**United Nations Development Programme**

**Turkmenistan**

# Terminal Evaluation of GEF Project:

# Improving Energy Efficiency in the Residential Building Sector of Turkmenistan

(GEF PMIS No: 4097; UNDP PIMS No: 4134)

April-June 2017

## Terminal Evaluation Report

***Prepared by:***

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## Acknowledgements

The Evaluator wishes to acknowledge with gratitude the time and effort expended by all project participants and stakeholders during the course of terminal evaluation in general and the evaluation missions in particular. This provided valuable insights, candid perspectives, and made the evaluation process more enjoyable. In particular, I wish to thank the Project Team headed by the Project Manager Ms. Irina Atamuradova, Energy Audit expert Mr. Arslan Zomov, UNDP CO Turkmenistan, especially Mr. Vitalie Vremis, Deputy Resident Representative and Mr. Rovshen Nurmuhamedov, Environment & Energy Programme Analyst, UNDP/GEF Istanbul Regional Hub Mr. John O'Brien, project International Consultants Mr. Mark Chao, Mr. Sergey Terekhov, Ms. Irina Terekhova, representatives of the Project Executing Agency State Concern "Turkmengas", as well as of other Partners, for their hospitality, discussions on their experiences in implementing this Project as well as on general matters related to the promoting energy efficiency in residential building sector of Turkmenistan. I hope that this report will contribute to the planning and implementation of the programmes and measures aimed at the further improvement of Energy Efficiency in the residential building sector of Turkmenistan.

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# i. Executive Summary

## Project Summary Table

| | | |
|---|---|---|
| Project Title: | Improving Energy Efficiency in the Residential Building Sector of Turkmenistan | |
| GEF Project ID: | 4097 | |
| UNDP Project ID: | 4134 | |
| Country: | Turkmenistan | |
| Region: | Europe and Central Asia | |
| Focal Area: | Climate Change | |
| Oerational Program: | SP1: Promoting energy efficiency in residential and commercial buildings | |
| Executing Agency | State Concern "Turkmengas" | |
| Other project partners | Ministry of Construction and Architecture<br>Ministry of Communal Services<br>State Concern "Turkmen Oil and Gas Construction"<br>State Design Institute "Turkmendovlettaslama"<br>Municipality of Ashgabat City<br>Turkmen State Architecture Construction Institute | |
| | *at endorsement (Million US$)* | *at completion (Million US$)* |
| GEF financing: | 2.516 | 2.516 |
| IA/EA own: | 0 | 0 |
| Government: | 43.687 | 63.272 (as of January 2017) |
| Other: | 0 | 0 |
| Total co-financing: | 43.687 | 63.272 (as of January 2017) |
| Total Project Cost: | 46.203 | 65.788 (as of January 2017) |
| ProDoc Signature (date project began): | | 17/11/2011 |
| (Operational) Closing Date: | Proposed: 31/12/2015 | Actual: 30/06/2017 |

## Project Description (brief)

The UNDP/GEF project "Improving Energy Efficiency in the Residential Building Sector of Turkmenistan" (EERB Project) aims to reduce greenhouse gases (GHG) emissions by improving energy management and reducing energy consumption in the residential building sector of Turkmenistan. This is in line with the National policy of Turkmenistan and UNDP as well.

Turkmenistan is the fourth largest natural gas exporter in the World and increase of exports is main direction of the energy policy. Therefore, savings in domestic natural gas consumption will increase its export potential. The National Climate Change Strategy of Turkmenistan adopted in 2012, considers Energy Efficiency and energy saving and the increased use of alternative energy sources as the main mitigation measures.

The development context for this project is also consistent with the UNDP and GEF priorities globally and in Turkmenistan as well. It falls within the GEF-4 Strategic Objective CC – 1 "To promote energy-efficient technologies and practices in the appliances and buildings"; United Nations Development Assistance Framework (UNDAF) for Turkmenistan 2010-2015, Outcome #3: Improvements to environmentally sustainable economic management for expansion of population's opportunities to

participate in social and economic development, especially in rural areas; Country Programme Action Plan (CPAP) between the Government of Turkmenistan and UNDP for 2010-2015 (Expected Outcome 3.2: Environmentally sustainable use of natural resources contributes to effectiveness of economic processes and increased quality of life; Output 3.2.3: Government introduces carbon reduction and energy saving technologies).

Achievement of the objective was planned through: (i) "Soft measures", which would help to achieve objectives immediately by revising the legal & regulatory framework under the existing institutional arrangements and energy market in a way that design of construction of new and reconstruction of existing buildings be based on energy efficiency principles; and (ii) "strategic approach", which included facilitation continued growth in EE buildings programs by awareness and capacity building measures, so that the government, the population, and other stakeholders could take advantage of the increasing market-based opportunities and incentives for EE.

The EERB Project consists of four components: (i) Energy efficient building codes and supporting capacity strengthening; (ii) Demand-Side Management partnership with Turkmengas; (iii) Improved design measures for major residential consumers; and (iv) Replication through training and support for policies that encourage energy efficiency.

## Evaluation Ratings Table

| **Monitoring and Evaluation** | Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|---|
| M&E design at Entry | HS | | | | | |
| M&E Plan Implementation | HS | | | | | |
| **Overall Quality of M&E** | **HS** | | | | | |
| **IA & EA Implementation/Execution** | Highly Satisfactory | Satisfactory | Moderately Satisfactory | Moderately Unsatisfactory | Unsatisfactory | Highly Unsatisfactory |
| Quality of UNDP (Implementing Agency) Implementation | HS | | | | | |
| Quality of Turkmengas (Executing Agency) Execution | HS | | | | | |
| **Overall Quality of IA & EA Implementation/Execution** | **HS** | | | | | |
| | Highly Satisfactory | Satisfactory | Moderately Satisfactory | Moderately Unsatisfactory | Unsatisfactory | Highly Unsatisfactory |
| **Achievement of Objective** | | **S** | | | | |
| **Achievement of Outcomes** | Highly Satisfactory | Satisfactory | Moderately Satisfactory | Moderately Unsatisfactory | Unsatisfactory | Highly Unsatisfactory |
| Outcome 1 | HS | | | | | |
| Outcome 2 | | S | | | | |
| Outcome 3 | | S | | | | |
| Outcome 4 | | S | | | | |

| | Relevant (R) | Not Relevant (NR) |
|---|---|---|
| Relevance | R | |

| | Highly Satisfactory | Satisfactory | Moderately Satisfactory | Moderately Unsatisfactory | Unsatisfactory | Highly Unsatisfactory |
|---|---|---|---|---|---|---|
| Effectiveness & Efficiency | | S | | | | |

| | Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|---|
| Sustainability | L | | | |
| **OVERAL RATING** | **SATISFACTORY** | | | |

## Summary of conclusions, recommendations and lessons

Overall, this EERB Project has had a substantial, sustainable effect on improvement of energy efficiency in residential buildings sector in Turkmenistan. Through the updating the regulatory framework it has improved design standards; through the implementation of pilot projects it demonstrated the best practices of design, energy performance and energy management in new/renovated residential buildings; and through the capacity building activities and outreach program created a local capacity and capabilities of local dedicated institutions and professionals for replication and scaling up of these activities in the sustainable way.

The EERB Project has demonstrated efficient, adaptive management in a very complex operating environment. The EERB Project team has effectively addressed and managed identified the differences between the situation during the preparatory and inception phases. It effectively managed identified issues and risks.

2 Corrective Action Requests (CAR) have been raised by the Consultant for design and 2 CARs for the Monitoring & Evaluation appropriate and adequate addressing of which will eliminate observed inconsistencies.

Two recommendations have been elaborated for following up and reinforcing of the benefits from the EERB Project:

Recommendation 1: To conduct a survey in the 6 pilot buildings and also in the Koshi micro-district on: baseline and project level types and numbers of electric and gas heaters and their costs; whether the residents stopped using heaters for additional heating. Based on survey data, financial benefits due to the avoided purchase of heaters, can be estimated

Recommendation 2: To prepare a short version of the revised “Summary of Project Results and Lessons Learned” for the stakeholders

Chapter 4 “Conclusions, Recommendations & Lessons” of this report provides a more detailed overview of these findings, lessons, and specific recommendations.

## ii. Acronyms and Abbreviations

| | | |
|---|---|---|
| ADB | - | Asian Development Bank |
| AWP | - | Annual work plan |
| CHT | - | Building code of Turkmenistan (Строительные Нормы Туркменистана – in Russian) |
| CO | - | Country Office |
| CPAP | - | Country Programme Action Plan |
| CTA | - | Chief Technical Adviser |
| DSM | - | Demand-side management |
| EE | - | Energy Efficiency |
| EERB | - | Energy Efficiency in Residential Buildings |
| EU | - | European Union |
| FSP | - | Full-size Project |
| GEF | - | Global Environment Facility |
| GHG | - | Greenhouse gases |
| INDC | - | Intended Nationally Determined Contributions |
| LPAC | - | Local Project Appraisal Committee |
| M & E | - | Monitoring & Evaluation |
| MfDR | - | Managing for Development Results |
| MTR | - | Mid-Term Review |
| PA | - | Project Assistant |
| PIF | - | Project Identification Form |
| PIR | - | Project Implementation Review |
| PM | - | Project Manager |
| PPG | - | Project Preparation Grant |
| ProDoc | - | Project Document |
| PSC | - | Project Steering Committee |
| R & D | - | Research & Development |
| RBM | - | Results-based Management |
| RES | - | Renewable Energy Sources |
| RTA | - | Regional Technical adviser |
| SEAP | - | Sustainable Energy Action Plan |
| TA | - | Technical assistance |
| TAPI | - | Turkmenistan-Afghanistan-Pakistan-India gas pipeline |
| TE | - | Terminal Evaluation |
| TMT | - | Turkmenistani Manat |

| | | |
|---|---|---|
| ToR | - | Terms of Reference |
| TSIAC | - | Turkmen State Institute for Architecture and Construction |
| TT | - | Tracking Tool |
| UNDAF | - | United Nations Development Assistance Framework |
| UNDP | - | United Nations Development Programme |
| UNFCCC | - | United Nations Framework Convention on Climate Change |

# 1. Introduction

This Terminal Evaluation (TE) report is prepared in accordance with the contract No. 2017-033-01, signed between the United Nations Development Programme (UNDP), the GEF Implementing Agency for this project, and the individual contractor for performing the services of International Consultant to conduct Terminal Evaluation (herein referred to as the "Consultant"). The report summarizes the findings of the TE for the UNDP-GEF full-size project (FSP) entitled “Improving Energy Efficiency in the Residential Building Sector of Turkmenistan” (herein referred to as the “EERB Project”) implemented by the UNDP with financing support provided by the Global Environment Facility (GEF).

## 1.1 Purpose of the Evaluation

The GEF implementing agencies and UNDP among them, are required to conduct a terminal evaluation at project completion for all GEF FSPs. The purpose of the TE of is to assess the efficiency and effectiveness of a project in achieving its intended results. TE also assesses the relevance and sustainability of the outcomes. According to “Project-Level Evaluation. Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects”[1] evaluations have the following complementary purposes:

- To promote accountability and transparency, and to assess and disclose the extent of project accomplishments
- To synthesize lessons that can help to improve the selection, design and implementation of future GEF financed UNDP activities
- To provide feedback on issues that are recurrent across the UNDP portfolio and need attention, and on improvements regarding previously identified issues
- To contribute to the overall assessment of results in achieving GEF strategic objectives aimed at global environmental benefit
- To gauge the extent of project convergence with other UN and UNDP priorities, including harmonization with other UN Development Assistance Framework (UNDAF) and UNDP Country Programme Action Plan (CPAP) outcomes and outputs.

## 1.2 Scope & Methodology

The Consultant has developed a methodology for execution of TE in accordance with the Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects, according to which the TE among others shall include evaluation of:

- Project strategy (Project design / Formulation, Project planning matrix, use of SMART[2] indicators and targets, assumptions and risks): To what extent is the project strategy relevant to country priorities, country ownership, and the best route towards expected results?
- Project implementation (including Adaptive management): Review of management arrangements, work planning, Monitoring and Evaluation system, reporting and communications, cost-effectiveness, risk management etc.

[1] http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf

[2] Specific, Measurable, Achievable, Relevant and Time-Bound

- Project results (evaluated against relevance, effectiveness, efficiency, sustainability and impact): Assessment of the extent of the achievement of the expected outcomes and objectives

In order to elaborate detailed mission programme, just after the signing the contract, the Consultant has established close working relations with the Project manager and the Consultant has got initial information (out of that one included into the TE ToR) on the Project as well as Project-related materials available in the electronic format. The Consultant also has developed approach for the TE, which is based on the clear understanding of the task and ways of its addressing. The main elements of the applied approach were as follows:

- The scope of the TE to cover the entire Project and its components
- The TE to be based on the analysis of Project-related documents as well as the evidenced information from different sources, which shall be cross-checked against the consistency
- In order to use the mission period effectively the interviews of the stakeholders to be thoroughly prepared. The interviews shall help in better understand the energy efficiency policy priorities in residential building sector of Turkmenistan, overall environment in which the project was being implemented, status of the stakeholders' involvement, prospects for scaling-up, etc.
- Review of GEF Climate Change Tracking Tool and input data used

This TE has been executed in accordance with the guidance provided in the ToR. The developed approach in general worked effectively. The Consultant has met all key stakeholders except the GEF Operational Focal Point, a meeting with whom couldn't be organized during the TE mission (request for a meeting should be sent far before the TE mission (An official request for the meeting should be sent at least 2 weeks prior the mission. A list of organizations to be interviewed during the mission was approved by UNDP CO). The stakeholders could answer on all the questions of the Consultant as well as provided valuable information from their fields of activities related either to the Project implementation (including implementation of pilot projects and approval of new building codes) or general policy, legal, regulatory, institutional frameworks, needs and actual opportunities for investments in residential buildings.

TE mission has been planned in a way that the Consultant has attended International Conference "Improving Energy efficiency in the Residential Building Sector of Turkmenistan" devoted to the completion of EERB Project. The goal of the conference held on 3-4 May 2017 was to present major EERB Project results and achievements, review capacity and further promoting EE aspects in Turkmenistan as well as recommend international best practices on EE in construction of residential buildings. Attendance of the conference greatly helped the Consultant to understand problems the EERB Project dealt with, scale of stakeholders' involvement and comparison of achievements with the similar projects in other post-soviet countries (Belarus, Kyrgyzstan, Moldova, Russian Federation, Ukraine, Uzbekistan).

The Consultant has had a number of interviews and discussions not only with the EERB Project Team but also with UNDP/GEF Istanbul Regional Hub, EERB Project Chief Technical advisor and International Consultants.

Based on the above mentioned it is the Consultant's opinion that the information obtained during the TE and included in this report is credible and reliable.

## 1.3 Structure of the evaluation report

This TE report is structured according to the TE ToR, which in turn is compliant with "Project-Level Evaluation, Guidance for Conducting Terminal Evaluations of UNDP-Supported GEF-Financed Projects", UNDP 2012.

The report consists of three main parts and annexes:

Chapter 2 – description of the EERB Project, problems sought to address, project objectives, baseline indicators, expected results, overview of stakeholders, etc.

Chapter 3 – description of the findings of the TE regarding:

- Project design/formulation
- Project implementation
- Project results
- Sustainability

Chapter 4 – Conclusions, Recommendations & Lessons

Annexes – TE ToR, Evaluation question matrix, List of persons interviewed, List of documents reviewed, etc.

## 2. Project Description and Development Context

The Project "Improving Energy Efficiency in the Residential Buildings Sector of Turkmenistan" aims to reduce greenhouse gases (GHG) emissions by improving energy management and reducing energy consumption in the residential building sector of Turkmenistan.

At present Turkmenistan occupies the 4th place in the world in terms of natural gas reserves and has a highly developed multi-variant pipeline infrastructure.

Capacity of the transnational gas pipeline Turkmenistan-Uzbekistan-Kazakhstan-China (current design capacity - 55 billion $m^3$) will reach 65 billion $m^3$ a year by 2021. The natural gas pipeline Turkmenistan-Afghanistan-Pakistan-India pipeline (TAPI) being developed by the Asian Development Bank (ADB) with design capacity of 33 billion $m^3$ a year, is expected to be operational by 2019. Gas supply to Turkey and the European Union in the future may reach 31 billion $^3$ a year. To achieve planned targets for the natural gas import, energy saving in the domestic consumption has a crucial importance and thus the energy efficiency is one of the priorities of the energy policy of Turkmenistan even the potential for energy saving is much less compared with the exports.

The National Climate Change Strategy of Turkmenistan (adopted on 15 June 2012) considers Energy Efficiency and energy saving and the increased use of alternative energy sources as the main priorities of the policy oriented towards reduction of GHG emissions. According to the Strategy, priorities for developing the housing and municipal services sector among others include:

- Improving performance efficiency of municipal heating supply systems
- Improving regulatory framework for construction standards and rules towards ensuring energy efficiency and heating supply security of buildings
- Promoting public awareness raising and motivation activities

The development context for this project is also consistent with the UNDP and GEF priorities globally and in Turkmenistan as well. In particular, it falls within the:

- GEF-4 Strategic Objective CC – 1 "To promote energy-efficient technologies and practices in the appliances and buildings ". The EERB Project was being implemented under the UNDP-led GEF Global Framework for Promoting Low Carbon Buildings with a primary focus on two thematic approaches promoted by the Global Framework: a) Promotion and increased uptake of High Quality Building Codes and Standards; and b) Developing and Promoting Energy Efficient Building Technologies, Building Materials and Construction Practices.
- United Nations Development Assistance Framework (UNDAF) for Turkmenistan 2010-2015, Outcome #3: Improvements to environmentally sustainable economic management for expansion of population's opportunities to participate in social and economic development, especially in rural areas. UNDAF for 2016-2020 also includes Energy Efficiency among the priorities. Under the Strategic Area 3: Environmental Sustainability and Energy Efficiency, the Outcome 5 considers the national policy, legislative and institutional frameworks, aligned to reduce GHG emissions and to promote EE, the use of RES, urban development and waste management
- GHG emissions reduction is the priority of the Country Programme Action Plan (CPAP) between the Government of Turkmenistan and UNDP for 2010-2015 (Expected Outcome 3.2: Environmentally sustainable use of natural resources contributes to effectiveness of economic processes and increased quality of life; Output 3.2.3: Government introduces carbon reduction and energy saving technologies).

## 2.1 Project Start and Duration

The EERB Project has been officially started after the signing of the project document (ProDoc) by the State concern Turkmengas as an Executing Agency, and UNDP Turkmenistan as an Implementing Agency, on November 17, 2011. Project Team consisted of Project Manager, Technical advisor and 3 component experts, has been appointed early 2012. The inception workshop was held on January 30, 2012. A first project meeting of the Local Program Appraisal Committee was held on May 11, 2012. At the meeting draft of Annual Work Plan (AWP) was approved as well as a Steering Committee and an Advisory Committee established and members of the Steering Committee and Advisory Committee nominated.

Originally duration of the EERB Project was planned to last for 4 years until December 31, 2015. However, in 2015 the duration was extended until June 30, 2017 without cost (budget) extension, i.e. actual duration of the EERB Project equals to 5.5 years. This is in line with the recommendation of Mid-term Review of the EERB Project, according to which "the overall finalization of the project is expected to require a non-cost project extension in the range of 1 to 1.5 years".

## 2.2 Problems that the project sought to address

Even though prior to the EERB Project the Government of Turkmenistan was promoting housing construction and private sector investment in construction by introducing credit lines and mortgages for housing, neither new construction nor refurbishment projects considered the energy performance of the buildings involved. Indeed, before the initiation of this EERB Project designs of newly constructed and refurbished buildings didn't include measures specially aimed at improving of energy efficiency; designs meet a minimal requirements of heat resistance for building envelopes or energy performance. As a result, associated GHG emissions plaid an increasing role in the overall emissions in Turkmenistan, and the residential sector became the fourth largest source of emissions. On the other hand, the National Strategy on Climate Change of Turkmenistan adopted just after the EERB Project start puts energy efficiency into the highest priorities and highlights "housing" as one of four key sectors with highest potential of GHG reduction.

At the EERB Project preparatory phase a number of barriers have been identified, which hampered the wide application of energy efficiency practices in the building sector of Turkmenistan. Among them:

- Legal/regulatory/policy barriers – demand-side barriers in the legal, regulatory, and policy framework that restricted incentives to invest in energy efficiency. The building code for residential buildings, CHT[3] 3.04.03-94 existing before the EERB Project start, was comparable to EU codes in terms of the maximum specific heat consumption (per $m^2$ per degree-day) but it didn't consider the energy performance of buildings per se and thus there was no incentives to construct buildings that would exceed those performance requirements. In addition, implementation of CHT was enforced through a design review and site checks, but no actual auditing was required to determine the energy performance of buildings.
- Awareness barriers – lack of information and knowledge regarding general benefits of energy savings and specific opportunities for savings
- Capacity barriers – barriers restricting the ability of stakeholders to identify and realize investments in energy-efficient residential buildings

[3] CHT – abbreviation Building code of Turkmenistan (Строительные Нормы Туркменистана – in Russian)

- As for the financial barriers two types of them were identified: (i) lack of investments in EE measures; and (ii) absence of incentives for the energy savings due to the very low tariff for heat and electricity in Turkmenistan. However, none of these barriers were critical by the EERB Project start. In fact, the government was consistently investing in the housing stock and it could finance more expensive but more efficient buildings as well. As for the second point, Turkmengas had a strong financial incentive to reduce energy consumption in the residential sector, as it could export saved gas.

The EERB Project has been designed to address the above-mentioned barriers. In particular, it was planned to work in two different directions: (i) "Soft measures", which would help to achieve objectives immediately by revising the legal & regulatory framework under the existing institutional arrangements and energy market in a way that design of construction of new and reconstruction of existing buildings be based on energy efficiency principles; and (ii) "strategic approach", which included facilitation continued growth in EE buildings programs by awareness and capacity building measures, so that the government, the population, and other stakeholders could take advantage of the increasing market-based opportunities and incentives for EE.

The EERB Project consists of four components; each of them addresses some of the above-mentioned barriers. In particular:

**Component 1: Energy efficient building codes and supporting capacity strengthening** directly addresses: Legal/Regulatory barriers (a lack of incentives to build EE buildings); Awareness barriers (a lack of awareness of the potential for energy savings in the residential sector) and Technical/capacity barriers (a lack of experience and knowledge regarding EE technologies and approaches and a lack of capacity due to the absence of energy auditing equipment and trained auditors in Turkmenistan)

**Component 2: Demand-Side Management partnership with Turkmengas** addresses: Institutional/ awareness barriers (at the project start Turkmengas was not aware of the potential to save energy in its building stock); Technical/capacity barriers (only a negligible amount of metering systems installed in buildings and no energy audits in the absence of energy auditing equipment and trained staff); Awareness barriers (data on consumption would be available)

**Component 3: Improved design measures for major residential consumers** includes both new buildings and capital repairs on existing buildings in order to maximize its impact on the residential construction market in Ashgabat. This component addresses: Technology / capacity barriers (architects and engineers lack the skills and technologies to construct and reconstruct buildings with high energy performance); Institutional barriers (lack of performance requirements for capital repairs); Information /awareness barriers (lack of data on the actual energy performance of the buildings and lack of an energy passport system)

**Component 4: Replication through training and support for policies that encourage energy efficiency** will work to expand the use of energy-efficient techniques to the broader housing market and to "mainstream" energy efficiency considerations into construction and housing policy decisions. This component addresses: Institutional barriers (lack of a legal framework for EE); Regulatory barriers (lack of specific energy-saving policies and measures); Awareness barriers (lack of information available to policy-makers on EE policies and measures); Technology / capacity barriers (lack of information on the most effective means of reconstructing common building types to improve energy performance)

## 2.3 Immediate and development objectives of the project

The overall objective of the EERB Project is to reduce GHG gas emissions in the residential sector in Turkmenistan by facilitating the improvement of energy management and reducing energy consumption. This objective was supposed to achieve through the transformation of residential building design and construction practices in Turkmenistan so that to save energy for heating and cooling and consequently reduce GHG emissions. The implementation strategy of the EERB Project was focused on the demand-side rather than supply-side (meaning generation of energy for heating, cooling / air conditioning, preparation of hot water).

It was supposed that the EERB Project would reduce energy consumption and associated direct GHG emissions from residential building sector of Turkmenistan by 202,866 t of $CO_2$ over a 20-year lifetime through the new and retrofitted (by the EERB Project) buildings; Direct energy savings equivalent to 5,133,535 $m^3$ of natural gas per year (or 102,670,709 $m^3$ over a 20-year lifetime).

The immediate objectives of the EERB Project included design and implementation of new building energy codes, improved design and management practices, training of relevant national professionals involved in design, construction and maintenance of residential buildings, demonstration and replication of best practices. The project was focused on improving EE in the residential sector in both new and refurbished buildings in the City of Ashgabat with the largest building stock.

The immediate objectives of the EERB Project among others include:

- Elaboration of the incentive program for highly-efficient buildings
- Elaboration of new building codes with more stringent requirements for energy performance in buildings and strengthening capacity for enforcement and revision of building codes
- Introduction of energy passport system to promote and enforce more EE construction
- Determination of the most cost-effective means of reducing energy consumption in the residential buildings
- Introducing energy management advanced practices
- Implementation of pilot projects (new and reconstructed multi-apartment residential buildings) with significantly improved energy performance including comprehensive monitoring and evaluation
- Organization of intensive training programme for architects, engineers and students in the fields of architecture and engineering, integrating efficient techniques into the buildings,
- Organization of an international study tour on existing best practice in highly-efficient buildings

In the absence of the EERB Project (business-as-usual scenario) EE in residential buildings would receive limited attention.

## 2.4 Baseline Indicators established

The indicators and targets for each project outcome for measuring progress and performance have been established already in the Project Identification Form (PIF); baseline levels/values of each indicator, means of their verification, associated risks and key assumptions. Baseline indicators are presented also in the original ProDoc, namely in the Project Results Framework (LogFrame).

The original LogFrame has been revised during the inception phase and included into the Inception report. The Mid-Term Review (MTR) of the EERB Project didn't recommend any changes in the LogFrame including baseline levels of established indicators.

Original and revised indicators and their baseline levels are presented in Tab 1. In the baseline scenario, practically all the indicators have zero values.

***Table 1: Baseline indicators***

| Objective/Outcome | | Indicator | | Baseline | |
|---|---|---|---|---|---|
| Original | Revised | Original | Revised | Original | Revised |
| **Objective** | | | | | |
| | Reduce GHG emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan | Tonnes $CO_2$eq per year reduced (direct reductions)<br>Tonnes $CO_2$eq reduced over the lifetime of the EE measures introduced (direct reductions) | Reduction of direct GHG emissions from residential sector of Turkmenistan as a result of the project over 20 years, t$CO_2$e | 0 (No reductions currently planned in the buildings sector)<br>0 (No reductions currently planned in the buildings sector) | 0 |
| | | 1000 $m^3$ natural gas saved annually as a direct result of this project | Natural gas saved annually as a direct result of the project | 0 (No savings programs currently underway) | 0 |
| | | Co-financing leveraged | Co-financing leveraged for investments in EE reconstruction of existing buildings and construction of new EE housing stock (i.e. beyond existing building code requirements) | 0 (No money currently spent on EE construction) | 0 |
| **Outcome 1** | | | | | |
| Energy Efficiency Building Codes and Supporting Capacity Strengthened | Energy consumption in new buildings is reduced beyond current requirements | Incentive Program for highly efficient buildings developed | Existence and content of applicable building codes on building energy performance | No incentives currently exist to build residential buildings that exceed current building codes | No code on whole-building energy performance. Existing codes regulate thermal resistance of building elements, but not whole-building consumption per $m^2$. Resultant whole-building energy consumption levels under code compliance therefore vary from building to building<br>Existing thermal engineering code adopted in 1998 contains two levels of prescriptive thermal envelope requirements, Level 1 and Level 2. |
| | | Authorities trained in enforcement and design review for more efficient codes | | No training geared towards enforcing above-average EE standards in the residential sector exists | |
| | | At least one policy tool to encourage more efficient residential construction is developed and introduced | | No policy tools to encourage EE residential construction have been developed or introduced in Turkmenistan | |
| | | Guidance on the incentive programs and training on compliance developed and provided to architects and engineers | | No architects or engineers trained to meet above-average EE standards in the residential sector | |

| Objective/Outcome | | Indicator | | Baseline | |
|---|---|---|---|---|---|
| Original | Revised | Original | Revised | Original | Revised |
| | | | | | Buildings consume 35-70 % less energy under Level 2 than under Level 1, but Level 2 is implemented in practice only for elite residential buildings, not common building designs for standard housing |
| **Outcome 2** | | | | | |
| Demand-side management partnership with Turkmengas implemented | Turkmengas and other national agencies understand the potential for savings in its housing stock and have the capacity to identify and undertake investments in EE there | Analysis conducted on the most cost-effective means of reducing energy consumption in the residential sector | Number of energy audits<br>Number of professionals trained<br>Existence and volume of activity of program, run and funded by Turkmengas and/or other state agencies, on energy efficiency investment in buildings | No comprehensive analysis has considered end-use efficiency in the residential sector; no comprehensive data on sectoral consumption available | No audits, training, or investment program |
| | | Officials in the construction department of the company are trained in energy auditing and management in the housing stock | | Construction Department staff do not have capacity to carry out audits. Energy audits are not currently conducted and equipment is not available for auditing; no knowledge of energy performance in unmetered buildings | |
| | | Investment plan for reducing energy losses developed by the Construction Department for the housing stock that Turkmengas supplies | | Turkmengas does not address energy losses in end-use sectors and does not have the planning tools to do so | |
| **Outcome 3** | | | | | |
| Improved Design Measures for Major Residential Consumers Implemented | Energy efficient design and technologies are incorporated and visually demonstrated in new and reconstructed residential buildings | Three new multi-unit residential buildings with significantly improved energy performance are designed and constructed by the end of Year 4 of the project | Number of pilot buildings designed and built<br>Energy consumption of pilot buildings relative to similar new and existing buildings in Turkmenistan | No residential buildings have been constructed in Ashgabat that significantly exceed mandated energy performance | No demonstration buildings yet built or renovated<br>Baseline energy consumption to be determined by calculation based on assumed standard features, as well as code requirements and |
| | | Three multi-unit residential buildings are reconstructed | | No residential buildings in Ashgabat have been | |

| Objective/Outcome | | Indicator | | Baseline | |
|---|---|---|---|---|---|
| Original | Revised | Original | Revised | Original | Revised |
| | | with significantly improved energy performance by the end of Year 4 of the project | | reconstructed or renovated to significantly exceed mandated energy performance) | statistical data on analogous existing buildings if available |
| | | Model energy passport developed and applied in pilot buildings | | Energy passports and labels for buildings do not exist in Turkmenistan | |
| **Outcome 4** | | | | | |
| Replication through partnerships with other developers and support for housing reforms that encourage energy efficiency | Replication facilitated via development of skills, prototype designs and policies for energy efficient buildings | Protocols for EE retrofits in the three most common prototype residential building designs developed and applied in at least 25 buildings | Number of architects, engineers, and students trained with regard to EE building design Existence and content of executive reports and briefings of decision makers on project findings, lessons learned and recommendations and code compliance | No EE protocols exist for residential buildings of any kind in Turkmenistan | No training on EE building design and code compliance decision makers on EE buildings<br><br>No formal delivery of information or advocacy to |
| | | Design institutes and major housing developers are trained in and encouraged to incorporate EE protocols for the most common residential prototype designs | | Design institutes do not currently address energy performance when working on housing construction or retrofits, and housing developers do not explicitly request EE measures in tenders | |
| | | Recommendations from the project are incorporated into energy efficiency policies and programs | | While resource efficiency and sustainability are stated national priorities, Turkmenistan does not currently have explicit policies and/or programmes to support EE | |

## 2.5 Main stakeholders

Due to the complex nature of the EERB Project, it is assisting/cooperating with various representatives of the parties involved. The main Project stakeholders include:

- **Executing Agency:** The EERB Project is executed by the State Concern "Turkmengaz" under the modalities for nationally-executed projects. With regard of the EERB project Turkmengaz provides natural gas to households, subsidies tariff for gas and electricity and also oversees a significant amount of housing stock. Turkmengaz has affiliates, Turkmennebitgazgurlushik and Turkmennebitgazhyzmat, which oversee construction and utility services, respectively, for Turkmengaz's own stock (and of other agencies as well) of both industrial and residential buildings
- **Other Partners:**
  - ✓ Ministry of Construction of Turkmenistan - plays a key role in revising building codes and capacity building / training
  - ✓ Ministry of Communal Services - providing 3 pilot buildings for retrofitting under Component 3
  - ✓ State Concern "Turkmen Oil and Gas Construction" (or Turkmennebitgazgurlushik) – was involved in construction of two high-comfort demo-buildings
  - ✓ State Design Institute "Turkmendovlettaslama" – leading building design institution under the authorization of the Ministry of Construction and Architecture, was deeply involved in technical aspects of building code revision
  - ✓ Municipality of Ashgabat City – was involved in design and construction of one typical building. In the initial planning (as per ProDoc) the municipality should play more significant role. However, after establishment of the Ministry of Communal Services
  - ✓ Turkmen State Architecture Construction Institute – high-education institution, was the EERB Project's primary partner for development and implementation of new curricula for aspiring professionals
- **Other (non-key) stakeholders:**
  - ✓ Ministry of Finance – issues related to the state budget
  - ✓ Ministry of Justice - issuing final approval and registration of building code revisions
  - ✓ Members of the EERB Project Advisory Board:
    - National Parliament – Medjlis
    - Ministry of Economy and Development
    - Design Institute Ashgabataslama
    - Design Institute Turkmendjemagattaslama
    - Heating Utility Ashgabatteplo
    - Ministry of Energy and Industry
    - Ministry of Industry of Construction Materials
    - Institute of Strategic Planning and Economic Development

## 2.6 Expected Results

In the ProDoc expected results due to the implementation of the EERB Project are specified. In particular, after the implementation of four components of the EERB Project 4 Outcomes were expected to achieve along with a number of outputs. The following outcomes were planned in the original ProDoc:

**Outcome1:** Energy Efficient Building Codes and Supporting Capacity

Output 1.1: Incentive program for highly-efficient buildings

Output 1.2: Training for authorities in enforcement and design review under more efficient building requirements

Output 1.3: Policy tool to encourage more efficient residential construction

Output 1.4: Guidance on the incentive programs and training on compliance

**Outcome 2:** Demand-side management partnership developed with Turkmengas

Output 2.1: Analysis conducted on the most cost-effective means of reducing energy consumption in the residential sector

Output 2.2: Officials in the Construction Department of Turkmengas are trained in energy auditing and management in the housing stock

Output 2.3: Investment plan for reducing energy losses developed by the Construction Department for the housing stock that Turkmengas supplies

**Outcome 3:** Improved design measures for major residential consumers

Output 3.1: Construction of three new multi-unit residential buildings with significantly improved energy performance

Output 3.2: Reconstruction of three multi-unit residential buildings resulting in significantly improved energy performance

Output 3.3: Development and application of model energy passports for pilot buildings

**Outcome 4:** Replication through partnerships with other developers and support for housing reforms that encourage energy efficiency

Output 4.1: Protocols for EE retrofits in prototype buildings for the three most common prototype residential designs

Output 4.2: Design institutes, major housing developers, and post-secondary students in architecture and construction engineering trained in efficient building design

Output 4.3: Recommendations from the project are incorporated into EE policies and programs, including recommendations to mainstream EE into housing policy

During the inception phase the EERB Project Team undertook a review of the planned outcomes and outputs as well as the Project Results Framework (logical framework, or LogFrame) and concluded that within the approved budget and duration the EERB Project could target at achievement of more ambitious targets and therefore, at the Inception workshop held on January 30, 2012 proposed a revision of Outcomes and Outputs and also a LogFrame. It must be noted that outputs (both, revised and unchanged ones) haven't fixed in the revised LogFrame. The proposed changes have been approved by the PSC at its second meeting held on 23 March, 2013. The revised outcomes and outputs are as follows:

**Outcome1:** Energy consumption in new buildings is reduced beyond current requirements

Output 1.1: More stringent requirements for energy performance in buildings are adopted and supporting capacity for building code enforcement is strengthened

Output 1.2: Energy passport system and other policy tools to promote and enforce more energy efficient construction

Output 1.3: Development of new official normative document providing guidance on EE building design and compliance with new and revised codes, as building design beyond code requirements.

**Outcome 2:** Turkmengas and other national agencies understand the potential for savings in its housing stock and have the capacity to identify and undertake investments in energy efficiency there

Output 2.1: Analysis conducted on the most cost-effective means of reducing energy consumption in the residential sector.

Output 2.2: Responsible staff is trained in energy management and the identification of energy savings in the housing stock

Output 2.3: Investment plan for reducing energy losses for the housing stock that Turkmengaz supplies with natural gas in Ashgabat

**Outcome 3:** Energy-efficient design and technologies are incorporated and visually demonstrated in new and reconstructed residential buildings

Output 3.1: Three new multi-unit residential buildings with significantly improved energy performance are designed and constructed

Output 3.2: Three multi-unit residential buildings are reconstructed with significantly improved energy performance

**Outcome 4:** Replication facilitated via development of skills, prototype designs and policies for energy-efficient buildings

Output 4.1: Design institutes and major housing developers are trained in and encouraged to incorporate advanced energy efficiency in residential building design.

Output 4.2: Recommendations from the project are incorporated into government energy efficiency policies and programs.

# 3. Findings

(As requested by the ToR, in addition to a descriptive assessment, all criteria marked with (*) must be rated)

## 3.1 Project Design / Formulation

As recommended by the Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects the findings of this chapter are based on the analysis whether or not:

- The EERB Project objectives and components were clear, practicable and feasible within its time frame
- The capacities of the executing agency and its counterparts were properly considered when the project was designed
- Lessons from other relevant projects (if any) were properly incorporated in the project design
- The partnership arrangements were properly identified and roles and responsibilities negotiated prior to project approval
- Counterpart resources (funding, staff, and facilities), enabling legislation, and adequate project management arrangements were in place at project entry
- The project assumptions and risks were well-articulated in the ProDoc

An additional important point to raise in terms of project formulation is to consider whether the planned outcomes were "SMART" (S - Specific: Outcomes must use change language, describing a specific future condition; M - Measurable: Results, whether quantitative or qualitative, must have measurable indicators, making it possible to assess whether they were achieved or not; A - Achievable: Results must be within the capacity of the partners to achieve; R - Relevant: Results must make a contribution to selected priorities of the national development framework; T - Time- bound: Results are never open-ended. There should be an expected date of accomplishment).

Project objectives

The EERB Project is focused on creation of enabling environment for broad application of energy efficient measures in the construction of new and renovation of existing residential buildings in Turkmenistan and thereby reduce energy consumption for heating, ventilation and/or air conditioning, which in turn will lead to the reduction of GHG emissions. This goal was supposed to achieve through: (i) the application of the higher, in terms of EE, standards in construction; (ii) activities aimed at strengthening capacity of all parties involved in design, implementation and operation of residential buildings' construction and renovation projects; (iii) demonstration of EE performance in pilot buildings; and (iv) replication via education, outreach, training, and policy. The EERB Project thus has been designed to:

- Revise existing building codes and associated normative/regulatory documents in a way to consider EE measures
- Develop capacity at Turkmengas and other state entities to identify end-use energy savings in their housing stock and implement investments to reduce end-use energy consumption
- Introduce improved EE design measures to major housing designers and developers, and replicate these measures through protocols for energy-saving measures in prototype buildings and through mainstreaming EE issues into state construction and housing policies and programs.

The appropriateness of the above formulation of the EERB Project can be reviewed only in conjunction with the developments in the country during the last decade including overall economic situation and strategic directions of the energy policy.

Relevance of the problem addressed

Need in EE to reduce the consumption of the natural gas for energy supply to the residential buildings and thereby increase the exports is convincingly justified in the ProDoc. Based on the housing sector development trends and state of energy performance of buildings in the baseline scenario, it is demonstrated that there is a high likelihood of scaling up construction (and renovation as well) of residential buildings and there is a high potential for energy savings (compared with baseline) in each building. Implementation of the EE measures will lead to the significant savings of natural gas (that would be exported) and thus, increase of revenues due to the more exports. In addition, as provided in the ProDoc discussions with stakeholders during project identification and preparation indicated that there is high level interest in pursuing demand-side opportunities to reduce energy consumption.

Continuation of the construction of residential buildings at about the same magnitude as in pre-project period, has been actually demonstrated during the EERB Project implementation, especially before 2015. Reconstruction of existing residential buildings in Ashgabat (built from the 1950s through the 1990s) has been accelerated after the EERB Project start. However, most of the existing residential buildings built before 2000-ies suffers from outdated design and inefficient heating systems and the renovations include typically only improvement of their appearance, but not energy efficiency measures such as building insulation and shading (in some cases roofs are reconstructed/replaced). Besides there is a lack of capacity for improvements of the legal and regulatory framework in this sector.

The design of the EERB Project considers introduction of EE construction standards and improved design measures in the residential sector of Turkmenistan. These measures were planned to be demonstrated through the implementation of pilot projects and through mainstreaming EE issues into the state construction and housing policies and programs.

In addition, improvement of EE in the residential buildings is in line with the international commitments (this has been evidenced after the EERB Project start: according to the INDC “Energy efficiency and conservation, sustainable use of natural gas and petroleum products, increased use of alternative energy sources are the main priorities of the policy for limiting GHG emissions”); this is compliant with the national energy and environment policy priorities (this also has been evidenced after the EERB Project start; e.g. according to the National Climate Change Strategy of Turkmenistan “priorities for developing the housing and municipal services sector based on its improved energy efficiency are the following: Improving performance efficiency of municipal heating supply systems; Promoting further renovation of housing stock with due account for climate change”).

### 3.1.1 Analysis of Logical Framework (Project logic /strategy; Indicators)

The Logical Framework (LogFrame) is a key basis for planning of detailed activities under the implementation framework that was defined in the ProDoc. The LogFrame shall in principle serve to monitor & evaluate the overall project achievements – based on defined targets and indicators to measure these targets.

The original LogFrame, at the certain level, is lacking internal logic and consistency. For instance:

- Target for indicator for the overall objective, GHG reduced by 10,143 t $CO_2$ equivalent annually, was overestimated. This issue first was flagged in the Inception report and then confirmed in the MTR report (details are provided in the corresponding chapters of this report)

- Output 1.1: Incentive Program for highly efficient buildings developed (in the first 18 months of implementation) – it is unclear what kind of incentive program is meant. The activities under this output ends-up with "Development of a final version of the program for presentation to key decision-makers". But without its approval unlikely such program would be implemented in Turkmenistan and if so the value added of this output is questionable.
- Output 1.3: Policy tool to encourage more efficient residential construction – activities include publication of a report on the potential for energy savings in the building sector if building heat performance standards were expanded to apply to existing buildings undergoing capital renovation, publication of a report on the potential benefits of the introduction of an energy passport system for new and reconstructed buildings, presentation of project reports on policy tools to key decision-makers. The activities don't match with the target: "At least one policy tool developed and introduced by the end of Year 4" due to two reasons: (i) report itself doesn't represent a Tool; and (ii) presentation of a report to the decision makers doesn't necessarily lead to the introducing of a Tool (for this report should be "transformed" into the Tool and then this Tool should be approved. In this process assistance of EERB Project would be required)
- Output 3.1: Three new multi-unit residential buildings with significantly improved energy performance are designed and constructed by the end of Year 4 of the project; Output 3.2: Three multi-unit residential buildings are reconstructed with significantly improved energy performance by the end of Year 4 of the project – this means that the constructions would be completed just before the EERB Project end (in the original ProDoc the duration of the EERB Project was 4 years) and thus there would be no time for post-implementation monitoring and evaluation of results (whether or targets were met), which is in line neither GEF nor UNDP implementation strategy

The issue of inconsistencies in the LogFrame was raised during the inception phase, and several changes proposed. In addition, the most recent developments in Turkmenistan related to the objective and scope of works under the EERB Project have been taken into account and as a result some indicators and targets have been redefined to better and more specifically reflect project outputs and revised project activities and to remove duplications. The analysis of the revised LogFrame is presented in Chapter 3.2.1 of this report.

### 3.1.2 Assumptions and Risks

**Assumptions**

Assumptions and risks are outlined in the Project Results Framework for each project indicator and target and built around the continued commitment of all EERB Project Partners:

- Continued interest in and investment in the residential housing sector
- Willingness and availability for training by project stakeholders
- Interest and cooperation on the side of Turkmengas will remain strong
- Construction will take place as planned
- EE policy will be developed and decision-makers will be willing to incorporate key project findings

However, assumptions are not always logical and robust. In particular:

- Assumption regarding the **continued interest of Turkmengas in investing in new residential buildings** should be based on more thorough analysis. Indeed, the main interest of Turkmengas is

in its core business including export of gas, which constitute significant part of State revenues of Turkmenistan. The data on the exports of natural gas are presented in the below table.

***Table 2: Production, consumption and export of natural gas in Turkmenistan (in billion $m^3$)***

| Year | Production | Consumption | Exports | Exports to Russia | Exports to China | Exports to Iran |
|---|---|---|---|---|---|---|
| 2005 | 57.0 | 16.1 | 40.9 | 35.1 | 0 | 5.8 |
| 2008 | 66.1 | 20.5 | 45.6 | 39.1 | 0 | 6.5 |
| 2009 | 36.4 | 19.9 | 16.7 | 10.7 | 0 | 5.8 |
| 2010 | 42.4 | 22.6 | 19.7 | 9.7 | 3.5 | 6.5 |
| 2011 | 59.5 | 25.0 | 34.5 | 10.1 | 14.3 | 10.2 |
| 2012 | 62.3 | 23.3 | 41.1 | 9.9 | 21.3 | 9.0 |
| 2013 | 62.3 | 22.3 | 40.1 | 9.9 | 24.4 | 4.7 |

Source: https://en.wikipedia.org/wiki/Economy_of_Turkmenistan

It is clear from the table that until 2010, Russia was the largest market, accounting for about 90% of natural gas exports. Then Russia began to reduce the volume of gas purchased and Turkmenistan looked for a new large consumer. By 2015, Turkmenistan completely compensated for the loss of the Russian market by gas supplies to China, who plans to double imports from Turkmenistan by 2020 (http://factsanddetails.com/central-asia/Turkmenistan/sub8_7d/entry-4837.html).

Another issue is that the potential variation of the natural gas price at the international markets, which might affect the country's economy, has not been assessed. Actually "A steep drop in global prices for natural gas, as well as complexities in Turkmenistan's negotiations with its international customers (specifically, China, Iran, and Russia) have led to a significant reduction in state budget revenue… Under these conditions, the idea of spending scarce cash to save energy in buildings and increase gas exports has become more difficult to justify in Turkmenistan"[4].

Based on the abovementioned, it is unlikely that the investment in housing sector was the highest priority for Turkmengas even by the EERB Project start; there were much more important issues to deal with. And for sure, it would become less priority due to the external factor, reduction of oil (and possibly gas) prices that took place worldwide after the EERB Project start.

- It is assumed in the ProDoc that **"symbolic" tariffs for communal services including for heating and air conditioning would apply throughout the EERB Project duration and even beyond it**. The last developments show that changes are expected in the tariff methodology. Some changes have been already happened in this direction, the state subsidies have been reduced. In particular, the price for natural gas increased to 20 TMT per 1,000 $m^3$ on consumption above the maximum allocated free amount of 50 $m^3$ per person; free gasoline rations were removed entirely in 2014).

In the MTR report only assumptions, used for ex-ante estimation of the GHG emission reductions, are analyzed and correctly found inappropriate. Therefore, the MTR recommendations are built around the comprehensive monitoring of energy savings and calculation of GHG reductions.

**Risks**

Initially the risks have been identified in the ProDoc. Then during the inception phase risks have been analyzed and updated and new risks added. During the MTR, the analysis of the risk management has

[4] Summary of EERB Project Results and Lessons Learned

been conducted and new potential risks identified. Two organizational risks have been identified and put in ATLAS system in 2015. The summary data on the risks are presented in Tab.3.

***Table 3: Summary of EERB Project risks***

| EERB Project Risks | | | Rating[5] | | | |
|---|---|---|---|---|---|---|
| Type | Description | Identified (Source or date) | ProDoc | Inception report | MTR report | After MTR |
| Political | Lack of governmental commitment to revise and introduce more stringent building codes and other regulations supporting energy efficiency | ProDoc | L | L – M | L - M | ? |
| Strategic | Low incentives among housing developers to introduce more efficient designs and energy-saving measures | ProDoc | L – M | L | L | ? |
| Financial | Lack of funding to support investments in the housing sector and to finance pilot projects | ProDoc | L | L | L - M | ? |
| Financial | Lack of funding for replication of pilot projects | Inception report | - | M | M | ? |
| Financial | Incremental costs of pilot projects, especially in case of newly constructed buildings will be unnecessarily high (and correspondingly costs of GHG emission reductions in USD/ton of $CO_2$ as well) | Inception report | - | M | M | ? |
| Financial | Replication factor of pilot buildings and sustainability of project results will be limited | Inception report | - | L - M | M | ? |
| Organizational | In late 2014, project management identified the risk that the State Committee on Hydrometeorology would not release new climate data except if paid an exorbitant fee | 01.01.2015 (ATLAS) | - | - | - | Non-critical[6] |
| Organizational | A continued risk that demonstration projects on building renovation would be delayed further (after two years of delays already) into 2015 | 01.01.2015 (ATLAS) | - | - | - | Non-critical |

As it is seen from the table, not all of the potential risks were identified in the ProDoc and the identified ones were underestimated. Unfortunately, risks weren't monitored carefully (no updates in ATLAS, no risk analysis/management in PIRs).

MTR also identified two potential risks: (i) Delay in the schedule set for the pilot building construction and overall delay in project finalization; and (ii) GHG emission reductions are much lower than initially foreseen. However, these risks haven't been entered the ATLAS system. At the same time MTR recommended that "Project needs to monitor results effectively with the given timeline and to keep track of possible risks that need to be managed".

Finally, the Biannual Report on the EERB Project for July-December 2014 includes a chapter "Summary of key risks and ways to manage them", in which six more risks were identified. Two of them were

[5] Rating of risks: L – Low, M – Medium, H - High

[6] In ATLAS risks are either critical or non-critical

entered in ATLAS system (see Table 3), four others are as follows: (i) Economic assessment and recommendations on state investment are not effective in elevating energy efficiency as a priority among key decision makers; and (ii) Adoption of new state standards is delayed or blocked by state requirements for necessary permissions; (iii) Study tour to Croatia is delayed because of unavailability of key personnel; and (iv) Media coverage of project and of benefits of energy efficiency is insufficient. It must be noted that last two are issues rather than risks. The consequent Biannual Reports don't provide any further information on status of those risks.

Based on the abovementioned is the Consultant's opinion that not all the potential risks have been identified in the EERB Project design.

### 3.1.3 Lessons from other relevant projects incorporated into project design

Before the EERB Project start certain lessons were learned from the UNDP/GEF project "Turkmenistan - Improving the Energy Efficiency of the Heat and Hot Water Supply" (TUK/01/G35/A/1G/99), which was focused on EE mostly at supply side. Nevertheless, the project has implemented a number of activities relevant to this EERB Project and among them developed training materials on reducing of heat losses; elimination of surplus heat consumption in heat supply for residential buildings, etc. The relevant lessons learned from this project has been incorporated in the EERB Project design. In particular:

- There is a need to pay special attention to renovation as a sector with large potential for savings
- The project should reach beyond space heating to address cooling, lighting, and hot water provision in all training and design activities because of their significant roles in residential energy consumption
- In order to address the principal-agent issues in the energy sector of Turkmenistan, the energy provider should be fully engaged in project implementation
- The project will require significant time for the pilot buildings design and construction in order to allow local experts to be involved in the process in a meaningful way that will allow them to develop these skills, which can then be applied elsewhere.

ProDoc also refers to the UNDP/GEF projects on energy efficient buildings in the region (in Armenia, Kazakhstan, Kyrgyzstan, Uzbekistan) but none of them have been completed before the EERB Project start; only Armenian project was just started (in 2010). The earliest project (Promoting Energy Efficiency in Public Buildings in Uzbekistan) started in 2009; its MTR took place in 2012; TE in 2015 but it was firstly, it was for public buildings and secondly, MTR report was not available while designing EERB Project. Therefore, just few lessons from those projects were available and thus incorporated into the EERB Project design.

### 3.1.4 Planned stakeholder participation

EERB Project key stakeholders including governmental agencies and ministries, namely Turkmengaz as the Executing Agency of the project, the Ministry of Construction, Ministry of Natural Resources (GEF National Focal Point) and the municipality of City of Ashgabat have been actively involved during the design phase.

The consultations with the stakeholders started by organizing an Inception workshop within the PPG (Project Preparation Grant) in April 2010.

Planning of the stakeholder participation has started from the early stages of the EERB Project development. The planning was based on clear understanding of the unique feature of Turkmenistan regarding the housing sector, namely multiple roles played by key institutions. Key agencies could influence residential construction and energy policy, and at same time design and manage housing for their employees. For instance, Turkmengas in parallel of activities related to its core business, commissions, builds, and manages housing for its employees through several subsidiaries. For instance, Nebitgazkhyzmat is the subsidiary in charge of providing energy to new buildings built by the Oil and Gas Complex. Another subsidiary, Neftegazstroy (Oil and Gas Construction), as a contractor to Turkmengas, is responsible for constructing employee housing and public buildings.

One of the key roles was given to the City of Ashgabat local administration, which was responsible for commission, design, and managing housing stock. By that time the Ministry of Communal Services was just established and its mandate and responsibilities were not fully clear. Nevertheless, in PIF it also was considered as a key stakeholder (Stakeholder Involvement Matrix describing roles and responsibilities of identified stakeholders, relevant to the EERB Project as well as their involvement in the EERB Project has been included in PIF). Stakeholder Involvement Matrix among others included the following:

- State Concern Turkmengas - to serve as the project executive and project beneficiary; member of the Project Board. Will be involved in all aspects of the project implementation and will participate actively in Component 2, providing meters for data collection and staff for training and analysis activities. Will work with the project team to develop and integrated resources plan for providing energy to the housing stock and will accept the plan developed. May adopt incentive program for highly-efficient construction
- Ministry of Construction- to serve as the project beneficiary; member of the Project Board. Will provide both technical assistance and investment funds for efficient construction. Ministry staff will participate in training, particularly on code-related issues in Component 1. Will endorse efficient protocols for standard building types. May adopt incentive program for highly efficient construction
- City of Ashgabat Local Administration - Member of the Project Board; will be involved in all project components, particularly those affecting new construction and reconstruction in Ashgabat, such as the pilot buildings and protocols in Component 3. May adopt incentive program for highly-efficient construction developed under Component 1. Will provide investment funds for new and/or reconstructed pilot buildings in Component 3 and/or apply protocols for new construction and reconstruction developed under Component 4.
- Ministry of Nature Protection - Member of the Project Board; will provide guidance on determine local environmental benefits from the project and will ensure coordination with other GEF projects in Turkmenistan.
- Ministry of Energy and Industry - Member of Project Board. Will gather lessons learned for its own housing stock and may oversee the integration of project recommendations into the anticipated Law on Energy Efficiency Turkmenistan
- Polytechnic Institute - Member of the Project Board. Will introduce a curriculum on energy efficiency to its Construction Faculty and train students under Component 4. Will support the implementation of the student design competition in Component 4.
- Ministry of Communal Services - Member of Project Board. Will hopefully provide support on applying lessons learned in demand-side management and investment to the communal services sector in Turkmenistan.

Before the EERB Project start energy consumptions of most of the buildings managed by the above-mentioned institutions, were unknown because they weren't metered and thus it was not possible to identify or prioritize EE measures in any significant way. Another issue was that building codes in Turkmenistan don't have binding requirements regarding the overall energy performance of buildings and thus there were no incentives to construct buildings that exceed the existing thermal requirements. Therefore, active involvement of the above stakeholders has been adequately planned. In particular, Turkmengaz having a direct interest in all EERB Project components, and its corporate leadership was interested in supporting national efforts to prioritize resource efficiency, has designated as an Executing Agency; inviting Turkmengaz to this position was a crucial decision that supported local ownership of the EERB Project.

Based on the abovementioned it is Consultant's opinion that stakeholder participation has been planned adequately.

### 3.1.5 Replication approach

Along with sustainability of global environmental benefits, institutional continuity and replicability belongs to the key GEF operational principles and thus it was incorporated in the EERB Project design.

The EERB Project has been designed to revise building codes, develop local capacity to design and construct new and renovate existing buildings in EE way and implement pilot projects. Component 4 of it is completely devoted to the replication. The proposed approach for replicability, which is an integral part of the overall implementation approach, includes the following main elements, both demand-side and supply-side:

- Close cooperation with the Ministry of Construction (oversees government-funded construction in the residential sector) in order to increase the uptake of the techniques applied in the pilot buildings and thereby facilitate replicability in other state-funded construction
- Close cooperation with municipalities (oversee residential sector renovation[7]) for replication in municipalities across Turkmenistan
- Partnerships with other developers and support for policies that encourage EE considerations into construction and housing. It must be noted that implementation of revised building codes will generate energy savings not only in residential buildings but public buildings as well
- Expansion the use of EE techniques to the broader housing market
- Support capacity development in efficient building techniques of practicing architects, who design both public and private buildings as well as architecture and engineering students
- Research & Development including development of prototype designs, demand-side management
- Usage of locally-available materials and straightforward design techniques that are also affordable and do not add substantially to the cost of the building
- Awareness raising campaign and dissemination of lessons learned. It must be noted in this regard that the construction and renovation of pilot buildings is not an ultimate goal per se. It should serve for gaining practical experience that could be further disseminated.

[7] Currently Ministry of Communal Services as well

### 3.1.6 UNDP comparative advantage

In general UNDP comparative advantage lies in its experience in integrated policy development. UNDP's assistance in designing and implementing activities is consistent with both the GEF mandate and national sustainable development plans.

UNDP has implemented a number of EE in buildings projects in Central and Eastern Europe and in the CIS region including Central Asia (Kazakhstan, Kyrgyzstan and Uzbekistan).

UNDP Turkmenistan has the adequate administrative capacity for implementation of this EERB Project.

### 3.1.7 Linkages between project and other interventions within the sector

As mentioned above, the EERB Project design considers lessons learned and challenges identified by the UNDP/GEF project "Turkmenistan - Improving the Energy Efficiency of the Heat and Hot Water Supply". EERB Project design also included cooperation with similar activities in the sector, in particular, with UK-initiated project to develop a Law on Energy Efficiency and Renewable Energy and a National Energy Efficiency Action Plan of Turkmenistan through the Energy Working Group that it has convened.

The ProDoc includes plan for cooperation with EU funded similar regional projects covering Turkmenistan, e.g. ESIB project (Energy Saving Initiative in Buildings), which was dedicated to the promotion of EE in Partner Countries of the INOGATE programme (Turkmenistan is a member of INOGATE together with Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kirghizstan, Moldova, Tajikistan, Ukraine and Uzbekistan) and was being implemented during 2010-2014. ESIB scope of activities covered all types of buildings: housing, public buildings, schools, hospitals, offices, shops, other tertiary buildings, etc. and was providing Technical assistance (TA) in legal, financial, technical and professional (improving the regulations and technical norms to stimulate the use of EE solutions adapted to local conditions; capacity building) and awareness raising aspects. Therefore, it is stated in the ProDoc that the TAs provided by the EERB Project and ESIB shouldn't be duplicated.

### 3.1.8 Management arrangements

The EERB Project was designed for national execution by UNDP. The original management arrangements were specified in PIF and ProDoc in a following way:

- Executing Agency - Turkmengaz
- Project Board - would be responsible for overall management of the project by making management decisions and playing critical role in quality assurance of monitoring and evaluation
- Project Manager (PM) - responsible for day-to-day management on behalf of UNDP to ensure that the project produces the results specified in ProDoc

During the first project meeting (Local Program Appraisal Committee meeting), held on May 11, 2012, the management arrangements have been slightly changed. LPAC among others approved establishment of a Project Steering Committee (PSC) and an Advisory Board as well as nominated institutional members of the Steering Committee and Advisory Board. The revised management arrangements are presented on Fig. 1.

In the new arrangement, the Board was replaced by the PSC led by Turkmengas and consisted of representatives of:

- Turkmengas
- Ashgabat Municipality
- Ministry of Communal Services
- Ministry of Construction
- Ministry of Energy and Industry
- Ministry of Environmental Protection
- UNDP

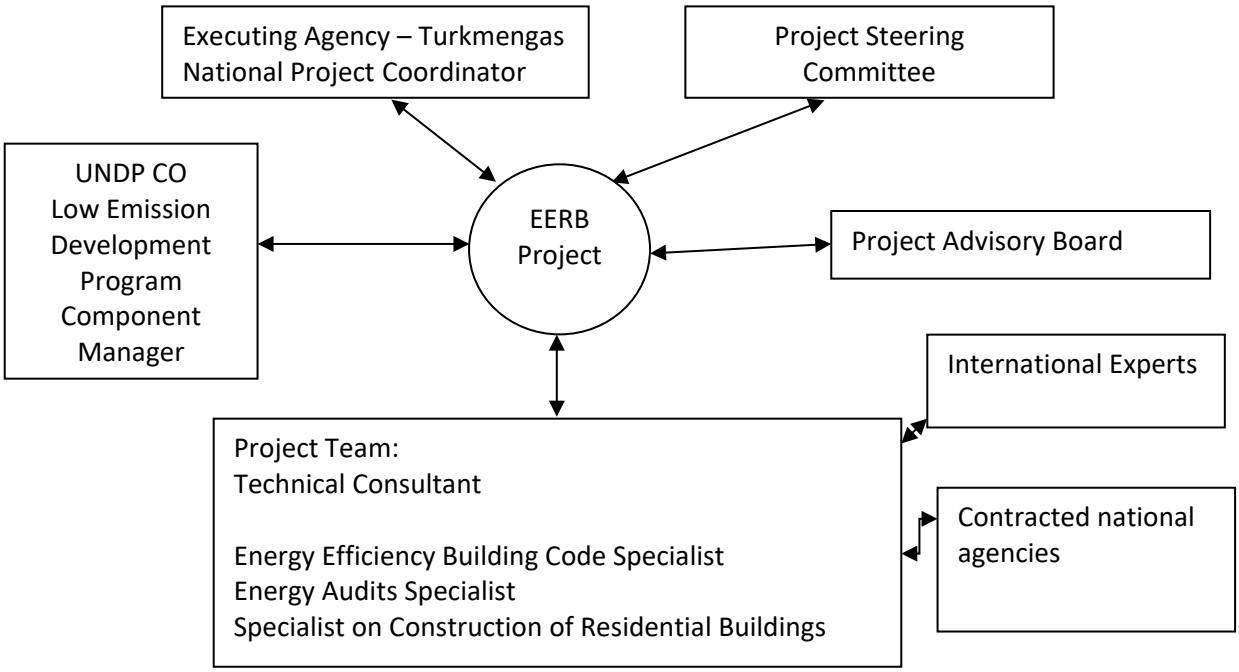


***Figure 1: Project Management Organigram. Source: EERB Project Inception report***

Advisory Board consisted of representatives of decision makers and also EERB Project:

- National Parliament – Medjlis
- Ministry of Economy and Development
- Turkmengas
- Turkmennebitgasgurlushchik, also referred to as Turkmenneftegasstroi (Turkmen oil and gas construction) – building design and construction company associated with Turkmengas
- Neftegaskhizmat
- Ashgabat municipality, Department of Capital Construction
- Main Department of Architecture and Urban Planning
- Ashgabataslama Design Institute
- Ministry of Communal Services
- Turkmendjemagattaslama Design Institute
- Ashgabatteplo Heating Utility
- Ministry of Energy and Industry
- Ministry of Construction, Department of Main State Expertise (Glavgosexpertise)
- Ministry of Construction, Department of Architecture, Urban Planning and Science

- Turkmendovlettaslama Design Institute
- Ministry of Industry of Construction Materials
- Institute of Strategic Planning and Economic Development
- Polytechnic Institute (Institute for Architecture and Development)
- UNDP – Low Emission Development Program Manager
- Technical Consultant of the Project on improving energy-efficiency in residential buildings sector of Turkmenistan

Project Team consisted of the:

- Low Emission Development Program Component Manager – responsible for strategic project management and for implementation of effective adaptive management if needed
- Technical Advisor – responsible for daily project management
- National experts:
    - Energy Efficiency Building Code Specialist – primarily responsible for delivery of Outcome 1
    - Energy Audits Specialist – primarily responsible for delivery of Outcome 2
    - Specialist on Construction of Residential Building – primarily responsible for delivery of Outcome 3

Project team was supported by the short-term International consultants:

- International Chief Technical Advisor (CTA) – to provide advice and guidance on implementation of all project components
- International Consultant in Building Energy Codes - to lead and guide a review of an existing building codes in line with international standards and to deliver trainings on building codes
- International Consultant in Building Design - delivery trainings in building design and; assistance in design of new and renovated pilot buildings
- International Consultant in Economic Analysis and Demand-side Management (DSM) Planning - analysis of expected energy performance and cost-effectiveness; development of plans for a scaled-up national program of EE investments in building sector

These management arrangements in general, with some exceptions, worked well during the EERB Project implementation:

- 9 meetings of PSC were organized in total. At each of PSC meetings the achievements to date were discussed, assessed and agreed and also guidance for the future implementation provided
- Less contribution was made by the Advisory Board, which practically met only once, during the Inception workshop
- Until 2014 the project has been managed (full-time) by Ms. Irina Atamuradova, Low-emission Development Component Manager and Mr. Vadim Shmidt, National Technical Advisor, provided management support to Ms. Atamuradova. National Technical Advisor's responsibilities included general oversight of the national experts; he also bore primary responsibility for communication with national partners. In 2013 Mr. Shmidt left the EERB Project. This position has not been refilled, Ms. Atamuradova took full responsibility of Project Manager (PM); CTA was providing extensive assistance in that. Therefore, the National Technical Advisor hasn't been involved since that in the EERB Project implementation.

## 3.2 Project Implementation

As recommended by the Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects, TE findings in this chapter are based on assessment of implementation approach, whether or not: (i) The logical framework is used during implementation as a management and M&E tool; (ii) Effective partnerships arrangements are established for implementation of the project with relevant stakeholders involved; (iii) Lessons from other relevant projects are incorporated into project implementation; and (iv) Feedback from M&E activities used for adaptive management.

The implementation approach of the EERB Project is based on transfer of best international practices in designing EE housing with affordable costs and conducting of corresponding capacity building and outreach/awareness raising activities. The approach applied during the actual implementation is logical, considers effective cooperation with the key stakeholders including through the formal agreements, lives a room for flexibility to easier apply adaptive management, and allows providing immediate assistance in adaption of best international practices to the local conditions.

### 3.2.1 Adaptive management (changes to the project design and project outputs during implementation)

The EERB Project extensively applied adaptive management based on the results of either observations or monitoring and evaluation.

At the inception workshop the revision of LogFrame has been proposed by the EERB Project Team and agreed by the Project Partners. The rationale for this revision was the changing environment (conditions and opportunities) in Turkmenistan.

Some indicators and targets were revised in the original LogFrame in order to better / more specifically reflect project outputs. The main changes are as follows:

- Elimination of Output 1.1 (numbers of outputs correspond to those ones in the original LogFrame), with merging of certain of its activities into Component 2
- All seminars and training for building designers have been consolidated in Output 4.2
- Indicators for Outcome 2 were made more concrete, with descriptions of activities in energy management and audit, plus more clarity about our goals for the investment program
- Output 3.3 (model energy passports) has been consolidated with Output 1.3
- Output 4.1 has been eliminated because of redundancy with Component 2, which already foresees replication of the most cost-effective retrofit measures., as well as Outputs 3.1 and 3.2, which specifically call for replication of demonstration-project designs

According to the MTR, the LogFrame generally provides a clear summary of targets to be achieved within the different project components. In general, we agree on this statement with some exceptions.

1. In the Inception report, changes in outputs are discussed in details. However, the revised LogFrame doesn't contain outputs at all[8], only outcomes are presented and therefore it is unclear e.g. how Output 3.3 consolidated with original Output 1.3 looks now. The same situation is with indicators and targets. Without outputs the outcomes are lacking specifics

[8] Revised outputs are discussed in the Section VII: Revised project activities of the Inception report but they are not presented in Section VIII: Revised Project Results Framework

2. The MTR amendment of the GHG emission reduction targets due to wrong assumptions made in the baseline calculations provided in the ProDoc. As provided in the MTR report Initial GHG reduction targets have been far overestimated (based on wrong assumptions). Total estimated avoided $CO_2$ emissions from 6 pilot buildings over 20-year lifetime should be of 26,056 t $CO_2$ instead of original target - 202,866 t $CO_2$ as a result of the project over 20 years. Similarly, natural gas savings also should be revised.

   In the MTR, corresponding recommendation is formulated in the following way: **Recommendation 3:** Monitoring of project results and GHG emission reductions to be followed-up and results visualized:

   - GHG emission reduction targets had to be significantly amended due to wrong assumptions made in the baseline calculations provided in the ProDoc[9]
   - Etc.

   Management Response to the Recommendation 3 doesn't provide any comment to the underlined text, i.e. the amendment of the GHG emission reduction target has been accepted. However, the corresponding revision of LogFrame was neither planned nor actually implemented.

3. The baseline scenario in the revised LogFrame represents Status Quo, i.e. indicators would remain unchanged after the project start. Indeed, the baseline of indicators is either zero, or "No code on whole-building energy performance", "No audits, training, or investment program", etc. This is not appropriate for two indicators:

   - The baseline energy savings target cannot be zero because as provided in the Inception report, 10% energy savings of the baseline consumption have been estimated to be achieved even without the project. It must be noted that this 10% savings are deducted from the calculation of the target. Nevertheless, it should be considered in the baseline as well (i.e. being not zero)
   - The building codes would be revised even without EERB Project. However, these revisions unlikely address issues related to EE. Nevertheless, the baseline won't be "no codes"

### 3.2.2 Partnership arrangements (with relevant stakeholders involved in the country/region)

During 2013, the EERB Project faced difficulties and some delays across all major components. The delays arose largely because the timing and annual budgets of government stakeholders did not match with the planned activities of the project. Then the EERB Project experienced major and repeated delays in its demonstration projects because of unexpected slowness of necessary approvals and authorizations. Delays have also occurred in the development and adoption of building code revisions. To avoid further delays and also improve the efficiency of the implementation of the pilot projects and adoption of the revised building codes the bilateral agreements have been signed between the UNDP and respective parties. In particular, Bilateral Agreements on pilot designs and Standard Letters of Agreement on the joint implementation of activities (revision of building codes, construction/renovation of demo pilot projects) under the EERB Project with detailed action plans and expected responsibilities have been signed during March-October 2014 between the UNDP and:

[9] Underlined by the Consultant

- ✓ Ministry of Construction and Architecture of Turkmenistan - to implement Joint Action Plan for revision of building codes and development of guidance manuals to building codes
- ✓ Ministry of Communal Services of Turkmenistan – client for retrofitting of three pilot projects (typical demo-buildings). In addition, informal agreement was reached on conducting energy audits of 22 buildings in 9 cities of Turkmenistan
- ✓ Housing Operational Trust of Kopetdag District of Ashgabat City of the Ministry of Communal Services of Turkmenistan – client/owner for retrofitting of one typical demo-building
- ✓ Directorate of Constructed Units of the State Corporation "Turkmen Oil and Gas Construction" - client/owner for construction of two high-comfort demo-buildings. Bilateral agreement on design also was signed
- ✓ Turkmen State Architecture and Construction Institute of the Ministry of Education of Turkmenistan - on revising typical programs for students and Letter of Agreement for developing and adding a section, ”Energy Conservation” to the typical program of four specialties
- ✓ Department of Capital Construction of the Municipality of Ashgabat - client/owner for construction of one typical demo-building. Bilateral agreement on design also was signed

Signing of the above agreements appeared a useful management tool for planning and implementing activities jointly - works were proceeded essentially without delays afterward and in general, collaboration in key areas, including demonstration projects on renovation and energy management, as well as delivery of training on energy audit and energy management, became easier and more efficient.

Other general means for establishment of the effective partnership included:

- Use of capacity of Turkmengas (Executive Agency) to secure support from key government agencies
- Support from the Senior UNDP management, including the Resident Representative (RR) and Deputy Resident Representative (DRR) via formal letters and participation in high-level meetings
- Organization of study tours with participation of high-level authorities – helped in establishing trust and close relationships
- Ministry of Communal Services - on conducting energy audits of 22 buildings in 9 cities of Turkmenistan

### 3.2.3 Feedback from M&E activities used for adaptive management

The EERB Project regularly used feedback from M&E to appropriately and adequately address any new challenges (issues) and thereby ensure the achievement of established targets. The M&E plan among includes also LogFrame, Inception Report and Mid-Term Review and thus changes in the LogFrame after the Inception phase and recommendations of the Mid-Term Review also were used as a basis for adaptive management.

The changes in the LogFrame are already discussed in the Chapter 3.2.1 above. Other feedbacks from M&E activities used for adaptive management are as follows:

- Strengthening the management structure – after revision of the LogFrame by establishing more ambitious targets as well as delays in implementation observed practically from the first

year of implementation, the Project Manager, who was initially supposed to implement strategic management, took responsibility of day-to-day management as well. Deeper engagement of the Chief Technical Advisor in the of the EERB Project management throughout the whole duration implementation including after the extension, also was ensured

- To ensure stronger ownership / commitments from the EERB Project and thereby avoid further delays the EERB Project, actively supported by the Senior Management of the UNDP CO, was doing its best to fully engage Partners. This was done through regular contacts and meetings, official communication on support for co-signature; engagement of Turkmengaz to exert its persuasive influence on other agencies; etc.
- Focus of Component 1 was shifted to the development and adoption of new and revised building codes
- National investment plan for EE improvements to buildings. The project has recognized that even with the strongest technical justification, advocacy for such a plan would likely face a difficult path to approval by the Cabinet of Ministers of Turkmenistan, with even the very term "investment plan" likely to trigger skepticism and resistance

  Original Output 2.3: Investment plan for reducing energy losses developed by the Construction Department for the housing stock that Turkmengas supplies with natural gas in Ashgabat – has been slightly revised during the Inception phase. However, its scope and coverage (investment plan for Ashgabat only) was left unchanged. Later it was understood that even with upgrading to the national scale the National investment plan for EE improvements to buildings even with the strongest technical justification, advocacy for such a plan would likely face a difficult path to approval by the Cabinet of Ministers of Turkmenistan, with even the very term "investment plan" likely to trigger skepticism and resistance. Instead, it was decided to elaborate National Action Plan for Rational Use of Energy in Buildings that still calls for significant direct investment, but also includes other key elements such as support for implementation and periodic revision of building codes, training, etc. In addition, it is based on results of the Report on financial feasibility of investments in improving building efficiency in existing residential buildings in Turkmenistan prepared by the International Consultant in Economic Analysis
- Adaptive management in response to the Recommendations of MTR:
  - ✓ Recommendation 1 is focused on Government adoptions of building code and linking it with National Action Plan for Rational Use of Energy in Buildings. For this purpose meeting with the Deputy Prime Minister has been organized followed by the study visit to Croatia with participation of the Government representatives
  - ✓ Recommendation 2 among others included market awareness (more basic information on energy use in buildings). In response EERB Project developed a catalog on thermal bridges in building joints
  - ✓ Recommendation 3 among others stated that there is a need for a detailed methodology for monitoring of energy consumption, energy savings, and associated emissions and emissions reductions and that monitoring period should last at least for a year. In response, the methodology for energy monitoring has been revised; EERB Project duration has been extended and comprehensive monitoring implemented as per the methodology
  - ✓ MTR also recommended to keep track of possible risks that need to be managed. In response, the EERB Project developed detailed AWPs for the remaining years with

month-by-month sequencing of activities and elaboration of risks and alternative scenarios, including timetables and budget adjustments. Unfortunately, risk log hasn't been updated along with these measures

- ✓ Finally, MTR recommended to introduce a higher level of public outreach and institutionalize public awareness activities. The EERB Project updated communication plan and implemented monitoring of its implementation

### 3.2.4 Project Finance

For the evaluation of EERB Project finance the key financial aspects of the actual costs and leveraged and financing have been assessed. Differences between planned and actual expenditures also were assessed and explained. Findings of the financial audits also were considered. The following has been observed:

- In the ProDoc the EERB Project resources were amounted to USD 46,003,280, including a GEF grant (USD 2,516,280), UNDP co-financing (USD 100,000) and parallel financing from the Government of Turkmenistan (USD 43,387,000). The planned and actual co-financing are presented in Tab. 4.

***Table 4: Planned and Actual Co-financing (in USD million)***

| Co-financing (type/source) | UNDP own financing | | Government | | Partner Agency | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual |
| Grants | | | | | | | | |
| Loans/Concessions | | | | | | | | |
| - In-kind support | 0.100 | 0.129 (as of January 2017) | 43.387[10] | 63.272 (as of January 2017) | | | 43.487 | 63.401 |
| - Other | | | | | | | | |
| Totals | 0.100 | 0.129 | 43.387 | 63.272 | | | 43.487 | 63.401 |

- As it is seen from the table, more co-financing was provided by the Government of Turkmenistan and UNDP as well, that demonstrates clear interest of both, Government and UNDP. The reasons for that were higher costs of new residential buildings. Leveraging of additional almost USD 20 million co-financing from the Government side is a great success of the EERB Project.

  Government co-financing was used mainly for construction of 3 new buildings with costs of about USD 38 million, USD 21 million and USD 3 million; renovation of 3 buildings with total costs of about USD 1 million.

- Financial oversight of the project is provided by UNDP under the National execution arrangements. Combined Delivery Reports (CDRs) appear to have been prepared thoroughly, on a timely basis, and in a manner consistent with regulations on financial reporting. The annual disbursements amounted to:

  - ✓ USD 265,815 in 2012
  - ✓ USD 251,818 in 2013

[10] In ToR for the TE another figure, USD 43,687 is presented, which comes from the Request for CEO Endorsement/Approval (Section A), which additionally includes UNDP cash grant: USD 100,000 for MTR and TE and other PM costs – USD 100,000 and USD 200,000 for EE policy design. ProDoc doesn't include this co-financing

- ✓ USD 581,989 in 2014
- ✓ USD 597,001 in 2015
- ✓ USD 603,617 in 2016
- ✓ **Total (as of 31 December 2016): USD 2,300,240**
- ✓ **Planned budget for 2017: USD 216,040**

- Annual audits have been conducted according to UNDP regulations. The GEF grant funds and UNDP funds are monitored through UNDP's financial reporting system

### 3.2.5 Monitoring and evaluation: design at entry and implementation (*)

**M&E Design at Entry**

The Request for CEO Endorsement/Approval for the EERB Project among other includes description of the budgeted Monitoring and Evaluation (M&E) plan with identified responsible parties for M&E activities, allocated indicative budget, and specified time frame for each M&E activity. According to M&E plan, M&E should be conducted in accordance with established UNDP and GEF procedures. Monitoring Framework and Evaluation was further substantiated in the ProDoc. The indicative M&E budget was USD 129,200 or 5.1% of the total GEF grant.

M&E among others, activities also include development of a methodology for measuring building performance and related GHG reduction, measurement of means of verification for project indicators and measurement of means of verification for project progress and performance (measured on an annual basis), etc.

Standard M&E tools include LogFrame (contains performance and impact indicators as well as means of verification), Inception Report, Mid-Term Review, Terminal Evaluation as well as standard UNDP and GEF project progress reports – Annual Project Reviews (APR) and Project Implementation Reviews (PIR).

**Based on the above mentioned the M&E design at project start up is rated as Highly satisfactory (HS)**.

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| ✓ | | | | | |

**Implementation of M&E**

The actual implementation of M&E is in compliance with the M&E plan, because:

- The EERB Project is subject to regular review of the UNDP CO and has been supervised practically on a weekly basis by the Energy and Environment Unit, and then on a regular basis by the RR and DRR
- Project implementation has been regularly reviewed by the EERB Project Steering Committee (PSC). AWPs have been regularly developed and submitted for approval to the PSC . The PSC plays a critical role in M&E by quality assurance of the activities and outputs. It ensures that required resources are committed and negotiates solutions to any problems with external parties. 9 meetings of PSC were organized in total. At each of PSC meetings the achievements to date were discussed, assessed and agreed, and also guidance for the future implementation provided (30.01.2012; 29.03.2012; 24.07.203; 10.06.2014; 27.11.2014; 29.04.2015; 22.01.2016;

20.01.2017). Finally, members of PSC who were interviewed during the TE mission, stated that they felt sufficiently informed about progress and activities of EERB Project

- Inception Workshop was held on January 30, 2012 (Inception Report has been finalized in December 2012) with participation of UNDP CO, UNDP RTA, Turkmengas and CTA. Among others it approved revisions to the LogFrame
- The MTR mission was conducted in July 2014, MTR report delivered in December 2014, three years after the EERB Project launch. MTR overall rating was Moderately Satisfactory (MS), based mainly on ratings for Relevance (rated as "Satisfactory" - S), Efficiency (MS) and Effectiveness (MS).
- The project was also subject to external financial audit. All financial audits had "no comments or observations" and provided overall satisfactory ratings
- The revised LogFrame and M&E plan in the ProDoc served as a source of annual targets for the project. As for the baselines for the established indicators, some of them were appropriately and adequately based on the actual monitoring, e.g. energy consumptions in newly constructed and renovated buildings; conservatively estimated baseline emission (-10% compared with the level by the EERB Project start), for some other indicators the Status Quo scenario was used similarly to ProDoc, which is not always appropriate (see Chapter 3.2.1 above). It must be noted these inappropriate baseline assumptions didn't affect quantitative targets and thus overall quality of M&E.

Quality of M&E is satisfactory; lessons learned from the previous years were successfully applied. Therefore, **implementation of M&E plan is rated as Highly satisfactory (HS)**.

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| ✓ | | | | | |

### 3.2.6 UNDP and Implementing Partner implementation / execution coordination, and operational issues (*)

**UNDP (Implementing Agency) implementation**

The key aspects of the UNDP implementation are as follows:

- UNDP was permanently looking whether the EERB Project is being implemented based on under the Results Based Management with appropriate focus on established targets
- The UNDP support to the Executing Agency was always appropriate and adequate
- The UNDP support to the project team also was always adequate and timely:
  - ✓ The management structure of the EERB Project has been changed when and as appropriate (Full-time Project Manager instead of combination of Low-emission Development Component Manager and National Technical Advisor)
  - ✓ Adequate engagement of CTA and other International consultants in the implementation
  - ✓ Extension of the EERB Project duration just after the recommendation of MTR. In spite of the 1.5-year extension, due to the optimization of the funds and resources no additional funding has been requested
  - ✓ Providing necessary guidance for and approval of AWPs and their revisions
  - ✓ Encouraging application of the adaptive management

UNDP facilitated the effectiveness of PSC. It development Management Response to the MTR recommendations and ensured supervision of implementation of responsive activities.

UNDP successfully implemented risk mitigation measures even though risk log was not updated. During the mission, the Consultant got understanding that actually, risks were permanently monitored. Nevertheless, not updating the risk log at the certain level might cause delays in elaboration of the risk mitigation measures. It must be also noted that the delays didn't affect the achievement of targets because of the extension of the duration.

EERB Project is in high priority list of the CO, which is applying necessary procedures to ensure that the project implementation is operationally effective. For that purpose, a system for tracking procurement, recruitment, logistical, financial and other administrative activities was in place to provide regular weekly updates for every single activity and identify critical issues.

The UNDP Resident Representative and Environment and Energy Programme Analyst maintain contacts on a higher political level, such as to Ministries or the Cabinet of Ministers, which greatly contributed to the fulfillment by governmental institutions of their commitments. Project Manager maintains a good communication basis and exchange with the Project Partners and external stakeholders as well as implementers of pilot projects.

***Rating for UNDP implementation:***

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| ✓ | | | | | |

**Turkmengas (Executing Agency) execution**

Turkmengas is effectively implementing its both roles, aimed at providing management inputs as well as ensuring the high level of country ownership. The national base of Executive Agency plaid a positive role in advancing both policies and practical activities at the national level.

Turkmengas also undertook significant steps in revision of building codes and design and construction of pilot projects - new buildings. Turkmengas has installed gas meters not only in the pilot buildings and buildings selected for monitoring the baseline energy consumption and buildings subject to energy audit, but also in thousands of other residential buildings nationwide. This demonstrates significant commitment by Turkmengas and the Government to enhance awareness and rational use of energy in the building sector.

Turkmengas actively cooperated with UNDP and EERB Project Partners to resolve the issues of delays to the maximum extend.

***Rating for Turkmengas execution:***

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| ✓ | | | | | |

**Thus, Rating for IA/EA Implementation/Execution is rated as Highly Satisfactory (HS).**

## 3.3 Project Results

In this chapter EERB Project results including direct project outputs, short- to medium-term outcomes, and longer-term impact including global environmental benefits, replication effects and other local effects are evaluated. For better understanding of the logic of evaluation the detailed milestones (actions) as well as summary of the products developed by the EERRB Project, are presented in below tables.

***Table 5: Key actions implemented***

| 2012 | |
|---|---|
| Jan | The Inception Workshop held with participation of UNDP CO, UNDP RTA, Turkmengas, NPs and international consultant |
| Mar-Oct | The project team hired (PM, Technical adviser and 3 component experts) |
| May | Joint meeting of the project board and Local Program Appraisal Committee meeting held to approve AWP 2012 |
| Jul | 3 retrofits and 3 similar existing buildings selected and agreed with Ministry of Communal Services |
| Aug | A draft methodology developed to estimate base line energy consumption in pilot buildings |
| Oct-Nov | Heat and electricity meters installed in the 3 existing buildings chosen for retrofit, as well as 3 neighboring buildings serving as baselines for comparison |
| Sep-Dec | Inception phase completed. Project results Framework revised, inception report developed |
| Nov | A study tour on EE design and construction of residential buildings to Germany and Denmark |
| 2013 | |
| COMPONENT 1 | |
| Jan-Feb | Revision of SNT “Residential buildings” and SNT “Roofs and roofing” included to the annual plan of Ministry of Construction |
| Mar-Apr | ToR for the revision of SNT “Residential buildings” and SNT “Roofs and roofing” and development of guidance manuals for the SNTs drafted and approved by the Ministry of Construction |
| May-Dec | A draft revision of SNT “Residential buildings” and SNT “Roofs and roofing” prepared and sent for review to interested local stakeholders. A draft version of the guidance manuals for the revised SNTs developed |
| COMPONENT 2 | |
| Jan-Dec | Energy monitoring started in 3 pilots (to be retrofitted) and 3 similar existing building (base line for retrofits) |
| Nov | A draft methodology for implementation of energy audits in residential buildings developed |
| Dec | Because of lack of approval for implementation of energy audits by the Ministry of Communal Services, energy audits postponed to 2014 |
| COMPONENT 3 | |
| Mar | 3 pilot sites for new construction selected: 54-unit standard, 114-unit and 66-unit well-comfort buildings |
| May | Base line of the new 54-unit standard building estimated. Technical specification for EE design drafted, signed by Ashgabat Municipality. Cost effectiveness assessment of EE measures for the pilot construction prepared |
| Sep | EE design of 54-unit standard building developed, verified by State Expertise at the Ministry of Construction |
| Oct | Base line of the new 114-unit well-comfort building estimated. Technical specification for EE design drafted, and signed by State Concern “Turkmen oil and gas construction”. Cost effectiveness assessment of EE measures for the pilot construction prepared |
| Oct | Letter of Agreement for a joint construction of 54-unit standard building signed by Ashgabat Municipality |
| Dec | Because of lack of co-financing for standard renovation of 3 selected buildings by Ministry of Communal Services, EE retrofits postponed to 2014. |
| COMPONENT 4 | |
| Jun | Workshop on EE design of residential buildings |
| Aug | Participation in International Construction conference in Ashgabat |

| | |
|---|---|
| Sep | Workshop on implementation of energy audits, workshop on revision of building codes |
| Dec | National conference of EE design and construction |
| 2014 | |
| COMPONENT 1 | |
| Jan-Feb | Revision of SNT “Building Thermal Engineering” and SNT “Building Climatology” included to the annual plan of Ministry of Construction |
| Mar | Revision of SNT “Residential buildings” and SNT “Roofs and roofing” finalized and sent for approval to Ministry of Construction |
| May | Letter of Agreement for implementation of a joint action plan signed by Ministry of Construction |
| Jun | ToR for the revision of SNT “Building Thermal Engineering” and SNT “Building Climatology” drafted and confirmed by Ministry of Construction |
| Dec | “Energy passport” form developed for SNT “Building Thermal Engineering” |
| Dec | Since National Committee “Turkmenhydromet” did not provide climatic data, the revision of SNT “Building Climatology” partially done and its completion postponed to 2015 |
| Dec | Guidance manuals for SNT “Residential buildings” and SNT “Roofs and roofing” finalized and confirmed by the Ministry of Construction |
| COMPONENT 2 | |
| Jan-Dec | Energy monitoring continued in 3 pilots (to be retrofitted) and 3 similar existing building (base line for retrofits) |
| Sep | Letter of Agreement for implementation of a joint action plan signed by Ministry of Communal Services |
| Oct | 22 energy audits implemented in 9 cities. The methodology on energy audit refined |
| Nov | Complex of 5 buildings selected in Koshi area (Ashgabat) for piloting energy management activities |
| COMPONENT 3 | |
| Mar | Base line of the new 66-unit standard building estimated. Technical specification for EE design drafted, and signed by State Concern “Turkmen oil and gas construction”. Cost effectiveness assessment of EE measures for the pilot construction prepared |
| Mar | Letter of Agreement for a joint construction of 114-unit well-comfort building signed by State Concern “Turkmen oil and gas construction” |
| May | Letter of Agreement for a joint construction of 66-unit well-comfort building signed by State Concern “Turkmen oil and gas construction” |
| Aug | Letter of Agreement for a joint reconstruction of 3 standard existing building signed by Ministry of Communal Services |
| Oct | Construction of 54-unit standard building completed. Energy monitoring started in the building |
| Oct | Construction of 114-unit well-comfort building completed. Energy monitoring started in the building |
| Dec | Because of lack of co-financing for standard renovation of 3 selected buildings by Ministry of Communal Services, EE retrofits postponed to 2015 |
| COMPONENT 4 | |
| Jan | Round table on energy management of residential buildings |
| Jun | Round table on results of the revised building codes SNT “Residential buildings” and SNT “Roofs and roofing” |
| Aug | Participation in International Construction conference in Ashgabat |
| Sep | Round table on discussion of the draft methodology on energy audits |
| Sep | Letter of Agreement for implementation of a join action plan signed by Turkmen State Institute of Architecture and Construction (TSIAC). |
| Sep | ToR for revision of TSIAC student curricula developed and confirmed by TSIAC. |
| Dec | Round tables on discussion for revision of student curricula and revision of SNT “Building Climatology” and “Building Thermal Engineering” |
| Dec | National conference of energy efficiency improvement in buildings |
| 2015 | |
| COMPONENT 1 | |

| | |
|---|---|
| Feb | Since State Committee “Turkmenhydromet” concerned about obtaining initial series of climatic data or input data to the project, as agreed “Turkmenhydromet” provides output climatic data after analyzing and processing initial data series by its specialists. For this, the project provided trainings on methodologies of data processing for “Turkmenhydromet” specialists. |
| Apr | Revised SNT “Roofs and roofing” approved by Ministry of Justice |
| Oct | Revised SNT “Residential buildings” approved by Ministry of Justice |
| Dec | Revision of SNT “Building Thermal Engineering” and SNT “Building Climatology” finalized and sent to interested stakeholders for review |
| Dec | ToR for development of a guidance manual for SNT “Building Thermal Engineering” drafted and confirmed by Ministry of Construction |
| Dec | ToR for development of a Catalogue of solutions to prevent thermal bridges in design of building envelopes drafted |
| COMPONENT 2 | |
| Jan-Dec | Energy monitoring continued in 3 pilots (to be retrofitted) and 3 similar existing building (base line for retrofits) |
| Jan-Dec | Energy monitoring continued in 54-unit standard pilot building |
| Jan-Dec | Energy monitoring continued in 114-unit well-comfort pilot building |
| Jan-Dec | Energy monitoring implemented in 5 buildings selected in Koshi area for piloting energy management activities |
| Nov | Provision (instruction) for implementation of energy audits in buildings drafted and sent to local stakeholders for review |
| Jan-Dec | 5 on-site trainings on conduction of energy audits delivered to local specialists in 5 regions. |
| Dec | Energy audits implemented in the pilot buildings: 3 standard buildings (to be retrofitted) and 3 similar existing building (base line for retrofits); 2 new pilot buildings; 5 buildings selected in Koshi area for energy management activities |
| COMPONENT 3 | |
| Oct | Construction of 66-unit well-comfort building completed. Energy monitoring started in the building |
| Dec | Reconstruction of 3 pilot standard buildings completed. |
| COMPONENT 4 | |
| Feb | Training on the revision of SNT “Building Climatology” for Turkmenhydromet specialists |
| Mar, Nov | Meetings of the working group on development of National action plan on EE in buildings |
| Jul | A study tour on energy management of residential buildings to Croatia |
| Aug | Participation in International Construction conference in Ashgabat |
| Aug, Nov | Round tables on introduction of energy audit and energy management practice in buildings |
| Sep | TSIAC student curricula revised, supportive materials (lectures, practical and laboratory manuals) developed |
| Sep | EE laboratory created in TSIAC in collaboration with Samsung company |
| Sep | TSIAC teachers trained for teaching the new section “Energy Conservation” |
| Dec | Financial analysis and investment plan prepared for EE modernization of existing residential buildings |
| Dec | National conference on energy management |
| Dec | Project implementation period extended by the end of June 2017 |
| 2016 | |
| COMPONENT 1 | |
| Oct | Revised SNT “Building Climatology” approved by Ministry of Justice |
| Oct | Revised SNT “Building Thermal Engineering” approved by Ministry of Construction and sent to Ministry of Justice for registration |
| Nov | Recommendation for revision of SNT “Instruction on structure and sequence of development, agreement and confirmation of design documentation on construction of buildings and facilities” developed and delivered to Ministry of Construction |
| Nov | Recommendations for revision of SNT “Heating, ventilation and air-conditioning” developed and delivered to Ministry of Construction |
| Dec | A draft of the guidance manual for SNT “Building Thermal Engineering” developed |

| | |
|---|---|
| Dec | A draft of the Catalogue of solutions to prevent thermal bridges in design of building envelopes developed |
| Dec | Energy Passport software tool developed and tested to accompany the revised SNT “Building thermal engineering” and support designers and energy auditors |
| COMPONENT 2 | |
| Jan-Dec | Energy monitoring continued in 3 retrofits |
| Jan-Dec | Energy monitoring continued in 54-unit standard pilot building |
| Jan-Dec | Energy monitoring continued in 114-unit well-comfort pilot building |
| Jan-Dec | Energy monitoring continued in 66-unit well-comfort pilot building |
| Jan-Dec | Energy monitoring continued in 5 buildings selected in Koshi area for piloting energy management activities |
| Jan-Dec | Energy monitoring implemented in 2 pilot low-rise buildings (individual cottages) |
| Jun | Methodology on implementation of energy audit and Provision (instruction) for implementation of energy audits in buildings refined basing on comments provided by local stakeholders |
| Jul | A guidance manual developed for planning and carrying out energy management in existing residential buildings |
| Aug | Energy management system installed and tested in 5 pilot buildings (Koshi area) |
| Jan-Dec | 5 on-site trainings on development and implementation of energy management delivered to local specialists in 5 regions |
| COMPONENT 3 | |
| Mar | Analysis of 11 typical designs of low-rise buildings (individual cottages) completed by studying the use of renewables in the buildings |
| May | Technical specification for EE design of 11 typical low-rise buildings drafted and signed by Turkmen Design Institute “Turkmendovlettaslama” |
| Dec | EE designs of 11 typical low-rise buildings developed and verified by IC on EE design. |
| Dec | An assembly site organized for producing a local automated heat-supply control device |
| COMPONENT 4 | |
| Mar | Training on EE design of low-rise buildings |
| Mar | Training on development of the Catalogue of solutions to prevent thermal bridges in design of building envelopes |
| Apr | The revised TSIAC student curricula approved by Ministry of Education |
| Mar, Jun | Meetings of the working group on development of National action plan on EE in buildings |
| Jul | A study tour on EE design, renovation and construction of residential buildings to Belarus |
| Aug | Participation in International Construction conference in Ashgabat |
| Sep | A study tour on EE renovation and energy management of residential buildings to Russia |
| Oct | A draft of National Action Plan on EE in buildings prepared and sent to local stakeholders for review |
| Nov | Training on the use of revised SNT “Building Thermal Engineering” and SNT “Building Climatology” for local designers from 5 regions |
| Dec | National conference on EE innovations in the building sector |
| 2017 | |
| COMPONENT 1 | |
| Jan-May | Registration of the revised SNT “Building Thermal Engineering” by Ministry of Justice is pending |
| Apr | The guidance manual for SNT “Building Thermal Engineering” finalized |
| Apr | The Catalogue of solutions to prevent thermal bridges in design of building envelopes finalized |
| Apr | Data base of Energy Passports of buildings developed |
| COMPONENT 2 | |
| Jan-Mar | Energy monitoring completed in 3 retrofits |
| Jan-Mar | Energy monitoring completed in 54-unit standard pilot building |
| Jan-Mar | Energy monitoring completed in 114-unit well-comfort pilot building |
| Jan-Mar | Energy monitoring completed in 66-unit well-comfort pilot building |
| Jan-Mar | Energy monitoring completed in 5 buildings selected for piloting energy management activities |

| | |
|---|---|
| Jan-Mar | Energy monitoring completed in 2 pilot low-rise buildings (individual cottages) |
| COMPONENT 3 | |
| Mar | 5 prototypes of the automated heat-supply control device assembled, installed and tested in 5 buildings selected for energy management activities |
| COMPONENT 4 | |
| Mar, May | On-site trainings on assembling and maintaining the automated heat-supply control device |
| May | Training for local designers on the use of the Guidance manual for SNT "Building Thermal Engineering" and Catalogue of solutions to prevent thermal bridges in design of building envelopes |
| May | International conference on Improving energy efficiency in the residential building sector of Turkmenistan |
| May | Contest of TSIAC students organized for the best EE designs of residential buildings |
| May-June | Project terminal evaluation |

***Table 6: Summary of Main Products Developed***

| # | Product | Type | Status |
|---|---|---|---|
| 1 | - Building code "Residential Buildings"<br>- Building code "Roofs and Roofing"<br>- Building code "Building Climatology"<br>- Building code "Building Thermal Engineering"<br><br>- Assessment of the benefits of the application of revised building codes | - Regulatory document<br>- Regulatory document<br>- Regulatory document<br>- Regulatory document<br><br>- Report (Assessment of EE) | - Adopted<br>- Adopted<br>- Adopted<br>- In process of adoption<br>- Developed |
| 2 | - Guidance manual to building code "Residential Buildings"<br>- Guidance manual to building code "Roofs and Roofing"<br>- Guidance manual to building code "Building Thermal Engineering" | - Guidance manual<br><br>- Guidance manual<br><br>- Guidance manual | - Adopted<br><br>- Adopted<br><br>- Under consideration |
| 3 | - Building code "Instruction on the composition, procedure for the development, approval and adoption of project documentation for the construction of enterprises, buildings and structures" | - Regulatory document | - In process of adoption |
| 4 | - Building code "Heating, ventilation and air conditioning" | - Regulatory document | - Changes on EE integrated |
| | -Methodology for energy audit of residential buildings<br><br>- Provisions on rules and process for energy audit in residential buildings of Turkmenistan<br>- Energy audit of 22 pilot residential buildings in 9 cities of Turkmenistan<br>- Energy audit of 6 pilot buildings (3 new for construction, 3 for renovation) in Ashgabat | - Guidance manual<br><br>- Instruction<br><br>- Report<br><br>- Report | - Under consideration<br>- Under consideration<br>- Developed<br><br>- Developed |
| 6 | - Software «Energy passport of buildings»<br>- Data base of energy passports of buildings | - Software<br>- Software package | - Developed<br>- Developed |
| 7 | -Catalog of materials and assemblies for reducing heat losses (thermal bridges) in the design of building envelope elements<br>- Assessment of benefits from the use of the Catalog of materials and assemblies for the design of building envelope envelops | - Guidance manual<br><br>- Brief report (Assessment of EE) | - Under consideration<br><br>- Developed |

| # | Product | Type | Status |
|---|---|---|---|
| 8 | - Analysis of 11 standard designs of cottages subject to revising<br>- 11 revised standard designs of cottages and 11 energy passports<br>- Monitoring of energy consumption in pilot cottages<br>- Analysis of 11 revised standard designs of cottages<br>- Evaluation of benefits from the use of 11 revised designs of cottages | - Report<br>- Design and cost estimation<br>- Report<br>- Report<br>- Brief report (Assessment of EE) | - Developed<br>- Developed<br>- Developed<br>- Developed<br>- Developed |
| 9 | - Pilot 9-storey 54-apartment house of the U-148 series (design, construction, monitoring, EE assessment)<br>- Pilot elite 12-storey 114-apartment residential building (design, construction, monitoring, assessment of EE)<br>- Pilot elite 12-storey 66-apartment residential building (design, construction, monitoring, assessment of EE)<br>- 3 pilot reconstructed residential houses (design, construction, monitoring, EE assessment) | - Report<br>- Report<br>- Report<br>- Report | - Developed<br>- Developed<br>- Developed<br>- Developed |
| 10 | - National Action Plan for Rational Use of Energy in the Residential Sector<br>- Scenarios for EE renovation of the residential building sector<br>- Financial assessment and investment plan for the renovation of the residential sector | - Regulatory document<br>- Report (Assessment of EE - 3 scenario)<br>- Report | - Under consideration<br>- Developed<br>- Developed |
| 11 | - Development, commissioning and operation of the automated heat control/regulation<br>- Evaluation of benefits from the use of an automated heat control/regulator | - Report<br>- Brief report (Assessment of EE) | - Developed<br>- Developed |
| 12 | -Installation of energy management system in 5 pilot buildings in the residential area of Koshi microdistrict<br>- Monitoring of energy consumption of 5 pilot houses in the residential area of Koshi microdistrict | - Report<br>- Report | - Developed<br>- Developed |
| 13 | - Revised Curricular program for students of TSIAC<br>- Lecture material and practical work for the section "Energy Saving"<br>- Laboratory works for the section "Energy saving"<br>- Energy Saving Laboratory<br>- Competition for students of TSIAC<br>- Management of the preparation of the diploma theses for students of the TSIAC | - Document<br>- Tutorial<br>- Tutorial<br>- Equipment<br>- EE projects by students, report<br>- Diploma thesis | - Adopted<br>- Developed<br>- Developed<br>- Equipped<br>- Developed, developed<br>- Defended |
| 14 | - A manual on improving the energy efficiency of residential buildings | - Report | - Developed |
| 15 | - Guidance on the planning and implementation of energy management for existing residential buildings in Turkmenistan | - Report | - Developed |

### 3.3.1 Overall results (attainment of objectives) (*)

In this Chapter, the achievements of expected results are evaluated in terms of attainment of overall objective as well as identified outcomes and outputs. For this the performance by components is analyzed by looking at: (i) general progress towards the established baseline level of the indicators; (ii) actual values of indicators by the end of the EERB Project vs. designed ones; (iii) evidences of relevance, effectiveness and efficiency of the results as well as how these evidences were documented.

**Overall results of the EERB Project are rated as Satisfactory (S)**

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| | ✓ | | | | |

The summary of evaluation of attainment of Objective and Outcomes of the EERB Project are presented in Table 7.

***Table 7: Matrix for rating the Achievement of Outcomes***

| Objective/ Outcome | Performance Indicator | 2011 Baseline | 2017 End of EERB Project Target | 2017 End of EERB Project Status | TE Comments | Rating |
|---|---|---|---|---|---|---|
| To reduce GHG emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan | Reduction of direct GHG emissions from residential sector of Turkmenistan as a result of the project over 20 years, $tCO_2e$ | 0 | 202,866 $tCO_2e$ by the end of the project[11] | Reported[12]:<br>52,000 t $CO_2$ over 20 years, out of which 49,200 $tCO_2$ due to implementation of pilot buildings projects; 3,000 t $CO_2$ - implementation of revised building codes<br>5,800 t $CO_2$ by the end of the EERB Project (2,800 $tCO_2$ - pilot buildings; 3,000 t $CO_2$ - implementation of building codes | Verified:<br>The reductions due to the implementation of pilot projects should be estimated over 20 years but not 30 years. Thus, reductions should be 1,639.7 x 20 = **32,794 t $CO_2$**<br>GHG reductions due to revision of building codes is not convincingly justified. Nevertheless, even without it, GHG reductions would exceed the **target** if the latter is correctly established (should be **26,060 $tCO_2$**) | **S** |
| | Natural gas saved annually as a direct result of the project[13] | 0 | 5,133 thousand $m^3$ | Not reported | Target should be re-established. If doing so, actual saving would be above the target | |
| | Co-financing leveraged for investments in EE reconstruction of existing buildings and construction of new EE housing stock (i.e. beyond existing building | 0 | USD 40,000,000 | USD 63,272,300 | Target has been exceeded | |

[11] 26,056 t $CO_2$ in the MTR

[12] In EERB Project reports

[13] This indicator is not included in the revised LogFrame. However, status of its achievement is presented in PIRs and that's why it is included in this table

| Objective/ Outcome | Performance Indicator | 2011 Baseline | 2017 End of EERB Project Target | 2017 End of EERB Project Status | TE Comments | Rating |
|---|---|---|---|---|---|---|
| | code requirements)[13] | | | | | |
| **Outcome 1:** Energy consumption in new buildings is reduced beyond current requirements | Existence and content of applicable building codes on building energy performance | No code on whole-building energy performance. Existing codes regulate thermal resistance of building elements, but not whole-building consumption per $m^2$. Resultant whole-building energy consumption levels under code compliance, therefore, vary from building to building<br><br>Existing thermal engineering code adopted in 1998, contains two levels of prescriptive thermal envelope requirements, Level 1 and Level 2. Buildings consume 35-70 % less energy under Level 2 than under Level 1, but Level 2 is implemented in practice only for elite residential buildings, not common building designs for standard housing | New building energy efficiency code on whole-building thermal performance and revisions of existing building codes on roofs and roofing, residential buildings, and building climatology developed and implemented<br><br>New code requires heat energy consumption at or beyond Level 2 for all buildings (5 to 10 percent less than Level 2 for elite residential buildings), with Level 1 compliance no longer applicable<br><br>Introduction of energy passport system in conjunction with adopted new and revised building codes | Four building codes were revised: "Roofs and Roofing" (approved by Ministry of Justice in 2015), "Residential Buildings" (approved in 2015), "Building Climatology" (approved in 2016, and "Building Thermal Engineering" (is awaiting final approval). Implementation of revised codes will lead to energy savings<br><br>The EERB Project also assisted building designers in ensuring compliance with the revised building codes by preparation of guidance manuals**,** which explain new code requirements and provide recommended examples of design solutions and materials. The manuals also provide guidance on technical calculations of energy consumption and other parameters | The actual achievements are far beyond the initially planned (in ProDoc) and fully in line with the revised targets: building codes were revised, approved and are being in use while the ProDoc considered development and introduction of "At least one policy tool to encourage more efficient residential construction" | **HS** |
| **Outcome 2:** Turkmengas and other national agencies understand the potential for savings in its housing stock | Number of energy audits | No audits | 25 energy audits carried out by project (5 planned for 2013, 10 each for 2014 and 2015) | Methodology and official instructions on energy audits were developed<br><br>Energy audits have been implemented for pilot buildings (2 new and 3 retrofits) as well as in 3 similar buildings | Methodology includes all necessary provisions and is actually used<br><br>Actual number of energy audits carried of | **S** |

| Objective/ Outcome | Performance Indicator | 2011 Baseline | 2017 End of EERB Project Target | 2017 End of EERB Project Status | TE Comments | Rating |
|---|---|---|---|---|---|---|
| and have the capacity to identify and undertake investments in EE there | | | | Energy audits were also implemented for 22 buildings in 9 cities of Turkmenistan, with recommendations on the most cost-effective EE retrofits<br><br>The energy management has been demonstrated in the Koshi microdistrict of Ashgabat. This pilot included energy audits of 5 neighboring buildings, with subsequent monitoring over two heating and cooling seasons. The thermostatic controls for each building and automated data collection were implemented | exceeds the established target (2+3+3+22+5=35 vs. 25) | |
| | Number of professionals trained | No training | At least 30 professionals including Turkmengas staff trained | 5 training seminars for 100 specialists and 1 national seminar on energy organized<br><br>5 training seminars for 100 specialists and 1 national seminar were organized on energy management | Much more professionals were actually trained<br><br>Training programme covered all relevant aspects of energy audit and energy management | |
| | Existence and volume of activity of program, run and funded by Turkmengas and/ or other state agencies, on EE investment in buildings | No investment program | Short- and long-term investment plan for Turkmengas and Ashgabat housing stock developed, with EE design and/or retrofit carried out in at least 25 buildings by the end of the project | National Action Plan for EE in buildings has been developed, with much broader scale and impact on EE improvement, compared with the Agency's investment plan<br><br>Action plan is based on comprehensive financial analysis of different scenarios<br><br>A working group was established consisted of high-level representatives of the Ministry of Finance, Ministry of Construction and Architecture, Ministry of Communal Services, Turkmengaz, and others. The National Action Plan was discussed at meetings of the working group | A final draft of the National Plan was completed and is expected to be approved | |

| Objective/ Outcome | Performance Indicator | 2011 Baseline | 2017 End of EERB Project Target | 2017 End of EERB Project Status | TE Comments | Rating |
|---|---|---|---|---|---|---|
| **Outcome 3:** EE design and technologies are incorporated and visually demonstrated in new and reconstructed residential buildings | Number of pilot buildings designed and built<br><br>Energy consumption of pilot buildings relative to similar new and existing buildings in Turkmenistan | No demonstration buildings yet built or renovated<br><br>Baseline energy consumption to be determined by calculation based on assumed standard features, as well as code requirements and statistical data on analogous existing buildings if available | New pilot buildings designed and constructed with calculated energy consumption 15% less than required by code, and 5% less than prevailing best practice for elite buildings<br><br>3 designs for reconstruction developed and implemented with at least 44% energy consumption reduction | 3 buildings were constructed and 3 others renovated. For all these buildings, the EERB Project provided consultancy in the EE design and covered incremental costs of EE measures<br><br>Constructions/renovations of pilot buildings were completed and followed by subsequent monitoring of energy performance<br><br>The comprehensive monitoring plan has been developed and implemented<br><br>Achieved energy consumption reductions exceed the targets | Buildings have been constructed /renovated with some limitations (not all potential EE measures were implemented)<br><br>Evaluation of Koshi pilot project is incomplete. Range of the energy savings for heating and cooling was determined based on the monitoring data, while the actual energy savings and GHG reductions weren't estimated | **S** |
| **Outcome 4:** Replication facilitated via development of skills, prototype designs and policies for EE buildings | Number of architects, engineers, and students trained with regard to EE building design and code compliance | No training on EE building design and code compliance | Training on EE building reconstruction, experience from implementing integrated building design delivered to at least 50 architects and/or engineers<br><br>Course materials on EE building design and reconstruction developed and delivered to at least 30 students by the end of Q4/2014 | The implemented training programme included:<br><br>- Creation of a new classroom training module on EE in buildings, which has been officially approved and included in the curriculum in TSIAC. Energy audit equipment was transferred to this laboratory<br><br>- Training on EE to eight instructors at TSIAC, to prepare them to teach the module<br><br>- Training of hundreds of building professionals on EE residential building design<br><br>- 4 study tours for selected professionals from key government agencies and design institutes to Germany and Denmark, Croatia, Belarus, and Russia, on matters related to EE in buildings | The established targets have been achieved | **S** |

| Objective/ Outcome | Performance Indicator | 2011 Baseline | 2017 End of EERB Project Target | 2017 End of EERB Project Status | TE Comments | Rating |
|---|---|---|---|---|---|---|
| | Existence and content of executive reports and briefings of decision makers on project findings, lessons learned and recommendations | No formal delivery of information or advocacy to decision makers on EE buildings | Executive reports and at least one high-level meeting on project findings, lessons learned and recommendations for policy makers developed and delivered to key governmental and regional policy makers by the end of the Q3/ 2015 | An international conference has been organized on 3-4 May 2017. The goal of conference was to present international experiences and results of EERB Project for further application in Turkmenistan<br><br>Some results of the EERB Project are already incorporated into the EE policies and programs - New/revised building codes, National Action Plan for Rational Use of Energy in Buildings<br><br>Recently prepared report Summary of Project Results and Lessons Learned, also will provide valuable inputs to the elaboration of both, EE policy and tools/ programmes/action plans for its implementation | Target is partially achieved; achievement is expected by the end of the EERB Project | |

| Color coding: |
|---|
| Green: completed, indicator shows successful achievement |
| Yellow: indicator shows expected completion by the end of the project |
| Red: indicator shows poor achievement – unlikely to be completed by project closure |

**Objective: To reduce GHG emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan**

**Target 1: Reduction of direct GHG emissions from residential sector of Turkmenistan as a result of the project over 20 years, by 202,866 $tCO_2$ equivalent**

First of all, it must be noted that the target to be achieved by the end of the EERB Project is incorrect. Indeed, according to the ProDoc GHG reduction of 202,866 $tCO_2$ should be achieved over 20 years (assumed building lifetime) based on the annual direct reductions of 10,143 $tCO_2$ due to savings from the six pilot buildings. It is not stated in the ProDoc when exactly the pilot buildings would be commissioned. If assume that that would happen by the middle of the implementation (i.e. 2 years before the EERB Project end), then the GHG direct reduction due to the pilot buildings would equal to 20,286 $tCO_2$ by the end of the EERB Project. Another issue is that annual GHG reduction itself (10,143 $tCO_2$) is very high because the baseline emissions are largely overestimated. The MTR report estimated annual GHG reduction as 1,303 $tCO_2/a$; reductions for 20 years as 26,060 $tCO_2$. Actual GHG reductions in the pilot buildings have been calculated based on the developed methodology and monitored data. The results of the monitoring as well as GHG reductions are presented in Tab. 8.

***Table 8: Monitoring data on the pilot buildings (on the annual basis)***

| **Monitoring parameter (metered/calculated)** | **New construction** | | | | **Renovation** | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| | *12-story 114-unit high-comfort residential building; Niyazov str. 145* | *12-story 66-unit high-comfort residential building; Oguzkhan str. 126* | *9-story 54-unit residential building (typical standard design) Parahat 7/2* | ***Sub-total*** | *9-story 54-unit residential building (typical standard design) Parahat 4/1* | *5-story 45-unit residential building (typical standard design) Parahat 3/1* | *5-story 40-unit residential building (typical standard design) Parahat 2/2* | ***Sub-total*** | |
| Heat energy consumption in baseline scenario, kWh | *3,081,585* | *1,971,042* | *507,478* | ***5,560,105*** | *586,042* | *348,769* | *291,575* | ***1,226,386*** | **6,786,491** |
| Heat energy consumption in project scenario, kWh | *1,996,360* | *1,404,288* | *347,545* | ***3,748,194*** | *393,205* | *213,799* | *200,336* | ***807,340*** | **4,555,533** |
| **Heat energy savings, kWh** | ***1,085,225*** | ***566,754*** | ***159,933*** | ***1,811,912*** | ***192,837*** | ***134,970*** | ***91,239*** | ***419,046*** | **2,230,958** |
| Baseline gas consumption for additional heating, m3 | | | | | *18,548* | *13,751* | *6,845* | ***39,144*** | **39,144** |
| Gas consumption for additional heating (project), $m^3$ | | | | | *3,429* | *3,247* | *1,936* | ***8,611*** | **8,611** |
| **Gas saving for the additional heating, $m^3$** | | | | | *15,119* | *10,504* | *4,909* | ***30,533*** | **30,533** |
| Electricity for cooling (baseline), kWh | *1,064,288* | *338,459* | *56,105* | ***1,458,852*** | *135,773* | *63,592* | *54,269* | ***253,634*** | **1,712,486** |
| Electricity for cooling (project), kWh | *533,492* | *194,360* | *27,097* | ***754,949*** | *61,004* | *36,055* | *24,677* | ***121,735*** | **876,685** |
| **Electricity savings for cooling, kWh** | ***530,796*** | ***144,099*** | ***29,008*** | ***703,902*** | ***74,770*** | ***27,537*** | ***29,592*** | ***131,899*** | **835,801** |
| Electricity consumption for additional heating (baseline), kWh | *430,956* | *61,333* | *48,691* | ***540,980*** | *191,132* | *100,140* | *57,944* | ***349,216*** | **890,195** |
| Electricity consumption for additional heating (project), kWh | *212,238* | *4,823* | *9,904* | ***226,964*** | *66,127* | *36,465* | *14,736* | ***117,328*** | **344,292** |
| **Electricity savings for additional heating, kWh** | ***218,718*** | ***56,510*** | ***38,787*** | ***314,015*** | ***125,005*** | ***63,675*** | ***43,207*** | ***231,887*** | **545,903** |
| Total energy (Heat + electricity) for (heating + cooling + additional heating) in baseline, kWh | ***4,576,829*** | ***2,370,834*** | ***612,274*** | ***7,559,936*** | ***1,068,250*** | ***627,633*** | ***461,102*** | ***2,156,985*** | **9,716,921** |
| Total energy consumption (project), kWh | ***2,742,090*** | ***1,603,471*** | ***384,546*** | ***4,730,107*** | ***549,044*** | ***313,504*** | ***255,958*** | ***1,118,505*** | **5,848,612** |
| **Total energy savings, kWh** | ***1,834,739*** | ***767,363*** | ***227,728*** | ***2,829,829*** | ***519,205*** | ***314,130*** | ***205,144*** | ***1,038,479*** | **3,868,309** |
| **Total energy savings, % from baseline level** | ***40%*** | ***32%*** | ***37%*** | ***37%*** | ***49%*** | ***50%*** | ***44%*** | ***48%*** | **40%** |
| **Heated/cooled area, $m^2$** | ***35,498*** | ***23,307*** | ***4,972*** | ***63,777*** | ***4,972*** | ***2,282*** | ***2,672*** | ***9,926*** | **73,703** |
| Total baseline energy for 1 $m^2$ area, kWh/$m^2$ | *129* | *102* | *123* | *119* | *215* | *275* | *173* | *217* | **132** |
| Total energy for 1 $m^2$ in pilot buildings, kWh/$m^2$ | *77* | *69* | *77* | *74* | *110* | *137* | *96* | *113* | **79** |
| **Total energy saving for 1 $m^2$ area, kWh/$m^2$** | ***52*** | ***33*** | ***46*** | ***44*** | ***104*** | ***138*** | ***77*** | ***105*** | **52** |
| **Total energy saving for 1 $m^2$ area, % from baseline level** | ***40%*** | ***32%*** | ***37%*** | ***37%*** | ***49%*** | ***50%*** | ***44%*** | ***48%*** | **40%** |
| Total baseline emissions, t $CO_2$ | *1,812* | *762* | *198* | *2,771* | *401* | *292* | *164* | ***857*** | **3,629** |
| Total emissions in pilot buildings, t $CO_2$ | *1,015* | *482* | *110* | *1,607* | *192* | *110* | *80* | ***382*** | **1,989** |
| **Total GHG reduction, t $CO_2$** | ***797*** | ***280*** | ***87*** | ***1,164*** | ***209*** | ***183*** | ***83*** | ***475*** | **1,640** |
| **Total GHG reduction, % from baseline level** | ***44%*** | ***37%*** | ***44%*** | ***42%*** | ***52%*** | ***63%*** | ***51%*** | ***55%*** | **45%** |
| **Lifetime (20 y) GHG reduction, t $CO_2$** | **15,942** | **5,604** | **1,742** | **23,288** | **4,182** | **3,656** | **1,668** | **9,506** | **32,794** |

The Consultant agrees that baseline emissions are overestimated. Indeed, according to document submitted to the GEF Council, Annual Energy Demand (i.e. baseline energy consumption, assuming that energy demand is met in the baseline scenario) equals to 6,454,272 $m^3$ of natural gas, out of which 723,118 $m^3$ for heat and hot water and 5,731,154 $m^3$ for cooling and electricity used for other needs (lighting, appliances), and these values seem very high compared to the actual figures presented in Tab.8. For comparison, first of all, the monitoring data must be verified, which in turn, can be done only on the basis of the review of the monitoring methodology and how the monitoring has been actually implemented.

- Monitoring methodology - It is Consultant's opinion that the monitoring methodology is in line with the best international practice as well as ProDoc and recommendations of MTR. The methodology considers monitoring of both, baseline scenario and project scenario parameters. Baseline parameters are based on:
    - ✓ New constructions: Actual measurements of parameters in the reference building (High comfort building located at Niyazov str. 145 and Oguzhan str. 126; typical standard design building located at Parahat 7/2, bld. 8)
    - ✓ Renovation: Actual energy consumption (records of meters) for 2 years before the renovation adjusted in accordance with the weather conditions were used
- Actual monitoring - It is Consultant's opinion that the monitoring has been implemented in accordance with the methodology. All parameters were metered, recorded and processed appropriately. Parameters, which were not directly measured/metered, were correctly calculated by using monitoring data and default or designed values of parameters (e.g. Net Calorific Value and GHG emission factors of natural gas, efficiency of heat and electricity generation in boiler houses and power plants, etc.)

Based on the abovementioned it is Consultant's opinion that the **energy savings and GHG reductions achieved due to the implementation of pilot projects – construction of new and renovation of existing buildings - are reliable and can be verified**.

The heated area of 6 pilot buildings are: ProDoc – 69,273 $m^2$ (3 x 20,299 $m^2$ + 3 x 2,792 $m^2$); actually – 73,703 $m^2$, i.e. in the same range. Annual emission reductions in ProDoc is mainly generated by the new buildings (3,198 t $CO_2$ by each new building vs. 183 t $CO_2$ by each renovated building). According to the ProDoc natural gas consumption is reduced by 25% in new buildings. That means, annual baseline emissions only in new all 3 buildings should be 3,198 x 3 / 25% = 38,376 t $CO_2$. Actually, monitored annual baseline emissions in 6 pilot buildings with more heated/cooled area is only 3,629 t $CO_2$, i.e. 10 times higher. This clearly indicates that **baseline emissions in the ProDoc were largely overestimated** in spite the baseline emissions in ProDoc includes also emissions due to lighting and electric appliances but their values objectively should be not as high as of heating and cooling.

At the Mid-Term stage MTR used the best available (by that date) data for estimation of annual GHG reduction target. However, the target to be achieved by the end of EERB Project, hasn't been estimated. During the MTR mission (July 2014) none of the pilot buildings was commissioned and MTR recommended extension of the duration by 1.5 years. The rational was that EERP Project should be completed at least a year after the commissioning of the last pilot building (to implement minimum 1-year comprehensive monitoring). For the conservativeness, it can be assumed that emission targets by the EERB Project end should be 1,303 $tCO_2$/a x 2 years = 2,606 $tCO_2$.

**Direct GHG reductions by May 1, 2017**

GHG Emission reductions by the end of EERB Project, due to the implementation of 6 pilot building projects, is estimated as a sum of reductions by individual projects. Individual reductions in turn, are

calculated as annual reductions, times number of years. The results of calculations are presented in Tab. 9.

***Table 9:***

| Pilot building | Date of completion | Heating (H) and cooling (C) | | | | | | | | Years | Annual GHG reduct. | **Total GHG reduct.** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2014 | 2015 | | | 2016 | | | 2017 | | | |
| | | H | H | C | H | H | C | H | H | | | |
| 12-story 114-unit high-comfort - new | Oct.2014 | | | | | | | | | 2.5 | 797 | **1,993** |
| 12-story 66-unit high-comfort - new | Oct. 2015 | | | | | | | | | 1.5 | 280 | **420** |
| 9-story 54-unit residential typical - new | Oct. 2014 | | | | | | | | | 2.5 | 87 | **218** |
| 9-story 54-unit typical - renovation | May 2016 | | | | | | | | | 1 | 209 | **209** |
| 5-story 45-unit typical - renovation | May 2016 | | | | | | | | | 1 | 183 | **183** |
| 5-story 40-unit typical - renovation | May 2016 | | | | | | | | | 1 | 83 | **83** |
| | | | | | | | | | | | **1,640** | **3,106** |

**Notes:**

- In column "Years" numbers of full years (meaning whole length of heating and cooling seasons) from completion to May 1, 2017 are presented
- Full heating season but no cooling season is conservatively assumed as 0.5 year

This total GHG reductions due to the implementation of 6 pilot building projects estimated by the Consultant, 3,106 t $CO_2$ differs from its value presented in the report Summary of Project Results and Lessons Learned, according to which "The measured direct savings from the project are limited to the demonstration projects, … about 2.2 GWh of heat energy and 1.4 GWh of electricity saved per year, leading to avoided annual $CO_2$ emissions reductions of more than 1,640 tonnes per year, or a total of about 2,800 tonnes during the project period".

Another issue is related to the GHG reductions due to the implementation of new (revised) building code. The pilot buildings were not only the sources of GHG emission reductions. From one hand the afore mentioned report states that GHG reductions are generated by demo projects only (see the above citation), on the other hand it is stated in the same report that "Additional direct energy savings during the project period could be attributed to implementation of provisions of the revised codes SNT Residential Buildings (with its recommendations on creation of enclosed entryways) and SNT Roofs and Roofing (with its requirements for thermal insulation of roofs and roofing). Conservatively estimating only partial implementation of these codes during 2016 and 2017, the project team estimates further direct $CO_2$ emissions reductions of about 3000 tonnes". It is unclear, why (based on which considerations) the reductions due to the building codes are attributed only to 2016 and 2017 but not beyond the duration of EERB Project.

It must be noted that there is one more of source of GHG direct reduction, due to the implementation of advanced energy management in the Koshi micro-district. In particular, due to the automated heat control energy production and delivery has been optimized, that certainly would lead to the GHG reductions. As stated in the abovementioned report the original design of those buildings in Koshi considered automated controls of the heating system, but such controls were absent, until the EERB Project installed them in late 2016. This means that installation of automated heat control was not enforces and probably the baseline scenario would be without such control. Then the attributed GHG reductions should be considered as Direct Project emissions reductions. It is stated in the brochure "Key Achievements of the EERB Project" that implementation of Energy management system for

collection and transmittal of data for energy consumption together with automatic heat supply controls will lead to energy savings for heating and cooling by 16-20%.

**It is Consultant's opinion that the target, reduction of direct GHG emissions from residential sector of Turkmenistan, as a result of the project over 20 years, has been achieved**

**Pilot project in the Koshi microdistrict of Ashgabat**

The centerpiece of the project's work on energy management is a pilot project, added as an activity based on the clear need to test and clarify the concept in order to create a basis for implementation.

This project began with energy audits of five neighboring buildings, with subsequent monitoring and control of heat supply over two heating and cooling seasons.

The pilot involves the installation of thermostatic controls for each building, as well as automated data collection in which data loggers are connected to a central data repository via Ethernet cables.

Data were regularly collected from all five Koshi buildings, as well as the boiler house that serves them. (Such remote collection of energy-consumption data was in itself completely new in Turkmenistan.) Then the data were delivered to the Ashgabat heat utility Ashgabatteplo, to provide a basis for optimizing heat energy production and delivery.

*Summary of Project Results and Lessons Learned, p.10*

**Indirect GHG reductions**

The target for the indirect GHG emissions is not explicitly established in the ProDoc; it is just stated that with consideration of indirect emission reductions the cost per tonne of abatement is estimated at USD 1.11-1.13/tCO2. The most recent GEF Guidelines[14] recommend the use of a term "consequential emissions" instead of the previously used "indirect emissions". Consequential GHG emission reductions are determined as those projected emissions that could result from a broader adoption of the outcomes of a GEF project plus longer-term emission reductions from behavioral change.

There are at least two sources of GHG reductions, which don't generate reductions yet but will do it after EERB Project end:

- The EERB Project has developed EE designs for 11 types of single-family homes. Although a certain level of GHG reductions is expected from compliance with the revised building codes, further reductions are expected, because energy savings due to the EE designs exceed those ones due to the compliance with building codes. Calculated energy consumption for heating and ventilation of the revised designs was reduced by an average of 57%, and cooling energy consumption reduced by an average of 40%[15]
- Similarly, a multifamily building designed in compliance with building codes might achieve a certain level of energy savings, but with application of thermal-bridge solutions, major additional savings could be achieved

Other source of consequential reductions could be adoption and implementation of the National Action Plan for Rational Use of Energy in the residential building sector developed by the EERB Project.

[14] Guidelines for Greenhouse Gas Emissions Accounting and Reporting for GEF Projects - Findings and Recommendations of GEF Working Groups, 2015

[15] Summary of Project Results and Lessons Learned

Consequential GHG reductions are estimated as:

- Due to application of new building code requirements and thermal-bridge solutions in new buildings, additional measures of the 11 revised designs of single-family homes, and heat controls for new and existing buildings - approximately 1.4 million tonnes of $CO_2$
- Modernization of existing buildings via investments recommended in the National Action Plan, beyond the heat controls already included in the figures above 2.5 million tonnes of additional CO2 emissions reductions from.

### Objective. Target 2: 5,133 thousand $m^3$ of natural gas saved annually as a direct result of the project

This target was overestimated due to very high energy demand in the baseline scenario developed during the EERB Project implementation. In particular, annual consumption of 20,133,425 $m^3$ of natural gas was expected by the pilot projects. As shown above application of the overestimated demand in the baseline led to very high annually expected GHG reductions compared with the reductions estimated based on the monitoring data (10,143 $tCO_2$ vs. 1,640 $tCO_2$). The same proportion would be with regard this target (savings - 5,133,000 $m^3$) and thus, **it is Consultant's opinion that similarly to GHG reduction target, this target also has been achieved**. Exact value of the natural gas saved will be presented in PIR 2017.

### Objective. Target 3: USD 40 million co-financing leveraged for investments in EE reconstruction of existing buildings and construction of new EE housing stock (i.e. beyond existing building code requirements)

This target was largely exceeded and Government co-financing equaled to about USD 63 million, out of which: about USD 38 million, USD 21 million and USD 3 million for construction of new buildings; about 1.1 million for renovation of existing buildings.

**Based on the abovementioned the achievement of the Objective is rated as Satisfactory (S).**

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| | ✓ | | | | |

### Outcome 1: Energy consumption in new buildings is reduced beyond current requirements

The EERB Project was very successful in implementation of Component 1 and thus achieving of Outcome 1. As already stated in Chapter 3.2.3 after revision of the LogFrame more ambitious targets have been established and among them building codes were revised, approved and are being in use while the ProDoc considered development and introduction of "At least one policy tool to encourage more efficient residential construction".

As mentioned in Chapter 3.2.1 revised outputs are discussed in the Inception report but they are not presented in a LogFrame and thus, indicators and targets are not established for them. Nevertheless, the Consultant has evaluated not only Outcome, for which indicators and targets were established, but also outputs:

- More stringent requirements for energy performance in buildings are adopted and supporting capacity for building code enforcement is strengthened

- Energy passport system and other policy tools to promote and enforce more energy efficient construction
- Development of new official normative document providing guidance on EE building design and compliance with new and revised codes, as building design beyond code requirements

### *Revision and implementation of building energy codes*

In collaboration with Turkmendovlettaslama, revisions to four codes were prepared: "Roofs and Roofing", which was approved by Ministry of Justice on 30 April 2015, "Residential Buildings", approved on 26 October 2015, "Building Climatology", approved on 8 October 2016, and "Building Thermal Engineering", which has been technically cleared by the Scientific-Technical Council of the Ministry of Construction and Architecture, and now awaits final approval by the Ministry of Justice. Key revisions include the following:

- **Residential Buildings**
  - ✓ New recommendation to include vestibules (enclosed entryways) – energy savings up to 4%
  - ✓ New requirement to use energy-efficient fixtures with compact fluorescent lamps or light-emitting diodes, combined with motion sensors, for lighting of stairwells, elevators, and corridors – reduction of electricity consumption by 75-90%
- **Roofs and Roofing**
  - ✓ A new section "Thermal Insulation of Roofs and Roofing" has been added, which includes:
    - Mandatory requirements for design roofs and roofing materials for thermal insulation
    - Requirements for preliminary auditing of existing buildings before planning and implementation of renovation
- **Building Climatology**
  - ✓ Outdated climate data were updated that increases the credibility and effectiveness of all energy-related aspects of building design
- **Building Thermal Engineering -** the most important of all four codes in terms of EE implications. The revisions include:
  - ✓ Increase of stringency for thermal resistance for all major building envelope elements (roofs, attics, walls, windows, entry doors) - expected heat energy savings 26-42%
  - ✓ Introduction of a new whole-building parameters for energy consumption for heating, ventilation, and cooling, which take into account not only thermal resistance of the building envelope, but also building geometry and solar gains
  - ✓ A new energy rating system with regard to both whole-building energy consumption and consumption for specific end uses
  - ✓ A new form and instructions for filling out the Energy Passport, a documentation system for building energy performance

### *Supporting compliance*

The EERB Project assisted building designers in ensuring compliance with the revised building codes by:

- **Preparation of guidance manuals -** Three guidance manuals on the revised codes *Residential Buildings, Roofs and Roofing,* and *Building Thermal Engineering.* The manuals explain new code requirements and provide concrete recommended examples of design solutions and materials that can be used to achieve compliance. The manuals also provide guidance on technical calculations of energy consumption and other parameters
- **Preparation of compendium of solutions to thermal bridges at joints in building envelopes -** how significant energy savings can be achieved at relatively little or no cost. The compendium is the first of its kind in Central Asia. It has been submitted to the Ministry of Construction and Architecture for approval and publication
- **Development of Energy Passport documentation system for buildings in Excel spreadsheet** - useful tool for building designers. A system for archiving Energy Passport data from many buildings using MS Access also was developed. The Energy Passport system has been submitted to the Ministry of Construction and Architecture for distribution to design agencies upon final registration of the revised code *Building Thermal Engineering*

### *New energy-efficiency enhancements to typical designs for single-family residential buildings*

The pace of single-family house construction is proceeding rapidly in Turkmenistan. According to the National Program for Development of Social and Household Conditions in Rural Areas more than 900,000 $m^2$ of new construction in 2017, rising to more than 2 million $m^2$ per year starting in 2020. Before 2016, there were no existing approved designs in Turkmenistan for EE designs of these houses and thus, the EERB project developed relatively simple additions to the most commonly-used existing designs, aimed at increasing their thermal efficiency to ensure code compliance. Many of these additional measures are analogous to those applied in the 6 pilot buildings. These measures were integrated in existing designs, 11 new designs in total. Calculated energy consumption for heating and ventilation of the revised designs is below the baseline (original design) by an average of 57% and cooling energy consumption reduced by an average of 40%. It must be noted that in order to establish baseline levels, the monitoring on energy consumption is ongoing in two of the most common single-family homes.

**Based on the abovementioned the achievement of the Outcome 1 is rated as Highly Satisfactory (HS).**

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| ✓ | | | | | |

### Outcome 2: Turkmengas and other national agencies understand the potential for savings in its housing stock and have the capacity to identify and undertake investments in EE there

The EERB Project successfully has implemented activities under the Component 2 and expected Outcome 2 has been achieved. First of all, it must be noted that after the revision of LogFrame, the Outcome 2 became more clear and focused, compared with the original one, which considered implementation of Demand-side management partnership with Turkmengas.

The revised Outputs of Component 2 (as mentioned above, indicators and targets weren't established for them) are as follows:

Output 2.1: Analysis conducted on the most cost-effective means of reducing energy consumption in the residential sector

Output 2.2: Responsible staff is trained in energy management and the identification of energy savings in the housing stock

Output 2.3: Investment plan for reducing energy losses for the housing stock that Turkmengaz supplies with natural gas in Ashgabat

The following has been achieved:

### *Energy audits*

The works on introducing building energy audits included:

- Development of a methodology - official provisions (instructions)
- Implementation of energy audits in 2 new pilot buildings and 3 retrofits as well as in 3 similar buildings
- Implementation of energy audits for 22 buildings in 9 cities of Turkmenistan, with recommendations on the most cost-effective EE retrofits
- Training of professionals in energy audit
- 5 training seminars for 100 specialists and 1 national seminar on energy audit of existing residential buildings

### *Energy management*

The EERB Project has introduced a concept of energy management as an on-going process aimed at improvement of energy performance in existing buildings via systematic monitoring and analysis of the performance.

The energy management has been demonstrated through the additional (not planned in the ProDoc) pilot project in the Koshi microdistrict of Ashgabat, to test and clarify the concept and thereby create a basis for implementation. This pilot project began with energy audits of five neighboring buildings, with subsequent monitoring over two heating and cooling seasons. The pilot involves the installation of thermostatic controls for each building, as well as automated data collection and delivery to the Ashgabat heat utility Ashgabatteplo, to provide a basis for optimizing heat energy production and delivery.

5 training seminars for 100 specialists and 1 national seminar were organized on energy management of existing residential buildings.

### *National Action Plan for Rational Use of Energy in Buildings*

The fruitful cooperation with the EERB Project Partners not only ensured achievement of the planned Outcomes and Outputs but also helped the Project Team to fully understand the process of decision making including on strategic matters. It was understood that:

- Neither Turkmengas nor other national agencies can decide unilaterally where to allocate their budget funds, especially for activities outside of core business (gas exploration, extraction, and delivery for the Turkmengas). This is a responsibility of the Cabinet of Ministers
- Even though Turkmengaz does have its own agencies responsible for construction and building utility services, the responsibility for most new construction in the country lies with the Ministry of Construction and the responsibility for renovating existing building stock lies with the Ministry of Communal Services

- Investment program for EE in buildings would require approval at the Cabinet of Ministers level and implementation - at the Ministry level, but wouldn't be implemented as a program of Turkmengaz

The above understanding led to the revision of this output in a way that its target is not an investment by Turkmengaz, but rather a national investment program and the target audience is not Turkmengaz's management, but rather decisionmakers at the Cabinet of Ministers level. Consequently, it was decided to elaborate a national plan that would include not only investment component but also other similar activities of the EERB Project. For this purpose, the following activities were implemented:

- Identification of technically and financially feasible measures - on the basis of the 22 energy audits in nine cities of Turkmenistan and cost-benefit analysis conducted by the International consultants
- Three scenarios for implementation of packages of EE measures were developed, each representing a different cost level, different time frames for implementation and different financing schemes. In total financial analysis has been conducted for 24 different scenarios, out of which several scenarios for EE were found financially feasible
- In parallel the EERB Project's efforts were resulted in the formation of a working group of high-ranking representatives of the Ministry of Finance (responsible for preparing the state budget), the Ministry of Construction and Architecture (responsible for new buildings and building codes), the Ministry of Communal Services (responsible for existing buildings, associated utility services and renovation), Turkmengaz, and others. The first meeting of the working group held in November 2015 discussed the National Action Plan for Rational Use of Energy in Buildings, prepared by the EERB Project. A final draft of the National Plan was completed in 2016. It is now under official review by ministries and agencies to be involved in implementation of the plan, but has not yet been officially adopted.

**Based on the abovementioned the achievement of the Outcome 2 is rated as Satisfactory (S).**

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| | ✓ | | | | |

### Outcome 3: EE design and technologies are incorporated and visually demonstrated in new and re-constructed residential buildings

Achievement of this Outcome was the main challenge of the EERB Project. In total 6 projects demonstrating EE design and technologies were planned in the ProDoc. Actually, 3 buildings of new construction, presented on Fig. 2 and 3 of building renovation, presented on Fig.3, were selected for implementation. Two newly constructed buildings are luxury buildings with unique designs; the third one represents a standard design for public housing. All three of the renovation pilot buildings represent standard building designs widely applied throughout the country. For all demonstration buildings, the EERB Project provided consultancy in the EE design and covered incremental costs of EE measures. Constructions/renovations of pilot buildings were completed and followed by subsequent monitoring of energy performance.

A. Niyazov Street 145 Oguzkhan Street 126 Parahat 7/2 microdistrict

***Figure 2: New pilot buildings***

Parahat 4/1 microdistrict Parahat 7/2 microdistrict Parahat 3/1 microdistrict

***Figure 3: Renovated pilot buildings***

The EE measures for two high-comfort buildings at Niyazov and Oguzkhan Streets, included: External mineral-wool insulation; Ventilated facades to prevent moisture damage to insulation; Windows with two-layer sealed glass units; Enhanced attic insulation made of domestic aerated-concrete pellets; Highly efficient local boiler and chiller systems with built-in controls; Highly efficient electric appliances (are provided as part of the sale of new apartments); Enclosure of balconies; etc. It must be noted that due to the existing restrictions/regulations (e.g. designed façade of the new building couldn't be changed) not all potential EE measures were planned and actually implemented.

Turkmengaz, as the client of the design and construction of the new buildings, covered almost all of the incremental costs of these measures.

Selection of EE measures for the "non-elite" buildings (one new and 3 renovated), was based on the consideration of initial costs. This factor is very important because due to the low energy tariffs and high costs of EE materials and equipment in Turkmenistan, payback period is very long and returns on investment are uncertain. The chosen measures included: Attic insulation; Low-emissivity window films; Enclosure of entryways; Controls at the heat point of the building; Heat-reflective panels behind radiators; LED lamps and motion sensors in common areas.

One project, involving energy management in the Koshi residential micro-district of Ashgabat, described above, also was implemented.

### *Monitoring and evaluation*

The comprehensive monitoring plan has been developed and implemented. The monitoring included constant measurement of indoor air temperature; monthly measurement of humidity and indoor air flow; consumption of heat energy, electricity, and natural gas, via monthly readings of records of meters installed specifically for these pilot projects.

The results of monitoring as well as summary evaluation of results are presented in Tab. 9 above, which show that established targets of energy savings have been exceeded. Specific energy saving (for 1 m2 of area) compared with the baseline, for new buildings equals on average to 37% and for renovated buildings - 48%; corresponding emission reductions equal to 42% and 55% respectively.

**All the above-mentioned demonstrates that EE design and technologies are incorporated and visually demonstrated in new and reconstructed residential buildings and thus, the achievement of the Outcome 3 is rated as Satisfactory (S).**

## Outcome 4: Replication facilitated via development of skills, prototype designs and policies for energy-efficient buildings

The goals of the activities under the Component 4 are: (i) to create capacity within the design institutes and major housing developers and encourage them in incorporating advanced EE in residential building design; and (ii) Results/Lessons learned/Recommendations from the EERB Project to be incorporated into government EE policies and programs.

### *Building capacity of design institutes and major housing developers*

The EERB Project has implemented a solid training programme including:

- Creation of a new classroom training module on EE in buildings, which has been officially approved and included in the curriculum in the Turkmen State Institute for Architecture and Construction (TSIAC); The revised curriculum and the accompanied materials are approved by the Ministry of Education and ordered for immediate use in 2016. This module includes lecture materials and practical work, as well as laboratory training. The EERB Project transferred energy audit equipment to this laboratory
- Delivery of training on EE to eight instructors at TSIAC, to prepare them to teach the module. EERB Project staff served as advisors to two students in preparation of diploma projects on EE in buildings
- Delivery of training to hundreds of building professionals on EE residential building design
- Organization of 4 study tours for selected professionals from key government agencies and design institutes to Germany and Denmark, Croatia, Belarus, and Russia, on building codes and regulations; design, construction, and operation of EE buildings; energy audit and EE renovation of existing buildings; energy management; effects of energy efficiency on economic development; tariff reform policy; and general establishment of professional linkages and collaboration

### *Results/Lessons learned/Recommendations from the EERB Project to be incorporated into government EE policies and programs*

The EERB Project has established a regular communication on project activities with high-level officials at Ministry of Construction and Architecture, Ministry of Communal Services, Turkmengas, Municipality of Ashgabat, leading design agencies, etc. This communication helped the EERB Project to

identify needs of policy decision makers and implementers not only in strengthening their capabilities in design, construction of buildings including heating and cooling systems but also their awareness on international EE policy tools and best practices, Results/Lessons learned/Recommendations from the EERB Project. To address these needs the following activities have been implemented:

- An international conference Improving Energy Efficiency in Residential Building Sector of Turkmenistan has been organized on 3-4 May 2017. The conference was attended by 75 participants representing international and national organizations including sectoral Ministries, international and national experts, Project Partners, donors and also similar UNDP-GEF projects. The goal of the conference was to present international experiences and results of EERB Project for further application in Turkmenistan
- Some results of the EERB Project are already incorporated into the EE policies and programs: New/revised building codes, National Action Plan for Rational Use of Energy in Buildings. It is expected that they will be incorporated in other official documents as well, e.g. INDC (when revised), National Action Plan for implementation of National Climate Change Strategy (CPAP 2016-2020 considers implementation of a new program "National Economic Program of Action on Adaptation and Mitigation to Climate Change)
- The EERB Project recently (in May 2017) has prepared a report "Summary of Project Results and Lessons Learned", which describes barrier removal process, summarizes results achieved and lessons learned. This report also will provide valuable inputs to the elaboration of both, EE policy and tools/programmes/action plans for its implementation.

**Based on the abovementioned the achievement of the Outcome 4 is rated as Satisfactory (S).**

| Highly Satisfactory | Satisfactory | Moderately Satisfactory | Moderately Unsatisfactory | Unsatisfactory | Highly Unsatisfactory |
|---|---|---|---|---|---|
| | ✓ | | | | |

Finally, the Consultant agrees with the PIRs and report "Summary of Project Results and Lessons Learned", which state that the EERB Project has introduced several activities not explicitly mentioned in the original ProDoc (Addition of energy-efficient features to 11 single-family house designs, Creation of a software version of the Energy Passport documentation system, Creation of a compendium of design solutions for thermal bridges, Elaboration of the National Action Plan for Rational Use of Energy in Buildings, Execution of a pilot project on energy management, Development and pilot deployment of a domestically-produced heat control device), with full recognition of the associated risks. Otherwise those additional activities would not be successfully implemented.

### 3.3.2 Relevance (*)

Relevance of the problem addressed by the EERB Project is already demonstrated above in introduction to Chapter 2 and Chapter 3.1. During the TE mission the Consultant has got evidences that achieved results are also relevant to the priorities of both, Government of Turkmenistan and UNDP.

Representatives of ERRB Project Partner organizations, who participated in the International Conference Improving Energy Efficiency in Residential Building Sector of Turkmenistan, held during the TE mission, in their presentations were underlining that the EERB Project was highly relevant to the country. The Stakeholders interviewed also unanimously agreed on that. In fact, one of the changes attributed to the EERB Project was the treatment of energy efficiency more broadly as a "hot topic" at

the highest levels of government. While the EERB Project provided specific advice and support in revising building codes and improvements in energy management, it improved visibility of an issue that is fully relevant to the country's climate change strategy priorities. This relevance is evidenced by the fact that not only building codes but also all activities planned for the implementation were approved by the respective Governmental institutions, mostly at the ministry level.

The project has also been highly relevant to UNDP activities in Turkmenistan. The UNDAF for 2016-2020, which has been developed during the implementation of EERB Project, includes Energy Efficiency among the priorities. Under the Strategic Area 3: Environmental Sustainability and Energy Efficiency, the Outcome 5 considers the national policy, legislative and institutional frameworks, aligned to reduce GHG emissions and to promote EE, the use of RES, urban development and waste management

GHG emissions reduction is the priority of CPAP 2016-2020, in Section 4.4 EE and its management is mentioned as a Priority 1. It is also stated there that "The awareness raised in the previous cooperation and the results of piloting of EE measures in the residential buildings are solid foundations to scale-up low-emission work".

**Based on the abovementioned the Relevance is rated as Relevant (R).**

| Relevant (R) | Not Relevant (NR) |
|---|---|
| ✓ | |

### 3.3.3 Effectiveness & Efficiency (*)

#### Effectiveness

The EERB Project has reached its overall Objective to reduce GHG emissions in residential building sector of Turkmenistan. It also laid down the necessary framework: revised building codes address EE issue; building codes are developed, adopted and being implemented. In parallel, necessary local capacity has been created and relevant tools developed. The EERB Project also created the prerequisites for reducing of energy consumption and thus GHG emissions, beyond the building code requirements. And finally, the EERB Project has implemented a number of activities not planned in the original ProDoc, but results of which greatly contributed to the scaling-up of the application of EE practices in the residential housing in a sustainable way. EERB Project Objective and Outcomes have been achieved; the most of established targets have been exceeded.

One more benefit of the EERB Project, and particularly of 6 pilot projects, is that baseline consumption of natural gas and electricity for additional heating (above the heat supply by the utility), has been reduced due to the implementation of EE measures. This, in turn, not only increased a level of comfort of residents (less indoor pollution due to less gas consumption; switching on and off of heaters) but also generate revenues due to the avoidance of purchase of electric heaters (or heaters with less capacity, which cost cheaper, will be required) and gas heaters (if any). Unlikely the tariff for electricity, the costs of electric heaters are not subsidized by the State but market-driven.

Considering the above mentioned, the Effectiveness of the EERB Project in achieving the Objective, is doubtless.

#### Efficiency

The EERB Project leveraged necessary financial resources (from Turkmengas) and support (from EERB Project Partners). The efficiency of the financial management of the EERB Project was evidenced by its ability to meet all of the procurement needs not only for initially planned activities (original ProDoc)

but also additional ones practically within the original budget (GEF resources were used as planned; UNDP contributed by about USD 129,000 instead of initially planned USD 100,000). This shows that decision on extension of the duration of EERB Project without cost extension, was appropriate.

UNDP and Turkmengas worked closely and intensively together in order to ensure that the highly complex process of tendering and procurement for the pilot buildings complied with both the existing government regulations for Turkmenistan and UNDP procedures. Relevant norms and standards at the national and international level were met during the implementation of pilot projects.

Even though the cost of GHG reduction was not included into the list of indicators, nevertheless its consideration is useful for evaluation of the effectiveness. The costs of GHG reductions for new buildings are presented in Tab. 10.

***Table 10: Costs of GHG reduction for new construction pilot projects***

| Parameter | High-comfort residential building; Niyazov str. 145 | High-comfort residential building; Oguzkhan str. 126 | Residential building (typical standard design) Parahat 7/1 | **Total** | 3 renovated buildings |
|---|---|---|---|---|---|
| Investment costs, USD | 38,000,000 | 21,000,000 | 3,100,000 | **62,100,000** | 1,100,000 |
| Cost of EE measures, % of invecstment costs | 0.42% | 0.62% | 2.70% | | 12.54% |
| Costs of EE measures, USD | 159,600 | 130,200 | 83,700 | **373,500** | 137,945 |
| Annual GHG reduction, t $CO_2$ | 797 | 280 | 87 | **1,164** | 475 |
| Lifetime (20 y) GHG reduction, t $CO_2$ | 15,942 | 5,604 | 1,742 | **23,288** | 9,500 |
| **Cost of GHG reduction, USD / t CO2** | **10.01** | **23.23** | **48.05** | **16.04** | 14.51 |
| Number of apartments | 114 | 66 | 54 | **234** | 139 |
| Heated/cooled area, $m^2$ | 35,498 | 23,307 | 4,972 | **63,777** | 9,926 |
| Costs of EE measures per apartment, USD/apartment | 1,400 | 1,973 | 1,550 | **1,596** | 992 |
| Costs of EE measures per $m^2$, USD/$m^2$ | 4.50 | 5.59 | 16.83 | **5.86** | 13.90 |

The costs of GHG reduction vary significantly by buildings from 10 to 48 USD/t$CO_2$. The reason might be a big difference in specific costs of EE measures. Indeed, if the costs of EE measures per apartment don't differ significantly (vary from 1,400 to 1,973 USD/apartment), there is a big difference between costs of EE measures per square meter (4.50; 5.59 and 16.83 USD/$m^2$). Nevertheless, more detailed analysis is required to make any conclusion on this matter.

The costs of GHG reductions in ProDoc was estimated as USD 2,516,280 (GEF funding) / 202,866 t $CO_2$ (direct emission reductions) = 12.40 USD/t$CO_2$, which is lower than average cost of GHG reductions in newly constructed pilot buildings (16 USD/t$CO_2$) and renovated buildings as well (14.51 USD/t$CO_2$). However, as mentioned above, direct GHG reductions in ProDoc were largely overestimated and thus, the correctly estimated value should be much higher than 12.40 USD/t$CO_2$.

As mentioned above, more results (compared with ProDoc) have been achieved practically at the same costs. However, it took longer time due to the several reasons and the duration of EERB Project has been extended by 1.5 years.

**Based on the above mentioned the Effectiveness & Efficiency is rated as Satisfactory (S).**

| Highly Satisfactory (HS) | Satisfactory (S) | Moderately Satisfactory (MS) | Moderately Unsatisfactory (MU) | Unsatisfactory (U) | Highly Unsatisfactory (HU) |
|---|---|---|---|---|---|
| | ✓ | | | | |

### 3.3.4 Country ownership

In the ProDoc a main role for the implementation was given to the state concern Turkmengaz. Although Turkmengaz was successful as an Executing Agency of the EERB Project, the state policy in the building sector is the responsibility of the Ministry of Construction (for new buildings) and the Ministry of Communal Services (for existing buildings); both in turn receive their policy mandates from the Cabinet of Ministers. Therefore, the success of the EERB Project was depending on support from these two ministries and the Cabinet.

Country ownership for this EERB Project was conditioned whether the EE belongs to the high priorities. Until the approval of the National Climate Change Strategy (NCCS), climate change mitigation, including through the improvement of EE, was not in the top priorities. Moreover, the necessity of EE improvement could be justified neither economically (because of abundant natural gas resources) nor financially (because of very low tariffs). Thus, at both the state level and the residents level, there was little impetus for energy savings. Last years this situation is changing. At the initiative of the President of Turkmenistan, the country is moving cautiously toward a transition to a market economy. The discussions about the possibility of gradual removal of subsidies for heat, gas, electricity, and water are initiated. Naturally, these processes led to the increase of the country ownership toward the EERB Project. As a result, all major activities of the EERB Project were approved by the ministries, building codes were developed with involvement from government officials.

### 3.3.5 Mainstreaming

The EERB Project is successfully mainstreaming other UNDP priorities. In particular:

- The EERB Project helped in job creation (EE measures were implemented by the local contractors by using local materials)
- The policy framework has been improved (revised building codes)
- EERB Project catalyzed integration of climate change mitigation into national strategies, and planning in the building sector
- EERB Project delivered education and raised capacity of aspiring and practicing professionals, as well as decision makers, with regard to climate change mitigation in the building sector
- Impact on environment has been released (less GHG, less air pollutants due to the energy savings)
- The EERB Project objectives conform to agreed priorities in the UNDAF and CPAP
- Gender issues - while gender issues were not taken directly into account in ProDoc, EERB Project staffing was balanced; trainings involved representative numbers of women and men

### 3.3.6 Sustainability (*)

The EERB Project has been designed to deliver sustainable impact in Turkmenistan. As stated in the UNDP-GEF guideline for TE, sustainability is generally considered to be the likelihood of continued benefits after the project ends. Consequently, the assessment of sustainability considers the risks that are likely to affect the continuation of project outcomes.

**Financial risks**

Question[16]: Are there financial risks that may jeopardize the sustainability of project outcomes?

Answer: There are two types of such risks. First one is related to the scale of investments in EE buildings by the State and the second one - to the lack of financial incentives of the residents in investing in EE measures. There is no risk related to the lack of finances for further revising of building codes

Question: What is the likelihood of financial and economic resources not being available once GEF grant assistance ends? (This might include funding through government - in the form of direct subsidies, or tax incentives, it may involve support from other donors, and also the private sector. The analysis could also point to macroeconomic factors.)?

Answer: The first risk mentioned above, is conditioned by two factors, whether the EE will remain in the future as a priority, and whether there will be available budgetary resources for construction and renovation of residential buildings. The likelihood of the first factor is high while the second one depends on overall economic situation, which in turn, at the certain extend, on gas exports. If the official plans regarding exports of natural gas will be implemented (likely to happen) the investing in the residential housing by the state institutions (ministries, stated-owned concerns and companies) likely will be continued. There is no risk that constructions and renovations will not include EE measures prescribed in building codes because in the reality of Turkmenistan, the implementation of legal and regulatory requirements are always enforced. As for the willingness of private companies (if any), condominiums or individual residents to invest in EE measures in their apartments/houses, it will depend on financial feasibility of such measure, which will be questionable unless the energy tariffs are at least closer to their production costs. However, the share of private investments is negligible in this sector and thus will have a limited impact on overall scale of investments.

**Based on the above-mentioned the Financial Risks are negligible and the sustainability is rated as Likely (L)**

| Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|
| ✓ | | | |

**Socio-economic risks**

Question: Are there social or political risks that may threaten the sustainability of project outcomes? What is the risk for instance that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained?

Answer: The social risk is identified neither by the EERB Project nor the Consultant. Only the political risk identified in the beginning of the EERB Project, was related to willingness of the Government to approve building codes. This risk doesn't exist at present.

Question: Do the various key stakeholders see that it is in their interest that the project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?

Answer: Certainly yes, stakeholders are interested in EE in residential sector because this will facilitate the implementation of the National Climate Change Strategy (Government), increase the

[16] Questions are taken from the Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects

natural gas export potential (Turkmengas), further application of best design and energy management practices (Design, academic institutes), improvement of energy statistics through energy passport system.

**Based on the above-mentioned the Socio-economic Risks are negligible and the sustainability is rated as Likely (L)**

| Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|
| ✓ | | | |

**Institutional framework and governance risks**

Question: Do the legal frameworks, policies and governance structures and processes, within which the project operates, pose risks that may jeopardize sustenance of project benefits?

Answer: There are no such risks existing at present.

Question: Are requisite systems for accountability and transparency, and required technical knowhow, in place?

Answer: Certainly yes

**Based on the above-mentioned the Institutional framework and governance risks are negligible and the sustainability is rated as Likely (L)**

| Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|
| ✓ | | | |

**Environmental risks to sustainability**

Question: Are there ongoing activities that may pose an environmental threat to the sustainability of project outcomes? For example, biodiversity-related gains or water quality-related gains at risk due to frequent severe storms?

Answer: No, there are no such activities.

**Based on the above-mentioned the Environmental risks are negligible and the sustainability is rated as Likely (L)**

| Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|
| ✓ | | | |

**Overall rating: All the associated risks are negligible and thus, the overall rating for Sustainability is Likely (L)**

| Likely (L) | Moderately Likely (ML) | Moderately Unlikely (MS) | Unlikely (U) |
|---|---|---|---|
| ✓ | | | |

### 3.3.7 Impact

The EERB project has made major and unprecedented advances in promoting EE in the residential building sector of Turkmenistan especially considering the starting point and the baseline scenario, in which EE was minimally reflected in national policy, investment, educational curricula, and design practice.

Many outputs of the EERB Project were first time achieved in Turkmenista – the first pilot/demonstration projects on EE in buildings; the first building code based on whole-building energy performance; the first Energy Passport system for documenting and calculating performance; the first EE cottage designs; and the first curricula for higher education on EE in buildings. These outcomes along with created local capacity created a foundation for real changes in practice in the country and the most important change is the increased national-level and agency-level ownership of energy efficiency as an issue. The EERB Project managed to change people's thinking and perception of energy savings.

The activities implemented by the EERB Project led to the development of the National Climate Change Strategy; indirectly promoted the envisioned gradual transition to realistic tariffs. The results of the EERB Project form a basis for sectoral action plans that would provide inputs to Turkmenistan's (revised in the future) Intended Nationally Determined Contributions (INDCs) as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC).

# 4. Conclusions, Recommendations & Lessons

## Conclusions

Overall, this EERB Project has had a substantial, sustainable effect on improvement of energy efficiency in residential buildings sector in Turkmenistan. Through the updating the regulatory framework it has improved design standards; through the implementation of pilot projects it demonstrated the best practices of design, energy performance and energy management in new/renovated residential buildings; and through the capacity building activities and outreach program created a local capacity and capabilities of local dedicated institutions and professionals for replication and scaling up of these activities in the sustainable way.

The EERB Project has demonstrated efficient, adaptive management in a very complex operating environment. The EERB Project team has effectively addressed and managed identified the differences between the situation during the preparatory and inception phases. It effectively managed identified issues and risks.

EERB Project used at the maximum extend the extension to finalize all the activities, implement comprehensive monitoring and evaluation of the results and thereby achieve the expected Outcomes.

**The overall rating of the project is Satisfactory.**

The project delivered most of planned results, although not all of them on time. Among them:

- Building codes Residential Buildings, Roofs and Roofing and Building Climatology have been reviewed and adopted; Adoption of the Building code, Building Thermal Engineering is in process. Guiding manuals and instructions to Building codes are also developed and either adopted or in process of adoption
- Methodology for energy audit in residential buildings has been developed; energy audit of 35 residential buildings conducted
- Energy Passport software tool developed and tested to accompany the revised building code Building thermal engineering. A system for archiving Energy Passport data from many buildings using MS Access also was developed – as mentioned by the International Consultant, under the guidance of which this tool has been developed, such a software and archiving of data aren't developed and used in his home country yet
- Due to the adequate Monitoring & Evaluation the energy savings and GHG reductions achieved due to the implementation of pilot projects – construction of new and renovation of existing buildings - are measurable and can be verified. GHG reduction targets established in the original LogFrame (in ProDoc) was objectively impossible to achieve because the baseline emissions in the ProDoc were largely overestimated
- Software Energy passports of buildings, also was developed
- 11 standard designs of cottages have been revised by integrating EE solutions
- 7 pilot projects have been implemented buildings (3 new buildings were constructed; 3 existing buildings renovated; automated heat control/regulation system has been installed in one group of residential buildings)
- National Action Plan for Rational Use of Energy in the Residential Sector has been developed

In addition to progress against the targets established in the LogFrame, the most significant changes due to the EERB Project activities, include putting of EE in high political agenda and creation of tools

and capacities for the implementation of adopted strategy documents (National strategy on Climate Change, Action plan on EE in buildings).

## 4.1 Corrective actions for the design, implementation, monitoring and evaluation of the project

### Design

**Corrective Action Request (CAR) for LogFrame**

CAR 1: Develop full-length LogFrame and include as an annex in report "Summary of Project Results and Lessons Learned"

Rationale: Inception report includes detailed description of changes in LogFrame at Outcome and Output levels. However, the LogFrame presented in it contains only Outcomes but not Outputs; ToR for TE includes changes in LogFrame only but not a full LogFrame; No other document related to the EERB Project, includes a full-length LogFrame (with Objective, Outcomes and Outputs).

CAR 2: Revise the GHG reduction target for the Objective (t $CO_2$ reduced)

Rationale: Baseline emissions are overestimated in the original LogFrame (details are presented on pp. 52-54)

Summary of Project Results and Lessons Learned doesn't contain table with GHG reduction numbers presented in GEF TT

### Monitoring and Evaluation

CAR 3: Calculate specific cost of GHG reduction (USD/t$CO_2$) for each EE measure in pilot buildings and include in "Summary Report on Monitoring of Pilot Buildings"

Rationale: This will help to rank these measures by the cost effectiveness, that will be useful for investors and designers

CAR 4: Revise a Section "Conclusions and lessons learned" of a report "Summary of Project Results and Lessons Learned" by using bullets for lessons learned

Rationale: This section does not provide in a compact form what exactly has been learned

## 4.2 Actions to follow up or reinforce initial benefits from the project

Recommendation 1: To conduct a survey in the 6 pilot buildings and also in the Koshi micro-district on: baseline and project level types and numbers of electric and gas heaters and their costs; whether the residents stopped using heaters for additional heating. Based on survey data, financial benefits due to the avoided purchase of heaters, can be estimated

Rationale: One of the benefits of the consideration of EE in pilot buildings is the sharp decrease of the additional heating by using electricity. However, electricity still is used for additional heating. Natural gas is also used for additional heating but only in renovated buildings (natural gas is not used in new buildings at all). Electric and gas appliances, used for additional heating might be electric and gas stoves used for cooking or electric and gas heaters. In the second case due to the already observed sharp reduction of additional heating, and eliminate of such need at all in case of automated heat control system, there will be no necessity to purchase heaters and significant expenses will be avoided.

Recommendation 2: Prepare a short version of the revised "Summary of Project Results and Lessons Learned" for the stakeholders

Rationale: Many results of the EERB Project have been achieved first time in Turkmenistan and it will be useful for future investors, designers and project developers to know not only the results of the EERB project but also be aware, what might be the major risks and how they could be mitigated, what are the key success factors, what kind of relationships had to be built, why the achievement of Outcomes has a positive impact on overall sustainable economic development, etc. Publishing of the short version of "Summary of Project Results and Lessons Learned", which will include key information and data from "Summary Report on Monitoring of Pilot Buildings" as an annex would be very useful.

## 4.3 Proposals for future directions underlining main objectives

The results of the EERB Project would create perfect platform for development of Programme of Activities (PoA) under the Clean Development Mechanism. Unfortunately, the current prices of Certified Emission Reductions are very low and will unlikely compensate even the costs of development of documents (design document, monitoring report) and corresponding procedures (validation, registration, issuance) requested for PoA and thus cannot be considered as a feasible option.

Alternatively, opportunities provided by the Green Climate Fund (GCF) might be used.

## 4.4 Best and worst practices in addressing issues relating to relevance, performance and success

It was expected that the construction of pilots will take long (PIF: The project will require significant time for the pilot buildings design and construction in order to address the principal-agent issues in the energy sector of Turkmenistan, the energy provider should be fully engaged in project implementation). Nevertheless, it took even longer. The delays were observed also in approval of building codes, construction plans, retrofits. Both, best and worst practices are directly related to the level of communication with the decision maker Partners to resolve timely the issues. It has been learned that continuous communication on a regular basis is necessary to keep key partners engaged.

# 5. Annexes

## Annex 1: ToR

### INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the *"Improving Energy Efficiency in the Residential Building Sector of Turkmenistan"* (PIMS #4134).

The essentials of the project to be evaluated are as follows:

### PROJECT SUMMARY TABLE

<table>
<tr><td>Project Title:</td><td colspan="5">Improving Energy Efficiency in the Residential Building Sector of Turkmenistan</td></tr>
<tr><td>GEF Project ID:</td><td>4097</td><td></td><td colspan="2"><u>at endorsement (Million US$)</u></td><td><u>at completion (Million US$)</u></td></tr>
<tr><td>UNDP Project ID:</td><td>4134</td><td>GEF financing:</td><td colspan="2">2,516,280</td><td>$ 2,516,280</td></tr>
<tr><td>Country:</td><td>Turkmenistan</td><td>IA/EA own:</td><td colspan="2">0</td><td>0</td></tr>
<tr><td>Region:</td><td>Europe and Central Asia</td><td>Government:</td><td colspan="2">43,687,000</td><td>63,272,300 (as of January 2017)</td></tr>
<tr><td>Focal Area:</td><td>Climate change</td><td>Other:</td><td colspan="2"></td><td></td></tr>
<tr><td>FA Objectives, (OP/SP):</td><td>CC-SP1</td><td>Total co-financing:</td><td colspan="2">43,687,000</td><td>63,272,300 (as of January 2017)</td></tr>
<tr><td>Executing Agency:</td><td>State Concern "Turkmengas"</td><td>Total Project Cost:</td><td colspan="2">46,203,280</td><td>65,788,580 (as of January 2017)</td></tr>
<tr><td rowspan="2">Other Partners involved:</td><td rowspan="2">Ministry of Construction and Architecture, Ministry of Communal Services, State Concern "Turkmen Oil and Gas Construction", Municipality of Ashgabat City, Turkmen State Architecture and Construction Institute</td><td colspan="2">ProDoc Signature (date project began):</td><td colspan="2">17/11/2011</td></tr>
<tr><td>(Operational) Closing Date:</td><td>Proposed:<br>31/12/2015</td><td>Actual:<br>30/06/2017</td></tr>
</table>

### OBJECTIVE AND SCOPE

The objective of the UNDP/GEF full-sized project Improving Energy Efficiency in the Residential Building Sector of Turkmenistan is to reduce greenhouse gas emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan.

The project has been designed to:

- strengthen building codes and associated normative documents on energy efficiency in buildings, develop capacity at Turkmengas State Corporation and other state entities to identify end-use energy savings in their housing stock and implement investments to reduce end-use energy consumption,
- introduce improved highly-efficient design measures to major housing designers and developers, and
- replicate these measures through protocols for energy-saving measures in prototype buildings and through mainstreaming EE issues into state construction and housing policies and programs.

The project seeks to reduce energy consumption and associated greenhouse gases in residential sector in Turkmenistan and is structured into four project components:

- Energy efficient building codes and supporting capacity strengthening
- Demand-side management: partnership with Turkmengas State Corporation
- Improved design measures for major residential building designers and developers
- Replication through partnership with other developers and support for policies that encourage energy efficiency.

At the beginning of the project, neither new construction nor refurbishment projects considered the energy performance of the buildings involved. The buildings being constructed and refurbished without any attention to energy efficiency were effectively "locking in" patterns of energy consumption – and associated greenhouse gas emissions -- for the next several decades at needlessly high levels. Even before the construction boom, emissions in the residential sector totaled more than 3 million tonnes of CO2, or nearly 10% of total CO2 emissions from fuel combustion. These emissions played an increasing role in the overall share of greenhouse gas emissions in Turkmenistan, and the residential sector was the third largest source of emissions in the country. Without intervention, these emissions will continue to grow unchecked.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects, which is accessible at http://web.undp.org/evaluation/guidance.shtml#gef.
The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

## EVALUATION APPROACH AND METHOD

An overall approach and method[17] for conducting project terminal evaluations of UNDP supported GEF financed projects have developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact,** as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects, which is accessible at http://web.undp.org/evaluation/guidance.shtml#gef A set of questions covering each of these criteria have been drafted and are included with this TOR (Annex C). The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is expected to conduct a field

[17] For additional information on methods, see the Handbook on Planning, Monitoring and Evaluating for Development Results, Chapter 7, pg. 163

mission to Ashgabat, Turkmenistan. Interviews will be held with the following organizations and individuals at a minimum: State Concern "Turkmengas", State Concern "Turkmen Oil and Gas Construction", Ministry of Construction and Architecture (Department of Capital Investments, State Design Institute "Turkmendovlettaslama"), Ministry of Communal Services (Department of residential buildings, Ashgabat Residential Administration), Municipality of Ashgabat City (Ashgabat Design Institute "Ashgabattaslama"), Turkmen State Architecture Construction Institute (Architecture Construction Department). Interviews for debriefing will be arranged with UNDP Turkmenistan Country Office and UNDP/GEF Istanbul Regional Hub, who is not involved in project implementation, but to whom the Evaluation Report to be prepared under Terms of Reference will be submitted.

The evaluator will review all relevant sources of information, such as the Country Programme Document (CPD) and Country Programme Action Plan (CPAP) for 2016 – 2020, the project document, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, GEF focal area tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in Annex B of this Terms of Reference.

## EVALUATION CRITERIA & RATINGS

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework (see Annex A), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact.** Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales are included in Annex D.

| **Evaluation Ratings:** | | | |
|---|---|---|---|
| **1. Monitoring and Evaluation** | ***rating*** | **2. IA& EA Execution** | ***rating*** |
| M&E design at entry | | Quality of UNDP Implementation | |
| M&E Plan Implementation | | Quality of Execution - Executing Agency | |
| Overall quality of M&E | | Overall quality of Implementation / Execution | |
| **3. Assessment of Outcomes** | **rating** | **4. Sustainability** | **rating** |
| Relevance | | Financial resources: | |
| Effectiveness | | Socio-political: | |
| Efficiency | | Institutional framework and governance: | |
| Overall Project Outcome Rating | | Environmental : | |
| | | Overall likelihood of sustainability: | |

## PROJECT FINANCE / COFINANCE

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

| Co-financing (type/source) | UNDP own financing (mill. US$) | | Government (mill. US$) | | Partner Agency (mill. US$) | | Total (mill. US$) | |
|---|---|---|---|---|---|---|---|---|
| | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual |
| Grants | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Loans/Concessions | | | | | | | | |
| • In-kind support | 100,000 | 128,751 (as of January 2017) | 43,687,000 | 63,272,300 (as of January 2017) | | | 43,787,000 | 63,401,051 |
| • Other | | | | | | | | |
| Totals | 100,000 | 128,751 | 43,687,000 | 63,272,300 | | | 43,787,000 | 63,401,051 |

## MAINSTREAMING

UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender.

## IMPACT

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.[18]

## CONCLUSIONS, RECOMMENDATIONS & LESSONS

The evaluation report must include a chapter providing a set of **conclusions**, **recommendations** and **lessons**.

## IMPLEMENTATION ARRANGEMENTS

The principal responsibility for managing this evaluation resides with the UNDP CO in Turkmenistan. The UNDP CO will contract the evaluator and ensure the timely provision of per diems and travel arrangements within the country for the evaluator. The Project Team will be responsible for liaising with the Evaluator to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

## EVALUATION TIMEFRAME

The total duration of the evaluation will be 26 days according to the following plan:

| Activity | Timing |
|---|---|
| **Preparation** | *3* days |
| **Evaluation Mission** | *11* days |
| **Draft Evaluation Report** | *9* days |
| **Final Report** | *3* days |

## EVALUATION DELIVERABLES

The evaluation team is expected to deliver the following:

| Deliverable | Content | Timing | Responsibilities |
|---|---|---|---|

[18] A useful tool for gauging progress to impact is the Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office: ROTI Handbook 2009

| | | | |
|---|---|---|---|
| **Inception Report** | Evaluator provides clarifications on timing and method | No later than 2 weeks before the evaluation mission. | Evaluator submits to UNDP CO |
| **Presentation** | Initial Findings | End of evaluation mission | To project management, UNDP CO |
| **Draft Final Report** | Full report, (per annexed template) with annexes | Within 3 weeks of the evaluation mission | Sent to CO, reviewed by RTA, PCU, GEF OFPs |
| **Final Report*** | Revised report | Within 1 week of receiving UNDP comments on draft | Sent to CO for uploading to UNDP ERC. |

*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report.

## TEAM COMPOSITION

The evaluation team will be composed of one (1) international consultant. The consultant shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. The evaluator selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

The Consultant must present the following qualifications:
**International Consultant (Team Leader)**
Duties and Responsibilities:

- Desk review of documents, development of draft methodology, detailed work plan and TE outline (maximum 3-day homework);
- Debriefing with UNDP CO, agreement on the methodology, scope and outline of the TE report (1 day);
- Interviews with project implementing partner (executing agency), relevant Government, NGO and donor representatives and UNDP/GEF Regional Technical Advisor (maximum 5.5 days);
- Field visit to the pilot project site and interviews (maximum 3.5 days);
- Debriefing with UNDP (1 day);
- Development and submission of the first TE report draft (maximum of 9 days). Submission is due on the 23rd day of the assignment. The draft will be shared with the UNDP CO, UNDP/GEF (UNDP/GEF RCU Istanbul) and key project stakeholders for review and commenting;
- Finalization and submission of the final TE report through incorporating suggestions received on the draft report (maximum 3 days).

Required Qualifications:

- Advanced university degree in construction, architecture, energy related issues or environmental science (20% of the technical score);
- At least 10 years of professional work experience in the building construction/maintenance and/or in energy efficiency initiatives (in the construction sector in particular) (15%);
- Experience in current best practices in energy-efficient building design, with regard to both heating and cooling as well as other relevant issues is an asset (10%);
- At least 5 years of proven experience in conducting relevant project evaluations; experience in evaluation of GEF-funded projects will be an asset (10%);
- Knowledge of UNDP and GEF;
- Familiarity with Results Based Management (RBM) approach;
- Familiarity with issues related to the UNFCCC will be a plus;
- Familiarity with greenhouse gas emission reduction calculations will be a plus;
- Conceptual thinking and analytical skills;
- Excellent English communication skills; strong writing and analytical skills coupled with experience in monitoring and evaluation techniques. Skill in written and spoken Russian is strongly preferred (10%);
- Computer literacy (5%).

## EVALUATOR ETHICS

Evaluation consultant will be held to the highest ethical standards and are required to sign a Code of Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluations', which can be accessed at http://www.unevaluation.org/document/detail/102

## PAYMENT MODALITIES AND SPECIFICATIONS

| % | Milestone |
|---|---|
| *50%* | Following submission and approval of the 1ST draft terminal evaluation report |
| *50%* | Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report |

## APPLICATION PROCESS

Individual consultants are invited to submit applications together with their CV for these positions by February 1st, 2017. The application should contain a current and complete C.V. in English with indication of the e-mail and phone contact. Shortlisted candidates will be requested to submit a price offer indicating the total cost of the assignment (including daily fee, per diem and travel costs) and methodology.

UNDP applies a fair and transparent selection process that will take into account the competencies/skills of the applicants as well as their financial proposals. Qualified women and members of social minorities are encouraged to apply.

Evaluation

The Individual will be evaluated against a combination of the Offerors' qualifications and financial proposal:

a) Technical criteria -70%, which includes:
   - appropriate education -20 %
   - relevant experience – 35 %
   - additional skills (language, etc.) – 15 %

b) Financial proposal – 30%

Additional requirements for recommended contractor

Recommended contractors aged 62 and older, if the travel is required, shall undergo a full medical examination including x-ray, and obtain medical clearance from the un-approved doctor prior to taking up their assignment. The medical examination is to be cleared by the un physicians, and shall be paid by the consultant.

## ANNEX A: LOGICAL FRAMEWORK MATRIX AND OUTPUTS – PROPOSED CHANGES

| | Indicator | Baseline | Target | Source of verification |
|---|---|---|---|---|
| **Project Goal:** Reduce greenhouse gas emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan | Reduction of direct GHG emissions from residential sector of Turkmenistan as a result of the project over 20 years, tCO2e | 0 | 202,866 tCO2e by the end of the project[1] | Energy savings (heating and cooling) from the re/constructed buildings and calculation based on transparent methodology |
| | Natural gas saved annually as a direct result of the project | 0 | 5 133 thousand m3 | Energy savings (heating and cooling) from the re/constructed buildings |
| | Co-financing leveraged for investments in energy efficient reconstruction of existing buildings and construction of new energy efficient housing stock (i.e. beyond existing building code requirements) | 0 | USD 40,000,000 | Contracts with suppliers, information from investors/developers |
| **Outcome 1:** Energy consumption in new buildings is reduced beyond current requirements | Existence and content of applicable building codes on building energy performance | No code on whole-building energy performance. Existing codes regulate thermal resistance of building elements, but not whole-building consumption per square meter. Resultant whole-building energy consumption levels under code compliance therefore vary from building to building<br><br>Existing thermal engineering code adopted in 1998 contains two levels of prescriptive thermal | New building energy efficiency code on whole-building thermal performance and revisions of existing building codes on roofs and roofing, residential buildings, and building climatology developed and implemented<br><br>New code requires heat energy consumption at or beyond Level 2 for all buildings (5 | Publication of official building codes. Official data on code compliance, with verification via interviews with officials and building designers, as well as possible selective field verification of buildings |

| | | | | |
|---|---|---|---|---|
| | | envelope requirements, Level 1 and Level 2. Buildings consume 35-70 percent less energy under Level 2 than under Level 1, but Level 2 is implemented in practice only for elite residential buildings, not common building designs for standard housing | to 10 percent less than Level 2 for elite residential buildings), with Level 1 compliance no longer applicable<br>Introduction of energy passport system in conjunction with adopted new and revised building codes | |
| **Outcome 2:** Turkmengas and other national agencies understand the potential for savings in its housing stock and have the capacity to identify and undertake investments in energy efficiency there. | Number of energy audits<br>Number of professionals trained<br>Existence and volume of activity of program, run and funded by Turkmengas and/or other state agencies, on energy efficiency investment in buildings | No audits, training, or investment program | 25 energy audits carried out by project (5 planned for 2013, 10 each for 2014 and 2015).<br>At least 30 professionals including Turkmengas staff trained<br>Short- and long-term investment plan for Turkmengas and Ashgabat housing stock developed , with EE design and/or retrofit carried out in at least 25 buildings by the end of the project | Review of project deliverables and documentation<br>Interviews with Turkmengas personnel |
| **Outcome 3:** Energy efficient design and technologies are incorporated and visually demonstrated in new and | Number of pilot buildings designed and built<br>Energy consumption of pilot buildings relative to similar new and existing | No demonstration buildings yet built or renovated<br>Baseline energy consumption to be determined by calculation based on assumed standard features, as well as code requirements and | New pilot buildings designed and constructed with calculated energy consumption 15 percent less than required by code, and five percent less than | Review of the project deliverables – building designs, interviews with designers, and results of monitoring |

| | | | | |
|---|---|---|---|---|
| reconstructed residential buildings | buildings in Turkmenistan | statistical data on analogous existing buildings if available | prevailing best practice for elite buildings<br>Three designs for reconstruction developed and implemented with at least 44%(1) energy consumption reduction | |
| **Outcome 4:**<br>Replication facilitated via development of skills, prototype designs and policies for energy efficient buildings | Number of architects, engineers, and students trained with regard to EE building design and code compliance<br>Existence and content of executive reports and briefings of decisionmakers on project findings, lessons learned and recommendations | No training on EE building design and code compliance<br>No formal delivery of information or advocacy to decisionmakers on EE buildings | Training on EE building re/construction, experience from implementing integrated building design delivered to at least 50 architects and/or engineers<br>Course materials on energy efficient building design and re/construction developed and delivered to at least 30 students by the end of Q4/2014<br>Executive reports and at least one high-level meeting on project findings, lessons learned and recommendations for policy makers developed and delivered to key governmental and regional policy makers by the end of the Q3/2015 | Review of project deliverables, participant rosters, interviews or surveys of participants |

## ANNEX B: LIST OF DOCUMENTS TO BE REVIEWED BY THE EVALUATORS

**The following documents can be used as a basis for evaluation of the project:**

| Document | Description |
|---|---|
| Project document | Project Document |
| Project reports | Inception Report<br>Mid-Term Evaluation<br>Annual work plans<br>Biannual reports by the International Chief Technical Advisor<br>Steering committee meeting minutes<br>Relevant tracking tools |
| Annual Project Report to GEF | PIR 2012 PIR 2013 PIR 2014 PIR 2015 PIR 2016 |
| Other relevant materials: | Project = outputs: key documents about project activities |

## ANNEX C: EVALUATION QUESTIONS

*This is a preliminary list, to be further detailed with more specific questions by CO and UNDP GEF Technical Adviser based on the particulars of the project.*

| Evaluative Criteria Questions | Indicators | Sources | Methodology |
|---|---|---|---|
| **Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?** | | | |
| • To what extent do the project design and implementation align with the main objectives of the GEF focal area (climate change mitigation)? | • Stated objectives of Project Document and GEF Focal Area Strategy | • GEF-5 Focal Area Strategy, Project Document | • |
| • To what extent do the project design and implementation align with national development priorities regarding climate change mitigation? | • Stated objectives of Project Document and national policies and strategies on climate change mitigation | • Project Document, national policies and strategies on climate change mitigation | • |
| • To what extent does the project fulfill other development priorities of Turkmenistan? | • Stated objectives of Project Document and national policies and strategies on economic development, construction, utility services, etc. | • Project Document, national policies and strategies on economic development, construction, utility services, etc. | • |
| **Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?** | | | |
| • Have the objectives, outcomes, and intended outputs been defined clearly and correctly? | • Objectives, outcomes, and outputs in Project Document and Annual Work Plans | • Project Document (especially Project Results Framework), Annual Work Plans | • |
| • To what extent has the project fulfilled its overall objectives in terms of climate change mitigation, and its component-specific outcomes? | • Various indicators for overall objectives and outcomes | • Annual Work Plans, Project Implementation Reviews, other project documentation, interviews | • |
| • To what extent has the project fulfilled its intended outputs effectively and in a timely way, as set forth in the Project Document and its Annual Work Plans? | Various indicators for outputs | • Annual Work Plans, Project Implementation Reviews, other project documentation, interviews | • |
| **Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?** | | | |
| • To what extent did the Project Manager, staff, consultants, national partners, and the UNDP Country Office carry out the work of the project with | • Content and timing of reported outputs, as compared with targets of Project | • Interviews, Project Implementation Reviews, other project documentation | • |

| | | | |
|---|---|---|---|
| efficiency, in terms of time and project funds? | Document and Annual Work Plans | | |
| • What, if any, were the main causes of any inefficiencies, delays, cost overruns, or other avoidable problems? | • Qualitative description and assessment | • Interviews, Project Implementation Reviews, other project documentation | • |
| • To what extent and to what degree of effectiveness did the project overcome obstacles and engage in adaptive management? | • Qualitative description and assessment | • Interviews, Project Implementation Reviews, other project documentation | • |
| Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results? | | | |
| • What institutions and mechanisms are in place to ensure that policies and regulations adopted because of project contributions are implemented after the project period? | • Existence and content of national policies defining agency responsibilities and mechanisms | • Policy documents | • |
| • What institutions and mechanisms are in place to ensure that technical practices in building design, energy audit, and energy management continue after the project period? | • Existence and content of standard designs, guidance materials, and curricula for technical professionals | • Technical building designs and guidance materials, approved higher-education curricula | • |
| • What are the opportunities and needs for subsequent scale-up? | • Qualitative description and assessment | • Interviews, national policies and strategies, programming documents of international agencies | • |
| **Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?** | | | |
| • What are the demonstrated and expected future results in terms of energy savings and avoided emissions? | • Energy savings (avoided MWh of heat energy, avoided MWh of electricity, avoided direct gas consumption) and avoided GHG emissions (tonnes of CO2 equivalent) | • Building code requirements; project analysis of building code requirements and demonstration project energy savings; calculations for new standard designs; projections of construction volumes and compliance rates | • To be elaborated and confirmed jointly by project team and Terminal Evaluation Consultant, in accordance with rules of GEF (see Climate Change Tracking Tool and GEF Scientific and Technical Advisory Panel assessment methodology) |
| • What are the other environmental benefits of the project, in terms of creation of enabling conditions for future progress, transformation of practice, building of capacity, and so on? | • Presence and content of national policies; survey responses and interview content from professionals who received training from project; other qualitative description and assessment | • Project documentation; interviews; national policy documents | • |

## ANNEX D: RATING SCALES

| ***Ratings for Outcomes, Effectiveness, Efficiency, M&E, I&E Execution*** | ***Sustainability ratings:*** | ***Relevance ratings*** |
|---|---|---|
| 6: Highly Satisfactory (HS): no shortcomings<br>5: Satisfactory (S): minor shortcomings<br>4: Moderately Satisfactory (MS)<br>3. Moderately Unsatisfactory (MU): significant shortcomings<br>2. Unsatisfactory (U): major problems<br>1. Highly Unsatisfactory (HU): severe problems | 4. Likely (L): negligible risks to sustainability<br>3. Moderately Likely (ML): moderate risks<br>2. Moderately Unlikely (MU): significant risks<br>1. Unlikely (U): severe risks | 2. Relevant (R)<br>1.. Not relevant (NR)<br>***Impact Ratings:***<br>3. Significant (S)<br>2. Minimal (M)<br>1. Negligible (N) |
| *Additional ratings where relevant:*<br>Not Applicable (N/A)<br>Unable to Assess (U/A | | |

## ANNEX E: EVALUATION CONSULTANT CODE OF CONDUCT AND AGREEMENT FORM

**Evaluators:**

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 imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

**Evaluation Consultant Agreement Form**[19]

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

**Name of Consultant:** _____

**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 *place* on *date*

Signature: _____

[19] www.unevaluation.org/unegcodeofconduct

## ANNEX F: EVALUATION REPORT OUTLINE[20]

**i.** Opening page:
- Title of UNDP supported GEF financed project
- UNDP and GEF project ID#s.
- Evaluation time frame and date of evaluation report
- Region and countries included in the project
- GEF Operational Program/Strategic Program
- Implementing Partner and other project partners
- Evaluation team members
- Acknowledgements

**ii.** Executive Summary
- Project Summary Table
- Project Description (brief)
- Evaluation Rating Table
- Summary of conclusions, recommendations and lessons

**iii.** Acronyms and Abbreviations
(See: UNDP Editorial Manual[21])

**1.** Introduction
- Purpose of the evaluation
- Scope & Methodology
- Structure of the evaluation report

**2.** Project description and development context
- Project start and duration
- Problems that the project sought to address
- Immediate and development objectives of the project
- Baseline Indicators established
- Main stakeholders
- Expected Results

**3.** Findings
(In addition to a descriptive assessment, all criteria marked with (*) must be rated[22])

**3.1** Project Design / Formulation
- Analysis of LFA/Results Framework (Project logic /strategy; Indicators)
- Assumptions and Risks
- Lessons from other relevant projects (e.g., same focal area) incorporated into project design
- Planned stakeholder participation
- Replication approach
- UNDP comparative advantage
- Linkages between project and other interventions within the sector
- Management arrangements

**3.2** Project Implementation
- Adaptive management (changes to the project design and project outputs during implementation)
- Partnership arrangements (with relevant stakeholders involved in the country/region)
- Feedback from M&E activities used for adaptive management
- Project Finance:
- Monitoring and evaluation: design at entry and implementation (*)
- UNDP and Implementing Partner implementation / execution (*) coordination, and operational issues

**3.3** Project Results

[20]The Report length should not exceed *40* pages in total (not including annexes).
[21] UNDP Style Manual, Office of Communications, Partnerships Bureau, updated November 2008
[22] Using a six-point rating scale: 6: Highly Satisfactory, 5: Satisfactory, 4: Marginally Satisfactory, 3: Marginally Unsatisfactory, 2: Unsatisfactory and 1: Highly Unsatisfactory, see section 3.5, page 37 for ratings explanations.

- Overall results (attainment of objectives) (*)
- Relevance (*)
- Effectiveness & Efficiency (*)
- Country ownership
- Mainstreaming
- Sustainability (*)
- Impact

**4.** Conclusions, Recommendations & Lessons

- Corrective actions for the design, implementation, monitoring and evaluation of the project
- Actions to follow up or reinforce initial benefits from the project
- Proposals for future directions underlining main objectives
- Best and worst practices in addressing issues relating to relevance, performance and success

**5.** Annexes

- ToR
- Itinerary
- List of persons interviewed
- Summary of field visits
- List of documents reviewed
- Evaluation Question Matrix
- Questionnaire used and summary of results
- Evaluation Consultant Agreement Form

## ANNEX G: EVALUATION REPORT CLEARANCE FORM

*(to be completed by CO and UNDP GEF Technical Adviser based in the region and included in the final document)*

Evaluation Report Reviewed and Cleared by
UNDP Country Office
Name: _____
Signature: _____ Date: _____
UNDP GEF RTA
Name: _____
Signature: _____ Date: _____

## Annex 2: Itinerary

The TE mission included meetings with UNDP CO Senior Management (Deputy Resident Representative); meetings and discussions with the Environment & Energy Programme Analyst, representative of UNDP/GEF Istanbul Regional Hub; meetings/interviews with the project staff (Project Manager, project Energy Audit expert) and project International consultants/experts (CTA, International sectoral experts); meetings/interviews with the key stakeholders; visits of pilot projects' sites. Details are presented in the below table.

| Time | |
|---|---|
| **Monday, 1 May 2017** | |
| | Arrival to Ashgabat |
| 12:00-18.00 | Desk work |
| **Tuesday, 2 May 2017** | |
| 9.00-11.00 | Meeting with EERB Project staff (I.Atamuradova, A.Zomov) |
| 11.00-13.00 | Meeting with International consultants (S.Terekhov, I.Terekhova) |
| 15.00-17.00 | Meeting with CTA (M.Chao) |
| **Wednesday, 3 May 2017** | |
| 9.00-18.00 | Participation in the International Conference organized by the ERRB Project |
| **Thursday, 4 May 2017** | |
| 9.00-17.00 | Pilot projects site visits |
| **Friday, 5 May 2017** | |
| 9.00-10.30 | Meeting with EERB Project staff (I.Atamuradova, A.Zomov) |
| 11.00-12.00 | Meeting with the Ministry of architecture and construction: Sh.Amanov, B.Yakubov |
| 13.00-18.00 | Working on TE |
| **Saturday, 6 May 2017** | |
| 10.00-18.00 | Working on TE |
| **Sunday, 7 May 2017** | |
| 11.00-12.00 | Meeting with: 1. State Concern "Turkmengas" (B.Babayev), 2. State Concern "Turkmen Oil and Gas Construction" (B.Nariyev) |
| 15.00-16.00 | Meeting with Turkmen State Design Institute "Turkmendovlettaslana (V.Ovcharenko, G.Jumayeva, M.Berdiyev) |
| **Monday, 8 May 2017, Day off (instead of May 7)** | |
| 10.00-18.00 | Working on TE |
| **Tuesday, 9 May 2017, Official Holiday** | |
| 10.00-18.00 | Working on TE |
| **Wednesday, 10 May 2017** | |
| 10.00-11.00 | Meeting with Turkmen state institute of architecture and construction: P.Orazov, Y.Muradov |
| 12.00-13.30 | Meeting with Ministry of Communal Services: H.Hadjiev, Y.Seyitmuradov, D.Atamuradov, J.Pogasyan |
| 14.00-18.00 | Working on TE |
| **Thursday, 11 May 2017** | |
| 9.00-12.00 | Meeting with EERB Project staff (I.Atamuradova, A.Zomov) |
| 14.00-17.00 | Visit to pilot project sites |
| **Friday, 12 May 2017** | |
| 9.30-15.30 | Working on TE |
| 16.00-17.00 | De-briefing meeting in UNDP with Mr.V.Vremis |
| **Saturday, 13 May 2017** | |
| | Departure from Ashgabat |

## Annex 3: List of persons interviewed

| | |
|---|---|
| Project Team | - Irina Atamuradova, Project Manager<br>- Arslan Zomov, Energy Audit Expert<br>- Mark Chao, Chief Technical Advisor<br>- Sergey Terekhov, International Expert (building design, energy management)<br>- Irina Terekhova, International Expert, (building codes and supporting materials/tools) |
| UNDP Turkmenistan | - Vitalie Vremis, Deputy Resident Representative<br>- Rovshen Nurmuhamedov, Environment & Energy Programme Analyst |
| Ministry of Architecture and Construction | - Shamuhammat Amanov, Head of International and market development Department, National Focal Point<br>- Berdymurad Yakubov, Head of Innovative and Scientific Department |
| Ministry of Communal Services | - Yazli Seyitmuradov, Specialist of Residential Department, National Focal Point |
| State Concern Turkmengas | - Bekmurad Babayev, Senior environment specialist, National Focal Point |
| State Concern Turkmen Oil and Gas Construction | - Bazar Nariyev, Senior energy specialist, National Focal Point |
| Housing department (Zhet) of Ashgabat | - Hadji Hadjiev, Chief engineer,<br>- Dovlet Atamuradov, Zhet of Kopetdag district of Ashgabat<br>- Jana Pogasyan, Repair and Construction Department of ZhET of Ashgabat |
| Turkmen State Design Institute "Turkmendovlettaslana | - Valentina Ovcharenko, Deputy Head of Scientific Department<br>- Gulshirin Jumayeva, Head of Scientific Department<br>- Marat Berdiyev, Specialist of Heat engineering department<br>- Rahym Annakurbanov, Specialist of Architecture department |
| Turkmen state institute of architecture and construction | - Parahat Orazov, Vice Rector<br>- Yolly Muradov, Dean of faculty of economy and management |

In addition, discussions, meetings and/or e-mail correspondence took place with:

- John O'Brien, UNDP Regional Technical Advisor on Climate Change Mitigation
- Managers of similar UNDP/GEF projects in Russia (V.Beker), Belorus (A.Grebenkov), Ukraine (S.Varga)

## Annex 4: List of documents reviewed

- Improving Energy Efficiency in the Residential Building Sector of Turkmenistan. Project Identification Form (PIF)
- Improving Energy Efficiency in the Residential Building Sector of Turkmenistan. Request for CEO Endorsement/Approval
- Improving Energy Efficiency in the Residential Building Sector of Turkmenistan. Project Document
- United Nations Development Assistance Framework (UNDAF) for Turkmenistan 2010-2015
- UNDAF 2016-2020
- Country Programme Action Plan (CPAP) between the Government of Turkmenistan and the United Nations Development Programme 2010-2015
- CPAP 2016-2020
- Project Inception Report, 2012
- Project Implementation Reviews (4 PIRs: 2013; 2014; 2015; 2016)
- Biannual Reports on the EERB Project prepared by the CTA (7 biannual reports: Jul-Dec 2013; Jan-Jun 2014; Jul-Dec 2014; Jan-Jun 2015; Jul-Dec 2015; Jan-Jun 2016; Jul-Dec 2016)
- EERB Project Annual Work Plans (6 AWPs: 2012; 2013; 2014; 2015; 2016; 2017)
- Combined Delivery Reports (CDRs) for 2012, 2013, 2014, 2015 and 2016
- EERB Project Mid-Term Review Report, 2014
- Management Response. Mid-term Evaluation of Energy Efficiency in Residential Buildings Project
- Decisions of EERB Project Steering Committee meetings (Meeting No.2 – 17.12.202; No.3 – 29.03.2013; No.4 – 24.07.2013; No.5 – 10.06.2014; No.6 – 27.11.2014; No.7 – 29.04.2015; No.8 – 22.01.2016; No.9 – 20.01.2017)
- Summary of EERB Project Results and Lessons Learned prepared by the CTA, 2017
- Standard Letter of Agreement on the implementation of EERB Project between the UNDP and:
    - ✓ Ministry of Construction and Architecture of Turkmenistan
    - ✓ Ministry of Communal Services of Turkmenistan
    - ✓ Directorate of Constructed Units of the State Corporation "Turkmen Oil and Gas Construction"
    - ✓ Turkmen State Architecture and Construction Institute of the Ministry of Education of Turkmenistan
    - ✓ Department of Capital Construction of the Municipality of Ashgabat
    - ✓ Housing Operational Trust of Kopetdag District of Ashgabat City of the Ministry of Communal Services of Turkmenistan
- Draft of National Action Plan for Rational Use of Energy in Buildings (in Russian: Проект: Национальный план действий по рациональному использованию энергоресурсов в жилищном фонде Туркменистана), 2016

- Main Products Developed by the EERB Project (In Russian: Основные продукты, разработанные проектом), 2017
- GEF Tracking Tool for Climate Change Mitigation Projects
- Determination of Energy Savings and Avoided Emissions from the EERB Project, 2017
- Report of Independent Auditors to UNDP on EERB Project, 2014
- Combined Delivery Reports (CDR)
- Technical reports prepared by the Project experts and consultants:
    - ✓ D.Vitchev. Financial feasibility of investments in improving building efficiency in existing residential buildings in Turkmenistan, 2015
    - ✓ A.Ashirov, A.Zomov. Summary Report on Monitoring of Pilot Buildings (In Russian: Обощённый Отчет Мониторинга Пилотных Зданий), 2017
- Project publications
    - ✓ Revised building codes of Turkmenistan “Roofs and Roofing”, “Residential Buildings”, “Building Climatology”, “Building Thermal Engineering” (in Russian: Переработанные Строительные Нормы Туркменистана СНТ «Крыши и Кровли», СНТ «Жилые Здания», СНТ «Строительная Климатология», СНТ «Строительная Теплотехника»), 2016
    - ✓ Improvement of Energy Efficiency in the Residential Building Sector of Turkmenistan. Results of energy audits of multi-apartment residential buildings in Turkmenistan (in Russian: Улучшение Энергоэффективности в Секторе Жилищного Строительства Туркменистана. Результаты проведения энергоаудитов многоквартирных жилых домов в Туркменистане), 2016
    - ✓ Key achievements of the UNDP/GEF project Improvement of Energy Efficiency in the Residential Building Sector of Turkmenistan, 2017
    - ✓ Existing Systems of Energy Certificates of Buildings in the World. Indicator of Energy Efficiency and Energy Passport of the Building in Turkmenistan (in Russian: Существующие Системы Энергетических Сертификатов Зданий в Мире. Показатель Энергоэффективности и Энергетический Паспорт Здания в Туркменистане), 2016
- In addition, for better understanding of the sustainable energy policy of Turkmenistan the following documents have been studied:
    - ✓ National Climate Change Strategy of Turkmenistan, 2012
    - ✓ Intended Nationally-Determined Contribution (INDC) of Turkmenistan in accordance with decision 1/CP. 20 UNFCCC, 2015

## Annex 5: Evaluative Question Matrix

| Evaluative Criteria Questions | Indicators | Sources | Methodology |
|---|---|---|---|
| Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels? | | | |
| • Are project outcomes contributing to national development priorities and plans in accordance with the national legal and regulatory frameworks? | • % of energy consumption reduced in pilot residential buildings (*expressed in terms of TJs or MWh, depending on the situation*)<br>• *consistency of project with government policies and programs* | • *APRs/PIRs*<br>• *Other expert reports on Kazakhstan and Central Asia*<br>• *Public statements*<br>• *National Policy Docs. (e.g. Green Economy Concept)* | • UNDP/GEF Monitoring & Evaluation Policies |
| • How does the project relate to the GEF Strategic objective CC – 1 "To promote energy-efficient technologies and practices in the appliances and buildings" through improved energy performance in apartment buildings? | • # of adopted and mandatory energy efficient building codes<br>• *Extent of application of energy-efficient design and construction principles*<br>• *Use of efficient materials and technologies in new buildings* | • *Government register*<br>• *Project technical reports*<br>• *APRs/PIRs*<br>• *MTE* | • UNDP/GEF Monitoring & Evaluation Policies |

| Evaluative Criteria Questions | Indicators | Sources | Methodology |
|---|---|---|---|
| Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels? | | | |
| • To what extent do the project design and implementation align with the main objectives of the GEF focal area (climate change mitigation)? | • Stated objectives of Project Document and GEF Focal Area Strategy | • GEF-5 Focal Area Strategy, Project Document | • Comparative analysis of documents |
| • To what extent do the project design and implementation align with national development priorities regarding climate change mitigation? | • Stated objectives of Project Document and national policies and strategies on climate change mitigation | • Project Document, national policies and strategies on climate change mitigation | • Comparative analysis of PSC meetings, EERB Project reports, interviews |
| • To what extent does the project fulfill other development priorities of Turkmenistan? | • Stated objectives of Project Document and national policies and strategies on economic development, construction, utility services, etc. | • Project Document, national policies and strategies on economic development, construction, utility services, etc. | • Analysis of EERB Project reports, PSC meetings, interviews, own observations |
| Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved? | | | |
| • Have the objectives, outcomes, and intended outputs been defined clearly and correctly? | • Objectives, outcomes, and outputs in Project Document and Annual Work Plans | • Project Document (especially Project Results Framework), Annual Work Plans | • Analysis, own observations |
| • To what extent has the project fulfilled its overall objectives in terms of climate change mitigation, and its component-specific outcomes? | • Various indicators for overall objectives and outcomes | • Annual Work Plans, Project Implementation Reviews, other project documentation, interviews | • Analysis of Project reports and publications, presentations at the International Workshop, interviews, pilot project site visits, own estimates |

| | | | |
|---|---|---|---|
| • To what extent has the project fulfilled its intended outputs effectively and in a timely way, as set forth in the Project Document and its Annual Work Plans? | Various indicators for outputs | • Annual Work Plans, Project Implementation Reviews, other project documentation, interviews | • Analysis of AWPs and CDRs, PIRs, Biannual reports Audit report, interviews |
| Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards? | | | |
| • To what extent did the Project Manager, staff, consultants, national partners, and the UNDP Country Office carry out the work of the project with efficiency, in terms of time and project funds? | • Content and timing of reported outputs, as compared with targets of Project Document and Annual Work Plans | • Interviews, Project Implementation Reviews, other project documentation | • Analysis of PIRs, interviews |
| • What, if any, were the main causes of any inefficiencies, delays, cost overruns, or other avoidable problems? | • Qualitative description and assessment | • Interviews, Project Implementation Reviews, other project documentation | • Analysis of LogFrame vs. achievements, interviews |
| • To what extent and to what degree of effectiveness did the project overcome obstacles and engage in adaptive management? | • Qualitative description and assessment | • Interviews, Project Implementation Reviews, other project documentation | • Analysis of reports, interviews |
| Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results? | | | |
| • What institutions and mechanisms are in place to ensure that policies and regulations adopted because of project contributions are implemented after the project period? | • Existence and content of national policies defining agency responsibilities and mechanisms | • Policy documents | • Review of PSC decisions, interviews, Project reports |
| • What institutions and mechanisms are in place to ensure that technical practices in building design, energy audit, and energy management continue after the project period? | • Existence and content of standard designs, guidance materials, and curricula for technical professionals | • Technical building designs and guidance materials, approved higher-education curricula | • Review of technical reports, other visual materials, interviews |
| • What are the opportunities and needs for subsequent scale-up? | • Qualitative description and assessment | • Interviews, national policies and strategies, programming documents of international agencies | • Interviews and discussions with decision makers, UNDP |
| **Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?** | | | |
| • What are the demonstrated and expected future results in terms of energy savings and avoided emissions? | • Energy savings (avoided MWh of heat energy, avoided MWh of electricity, avoided direct gas consumption) and avoided GHG | • Building code requirements; project analysis of building code requirements and demonstration project energy savings; calculations for new | • To be elaborated and confirmed jointly by project team and Terminal Evaluation Consultant, in accordance with rules of GEF (see Climate Change Tracking Tool and GEF |

| | | | |
|---|---|---|---|
| | emissions (tonnes of CO2 equivalent) | standard designs; projections of construction volumes and compliance rates | Scientific and Technical Advisory Panel assessment methodology) |
| • What are the other environmental benefits of the project, in terms of creation of enabling conditions for future progress, transformation of practice, building of capacity, and so on? | • Presence and content of national policies; survey responses and interview content from professionals who received training from project; other qualitative description and assessment | • Project documentation; interviews; national policy documents | • Analysis of EERB Project results (achieved outcomes and outputs), assessment of future needs |

## Annex 6: Questionnaire used and summary of results

Interviews with the Project Team, Project Experts and Consultants, key stakeholders were focused on standard questions including:

- What would you say has been the most significant change you have seen due to the EERB Project?
- In your opinion, which activities were been the most effective? less effective?
- How relevant is the EERB Project and its activities to the challenges facing Turkmenistan today?
- Can you identify any external influences (policy, economic, social) that have influenced the project? Examples might include changes in tariffs, institutional restructuring, etc.
- Do you see any potential risks that could affect the results that the EERB Project has achieved after its end?
- Have you participated in other internationally-funded energy and/or climate change mitigation projects? If so, how would you compare this EERB Project to other projects?
- How useful is the assistance provided by the EERB Project to you personally or your organization?
- How effective was the EERB Project in terms of generating policy change?

## Annex 7: Ratings Scales

| Ratings for Outcomes, Effectiveness, Efficiency, M&E, I&E Execution | Sustainability ratings | Relevance ratings | Impact ratings |
|---|---|---|---|
| **6: Highly Satisfactory (HS):** The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency | **4. Likely (L):** negligible risks to sustainability | **2. Relevant (R)** | **3. Significant (S)** |
| **5: Satisfactory (S):** There were only minor shortcomings | **3. Moderately Likely (ML):** moderate risks | **1. Not relevant (NR)** | **2. Minimal (M)** |
| **4: Moderately Satisfactory (MS):** there were moderate shortcomings | **2. Moderately Unlikely (MU):** significant risks | | **1. Negligible (N)** |
| **3. Moderately Unsatisfactory (MU):** the project had significant shortcomings | **1. Unlikely (U):** severe risks | | |
| **2. Unsatisfactory (U):** there were major shortcomings in the achievement of project objectives in terms of relevance, effectiveness, or efficiency | | | |
| **1. Highly Unsatisfactory (HU):** The project had severe shortcomings | | | |
| Additional ratings where relevant:<br>Not Applicable (N/A)<br>Unable to Assess (U/A) | | | |

| **Project Sustainability rating** | | |
|---|---|---|
| 4 | Likely (L) | Negligible risks to sustainability, with key outcomes expected to continue into the foreseeable future |
| 3 | Moderately Likely (ML) | Moderate risks, but expectations that at least some outcomes will be sustained |
| 2 | Moderately Unlikely (MU) | Substantial risks that key outcomes will not carry on after project closure, although some outputs and activities should carry on |
| 1 | Unlikely (U) | Severe risks that project outcomes as well as key outputs will not be sustained |
| Not Applicable (N/A)<br>Unable to Assess (U/A) | | |

## Annex 8: Evaluation Consultant Agreement Form

**Evaluation Consultant Agreement Form**

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

**Name of Consultant:** Paata JANELIDZE

**I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.**

Signed at Ashgabat, 02.05.2017

Signature: _____