resources have been used to generate results and achieve project objectives with special emphasis on impact and sustainability.

The *overall objectives* of evaluation are to assess the achievement of project results, help identify and critically analyze the relevance of the project activities, as well as, the effectiveness of the implementation. The comprehensive evaluation will examine whether the activities, outputs and objectives outlined in project document have been achieved, and underlying factors affecting either positively or negatively the

iimplementation of the project, draw lessons and make forward-looking recommendations for improvement of the sustainability of benefits obtained from the project.

The UNDP Country Office (hereinafter UNDP CO) accordingly will make use of the exercise as a learning opportunity for the office and key partners and stakeholders, as inclusively and practically possible. In particular, the findings and recommendations generated by the evaluation should inform the implementation and targeting of activities planned for the next stage of the project (planned for October 2014 – September 2017).

1. **GENERAL TERMS OF EVALUATION AND PROPOSED METHODOLOGY**

The Evaluation of project will be conducted by one International Consultant and one National Consultant, working together as a team. The International Consultant will take the leadership and assume overall responsibility for the quality and timeliness in the performance of this assignment.

The Evaluation should mainly concentrate on the following categories of analysis and evaluation criteria:

**relevance, effectiveness, efficiency, sustainability, and impact.**

**Relevance**: the degree to which the purpose of the MEBP remains valid and pertinent.

**Efficiency**: the productivity of the implementation process - how good and how cost efficient was the process of transforming inputs into outputs and outcomes.

**Effectiveness**: a measure of the extent to which the MEBP has contributed to achieve its results through an effective use of resources.

**Sustainability** – to what extent are the MEBP project results sustainable, taking into consideration the existing capacity, structures and political context in the country?

**Impact:** to what degree did the project contribute to the development of sustainable energy production market in the country?

In principal, the evaluation is expected to address the following issues:

**Project outcome status:**

*Project outcome Analysis – what and how much progress has been made towards the achievement of the outcome (including contributing factors and constraints)?*

**Underlying factors:** Analyze the underlying factors beyond UNDP’s control that influenced the outcome. Distinguish the substantive design issues from the key implementation and/or management capacities and issues including the timeliness of outputs, the degree of stakeholders and partners’ involvement in the completion of outputs, and how processes were managed/ carried out.

**Outputs status:**

*Output Analysis – Were the outputs (project components) relevant to the overall project outcome? Were the outputs achieved? What are the factors that affected either positively or negatively the accomplishment of the outputs?*

**Activities status:**

*Analysis of activities - Were the activities to achieve the outputs effective and efficient?*

How well the activities were planned and implemented? Were key methodologies and approaches that facilitate the success of the project and delivery of necessary outputs appropriate? Were gender equality principles taken into consideration in the delivery and of key project outputs, i.e. were both men and women involved in design, implementation and ensuring the sustainability of project results in target localities, did women and men benefit equally from the project interventions?

**Inputs status:**

*Inputs Analysis - what contribution has been made by UNDP and implementing partners to the progress towards the implementation of activities and achievement of the output and outcome? How appropriate were the inputs? Were the inputs sufficient to achieve the results? How cost effective they were?*

**Partnership strategy:** Ascertain whether UNDP’s partnership strategy has been appropriate and effective. What were the partnerships formed? What was the role of UNDP? How did the partnership contribute to the achievement of the outcome? What was the level of stakeholders’ participation?

**Cross-cutting issues - Sustainability**: assess the likelihood that the projects results will endure after the active involvement of UNDP would end. To what extent the changes (and benefits) brought by the project can be expected to last after its completion. The evaluation team should provide recommendations for potential follow-up interventions, how feasible the follow-up actions would be, what alternatives can be identified and/or what components can be added to it, what knowledge products could be developed.

The evaluation must provide evidence-based information that is credible, reliable and useful. An overall guidance on project evaluation methodology can be found in the *UNDP Handbook on Monitoring and Evaluating for Results (Annex A)*. The evaluators should come up with a suitable methodology for the evaluation of this intervention based on the guidance given therein.

During the evaluation, the evaluators are expected to apply the following participatory and consultative approaches for data collection and analysis:

* + Desk review of relevant documents (project documents with amendments made, review reports - midterm/final, donor-specific, etc.);
  + Discussions with the Senior Management and programme staff of UNDP Country Office;
  + Briefing and debriefing sessions with UNDP, EU Delegation and the Government, as well as with other donors and partners;
  + Interviews with partners and stakeholders (including gathering the information on what the partners have achieved with regard to the outcome and what strategies they have used);
  + Field visits to selected project sites and discussions with project beneficiaries;
  + Consultation meetings.

Interviews will be held with the following key partners, organizations and individuals at a minimum:

* + - *EU Delegation to Rep. of Moldova*
    - *UNDP Moldova CO*
    - *Ministry of Economy*
    - *Energy Efficiency Agency*
    - *Ministry of Agriculture*
    - *Ministry of Education*
    - *Energy Institute, (Academy of Science)*
    - *Local Public Authorities*
    - *Managers of public institutions*
    - *NGO “Alliance for Energy Efficiency and Renewables”*
    - *Biofuel producers*
    - *Academia, independent experts*
    - *International organizations active in the Energy Efficiency and Renewables sector*

1. **COMPOSITION OF THE EVALUATION TEAM**

The International Consultant will be assisted by a National Consultant in fulfilling the assignment. Members of the evaluation team must not have been associated with the project’s formulation, implementation or monitoring. The International Consultant will undertake two visits to Moldova of minimum 5 days and 2 days respectively. During the first visit the International Consultant will undertake project site visits and interviews with the relevant stakeholders, will collect all necessary evidence and by the end of the visit will present the key findings to UNDP CO. During the second visit, the International Consultant will hold a debriefing session presenting the outcome of the evaluation to UNDP CO and project Implementing Partners. The National Consultant will provide substantive feedback and support to the International Consultant in the construction of the evaluation report and in conducting field missions to Moldova (including field visits to the MEBP project sites).

1. **EVALUATIONS’S ETHICS**

Evaluations (the review) in UNDP are conducted in accordance with the principles out lined in the United Nations Evaluation Group (UNEG) ‘Ethical Guidelines for Evaluation (Annex B). The Evaluation team will take every measure to safeguard the rights and confidentiality of key information providers in the collection of data.

1. **DUTIES AND RESPONSIBILITIES**

**International Consultant**

* + Lead the evaluation and assume overall responsibility for its quality and timeliness;
  + Desk review of documents, development of draft methodology, detailed work plan and Evaluation outline;
  + Briefing with UNDP CO, agreement on the methodology, scope and outline of the Evaluation report prior to the first mission;
  + Interviews with project implementing partners, relevant government bodies, NGO, independent experts, beneficiaries and donor representatives;
  + Field visit to the project site and interviews with local stakeholders;
  + Elaboration of a summary key findings based on interviews and site visits performed;
  + Debriefing with UNDP and project implementing partner;
  + Development and submission of the first Evaluation report draft. The draft will be shared with the UNDP CO, and key project stakeholders for review and commenting;
  + Finalization and submission of the final Evaluation report through incorporating suggestions received on the draft report;
  + Supervision of the work of the national expert (during entire evaluation period).

**National Consultant**

* Collection of background materials upon request by International Consultant;
* Provision of important inputs in developing methodologies, work plans and Evaluation report outlines upon request by International Consultant;
* Assistance to the International Consultant in desk review of materials;
* Assistance to the International Consultant in developing the mission agenda and establishing meeting with relevant stakeholders;
* Participation in debriefings with UNDP CO representatives;
* Assistance to the International Consultant in conducting interviews with relevant stakeholders;
* Arranging field visits and assistance to the International Consultant in interviewing local stakeholders at project sites, provision of interpretation in communication with beneficiaries when required;
* Assist the International Consultant in elaboration of a summary matrix of the project implementation key findings based on interviews and site visits performed;
* Participation in briefing with UNDP and project implementing partners;
* Assistance to the International Consultant in developing the first draft of the Evaluation report. The draft will be shared with the UNDP CO, and key project stakeholders for review and commenting;
* Assist the International Consultant in finalization of the Final Evaluation Report.

1. **TIMEFRAME**

It is expected that the evaluation would be conducted during September - November 2014, over a period of up to 45 days from the commencement of the assignment.

|  |  |
| --- | --- |
| Activity Timeframe: **Activity / Deliverable** | **Timing** |
| Evaluation methodology and work plan agreed. All relevant input documents reviewed (home based) | 7 days after commencement of assignment |
| First visit to Moldova. Project site visits, interviews with partners and key stakeholders conducted. Summary key findings presented to UNDP CO. | 14 days after commencement of assignment |
| Drafting of the evaluation report (home based) | Period between the first and the second visit to Moldova |
| Second Visit to Moldova. Presentation of Draft Report. Briefing with UNDP and implementing partners. | 35 days after commencement of assignment |
| Finalization of the evaluation report. Final evaluation report submitted and approved (home based) | 45 days after commencement of assignment |

1. **EXPECTED DELIVERABLES**

The key product expected from this evaluation is a comprehensive analytical report in English that should, as a minimum, include the following contents:

* Executive summary;
* Introduction;
* Description of the evaluation methodology;
* Analysis of the situation with regard to the outcome, the outputs and the partnership strategy;
* Analysis of opportunities to provide guidance for the future programming, incl. concrete recommendations for the second phase of the project;
* Key findings (including best practices and lessons learned);
* Conclusions and recommendations;
* Annexes: ToRs, field visits, people interviewed, documents reviewed, etc.

1. **ORGANIZATIONAL SETTINGS**

On operational level, the Consultants will work under the guidance of UNDP CO and under the supervision of the Project Manager for Project-related documentation, administrative and financial aspects.

The payment for services provided by the Consultants will be made according to deliverables completed, and approved by the UNDP.

The International Consultant shall bear all the travel related and subsistence expenses in Moldova. In-country transportation shall be provided by UNDP.

1. **REQUIRED QUALIFICATIONS AND COMPETENCIES**

The International and National Consultants must possess the following qualifications:

International Consultant:

* Master’s degree or equivalent in Management, Business Administration, Economy, Engineering, Local Development and/or other relevant fields;
* At least 8 years of work experience in the areas relevant to the assignment (economic, regional and local development, consulting services, private sector and business development, energy efficiency and renewable energy, participatory and sustainable development);
* At least 5 years experience in conducting monitoring and/or evaluation of development projects in the field of economic and energy efficiency/renewable energy field;
* Knowledge and experience with programming development, monitoring and evaluation;
* Excellent analytical and writing skills;
* Excellent spoken and writing skills in English. Knowledge of Russian or Romanian is an advantage;
* Familiarity with development approaches in the energy sector in the region is a strong advantage.

National Consultant:

* University degree in Natural Resource Management, Environmental management, Engineering, Energy, or other related areas;
* Minimum 5 years of professional experience/technical knowledge in providing management or consultancy services to the preferably in Environment, Engineering or Energy sectors;
* Good understanding of Moldovan Energy Efficiency and Renewable Energy policies and programmes;
* Previous experience with practical use of monitoring and evaluation methodologies;
* Experience in managing, monitoring and evaluating projects for UN or other international development agencies in the region will be an asset;
* Fluent in English and Romanian both written and spoken. Knowledge of Russian is an advantage

***K. REFERENCE MATERIALS***

The following documents should be studied by the evaluators:

1. UNDP Handbook on Monitoring and Evaluating for Results (Annex A)
2. Ethical Guidelines for Evaluation (Annex B)
3. UNDP Results-Oriented Annual Report (ROAR) for Moldova (2011, 2012, 2013)
4. MEBP Project Document (Description of Action), draft Project Document for the second phase and relevant progress reports
5. Other official documents and materials related to the domain from the government, donors, etc. Background documentation is available on [www.undp.md](http://www.undp.md/); [www.gov.md](http://www.gov.md/); [www.biomasa.md](http://www.biomasa.md/);
6. mission agenda

**Mission 13-17 October 2014**

| **Time** | **Person, Organization** |
| --- | --- |
| ***Friday, 10 October*** | |
| 11:30-12:30 | Briefing by Mr. Gavrilita with Alexandre Darras, Attaché - Project Manager, EU Delegation to Moldova |
| ***Monday, 13 October*** | |
| 09:00-10:00 | Briefing with Nadja Vetters and Valeria Ieseanu (UNDP) and Alexandru Ursul, MEBP Project Manager  Narine Sakhakyan, Deputy Resident Representative UNDP Moldova, |
| 10:00-11:15 | MEBP Project Management Team |
| 11: 30-12:30 | Mr. Valeriu Lazar, President of Chamber of Commerce and Industry, Former Deputy Prime Minister, Minister of Economy and former Chairman of the MEBP Board |
| 14:15-14:45 | Ms. Oxana Paierele, Head of Regional Development Department,  Ministry of Regional Development and Constructions |
| 15:00-16:00 | Ms. Mariana Botezatu, Head of Energy Security and Energy Eff. Department,  Ministry of Economy |
| 16:10-17:00 | Vladimir Berzan, Academy of Sciences, Institute of Energy |
| 17:00-18:00 | Mr. Valentin Arion, Technical University, Professor, Head of Thermoenergetics Dep. |
| 18:00-19:00 | Victoria Ignat, former MEBP PMT member |
| ***Tuesday, 14 October*** | |
| 09:00-09:45 | Ion Munteanu, IDIS Viitorul |
| 10:00-10:45 | Ina Zglavuta, MEBP PMT member, |
| 13:00-14:00 | Mariana Goras, Ministry of Education |
| 14:15-15:00 | Mr. Valeriu Bulgari, Executive Director, 2KR; Dan Prisacaru, Project Manager |
| 15:30-16:20 | Mr. Anatol Sirbu, Representative of Congress of Local Authorities of Moldova |
| 16:30-17:00 | Ion Tulbu, “Consocivil” and Valeriu Ceban, “DiTrade”, (design-build consortia) |
| 17:00-17:50 | Valeriu Plesca, “Green Farm”, (PPP) |
| 17:50-18:30 | Andrei Mereacre, “Darnic Gaz”, (small boilers) |
| ***Wednesday, 15 October*** | |
| 07:30-18:00 | Field visit to MEBP project sites, Balti, Donduseni and Floresti districts |
| ***Thursday, 16 October*** | |
| 07:40-15:00 | Field visit to MEBP project sites, Calarasi and Orhei districts |
| 16:00-17:30 | Mr. Mihai Stratan, Director of the Energy Efficiency Agency |
| 17:45-18:30 | Ms. Ludmila Andronic, Communication Expert |
| ***Friday, 17 October*** | |
| 09:00-09:45 | Mr. Iurie Senic, Ecological Agriculture, Renewables and Irrigation Department, Petru Tataru, Technology Dev. and Renewables Department, Ministry of Agriculture and Food Industry |
| 10:45-11:25 | Mr. Semion Berzoi – Energy Efficiency Expert, Energy Efficiency Fund |
| 11:30-12:30 | MEBP PMT; Ms. N. Vetters, |
| 12:30 – 13:00 | Ms. Narine Sahakyan, UNDP Deputy Resident Representative, Nadja Vetters, Valeria Ieseanu, UNDP Moldova and Alexandru Ursul, MEBP Project Manager |

1. Documents reviewed

Project documents, progress reports

* MEBP Project Document (August 2012)
* MEBP, Project Extension 2014-2017, Description of the Action
* MEBP Progress Report, January-June 2014
* MEBP Progress Report, 2011-2012
* Communication Strategy of the MEDP (2012)
* Country Analysis Moldova (United Nations, 2011)
* UN Development Assistance Framework for the Republic of Moldova, 2007-2011 (2005)
* *Towards Unity in Action,* Partnership Framework, Republic of Moldova 2013-2017 (United Nations, 2012)

Project-supported technical reports and materials

* Estimation of the energy potential of biomass for briquetting from agricultural crops at regional level and rayon levels for 2009-2010 (2012)
* Guidelines for a potential briquette producer (2012)
* List of suppliers for biomass equipment
* List of approved biomass projects (October 2014)
* Market survey on affordable rural biomass household heating solutions (2012)
* Newsletters, No. 1 to No. 17
* Various media monitoring reports
* Project website [www.biomasa.md](http://www.biomasa.md) and “Project info sheet” (2011)

Other publications and documents

* Government of Moldova (2012), *National Report for UN CSD Rio+20*
* Government of Moldova (2013), *National Renewable Energy Action Plan of the Republic of Moldova for 2013-2020*
* Government of Moldova (2013), *Energy Strategy of the Republic of Moldova until 2030*
* NBS (2012), *Energy balance 2012, Republic of Moldova*, National Bureau of Statistics
* Panoutsou, C. (2010)*, Biomass in Western Balkans, Moldova and Ukraine,* presentation
* UNECE (2009), *Republic of Moldova: National Energy Policy Information for Regional Analysis,* UN Economic Commission for Europe
* World Bank (2014), *Project Appraisal Document, District Heating Efficiency Improvement project*
* Zaharia, N. (MEBP), *Bioenergy in Moldova*

1. background information and sector context
   1. Energy in Moldova

Moldova imports all of its supplies of petroleum, coal, and natural gas, largely from Russia (and from Ukraine, and Central Asia). Imported energy sources are about 94%, with hydropower and wood & agricultural waste providing 1% and 5% respectively in 2007 (UNECE, 2009). Primary energy supply in 2011 (IEA website; Energy Balance 2011) was 3,324 ktoe (kilotons of oil equivalent), of which 123 ktoe local production only. Per fuel type, supply was coal (3%), diesel and fuel oil (16%), gasoline (8%), natural gas (64%), LPG (3%), wood (3%), electricity (11%) and other fuels (5%). After subtracting conversion losses (mainly in using gas to generate electricity and heat) total final consumption was 2328 ktoe, of which coal 4%, oil products 34%, natural gas 32%, electricity 17%, heat 10% and biomass fuels and waste 3%. Per sector, consumption was 674 ktoe in industry, agriculture and construction, 370 ktoe in transport, 961 ktoe in the residential sector, 257 ktoe in commercial and public sector with 66 ktoe for other uses.

Moldova has no domestic production of natural gas and relies entirely on pipeline imports from Russia. Natural gas made up about 40% of total primary energy supply in 2012 (according to Moldova's National Bureau of Statistics; EIA, 2014). Moldova is a transit country for natural gas. In 2010 it used 1152 million m3 of natural gas, while 19,990 million m3 was transited (NBS, 2010). Moldova has no significant refining capacity and imports most of its petroleum liquids. Petroleum products accounted for 36% of the country's total primary energy supply in 2012.

Power consumption in 2010 amounted to 4097 million kWh, consumed by industry and agriculture (22%), commercial and services (20%), residential (55%) and other uses (2%). Installed capacity was around 3000 MW, but only about 1600 MW as used (in 2007; UNECE, 2009). Power is generated basically by the large thermal power plant and a smaller hydro facility on the left-bank of the Dniester River (generating about 1675 million kWh in 2006)[[37]](#footnote-37) as well as from hydropower and CHP (combined heat & power) plants (generating 1192 in 2006)[[38]](#footnote-38) on the right bank territory (with 224 million kWh imported in 2006).

Heat production amounted to 232 ktoe in 2011, of which 178 ktoe in the before-mentioned CHP plants and 94 ktoe in thermal plants[[39]](#footnote-39). With the large CHPs within the city limits, Chisinau and Balti are the only two cities that now have operating district heating systems in Moldova. Termocom, the company serving Chisinau, has a pipeline network of 711 km and serves a population of more than 500,000 or about 62% of Chisinau residents, for whom the system is considered to be the least-cost option for heating. Due to the poor quality of but relative high cost of the district heating service, many of the wealthier residents of Chisinau, who could afford to, have transitioned to individual boilers in their own buildings. Although[[40]](#footnote-40)

One of the most evident problems in the energy sector in Moldova is also the current situation of the energy infrastructure (requiring extensive capital investment) and its dependence on energy imports that are extremely vulnerable towards political factors in the region.

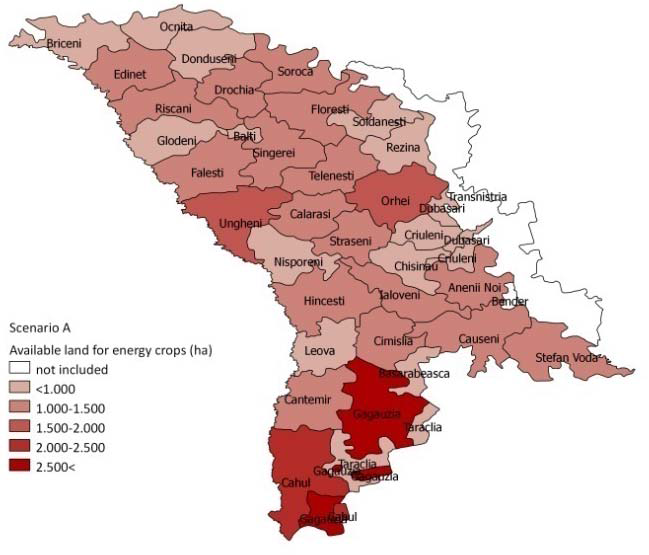
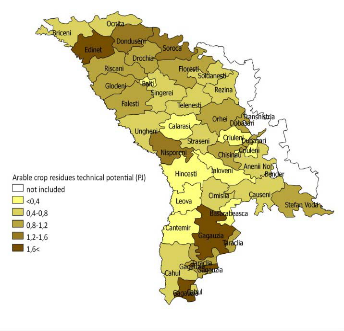
* 1. Renewable energy and biomass energy

Moldova uses only a very marginal part of its renewable energy potential, mainly wood and agriculture waste for heating. The potential of renewable sources of energy is considerable, but currently contributes only 3-4% of primary energy demand.

In the past, wind mechanical power was used (e.g. for milling), but in the 1960s these wind installation were replaced by grid electricity. Measurements in the 1990s (at a weather station located in the south) showed average wind speeds at 3-7 m/s (at 10 m height). New measurements by the Technical University in the first decade of 21st century shows speeds of 7 m/s or more at 50 m height and estimated total potential of wind in the south-western parts at 612 MW and potential production of 1,600 GWh[[41]](#footnote-41). On the short-term, about 26-35 MW could be developed, generating between 86-111 GWh annually. Moldova has two small hydropower plants at sites in Dniester and Prut river (64 MW in total, of which 40 MW available capacity) with small privately owned plants adding 141 kW.

Solar irradiation is an average 1211 kWh/m2/yr in the north and 1378 kWh/m2/yr in the south with sun radiation varying between 1.0-1.4 and 5.2-5.9 kWh/m2/day in December and July respectively. Solar energy is mostly in tobacco production; about 80% is the harvest is traditionally dried using solar heat (about 14,000 tons in 2002). Some solar water heaters are used (about 1500 m2 of solar collector area). Solar photovoltaics (PV) is limited to a few applications (e.g. remote installations or small power irrigation). The study UNECE (2009) gives a potential of 1 million m2 for solar water heating, 80,000 m2 for solar drying of agricultural products and a short-term potential of about 5800 PV installations (generating 6.3 MW).

Biomass (fuelwood, wood waste and agricultural residues) are burnt for cooking and heating needs. About 363,000 ha of forests cover the country’s (10.7% of its territory). In 2005, timber harvesting was 39,000 m3 and fuelwood gathering an estimated 352,200 m3 (UNECE, 2009)[[42]](#footnote-42). Apart from forest lands, fuelwood is gathered form orchards and vineyards.



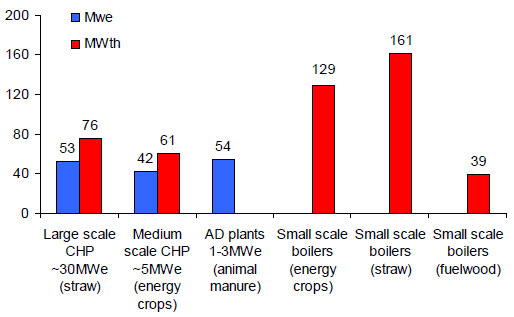
Source: Taken from Panoutsou (2010)

Box 12 Potential of arable crop residues (left) and forest biomass (right)

Other estimates put wood use for domestic heating in the order of 2 million m3 per year (around 600,000 tonnes), a proportion of which may be illegally logged. Moldova’s forest resources are limited and the problem of illegal logging is considered a priority of the forestry sector given negative environmental impacts of such logging.

**[](http://www.biomasa.md/photo-en/1142_ph_07-12-2012/)**There is consensus that agricultural residues forms Moldova's renewable energy source with the biggest short- to medium-term potential, mostly in the form of sunflower and grains residues (straw). The national arable cultivated area is approximately 1.5 million hectares, accounting for 75% of land use. The biomass potential is an estimated 21.0-50.4 petajoule (PJ) that would come from field crop residues (58%), dedicated energy crops (13%), forest-based biomass (10%), arboricultural residues (8%) from orchards and vineyards and livestock residues (8%)[[43]](#footnote-43). Biomass offers market opportunities to generate heat and power in cogeneration (CHP) schemes and for thermal purposes in boilers.

Box 13 Power and heat market opportunities for biomass in Moldova



Source: Panoutsou (2010)

On average 200 ha of winter wheat per settlement is grown annually generating up to 450 tons (nationally 700,000 tons), resulting in an equal amount of wheat straw with an energy content of around 5,300 GJ (nationally 8,200 TJ, equating to about 8% of current national energy consumption). The unwanted straw is either chopped and incorporated during ploughing or, more frequently burnt in the field (contrary to regulation). This mostly unused biomass represents an available, substantial and reliable source of renewable energy.

The total population as of January 2008, was around 3.5 million, of which 2.1 million (59%) lived in rural areas. There are 1,680 rural settlements in Moldova (including Transdniestria region), administered through 658 local administrations.

Households and public buildings

Rural settlements, villages and towns, are broadly similar in structure. Public buildings and apartment blocks (if any) are located in the town or village centre surrounded by private households. Each household usually has surrounding land and/or garden averaging 0.21 ha in size. Most households (85%) also have a land entitlement in the agricultural land surrounding a village (the former collective), on average 1.8 ha. Agricultural enterprises and individual families cultivate agricultural lands, for horticulture operations but predominantly for arable agriculture: cereals, grains and oilseeds are elements of annual arable rotations in every settlement, including winter wheat. Bioenergy has been mainly confined to residential wood stoves, often antiquated and inefficient using biomass in the form of firewood and straw. Other fuels used are coal or natural gas.

Public buildings (kindergarten, school, town hall, health centre, library, house of culture) are mainly heated by coal or gas. Households use wood and coal heating (wood as well as wastes such as maize husks accounting for up to 70% of fuel used), mainly from radiant stoves that also provide for cooking (but do not provide hot water or central heating).

Many villages in Moldova are connected to a natural gas main, where buildings in these areas can, at the owner’s expense, be connected to a natural gas supply. Since the rapid increase in gas prices connections have slowed very significantly. In the difficult winter conditions public buildings such as schools, kindergartens and community centres are usually maintained at uncomfortably low temperatures owing to energy inefficiency and a lack of funds available within local administration budgets for fossil fuels. This causes hardship and is cited as one of the reasons for the drift of people, especially the young, into towns or migration.

Agro-industries

While the residential sector comprises the majority of Moldovan energy demand (45% in 2005), industry makes up the second most important single sector (18%). Food processing is the largest domestic industry accounting for 39% of industrial output in 2008 (source: MEBP ProDoc), comprised of about 280 enterprises, while providing employment for over 26,000 people. There should be significant potential for biomass based co-generation of heat and power based on solid fuel combustion or biogas using agro-processing wastes such as those from the wine industry, fruit processing, as well as husks, kernels, dust, shelling, bark and trimmings.

Technological options

Direct combustion of biomass for power or heat generation is a mature, commercially available technology. There are various systems to process biomass feedstock and use in combustion systems.

* Stoves and furnaces to generate heat;
  + In Moldova, biomass residues (sunflower stems, maize cobs and stalks, straw) is used in domestic stoves but at efficiency of 50% and below. Employing more effective technology can increase energy efficiency to 75% or more and increase functionality (to provide for cooking, baking, hot water and central heating circuits), depending on cost and consumer preferences;
* Biomass-fired boilers to generate steam or hot water;
* Power generation, in which the biomass-heated steam drives a steam turbine which generates electricity.Combined heat and power (CHP) or cogeneration, is the simultaneous process of producing heat and electricity from one sources of energy, such as biomass or natural gas. Biomass CHP systems can provide heat or steam for use in industry or for the use of space and water heating in buildings. Biomass-for-heating systems can be quite economical in agro-industrial or wood processing industry where the biomass by-products of the processing activities can be used as fuel. Economics is also affected by the cost of transport of the biomass raw material to the plant’s site.
* Develop briquetting and pelletization of biomass as a substitute for wood, coal or natural gas. Densification of biomass (in particular forestry or agricultural residues) to briquettes or pellets increases their energy content per unit of volume. It reduces transport and handling cost of the biomass. Also, densification produces a fuel with more predictable burning characteristics than the original residue feedstock and this is important in the case of larger burning devices, such as boilers or furnaces. For example, some types of powdery biomass, such as rice husks ort sawdust have problems with the ash generated and would need special combustion systems. On the other hand, densification requires machinery and adds to the cost of the fuel. However, although the cost per tonne of feedstock is increased, the price of the feedstock per unit of energy can be reduced. Thus, densified solid biomass fuels (briquettes or pellets) are usually intended for household who can afford and industrial uses. A variety of processing methods are available, varying from low-pressure systems, such as manual presses, to high-pressure systems using rollers, pistons and screw extruders. The most important characteristics for producing good-quality briquettes or pellets are low water content of the raw material and low ash content.

Government policy and strategy

Moldova’s energy policy deals with objectives, measures and activities oriented towards a more efficient, competitive and reliable national energy industry whilst ensuring the country’s energy security, the upgrading of energy-related infrastructure, improved energy efficiency and use of renewable energy sources, and its integration into the European energy market.

To increase the share of renewable energy in power generation, in 2007 the Republic of Moldova adopted the **Law on Renewable Energy Sources** (No. 160, 2007), which introduced the concept of public tender procurement and electricity produced from renewable sources at a ‘cost-plus’ adjustable tariff. Changes in the regulatory framework were prepared to improve the current situation and to attract new investment. These regulations will provide clear tariffs for each type of renewable energy source and a transparent mechanism for energy procurement based on an open tendering system[[44]](#footnote-44). The Law sets the targets of 6% renewable energy in power generation by 2010 and 20% by 2020.

The Moldovan Government has sought to connect the country to the EU's internal energy market, and the country joined the **EU Energy Community** in 2010 with the goal of adopted the *acquis* of the Energy Community 2015[[45]](#footnote-45). In line with the EU Directive 2009/28/EC, Moldova committed to a binding share of 17% in renewable energy in final energy consumption.

Energy efficiency is given appropriate priority with an **Energy Efficiency Law** (No. 142, 2010) and **National Programme for Energy Efficiency** 2010-2020 (adopted in 2011), which sets the principles for energy efficiency and renewable energy. The *National Energy Efficiency Action Plan 2013-201***5** mentions specific planning activities in the sector of energy efficiency and promotion of development of the electricity, heating and cooling based on renewable sources of energy. A draft *Law on Energy Performance of Buildings* is currently under development and would provide a framework for improvement of energy performance of buildings, including promotion of decentralised energy (electricity, heating & cooling) supply systems based on renewable energy sources.

The L**aw on science and technology parks and innovation incubators** establishes incentives for the residents of the science and technology parks; VAT exemption (20%) on import of goods and services; custom tax exemption on import of goods and services, no-profit tax, as well as protection from any change in legislations for 10 years.

Energy efficiency, renewable energy and market development of network energies (electricity and gas) are the cornerstones of the recently adopted **Energy Strategy of Moldova by the Year 2030** (adopted in Feb. 2013). The Strategy is the successor of the *Energy Strategy of Moldova until 2020* (2007). Priorities in the Energy Strategy include:

* Fulfil the requirements of the Energy Community and EU; full integration in the EU’s internal energy market (gas and electricity by 2020);
* Strengthen the institutional framework for the new energy markets;
* Harmonize integration into the existing energy infrastructure and expected return of investments made in the additional generation of clean energy;
* Reduce the impact of energy production and use on the environment;
* This strategy targets a share of 20% of renewable energy in the gross final energy consumption by 2020 (with an intermediate target of 10% by 2015) and of 10% in power generation; and targets 10% share of biofuels by 2020 (4% by 2015)[[46]](#footnote-46);
* Reduce overall energy intensity by 20% in 2020; reduce energy consumption in buildings by 20% in 2020 (and achieve a 10% share in refurbished public buildings).

The **National Renewable Energy Action Plan 2013-2020** (approved in Dec 2013) further defines policies and actions towards development of renewable energy in Moldova. The Plan defines the sectoral targets towards achievement of 20% RES in 2020 and sets up the required legislative, regulatory and administrative actions to achieve those targets. The Plan mentions that small-scale cogeneration and heating projects in small towns and villages is a critical issue on the Government’s policy agenda. Priority will be given to the vulnerable groups in poor rural and urban areas to take advantage of sustainable socioeconomic development opportunities through adequate regional and local policies. It is possible the main supporting scheme in this case to be up-front subsidies financed.

* 1. UNDP and EU programme in Moldova

UNDP

This United Nations Development Assistance Framework (UNDAF) is the business plan for the UN system in Moldova for the period 2007-2011. It resulted from a consultative process between UN agencies, the Government of Moldova, and civil society partners. Outcome 3 of the UNDAF is “By 2011, vulnerable groups in poor rural and urban areas take advantage of sustainable socio-economic development opportunities through adequate regional and local policies implemented by Local Public Authorities (LPAs) and partners”. The MEBP project fits with the UNDAF Outcome and in particular with the Country programme outcome 3.2 “New businesses and jobs are created in targeted poor and rural and urban areas”.

Energy and climate change mitigation actions in general remain a focus area for the UN system in Moldova. Pillar 3 of the new Partnership Framework 2013-2017 is on “Environment, climate change and disaster risk management” and its outcome 3.2 refers to “Strengthened national policies and capacities enable climate and disaster resilient, low emission economic development and sustainable consumption” and mentions the following indicators:

* Energy and resource intensity (target energy intensity: reduce with 7% by 2017 in comparison with 2010);
* Share of renewable energy in gross domestic consumption (target: 11% by 2017, related to national target of 20% by 2020)

EU

INOGATE[[47]](#footnote-47) is an international energy cooperation program between the European Union (EU), the littoral states of the Black and Caspian seas and their neighbouring countries and is one of the longest running energy technical assistance programs funded by the EU. Up to 2006, it was funded by the TACIS Regional Cooperation Programme[[48]](#footnote-48), and as of 2007, it has been funded by the European Neighbourhood and Partnership Instrument (ENPI) under the ENPI-East Regional Indicative Programme 2007-2010 and 2010-2013. Moldova is a partner country of the EU INOGATE energy programme, which has four key topics: enhancing energy security, convergence of member state energy markets on the basis of EU internal energy market principles, supporting sustainable energy development, and attracting investment for energy projects of common and regional interest. In Moldova, INOGATE supports EBRD's Sustainable Energy Initiative, which establishes sustainable energy financing facilities through local financial intermediaries, such as MoSEFF (Moldova Sustainable Energy Finance Facility). Another program was Energy Saving Initiative in the Building Sector in the Eastern European and Central Asian Countries (ESIB; 2010-2014).

* 1. MEDP Project 2014-2017, Description of the Action (DoA)

After 3 years of implementation, it has been proposed to extend and expand activities in a “successor MEDP” to be implemented during 2014-2017, one hand based on his highly satisfactory performance and the other hand to be able to address a number of remaining gaps and additional needs. The proposed new project will again be implemented by UNDP with the main funding coming from the EU and is described in the draft document “Moldova Energy and Biomass Project, Project Extension 2014-2017, Annex 1; Description of the Action”.

Following the same logframe format, a summary of outputs and progress indicators is given below, taken from the DoA document. Reviewing the list of indicators of the results framework we have suggestions for improvement similar to the ones presented in Box7 in section 3.3. These are indicated in red text in the table below[[49]](#footnote-49).

Box 14 Description of activities and targets of the proposed successor phase (2014-2017)

| **Indicator** | **Extension target (2017), DoA** | **Summary description of DoA activities** |
| --- | --- | --- |
| **OUTPUT 1: Municipal biomass heating and fuel supply markets established** | | |
| *Activity 1.1 Heating systems in public buildings installed (Activity Result 1)* | | |
| 1. Heating systems installed  * Number * Capacity * Annual energy  1. Jobs created in target communities | a) 80 thermal heating systems burning biomass and about 20 solar hot water systems (SWH) will be installed totalling about 180 TJ (average installed capacity of boilers of approx. 220 kWth);  b) 144 jobs | * Continuation of community participation approach leading to installation of 80 biomass * Expansion of support to small towns and a specific regional focus (Transdniestria region, ATU Gagauzia and Taraclia district) * The same community mobilization approach will be followed (described in Section 4.1) * For the design and installation, the newly tested ‘design-bid-build’ approach will be followed, introduced in 2014) to current (design-build) * In at least 20 sites biomass heating systems will be complemented with SWH systems for hot water, especially in facilities operated throughout the year (kindergartens and medical facilities) * Seek collaboration and agreement with Energy Efficiency Fund (EEF) on setting up a co-financing partnership for public heating and hot water systems, based on EEF’s ‘joint finance scheme’ approach with private sector projects * Monitoring of the 144 biomass heating systems installed in the first phase (2011-14) looking at performance of equipment and collect performance indicators, community commitments and providing as-needed technical assistance |
| *Activity 1.2 Fuel cycle facilitated through leasing/hire-purchase mechanism for local fuel (Activity result 2)* | | |
| 1. Leased fuel supply systems  * System capacity | c) n.a. | * No more seed capital will be provided for the revolving funds (managed by 2KR and EEF), but the Project will monitor the operation of the two funds (spot-checks, field visits, audits and periodic reporting) and define a clear exit strategy for the continued use of the funds after the project’s end together with partners involved (MoAFI, MoE) and the EU Delegation |
| *Activity 1.3 Market environment enhanced to support quality, efficiency and effectiveness (Activity Result 3)* | | |
| d1) Status of quality control and certification body  d2) Number of business platforms  d3) Number and type of promotional events  d4) Status of studies on bioenergy potential and market stimulation instruments | d1) One Quality Assurance Centre supported  d2) Two business platforms  d3) X events and Y trade missions  d4) Two studies carried out | * Address the next main issue of *enforcing standards and regulation* by means of the establishment of an authorized laboratory (QA Centre) for testing and certification in cooperation with EEA, MoE and the National Institute for Standardization. The Project will provide support in capacity assessment, selecting the host for QA Centre, technical training and laboratory equipment. Following the establishment of the biomass fuel-testing laboratory, a handbook on “Solid Biofuels Quality Assurance” will be developed and provided to biomass fuel suppliers * In the first phase, 14 sensor systems were installed on biomass monitor. Based on this, a database and monitoring systems will be established (heat production, fuel consumption, temperature in buildings, emissions) that will be maintained by EEA; during the Project extension phase, field visits will provide additional data. Regulations will be assessed to allow the (mandatory) registration of boilers under the system with subsequent installation of sensor equipment; * Promote matchmaking biomass suppliers and users in online B2B (business-to-business) and B2C (business-to-consumers) platforms to facilitate the sales of biomass fuels, boilers and equipment by providing registration (fuel suppliers, biomass boiler importers/producers), info on technology, characteristics and performance, existing incentives and regulations as well as market data (prices, sales of biomass fuels). The project will support setting up the needed web portal and selection of the host organization; an interactive tool for producers to sell to consumer (‘market place’) might be added; * Promotional activities, such as roundtables and workshops on policy, regulations and biofuel market development, study tour (for selected entrepreneurs and policy makers on biomass fuel production, marketing and trading) as well as supporting trade missions (one for biofuel producers and one for biomass boiler producers and assemblers) * Provide support on reviewing existing studies, develop a consistent methodology with indicators and data collection and update estimates of the bioenergy potential according to the new methodology; * Study aiming at identifying all potential financial, fiscal, economic, legislative instruments for market stimulation and review their feasibility and suitability, and recommend options for the most promising package of interventions; * Expert facility: individual experts or consulting services from Europe will be made available to actors of the local biomass market, providing access to specialized knowledge in production and consumption of biomass, latest technologies and inventions, international market development and trends, policy and regulatory frameworks, support mechanisms and incentive schemes. |
| **OUTPUT 2: Foundations laid for establishment of efficient household heating, industrial cogeneration and biomass briquetting markets** | | |
| *Activity 2.1 Market solutions for high efficiency affordable rural biomass household heating identified and piloted (Activity result 4)* | | |
| 1. Deployment of systems:  * Number of residential heating systems  1. Jobs created | f) Systems:   * At least 300 household and small businesses   g) 30 jobs created | * Household and micro-enterprises support:   + Study on existing subsidy mechanism with suggestions for improvement, aiming at a better and targeted approach, both in the residential sector as well as small enterprises   + Installation of an additional 250 heating systems in private houses and 50 micro-enterprises with the financial incentive provided in partnership with EEA (including systems in regions not covered by MEBP earlier and with special attention to women-led households and enterprises). Criteria will be defined with EEA and Chamber of Commerce to be approved by Project Board. Eligible boilers (and stoves) are those (partially) assembled or Manufactured in Moldova using biomass briquettes and/or pellets; |
| *Activity 2.2 Industrial cogeneration using biomass fuel demonstrated (Activity Result 5)* | | |
| 1. Installation of at least one cogeneration plant | h) One cogeneration plant | * Complete study, propose a market development strategy (addressing policy and regulatory barriers identified); * Support development of at least one CHP unit, based on call for proposals (MEBP will provide for feasibility and design study and grant incentive) |
| *Activity 2.3 Market solutions for briquetting piloted (Activity Result 6):* | | |
| 1. Number of PPP for biomass supply and heating services implemented | i) 7 public-private partnerships (PPPs) established in addition (8 in total, 2011-17) | * Establishment of up to 7 PPPs established based on a competitive process (with MEBP covering the cost of feasibility study and grant incentive) and at least one PPP in Gagauzia, Taraclia or Transnistria areas. The selection of PPPs will be based on a competitive process, by collecting Expressions of Interest from district and local authorities and subsequent competitive tendering by the LPAs for the identification of the private sector partners[[50]](#footnote-50) |
| *Activity 2.4: Efficient and sustainable biomass burning technologies for production processes piloted and the potential of household level residues explored (newly added activity)* | | |
| 1. Number of pilot projects   j1 Status of replication strategy and guidelines |  | * Identification of economic sectors with high replication potential of using biomass in production processes; this assessment will be integrated with the analysis undertaken on support mechanism and biomass potential carried (see activity 1.3) * Piloting the use of biomass for heat generation for production processes in the framework of Agricultural Colleagues and Professional Schools[[51]](#footnote-51) in two institutions with own available raw materials, encompassing both production (e.g. briquetting) and use (biomass boilers) and linked with VET activities (see activity 3.5); * At least on pilot on collection of organic household and municipal waste for briquette production by municipal or private enterprises (to be delivered back to the households)[[52]](#footnote-52) * Promotion, dissemination of case studies and lessons learned; replication strategy (incl. financial support; incentives) and guidelines elaborated with MoSEFF and EEF and other partners |
| **OUTPUT 3: Capacity built for growth of biomass markets at regional and local levels** | | |
| *Activity 3.1 Capacity of municipal leaders to manage biomass systems enhanced (Activity Result 7)* | | |
| 1. Number of municipalities or public institutions whose leaders/managers are trained  * Number of people trained * Number of trainings organized | j) Leaders from 80 municipalities trained | * Continuation of training on biomass systems, EE (and expanded with solar heating) for Local Public authorities and building managers   + Adapting/updating materials, impact monitoring and lessons learned to the needs of each target group; translation into Russian were possible;   + Training workshops, study visits to sites with functioning biomass heating systems; international study tour for selected LPAs (all activities with specific regional focus on two small towns in Moldova as well as on Gagauzia, Transnistria, Taraclia);   + Use of ‘8-step roadmap for effective heating’ developed for biomass heating systems under MEBP[[53]](#footnote-53). A similar roadmap will be developed for solar collectors |
| *Activity 3.2 Training materials developed for sound operation of straw-fired boilers (Activity Result 8)* | | |
| 1. Training indicators:   k1) Number of staff (operators, managers) of boiler heating systems trained;  k2) Number of trainings organized  k3) % of participants expressing satisfaction with the training  k4) Number of training materials and/or guidebooks elaborated | k) | * Further dissemination of Guide for Boiler Operators; the training program for boiler operators will focus on ‘on-site learning & practice’ at MEBP project sites (from installers/providers of respective equipment) and participate in visits to successfully operated sites and tailor-made training for integrated biomass and solar systems * Support institutionalization of the training:   + Identify measures (such as mandatory periodic training requirements for boiler operators or at time of contracting) and support one or more relevant institutions with capacity strengthening (curricula and materials development, training of trainers)   + Conduct training with a sample group of boilers operators, from MEBP sites and new operators) |
| *Activity 3.3 Training materials developed for commercial fuel suppliers (Activity Result 9)* | | |
| 1. Number of fuel suppliers trained | l) 30 fuel suppliers trained | * Targeted capacity development will, in cooperation with Chamber of Commerce and EEA, continue on the aspects of setting up and running a biomass fuel supply operation (with an emphasis on fuel quality in line with the 2013 norms), focusing on 1) technologies for solid biofuels, 2) management, marketing, planning, trading, financing skills, 3) training on biofuel quality and capacity strengthening of Consumer Protection Agency) * Training materials updated in line with 2013 regulation, including elaboration of a ‘Solid Biofuels QA Handbook” that will also indicate steps to be undertaken to achieve biofuels’ certification; * Strengthening CSOs that work on women’s civic and economic empowerment issues (e.g. include workshops, round table discussions with successful business women, facilitating networks * Workshops with business community and representatives from government entities (EEA, line ministries, Consumer Protection Agency) * Assessment of needs and options to form a Biomass fuel suppliers association |
| *Activity 3.4 Community understanding and acceptance of biomass energy enhanced through school educational program (Activity Result 10)* | | |
| 1. Number of children participating in awareness activities | m) 2000 children | *Proposed activities and focus:*   * Continuation with awareness and educational activities for school children (specific focus on the three new target areas mentioned before); Translation of educational materials in Russian; organization of Summer Camps in Transnistria and of joint summer camps with participation of children from the right bank (incl. Gagauzia) and Transnistria |
| *Activity 3.5 Vocational educational training for renewable energy sector professionals introduced (new)* | | |
| 1. VET program developed and implemented | n) 1 vocational educational training (VET) program piloted | *Proposed activities and focus:*   * Assessment of integrating RE and EE in educational programs offered by VET institutions (esp. energy, engineering, construction) * Develop materials/curricula on RE and EE (differentiated for different professions), implement ‘training of trainers’ scheme; visits and exchange with selected VET institutions in Europe and establish partnerships) * Pilot a course at a VET institution (incl. providing a basic set of tools and equipment) * Based on the results with the pilot, support MoEdu with integrating RE course in curricula |
| **OUTPUT 4: Opportunities and benefits of biomass energy for Moldova are well known, visibility of project results is promoted** | | |
| *Activity 4.1 Media campaign (Activity Result 11)*  *Activity 4.2 Annual national awards (Activity Result 12)*  *Activity 4.3 Communication and visibility of project results (Activity Result 13)* | | |
| 1. Enquiries to the PMT increasing annually (in %) 2. Media references to project objective in positive light, awards and/or project impacts increase by x% annually 3. Evaluation surveys show that the awards are valued and indicate positive intention to take actions 4. Status of publications and media and communication campaign:   1. Status of project website; number of visitors to website;  2. Number of media materials disseminated  3. Number of Newsletters published and other number of other materials (PR materials; stories in third-party publications)  4. Number of Eco-Energetica events organized | o) Enquiries to PMT increase annually with 20%  p) Media reference increase by 20% annually  r) Surveys indicate 90% ‘high’ and ‘very high’ | *Proposed activities and focus:*   * Continuation of outreach communication actions (video/audio spots, TV/radio, news and press) with an increased focus and Transdniestria and Gagauzia (incl. development of a communication strategy for these regions) and an increased focus on market development for biofuel production * Extension of website in Russian (alongside Romanian and English) and making more materials available in Russian * Targeted training and study tour visit for journalists/NGOs/local authorities from selected regions to increase knowledge on RE and EE * With the Eco-Energetica contest ownership fully assumed by MoE and EEA, the project will limit to facilitate partnerships and provide some TA in organizing and transparent evaluation of competition and annual award ceremony * Participation in public events (e.g. Sustainable Energy week); showcasing success stories and results (incl. those related to women livelihood improvements) * Continued monitoring of project results and ensure EU and UNDP visibility, |

* 1. Overview of standards for solid biomass fuels

|  |  |  |
| --- | --- | --- |
| Nr. d/o | Indicativul standardului | Titlul standardului |
|  | SMV EN 14588:2012 | Solid biofuels - Terminology, definitions and descriptions  (EN 14588:2010, IDT) |
|  | SMV EN 14774-1:2012 | Solid biofuels - Determination of moisture content - Oven dry method - Part 1: Total moisture - Reference method  (EN 14774-1:2009, IDT) |
|  | SMV EN 14774-2:2012 | Solid biofuels - Determination of moisture content - Oven dry method - Part 2: Total moisture - Simplified method  (EN 14774-2:2009, IDT) |
|  | SMV EN 14774-3:2012 | Solid biofuels - Determination of moisture content - Oven dry method - Part 3: Moisture in general analysis sample  (EN 14774-3:2009, IDT) |
|  | SMV EN 14775:2012 | Solid biofuels - Determination of ash content  (EN 14775:2009, IDT) |
|  | SMV EN 14778:2012 | Solid biofuels - Sampling (EN 14778:2011, IDT) |
|  | SMV EN 14780:2012 | Solid biofuels - Sample preparation (EN 14780:2011, IDT) |
|  | SMV EN 14918:2012 | Solid biofuels - Determination of calorific value (EN 14918:2009, IDT) |
|  | SMV EN 14961-1:2012 | Solid biofuels - Fuel specifications and classes - Part 1: General requirements (EN 14961-1:2010, IDT) |
|  | SMV EN 14961-2:2012 | Solid biofuels - Fuel specifications and classes - Part 2: Wood pellets for non-industrial use (EN 14961-2:2011, IDT) |
|  | SMV EN 14961-3:2012 | Solid biofuels - Fuel specifications and classes - Part 3: Wood briquettes for non-industrial use (EN 14961-3:2011, IDT) |
|  | SMV EN 14961-4:2012 | Solid biofuels - Fuel specifications and classes - Part 4: Wood chips for non-industrial use (EN 14961-4:2011, IDT) |
|  | SMV EN 14961-5:2012 | Solid biofuels - Fuel specifications and classes - Part 5: Firewood for non-industrial use (EN 14961-5:2011, IDT) |
|  | SMV EN 14961-6:2012 | Solid biofuels - Fuel specifications and classes - Part 6: Non-woody pellets for non-industrial use (EN 14961-6:2012, IDT) |
|  | SMV EN 15103:2012 | Solid biofuels - Determination of bulk density  (EN 15103:2009, IDT) |
|  | SMV EN 15104:2012 | Solid biofuels - Determination of total content of carbon, hydrogen and nitrogen - Instrumental methods (EN 15104:2011, IDT) |
|  | SMV EN 15105:2012 | Solid biofuels - Determination of the water soluble chloride, sodium and potassium content (EN 15105:2011, IDT) |
|  | SMV EN 15148:2012 | Solid biofuels - Determination of the content of volatile matte (EN 15148:2009, IDT) |
|  | SMV EN 15149-1:2012 | Solid biofuels - Determination of particle size distribution - Part 1: Oscillating screen method using sieve apertures of 1 mm and above (EN 15149-1:2010, IDT) |
|  | SMV EN 15149-2:2012 | Solid biofuels - Determination of particle size distribution - Part 2: Vibrating screen method using sieve apertures of 3,15 mm and below (EN 15149-2:2010, IDT) |
|  | SMV EN 15150:2012 | Solid biofuels - Determination of particle density (EN 15150:2011, IDT) |
|  | SMV EN 15210-1:2012 | Solid biofuels - Determination of mechanical durability of pellets and briquettes - Part 1: Pellets (EN 15210:2009, IDT) |
|  | SMV EN 15210-2:2012 | Solid biofuels - Determination of mechanical durability of pellets and briquettes - Part 2: Briquettes (EN 15210-2:2010, IDT) |
|  | SMV EN 15234-1:2012 | Solid biofuels - Fuel quality assurance - Part 1: General requirements (EN 15234-1:2011, IDT) |
|  | SMV EN 15234-2:2012 | Solid biofuels - Fuel quality assurance - Part 2: Wood pellets for non-industrial use (EN 15234-2:2012, IDT) |
|  | SMV EN 15234-3:2012 | Solid biofuels - Fuel quality assurance - Part 3: Wood briquettes for non-industrial use (EN 15234-3:2012, IDT) |
|  | SMV EN 15234-4:2012 | Solid biofuels - Fuel quality assurance - Part 4: Wood chips for non-industrial use (EN 15234-4:2012, IDT) |
|  | SMV EN 15234-5:2012 | Solid biofuels - Fuel quality assurance - Part 5: Firewood for non-industrial use (EN 15234-5:2012, IDT) |
|  | SMV EN 15234-6:2012 | Solid biofuels - Fuel quality assurance - Part 6: Non-woody pellets for non-industrial use (EN 15234-6:2012, IDT) |
|  | SMV EN 15289:2012 | Solid biofuels - Determination of total content of sulfur and chlorine (EN 15289:2011, IDT) |
|  | SMV EN 15290:2012 | Solid biofuels - Determination of major elements - Al, Ca, Fe, Mg, P, K, Si, Na and Ti (EN 15290:2011, IDT) |
|  | SMV EN 15296:2012 | Solid biofuels - Conversion of analytical results from one basis to another (EN 15296:2011, IDT) |
|  | SMV EN 15297:2012 | Solid biofuels - Determination of minor elements - As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, V and Zn (EN 15297:2011, IDT) |
|  | SMV EN 15410:2012 | Solid recovered fuels - Methods for the determination of the content of major elements (Al, Ca, Fe, K, Mg, Na, P, Si, Ti)  (EN 15410:2011, IDT) |
|  | SMV EN 15149-3:2012 | Solid biofuels - Methods for the determination of particle size distribution - Part 3: Rotary screen method (CEN/TS 15149-3:2006, IDT) |
|  | SMV EN 15370-1:2006 | Solid biofuels - Method for the determination of ash melting behaviour - Part 1: Characteristic temperatures method (CEN/TS 15370-1:2006, IDT) |
|  | SMV EN 15569:2012 | Solid biofuels - A guide for a quality assurance system  (CEN/TR 15569:2009, IDT) |

1. About the evaluatorS

**Mr. Jan van den Akker** is a technology management scientist with a Master's degree from Eindhoven University of Technology (Netherlands), specializing in international development cooperation. He is an expert on sustainable energy policy and technologies. Mr. Van den Akker specializes in studies and analytical work, project design and development, project coordination and implementation, project monitoring and evaluation, knowledge management, capacity strengthening and public-private partnerships in the field of sustainable energy strategies, energy efficiency, energy technologies and supply, climate change and the Clean Development Mechanism. He has lived and worked abroad for over 7 years in Zambia, Mexico and Thailand. In addition, has undertaken numerous short missions to about 45 countries in Africa, Latin America and Asia & the Pacific.

In 2003/2004 he founded ASCENDIS, as an independent office, and has been providing consultancy on sustainable energy and climate change, specializing in development issues. ASCENDIS is based in Westerhoven, Netherlands, but offers services in Africa, Asia and the Pacific, Europe and Latin America & the Caribbean, often by associating itself with local freelance experts, professionals and organizations. As a long-term expert with the United Nations system, Mr. Van den Akker has provided advice to governments and organizations on the design of investment and capacity building programs for UNEP, UNDP and UNIDO, mostly in GEF-funded activities, UNFCCC and for NGOs/consultancy companies (e.g., Practical Action Consulting, Winrock) in the area of renewable energy, energy efficiency and sustainable transportation.

**Mr. Pavel Gavrilita** **i**s an environmental engineer with a Master’s of Science degree from Royal Institute of Technology (Stockholm, Sweden). He is an expert on climate change and energy efficiency. Mr. Gavrilita has experience in environmental policy, elaboration of strategic documents, coordination and implementation of UNDP and WB projects. For the last years, Mr. Gavrilita has had provided consultancy services for private sector, UNDP and UNFCCC.

1. consultant code of conduct form

**Evaluators/reviewers:**

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people’s right not to engage. Evaluators must respect people’s right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders’ dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

**Evaluation/reviewer Consultant Agreement Form**

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: J.H.A. VAN DEN AKKER (Team Leader, on behalf of the Team) Name of Consultancy Organization (where relevant): I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.



Signed at Westerhoven, Netherlands

Signature:

1. See for example Panoutsou (2010), Zaharia (MEBP) as well as national energy policy documents (see Annexes C and D). [↑](#footnote-ref-1)
2. European Bank for Reconstruction and Development [↑](#footnote-ref-2)
3. As mentioned in the Terms of Reference (ToR) of this evaluation (see Annex A) [↑](#footnote-ref-3)
4. See list of documents in Annex C, such as the Country Analysis (UN, 2011), UNDAF for the Republic of Moldova 2007-2011 and the UN Partnership Framework 2013-2017 [↑](#footnote-ref-4)
5. *UNDP Handbook on Monitoring and Evaluating for Results*; [↑](#footnote-ref-5)
6. Global Environment Facility [↑](#footnote-ref-6)
7. *Project-Level Monitoring: Guidance for Conducting Mid-term Reviews of UNDP-supported, GEF-financed projects* (UNDP, 2014) [↑](#footnote-ref-7)
8. *Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed projects* (UNDP, 2012) [↑](#footnote-ref-8)
9. Please note that this Indicator b) summarizes the indicators ‘jobs created’ mentioned in the ProDoc for Activity Results 1 and 2 [↑](#footnote-ref-9)
10. The ‘Evaluators’ observe that this Indicator does not adequately describe the activity. For example, “Number of standards and regulations” would have been a better indicator [↑](#footnote-ref-10)
11. Please note that the Indicator f) summarizes the indicators ‘jobs created’ mentioned in the ProDoc for Activity Results 4 and 5 [↑](#footnote-ref-11)
12. The ‘Evaluators’ observe that this Indicator does not adequately describe the activity. For example, “Number of PPP for biomass-based heating services implemented ” would have been a better indicator with as target value ‘one pilot PPP activity’ [↑](#footnote-ref-12)
13. The Evaluators believe that this indicator should have been slightly different. It is not clear what the definition of ‘leader’ is. Admittedly with the advantage of hindsight, we note that the number given, 150, more closely matches the “Number of municipalities or public institutions whose leaders/representatives are trained” and the actual number of people trained is much larger than just 150. The target value (Dec 2014) of this redefined indicator would then be “Leaders/managers from at least 150 municipalities trained. [↑](#footnote-ref-13)
14. This could be an Indicator to measure the effectiveness of the training, but it is not clear how ‘positive feedback’ should be defined and how the indicator should be operationalized. Not surprisingly, the progress of this Indicator is not reported in progress reports. As with Indicator j), this Indicator in fact underreports the actual results achieved of the project, which goes much beyond what the Indicator expresses. A better Indicator would have been, for example, “Number of Number of staff (operators, managers) of boiler heating systems trained;” and “Number of training materials and guidebooks” elaborated. [↑](#footnote-ref-14)
15. The body that considers and approves the project proposals relating to the installation of biomass-fired heating systems in rural communities. The Committee comprises representatives of project partner institutions. Approved by the Project Board in 2011, it has included the following seven members: 1) Ministry of Economy, 2) Ministry of Agriculture and Food Industry, 3) Ministry of Regional Development and Constructions, 4) Energy Efficiency Agency, 5) EU Delegation to the Republic of Moldova, 6) UNDP Moldova and 7) the Moldova Energy and Biomass Project (MEBP) [↑](#footnote-ref-15)
16. Selection of local initiatives was undertaken by the Project Selection Committee. The Committee based their decision on the project selection criteria such as: existence of a suitable public buildings in the community; community mobilization and capacity of local resources (aiming at 15% of project cost); the existence of local producers and regional biomass available in quantities necessary to provide the opportunity to store community biomass fuel required for heating season; Local Public Administration support; motivated leaders (of the public institutions); local partnership developed between local administration and community actors; immediate impact on project beneficiaries. [↑](#footnote-ref-16)
17. Although the Project Document specified that Limited International Competitions would be conducted in the form of Request for Proposals (RFP), in which the design-build contractors would be selected based on the best value and life-cycle cost of proposals, it was finally agreed to conduct the Limited International Competitions following the ITB format, where the contracts would be awarded to the lowest priced technically compliant offeror [↑](#footnote-ref-17)
18. The data in this section are taken from the Excel file “Heating Systems installed in Rural Public Institutions with MEDP”; dated 01.12.2014 [↑](#footnote-ref-18)
19. Note that the systems will be used in the winter period primarily [↑](#footnote-ref-19)
20. Cooperation project between Japan and Moldova providing support on purchasing tractors and other agricultural equipment to help increase production of food crops and stabilize productivity. 2KR Moldova has developed and tested lease-finance models for agricultural equipment [↑](#footnote-ref-20)
21. A list of biomass fuel suppliers is available from http://www.biomasa.md/img/docs/Briquettes-pellets-producers.pdf [↑](#footnote-ref-21)
22. Average cost of a 25 kW system is EUR 3,100. Subvention thus has been 40-41% of the boiler heating system cost [↑](#footnote-ref-22)
23. For more background info on the PPP model pioneered in Leova district, see the project publication “Feasibility Study, PPP establishment for development of biomass-based heat supply service to Leova district public buildings” [↑](#footnote-ref-23)
24. The web address was created in parallel with original webpage [www.biomasa.aee.md](http://www.biomasa.aee.md) to increase access by using a simpler name [↑](#footnote-ref-24)
25. [www.undp.org/content/dam/undp/library/Cross-Practice%20generic%20theme/UNDP\_RBEC\_SuccessStories\_v3.PDF](http://www.undp.org/content/dam/undp/library/Cross-Practice%20generic%20theme/UNDP_RBEC_SuccessStories_v3.PDF) [↑](#footnote-ref-25)
26. [www.undp.org/content/undp/en/home/ourwork/womenempowerment/successstories/women-fuel-success-in-moldova.html?cq\_ck=1393963529358](http://www.undp.org/content/undp/en/home/ourwork/womenempowerment/successstories/women-fuel-success-in-moldova.html?cq_ck=1393963529358) [↑](#footnote-ref-26)
27. Austria is one of the leading companies in the production and consumption of energy from renewable sources. In Austria, 32% of the total energy consumed comes from renewable sources and 58% comes from biomass. Source: MEBP project team [↑](#footnote-ref-27)
28. Formerly, Mr. Valeriu Lazar and currently Mr. Andrian Candu [↑](#footnote-ref-28)
29. Currently consisting of Alexandru Ursul (Project Manager); Tatiana Craciun (community mobilization), Nicolae Zaharia (business development), Victoria Ignat (training and capacity buildimg), Ina Prisacaru-Zglavuta (communications), Iuliana Bostan (project replaced assistant), Vitalie Vieru. (engineer), MIhail Maciuca (procurement) and Natalia Murahovschi (administration and finance). Mr. Vieru replaced Vsevolod Valcov, who sadly passed away early 2014. [↑](#footnote-ref-29)
30. See for example, the description on page 45 in the ProDoc of Activity Result 1, “130 thermal systems primarily burning straw will be installed” [↑](#footnote-ref-30)
31. It is mandatory for UNDP, UNICEF, UNFPA and WFP to use the HACT approach [↑](#footnote-ref-31)
32. The agricultural mechanisation and farmer support programme supported by the Government of Japan. [↑](#footnote-ref-32)
33. See the draft document “MEDP Project Extension 2014-2017, Description of the Action” [↑](#footnote-ref-33)
34. See www.biomasa.md/img/docs/Briquettes-pellets-producers.pdf [↑](#footnote-ref-34)
35. Transnistria-based entrepreneurs expressed their interest to start biomass processing businesses. Although covered by a natural gas network to a large extent, MEDP will be promoted in remote areas not yet connected to the network. Challenges will be to establish a good relation with the Transnistrian de-facto authorities and a good dialogue with the various stakeholders will be crucial [↑](#footnote-ref-35)
36. One of the biggest sunflower processing factories in Moldova is located in Gagauzia, producing significant quantities of sunflower husk residues which are currently used only in small quantities for pellets production. [↑](#footnote-ref-36)
37. This implies that 80% of electricity production capacity is located in the region of Transnistria (a.k.a as Transdnietsria) which has an uncertain administrative status with separatist tendencies [↑](#footnote-ref-37)
38. Including plants using natural gas as fuel as well as 9 CHP plants at sugar factories [↑](#footnote-ref-38)
39. Losses: 48 ktoe [↑](#footnote-ref-39)
40. World Bank (2014) [↑](#footnote-ref-40)
41. UNECA (2009) and Zaharia (MEBP). Similar estimates in a EBRD-supported analysis gives 500 MW potential and 1,300 GWh [↑](#footnote-ref-41)
42. Based on data from the State Forestry Agency and State Ecological Inspectorate [↑](#footnote-ref-42)
43. Data from MEBP ProDoc and Panoutsou (2010) [↑](#footnote-ref-43)
44. See for example, ANRE Resolution 321 on the Methodology for the determination, approval and application of tariffs for electricity generated from RES and biofuel and ANRE Resolution 330 (2009) on the provisions on guarantees of origin of electricity generated from renewable energy sources. The Guarantee of Origin can be obtained from the power Transmission System Operator. [↑](#footnote-ref-44)
45. The Energy Community is a community established between the European Union (EU) and a number of third countries to extend the EU internal energy market to Southeast Europe and beyond. With their signatures Parties commit themselves to implement the relevant EU *acquis communautaire*, to develop an adequate regulatory framework and to liberalize their energy markets in line with the *acquis* under the Treaty [↑](#footnote-ref-45)
46. Total energy consumption of 2,160 kilotons of oil equivalent (ktoe) in 2020 with a share of renewable energy of 367 ktoe [↑](#footnote-ref-46)
47. See www.inogate.org [↑](#footnote-ref-47)
48. Technical Assistance to the Commonwealth of Independent States (TACIS) from 1991-2006 [↑](#footnote-ref-48)
49. During the mission, the Evaluators reviewed a previous version of the results framework and provided comments and suggestions [↑](#footnote-ref-49)
50. In the PPP, a private company will be responsible for boiler operation (fuel type, quantity and quality, hiring and training operators, maintenance of boiler room, daily operation, etc.) on a for-profit basis in the heating system of a public building [↑](#footnote-ref-50)
51. In terms of cost consideration, the use of biomass fuels in closed-cycle systems, i.e. companies or entities that produce their own agricultural residues [↑](#footnote-ref-51)
52. The pilot project will co-finance the investment cost related to installing a briquette production line and a biomass boiler for the premises of the enterprise, and will cover the costs related to an awareness raising and education campaign among the households benefiting from the services. In addition, small scale equipment or low cost collection bins, as initial incentive for households, will be provided on a cost-sharing basis. [↑](#footnote-ref-52)
53. See the picture on page 32 of this report [↑](#footnote-ref-53)