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United Nations Development Programme
Country: Republic of Armenia
PROJECT DOCUMENT¹

Project Title: Green Urban Lighting

UNDAF Outcome(s): Environment and disaster risk reduction is integrated into national and local development frameworks

UNDP Strategic Plan Environment and Sustainable Development Primary Outcome: Mainstreaming environment and energy

Expected CP Outcome(s): 4.1 Armenia is better able to address key environmental challenges including climate change and natural resource sustainable management

Expected CPAP Output (s):

4.1.5 Innovative policies and practices for environmentally sound, energy efficient technologies and cleaner production developed and implemented

Executing Entity/Implementing Partner: Ministry of Nature Protection of RA

Implementing Entity/Responsible Partners: Ministry of Nature Protection of RA

Brief Description

The overarching goal of the project is to save energy and to reduce emissions of greenhouse gases by increasing energy efficiency of municipal lighting in the cities of Armenia via implementation of municipal investment programs and national policies. The proposed project is in compliance with the national priorities to strengthen the economic and energy independence of the Republic of Armenia by promoting resources efficient and climate resilient growth.

To realize this objective, the proposed project will carry out several activities that will deliver specific outputs. The work will be organized in four interrelated components: i) municipal energy audits and technical capacity-building; ii) demonstration projects; iii) replication via municipal lighting programs and associated financial instruments; iv) national policies, codes, and standards on lighting. Collectively, these components seek to put in place cornerstone policy instruments at both the municipal and national level, supported by technical, policy-related, educational, and financial measures to raise capacity, reduce investor risk, and help assure successful implementation.

These activities will contribute to UNDP's goal of increasing access to sustainable energy services by introducing regulatory and institutions frameworks, promoting technology transfer, expanding renewable energy practices and applying CDMs under the Kyoto Protocol.

¹ For UNDP supported GEF funded projects as this includes GEF-specific requirements

Programme Period:	CPD 2010-2015
Atlas Award ID:	00074869
Project ID:	00087057
PIMS #:	4669
Start date:	2013
End Date:	2017
Management Arrangements:	NIM
PAC Meeting Date:	2013

Total resources required:	10,095,000 USD
Total allocated resources:	10,095,000 USD
Cash resources:	
o GEF	1,600,000 USD
o UNDP	120,000 USD
o Local Administrations	7,055,000 USD
In-kind contributions:	
o UNDP in-kind	1,000,000 USD
o Government in -kind	320,000 USD

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

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Date/Month/Year

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ACRONYMS

APR	Annual Project Report
AWP	Annual Work Plan
CCM	Climate Change Mitigation
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CFL	Compact Fluorescent Lamp
CLASP	Collaborative Labelling and Appliance Standards Program
CIA	Counterpart International Armenia
CIS	Commonwealth of Independent States
EBRD	European Bank for Reconstruction and Development
EE	Energy-Efficient
FL	Tube-Type Mercury-Containing Fluorescent Lamp
ESCO	Energy Service Company
EU	European Union
GE	General Electric
GEF	Global Environment Facility
GEF	Grid Emission Factor
GHG	Greenhouse Gas
HPS	High Pressure Sodium
IFC	International Finance Corporation
IFIs	International Financial Institutions
IL	Incandescent Lighting
IW	Inception Workshop
LDCF	Least Developed Countries Fund
LED	Light Emitting Diode
LPS	Low Pressure Sodium
M&E	Monitoring and Evaluation
MNP	Ministry of Nature Protection of RA
MoENR	Ministry of Energy and Natural Resources of RA
MUD	Ministry of Urban Development
MWh	Megawatt Hour
ND	National Director
NPIF	Nagoya Protocol Implementation Fund
OFP	Operational Focal Point
O&M	Operation and Maintenance
PB	Project Board
PIF	Project Identification Form

PIR	Project Implementation Review
PPG	Project Preparatory Phase
QPR	Quarterly Progress Reports
RA	Republic of Armenia
RCU	Regional Coordinating Unit
R2E2 Fund	Renewable Resources and Energy Efficiency Fund of Armenia
RKU	Overhung Street Light for Mercury-Vapour Lamps
SBAA	Standard Basic Assistance Agreement
SCCF	Special Climate Change Fund
SL	Street Lighting
SRIE	Scientific Research Institute of Energy of Armenia
STAP	Scientific and Technical Advisory Panel
TL	Task Leader
TLT	Technology Life Time
TF	Trust Fund
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNDP CO	UNDP Country Office
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
USSR	Union of Soviet Socialist Republics
VAT	Value Added Tax
WB	World Bank
YIC	“Yerevan Illumination Company” CJSC
ZHKU	Overhung Street Light for DNAT Type Street Lamps

I. SITUATION ANALYSIS

Lighting is the second largest source of municipal GHG emissions in Armenia (after heating), accounting for about one-third of municipalities' GHG emissions and up to 50 percent of their electricity bill. Urban lighting costs of Armenian municipalities account for more than US \$5 million per annum (power costs and maintenance). Municipal lighting in the capital city of Yerevan accounts for the largest consumption in the country: 90 percent of all urban lighting energy use nationwide, or about 56,000 MWh/year. At the same time, there is considerable technical potential for cost-effective efficiency improvements in public lighting in Yerevan and other Armenian cities. Street lighting power use in Yerevan is 1.3-1.5 times higher than the average street lighting power consumption in European cities and towns.

The table below summarizes basic data on urban lighting for Yerevan and for 17 large and medium urban communities of the country².

Table 1. Public Lighting in Armenia

Parameters	Yerevan	Other cities
Number of illuminated objects, including:	1235	981
Streets	649	575
Yards	363	143
Parks	31	29
Underground and elevated passages	32	0
Bridges and arch-passages	72	13
Commercial (add) lighting	0	116
Buildings and constructions of architectural or artistic value	2	8
Monuments	68	35
Cultural houses and museums	5	9
Churches	5	10
Community administrative buildings	4	36
Higher education institutions	4	7
Number and type of street lights		
High pressure sodium 150W/250W (the majority of DNAT 250 type)	50785	7450
Mercury (250W)	2000	3734
Mercury (400W)	700	2740
CFL (majority up to 100 W - equivalent to about 250W)	1166	2200
LEDs (120 W)	0	110
Halogen (mainly for decorative illumination)	229	0
Total	54880	16234
Other relevant data		
Total installed capacity of street lighting system, MW	15	4
Annual electricity consumption for 2011, mln kWh/year	31,3	8,736
Annual electricity costs for 2011, mln USD/year	1,994	0,603
Average tariff, USD/kWh	0,063	0,069

² In total there are 48 urban communities in Armenia; data on urban lighting from these 17 cities covers about 80% of total urban lighting sector in Armenia.

Parameters	Yerevan	Other cities
Average daily length of operation of street lighting, hours	8	6,44
Annual GHG emissions from the street lighting system, tCO2/year	12520	3495
Number of not illuminated objects and number of street lights to be installed		
Streets and side streets	507	400
High pressure sodium bulbs of 250W	6071	5000
High pressure sodium bulbs of 150W	3685	3000

As shown above, the vast majority of bulbs used in street lighting in Yerevan are high pressure sodium bulb (HPS) of 250W capacity (about 93% of total street lights), whereas in the other cities street lighting is “divided” among three main types of lights, namely HPS (46%), mercury bulbs (40%) and CFLs (13%).

According to information received from the urban communities the majority of street lights (fixtures³ and bulbs) are produced in China and are of low quality. The key problem associated with these lights is inconsistency of technical parameters (wattage, luminosity, operational lifetime, etc.) named on appliances with real capacities. As a result, operation and maintenance costs of municipalities grow because of high replacement costs as well as the necessity to install bulbs of high capacity in order to ensure the requested level of street illumination. This, in its turn, leads to unjustified high energy consumption and associated GHG emissions in the street lighting sector. On the other hand, high energy consumption of the above mentioned “inefficient” street lighting technologies results in high energy costs that (along with high O&M costs) are usually quite burdensome for municipalities. This causes the majority of municipalities to reduce duration of street lighting or even stop illumination of some secondary streets and facilities in order to reduce street lighting costs and to keep the costs within the limits of available municipal budgets.

Baseline financing

In Yerevan and throughout Armenia, municipalities conduct regular activity on the maintenance and periodic upgrading of existing lighting systems, as well as the installation of new lighting in some areas. This activity includes the following aspects, which are particularly relevant to the UNDP/GEF project.

- The Municipality of Yerevan continues to pay a substantial energy bill for urban lighting services (about US \$4.5 million/year). It also covers costs of regular repair and maintenance of the city’s lighting infrastructure (about US \$2.7 million/year). The Yerevan Illumination Company (YIC), which is the authorized municipal company that handles public lighting in Yerevan, has elaborated a development program for 2013-2016 with total cost of about US \$7.2 million. The most important section of the program addresses installation of lighting for the streets and lanes that are still unlit. The program involves 507 streets and lanes with almost 300 km of new power lines. YIC has also begun initial field comparisons of 150W and 250W high-pressure sodium (HPS) street lighting lamps and fixtures of various product lines. The test is aimed to measure various parameters of street lighting equipment, specifically luminance of the street area (Annex G).

³ In some cities old Soviet-made aluminum fixtures are still in use; however, these fixtures are gradually replaced with new plastic ones.

- UNDP/Municipality “Beautiful Yerevan” Initiative is implementing infrastructure upgrade projects including public lighting in selected public areas with a focus on creation of “green” jobs and promotion of efficient lighting technologies, worth US \$1.0 million for a 3-year period.
- New urban development projects also include construction of new streets, underpasses, and parking areas. In 2013-2014 the cost for the lighting component of those projects, which currently call for inexpensive high-pressure sodium lamps, is around US\$ 0.32 million.
- The four-year development program of the town of Sevan includes plans for installation of lighting in a new park, as well as modernization of street lighting over 900 meters of roads. The municipal budget for these efforts is about US \$500,000, plus \$25,000 from the municipal budget for other new lighting in 2013 alone.
- The town of Spitak has included plans for modernization and extension of the urban lighting system in 2013-16 as part of its development program. The preliminary budget for this work is about US \$30,000, which the town is seeking from international financial institutions. In addition, the town has allocated about \$22,500 of its own budget funds for street lighting, which includes modernization as well as routine operation and maintenance.

In addition to the baseline activity already confirmed, there are several other emergent financing and program activity which the proposed UNDP-GEF project will leverage in support of municipal EE lighting upgrades in Armenia.

The **Municipality of Yerevan** is considering the possibility of introduction of a new concession for capital investment in new lighting and maintenance of existing street lighting systems.

Furthermore, the city has developed plans to seek partnerships or issue concessions to private contractors for major urban renovation projects (about \$ 70 million), involving landmark sites such as Victory Park. These plans foresee investment in new lighting as well, including introduction of LED lighting for parking and other public spaces. Implementation of these projects depends on the availability of outside funding from the private sector or from international institutions.

The Municipality is discussing with Austrian Bank, OeKB assistance in provision of a US \$100,000 grant for conducting energy audit and elaboration of an action plan for EE street lighting in Yerevan.

Counterpart International Armenia, within the framework of its local governance support activities, provides incentive grants to local governments for co-financing of new street lighting systems. In 2012, Counterpart International Armenia provided US \$95,000 towards the installation of new street lighting systems in four urban and 10 rural communities. This work is to be continued as reflected in the Letter from Counterpart International provided in the Annex.

The **European Bank for Reconstruction and Development (EBRD)** provides credit lines for energy efficiency projects in Armenia through its partner banks. In its Strategy for Armenia, which was approved in May 2012, EBRD identified sustainable energy, including energy efficiency, as one of four strategic priorities for its next period, and confirms that it will continue to provide credit for EE projects. EBRD is not currently involved with energy-efficient municipal lighting projects in Armenia, due to the sector-specific barriers explained below, but is ready to explore opportunities for collaboration with UNDP-GEF for such activity would be consistent with its support elsewhere for municipal infrastructure and utility services,.

The **International Finance Corporation (IFC)** in Armenia provides direct financing to ESCOs or other private companies for energy-efficiency projects, subject to criteria of minimum size, feasibility, and expected savings. Qualifying lighting projects are welcome to seek support, but clear long-term agreements have to be achieved with the municipal structures to ensure private sector participation. In

cases such as that of Yerevan, private companies managing the municipal lighting system can enter into an energy service agreement with the municipality, obligating the latter to pay baseline energy cost during the life of the agreement, and thereby enabling the private company to apply to IFC for a loan.

The **Green for Growth Fund (GGF)**, a partnership of the European Investment Bank (EIB) and KfW, supports establishment of dedicated loan facilities by its local partner banks for energy efficiency and renewable energy projects. One of the GCF partner banks, Ararat Bank, has indicated its willingness and interest to collaborate with the UNDP-GEF project on identification and financing of bankable EE lighting projects in Armenia (See letter of Intent in Annex H).

Baseline policy

During the project preparatory period, it has also become clear that there exist major opportunities for the UNDP/GEF project to contribute to the development and updating of national policies with regard to EE lighting.

The National Program on Energy Saving and Renewable Energy (2007) and Action Plan (2010) emphasize the importance of energy efficiency for Armenia. The National Program notes lighting as one of eight priority areas for energy saving, and identifies reduction of electricity consumption over a 10-year period through introduction of energy efficient lamps in lighting systems as a key energy-saving target (475 million kWh). The National Energy Efficiency Action Plan also considers street lighting as a priority in the public and private service sector.

On February 8, 2012, a new Law on Technical Regulation entered into force in Armenia. As per the recommendation of the Ministry of Energy and Natural Resources (MoENR), energy efficiency and renewable energy have been included in this law as the subjects of technical regulation. Now MoENR is planning to develop a comprehensive concept of technical regulation for energy efficiency, on whose basis concrete mandatory technical regulations will be prepared, covering labeling, operation, testing methods and disposition after use. MoENR has requested assistance from UNDP-GEF project to support the elaboration of the required technical regulations for EE lighting.

Consultations with MoENR have also indicated that the prospect of a phase-out of incandescent lamps is a particularly good fit with the ministry's current policy to improve energy efficiency and energy conservation of all sectors of the national economy, including residential and public buildings. Hence, the Ministry not only supports this planned initiative but indeed has expressed readiness and commitment to facilitate its approval by the Government.

Notably, Armenia has committed to harmonization of its regulations with those of the European Union, including the Commission Regulation (EU) No. 347/2010 and Commission Regulation (EC) No. 245/2009 with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps. However, EU regulations on household lamps, including CFLs, have not yet been included in the list of legal acts Armenia has committed to harmonize before 2020.

Furthermore, MoENR has already proposed that the Government include requirements on product-specific technical parameters, including minimum energy performance standards where applicable, in public procurement procedures. In response to this proposal, the Ministry of Finance of the Republic of Armenia suggested that MoENR should develop such requirements. However, MoENR currently lacks technical capacity for carrying such work. At MoENR's request, the proposed UNDP/GEF project will provide needed assistance to MoENR for development of such requirements.

Certain aspects of lighting design for buildings in Armenia are regulated by a building code on natural and artificial illumination approved by the Ministry of Urban Development of the Republic of Armenia (MUD). It has been noted to UNDP at senior levels of this Ministry that it would be desirable to analyze this code, compare it with the existing international norms, and propose amendments to bring the Armenian regulation into compliance with the international requirements.

With all these policy priorities in place, the current need is for research, technical analysis, policy development, and ultimately, enforcement support – all reflective of the conditions of Armenia, the needs of its citizens and institutions, and the lessons and experience of other countries where applicable. The UNDP/GEF project is well positioned to deliver needed assistance in these areas.

BARRIERS

Lack of information and awareness

Municipal agencies responsible for public lighting lack expertise on technical design, implementation, and financial performance of EE lighting upgrades. This problem is especially notable in regional municipalities, which lack qualified personnel to oversee lighting systems. In numerous cases, decision-makers in the municipalities misinterpret the concept of energy efficiency, replacing existing lamps, such as high-pressure sodium lamps, with lamps of lower capacity and lower luminous efficacy. This choice does lower energy consumption, but also dramatically reduces the level of street illumination, even below required levels.

The municipal government of Yerevan is something of an exception to this tendency because it assigns responsibility for development, operation, and maintenance of the city's lighting network to YIC, which does have qualified staff. YIC has been implementing a number of EE measures. However, because of budget limitations stipulated for urban lighting by the municipality of Yerevan, YIC generally implements the cheapest EE measures that have short payback (e.g. replacement of mercury lamps with HPS ones), ignoring more “radical” approaches that might be more beneficial in terms of overall efficiency of the system but require more funds. As a result, the full potential of energy saving in the system is not properly estimated and realized. (See barrier of lack of financing, below.)

The general population has some awareness of potential benefits of EE lighting products (e.g. CFLs) through advertisement of such lamps in various media; however, the low quality of the majority of such products available on local market contributes to distrust toward such products. There exists no efficient or standardized mechanism for ensuring consumer protection against low-quality, unlabeled lighting products, which sometimes even lack basic information about the producer. Higher-quality products are still too expensive for the majority of the population. As a result, the majority of the population continues to buy conventional incandescent lamps, thereby avoiding high upfront costs.

This barrier will be a focus of the proposed project's Components 1 (energy audits and technical capacity-building) and 2 (demonstration projects).

Low technical capacity

Municipal agencies lack experience with the design of energy-efficiency projects in lighting. Lighting for new developments is designed by licensed architectural organizations. In some cases, including Yerevan, installation of new lighting systems is outsourced to private companies. The degrees of technical capacity of these contractors vary from case to case. The provision of integrated energy services in the lighting sector via ESCOs or similar vehicles does not yet exist in Armenia due to

limited technical and financial capacity. Private-sector activity is present but still immature with regard to the import, assembly, sale, and installation of EE lighting.

This barrier will also be a focus of the proposed project's Components 1 and 2.

Lack of available financing for urban lighting

Municipal governments spend millions of dollars annually on lighting (about \$4.5 million annually in Yerevan alone), but their budgets are stretched, without extra capital funds available for major new investments and improvements. In the absence of dedicated municipal budget funds, investment in EE upgrades depends on the availability of outside financing.

But so far, such financing has been largely inaccessible in Armenia. Agreements between municipalities and their contracted lighting companies do not easily accommodate sharing of initial investment, recovery of savings, and associated financial risk for EE investments in lighting, especially given high initial costs and long payback. Private and municipal investment in urban infrastructure is substantial, but does not prioritize and realize cost-saving opportunities of green lighting. Revolving municipal funds for EE lighting do not exist.

Financing from private ESCOs is nearly absent because the sector is not yet developed, and even when ESCOs are present, lighting projects have not been their focus so far. Some conducive preconditions exist for ESCO development, including a tendency for increasing of energy prices, shortage of municipal funds for investment in green lighting, and the growing awareness of the customers on benefits of the energy-efficient lighting. But several factors are holding back ESCO involvement in urban lighting, including lack of experience in developing bankable proposals for green urban lighting projects and lack of practice in local banks in evaluating EE lighting projects; and lack of availability of low-cost, high quality, efficient lighting products due to low demand.

This barrier will be a major focus of Component 3 of the project.

Absence or insufficiency of policy and regulations

There are presently no restrictions on the wattage of household lamps in Armenia. Regulations on lighting design and installation in Republic of Armenia are integrated in building codes and health codes. The building code on natural and artificial lighting regulates the amount of light delivered into given indoor or outdoor spaces, with very limited requirements for energy efficiency. There exists a national law on product standards, including technical standards on lighting, but these existing lighting standards deal with health and safety, not energy efficiency. Furthermore, state procurement law requires purchase of equipment based on initial costs, without taking life-cycle costs into account, to the detriment of EE lighting, which costs less to operate and usually lasts longer than conventional lighting. There is also no state policy regarding promotion of energy-efficient lighting products.

This barrier will be the focus of Component 4 of the project.

II. STRATEGY

The proposed UNDP/GEF project will build upon current and planned activities at the municipal and national level with regard to lighting in Armenia, using GEF funds to address the above-described barriers and create incremental global environmental benefits.

The overarching goal of GEF-supported activity of the project is **to save energy and to reduce emissions of greenhouse gases by increasing energy efficiency of lighting in the cities of Armenia via the implementation of municipal investment programs and national policies**. This work will be organized in four interrelated components.

Component 1: Municipal energy audits and technical capacity-building

Component 2: Demonstration projects

Component 3: Replication via municipal lighting programs and associated financial instruments

Component 4: National policies, codes, and standards on lighting

These components retain all of the elements and intended outcomes elaborated at the PIF stage, but these elements have been streamlined and reorganized for greater clarity and ease of orderly implementation. The project now also includes some major new activity focusing on residential lighting.

Collectively, these components seek to put in place cornerstone policy instruments at both the municipal and national level, supported by technical, policy-related, educational, and financial measures to raise capacity, reduce investor risk, and help assure successful implementation. The four components will involve various planned outputs and activities, all designed to remove the barriers enumerated above. Table 2 shows how the planned work addresses the barriers. Then in the following section, outputs and activities are presented in detail.

Table 2. Key Planned Outputs and Barriers Addressed by the Proposed UNDP/GEF Project

Output (and number)	Barriers addressed			
	Information gaps	Low capacity	Absence of financing	Policy gaps
Energy audits of public lighting systems (Output 1.1)	X	X		
Study tour, co-financed outside of GEF financing (Output 1.2)	X	X		
Technical training and outreach (Output 1.3)	X	X		
Pilot projects (Component 2)	X	X	X	
Facilitation of financing for green lighting programs (Output 3.1)			X	X
Development and assistance in implementation of comprehensive municipal programs for green lighting (Output 3.2 and Output 3.3)	X	X		X
Support for development of a phase-out of incandescent lighting (Output 4.1)	X	X		X
New and/or expanded technical standards and codes for lighting equipment (Output 4.2)	X			X
Improvements to state procurement process (Output 4.3)		X	X	X

Component 1: Knowledge and capacities for urban green lighting

This component will seek to define the technical foundation for municipal investment programs for energy-efficient lighting. Audits of public lighting systems (parks, streets, neighborhoods, and public buildings) will provide rigorous information on available energy savings and projected financial returns. A study tour to Central Europe, to be covered entirely by funds outside of GEF, will familiarize key municipal personnel with the importance of energy-efficient lighting and instill them with new technical and managerial capacity to develop and manage municipal lighting programmes for maximal energy efficiency back in Armenia. The project will also support new training for lighting specialists and building designers in Armenia, at least partially in conjunction with periodic training offered by the Scientific Research Institute of Energy of Armenia. Finally, this component will also include outreach to the general public, via media coverage and other channels.

Output 1.1 Audits of public lighting systems. The project will organize the design and execution of at least ten technical audits of public lighting, with the goal of defining the technical basis for municipal plans and financial proposals for specific sets of upgrades to be carried out.

Output 1.2 Study tour to GEF Public Lighting project in Central Europe. The project will organize a study tour to Europe for key personnel of YIC, the municipality of Yerevan, and other responsible agencies. Participants will be exposed to best practices in urban lighting design, organization, and financing.

Output 1.3 Technical training and capacity building on energy-efficient lighting for specialists from municipal agencies, lighting companies, and building design institutes. The project will organize and deliver at least two half-day seminars or the equivalent for technical specialists on lighting in Armenia, covering technology and best practices in lighting design, installation, and monitoring and maintenance.

Output 1.4 Increased awareness and support among the general public for green urban lighting programs. The project will organize media coverage and other public outreach on energy-efficient lighting, to build support for the urban programs and also to promote EE lighting in the residential sector. . In addition, the project will contribute to global awareness raising on EE lighting by sharing its best practices via partnership with GEF/UNEP en.lighten initiative (see section A.7).

Component 2: Pilot urban green lighting projects

Drawing upon results of energy audits, the project will provide both technical assistance and incremental direct investment to support the implementation of selected pilot projects for energy-efficient public lighting in Yerevan and other selected urban areas. See the section below on Incremental Global Environmental Benefits for more details on technical plans and expected results of demonstration projects.

Pilot projects will serve several purposes.

- **Achievement of direct energy savings;**
- **Generation of technical and financial documentation** to confirm or deny the projections and recommendations of the public lighting audits;
- **Creation of a basis for a comprehensive city-wide plan** for public lighting upgrades;
- **Enhancement of capacity** of national and municipal officials, experts, and energy-service contractors to manage and implement lighting efficiency projects, in preparation for expanded implementation later;
- **Identification of financial partners and testing of financing mechanisms;**

- **Creation of a financial track record** to help define partners, terms, and conditions of future financing of expanded lighting efficiency programs (ideally reducing costs and increasing availability of financing by reducing investor risk);
- Creation of a vehicle for **public education and outreach** about the environmental and financial benefits and visual appeal of EE lighting;
- In certain cases, **acceleration of medium-term and long-term market penetration of LEDs** via increased awareness, reduction of the perception of risk, and stimulus for expanded supply.

Output 2.1 Design, completion, and documentation of demonstration projects on street lighting

Output 2.2 Design, completion, and documentation of demonstration project in municipal public buildings

Output 2.3 Design, completion, and documentation of demonstration project on lighting of outdoor spaces

For all demonstrations, the UNDP/GEF project will organize the solicitation of proposals from municipal governments and select projects based on their technical viability, replicability, and availability of secure co-financing. The UNDP/GEF project will also provide technical guidance on project design and will oversee quality control, monitoring, data collection, and compilation and dissemination of results.

Collectively, the demonstration projects are expected to cover various baseline and replacement technologies. Light-emitting diodes (LEDs) are expected to be an important focus of both indoor and outdoor lighting demonstrations. See Global Environmental Benefits section below, as well as Annex E, for more technical details on anticipated measures.

On the basis of the technical, procedural, and financial insight gained from the demonstration projects, replication will be organized via municipal programs and associated financing support. See Component 3.

Component 3: Financial and institutional mechanisms for scaling up municipal EE lighting programs

Based on the technical and financial-analysis results of Components 1 and 2, the project team and the municipal government of Yerevan will develop and implement a comprehensive program for upgrading public lighting. This activity may take place in stages, with some initial parts of the program developed after the audits and before the completion of the demonstration projects, and some further elements developed after first-year results of the demonstration projects become available. Based on this work in Yerevan, the third project component will also support analogous municipal programs in other urban areas of Armenia. For all municipalities, the UNDP/GEF project will play a key role in program development, coordination, and facilitation of linkages with financing; implementation will be carried out by municipal agencies themselves.

In all areas, the project will provide advocacy and justification for allocation of municipal budget funds for lighting efficiency improvements. It is most likely, however, that the baseline financing will not be sufficient to scale up implementation of EE lighting programs in municipalities. Other funding mechanisms will be needed. Therefore, the UNDP/GEF project will leverage additional financing in support of the municipal lighting programs, using various approaches depending on the sector and baseline conditions.

New street lighting

The UNDP/GEF project will design and help guide operation of **a revolving-fund mechanism** for recovery and reinvestment of saved funds from energy-efficient lighting upgrades. The municipality of Yerevan has already noted its readiness to allocate saved funds for reinvestment in further system improvement. The project will work with the municipality and YIC to define the parameters of a dedicated fund and to plan for its development and operation.

Savings from just the demonstration projects on street lighting are expected to provide about \$100,000 per year (see section B.3, which discusses cost-effectiveness). If these savings can be tracked and set aside, the project expects that a revolving fund could cover a major portion of the incremental costs necessary for new EE street lighting projects.

Existing street lighting

It is certainly possible that the revolving fund could also cover some upgrades of existing street lighting. The needs for upgrades of existing street lighting are so broad; however, that it is unrealistic to expect the revolving fund could cover the entire need in Yerevan or elsewhere. Therefore the UNDP/GEF project will assist municipalities in preparing applications for outside funding.

Specifically, the project will work with the municipality of Yerevan and YIC to prepare **an application for credit from one of various existing sources of EE financing in Armenia, including EBRD, IFC or GGF**. The demonstration projects will help to prove the bankability of the proposed activity to be financed.

In the smaller municipalities of Sevan and Spitak, the UNDP/GEF project will help to facilitate **ESCO financing**, with the assistance of the World Bank project run by the R2E2 Fund (see discussion on proposed cooperation with R2E2 in Section A.7 below). When doing so, UNDP/GEF project will help adapt and introduce to Armenia the process used by the UNDP/GEF lighting project in Russia, which succeeded in structuring energy performance contracts and securing ESCO financing for analogous municipal lighting upgrades in the city of Nizhniy Novgorod.

EE lighting in buildings

To date, the World Bank project run by the R2E2 Fund has not pursued support for energy-efficient lighting projects in public buildings, in part because the bankability of EE lighting upgrade investments has not yet been demonstrated. The UNDP/GEF project will take the results of its audits and demonstration projects to develop robust, bankable proposals to present to the Fund for qualifying projects. Funding from this avenue would be especially expedient for buildings, given that this sector is less likely to fit with the criteria of larger financiers.

UNDP and R2E2 have already agreed to provide mutual support, working together with regard to budgeting, financing, and procurement. The UNDP/GEF project and the R2E2 Fund will also together provide technical support and capacity-building to ESCOs themselves, to ensure not only successful implementation of individual upgrades, but also improved and extended energy efficiency service provision overall, and ultimately the development and testing of replicable and sustainable models for energy-efficiency services.

Outdoor lighting

In collaboration with Yerevan and other interested municipalities, the UNDP/GEF project will elaborate mandatory criteria for lighting to be fulfilled under concessions for development of parks, parking areas and other outdoor spaces. This procurement-based approach will place the burdens and

risks of financing for EE lighting on the developer, but given the size of the concessions, it is foreseeable that the lighting requirements will be tolerated.

Output 3.1 Support for private, international, and innovative municipal financing for EE urban lighting programs

As elaborated above, the project will provide technical support and facilitation for the submittal of financial proposals from municipalities to various potential sources. Specific modalities and proposal contents will depend on the specific features of given projects; but overall, this output is expected to include work in all of the following areas:

- Assessment of the possibility of using project funds to reduce financial risk for investors, lenders, or ESCOs;
- Development and delivery of an application to financial institutes and facilities (EBRD, ICF, GCF) for credit for EE lighting investments in Yerevan;
- Organization of a tender for at least one ESCO to provide and install energy-efficiency upgrades for part or all of the municipal lighting program in at least one city outside Yerevan, and if applicable, also for Yerevan itself;
- Design of a municipal revolving-fund mechanism for recovery and reinvestment of funds saved from the implementation of the program;
- Facilitation of negotiations with the R2E2 Fund, IFC, and/or other international agencies that might provide financing for municipal lighting upgrades, including but not limited to lighting in buildings;
- Elaboration of procurement rules for energy performance of lighting to be provided as part of development concessions for parks and other outdoor spaces in Yerevan.

Output 3.2 Development and approval of the city-wide program on public lighting in Yerevan. Based on technical results of Components 1 and 2, as well as the results of financing efforts connected with Output 3.1, the project will assist the municipality of Yerevan and YIC in developing a program for comprehensive city-wide upgrades of public lighting, with financing secured through mechanisms developed under Output 3.1

Output 3.3 Facilitation of analogous programs in other cities in Armenia. Drawing upon lessons learned from Yerevan but also recognizing the particularities of each region, the project will support the implementation of analogous programs in other municipalities around Armenia. As with Output 3.2, this output will also involve ongoing maintenance, monitoring, and evaluation.

Component 4: National policies, codes, and standards on EE lighting

The fourth project component will focus on the development and implementation of broad policy instruments to promote energy-efficient lighting in Armenia. These planned instruments include a legislative mandate for phase-out of incandescent and other inefficient lighting; technical standards for lighting products; lighting provisions in codes on building energy performance and health; and procurement law and accompanying rules for public institutions. Such policies would not only support the municipal lighting programs of Component 3, but would have an expanded cross-sectoral impact, especially in the public and residential building sectors.

These policy-related activities will, of course, be fully consistent with the legal and political processes and priorities of Armenia. The activities are intended to make up an integrated whole, mutually

reinforcing each other. But the policies are also designed to be effective individually even if one or more of the others proves impossible to implement.

The appropriate policy mechanism for a phase-out of incandescent and other inefficient lighting would be legislation adopted by the government of the Republic of Armenia. The UNDP/GEF project will fill the key role of drafting this legislation, including compilation of technical information, delivery of national and international expertise, definition and justification of proposed phase-out provisions, and coordination among partners and other stakeholders, including government ministries as well as other constituencies.

The adoption of a phased ban on incandescents will not be a simple matter – neither technically nor politically. If incandescents are phased out, they could be replaced in the short term largely by compact fluorescent lamps (CFLs), which one can expect to be unpopular among many stakeholders for various reasons. Their initial price is about five times higher than that of equivalent incandescents in Armenia. Though lower energy costs and longer operating life should in theory pay back the initial price difference many times over, many CFLs available in Armenia are of low quality and reliability, thus presenting a perceived risk for consumers that payback might not actually be achieved. Moreover, CFLs are still widely considered to provide less visually comfortable and useful for household use than ILs because of their shape and typically cold light quality.

CFLs also contain mercury, both in the form of vapor and attached to phosphor powders inside the lamp. Therefore a ban on incandescent lamps would create a significant increase in the mercury content of municipal waste, via both spent and broken compact fluorescent lamps. But at present, Armenia does not have separate facilities for separation, containment, and processing of mercury wastes. Therefore approval of a phase-out of incandescents would also have to be accompanied by a robust plan and possibly regulations for handling of spent fluorescent lamps.

Therefore the project's task of justifying a phase-out will be analytically very complex and politically rather sensitive. One leading possibility is to adopt a phase-out that sets limits on wattage for lamps within a certain range of luminous flux. This approach, which has been adopted in the United States, allows the continued use of incandescents, but with reductions of about 25 to 30 percent in energy consumption – for example, with new-generation 72W incandescents replacing 100W bulbs, 53W lamps replacing 75W, and 43W replacing 60W – with little or no sacrifice of the quantity or quality of light. This solution, while much less than optimal in terms of technical energy-efficiency potential compared with a full transition to CFLs and LEDs, could significantly eliminate political controversy, alleviate mercury-related concerns, and overall reduce the risk that phase-out efforts could lead nowhere at all.

Given international experience, it still remains quite possible that the net economic and environmental benefits would indeed warrant a more progressive phase-out on some timetable, especially given appropriate accompanying provisions for product quality and mercury containment. Indeed, the example of other countries can in itself be expected to be a powerful influence on Armenia's policy directions in this area. As mentioned above, Armenia is already looking to harmonize some of its lighting-related regulations with those of the European Union (see section on baseline project.) Russia and Kazakhstan could also serve as examples for Armenia, having both also adopted phase-outs of incandescent lighting; both countries are now implementing the phase-outs with the assistance of analogous UNDP/GEF projects.

In addition to justification and advocacy for a phase-out, the project will coordinate the formation of a working group for the development of technical standards on advanced lighting products, including CFLs and LEDs. Technical standards are expected to include criteria for efficiency, performance, operating life, and mercury content. They will also include procedures for testing and certification of compliance.

Activities with regard to codes and regulations will include recommendations to the RA Ministry of Urban Development on enhancements to the building code “Natural and Artificial Lighting” with regard to energy efficiency of lighting in buildings. Such work will be carried out in synergy with the ongoing UNDP/GEF project “Improving Energy Efficiency in Buildings,” which has strong connections with this ministry and its staff responsible for building codes.

The project will also investigate health-code requirements with regard to LED lighting. Elsewhere in the region (for example, in Kazakhstan), LEDs are prohibited for certain indoor uses because of perceived deficiencies in lighting quality. The UNDP/GEF project in Kazakhstan plans to develop and propose new requirements permitting the expanded use of LEDs. The UNDP/GEF project in Armenia will conduct analogous activity drawing on the experience of Kazakhstan as appropriate.

Finally, the project will work to promote increased bulk purchasing of energy-efficient lighting by public agencies. Such efforts would have to be compatible with the national law. The law itself is rather broad and procedural, without technical criteria or energy performance requirements for specific product types. The project team has determined that seeking to amend the law itself would be unproductive. Instead, the team will develop and propose new rules and/or guidance defining how best to select lighting services and equipment, and if possible, introducing requirements and specific criteria for life-cycle cost analysis. This approach is analogous to the planned procurement-related work of UNDP/GEF projects elsewhere in the region.

Output 4.1 Phase-out of incandescent lighting and/or other major national policies on EE lighting

The project will carry out a comprehensive review providing technical and policy justification for a phase-out of inefficient incandescent lighting (IL) in Armenia. This review will include comparative analysis of energy consumption, life-cycle costs, and environmental effects of incandescent lighting and potential replacement technologies, including CFLs and LEDs, in Armenia. The review will also present international experience with laws, regulations, and enforcement mechanisms with regard to phase-out of incandescent lighting, as well as market-based or tax-related incentives for EE lighting. Then, based on the results of the review, the project will support MoENR in drafting and building support towards adoption of proposed legislation and enforcement mechanisms.

This output will also include a review of international best practices with regard to handling of spent and broken mercury-containing lamps, and on this basis, drafting and support towards adoption of relevant programs in Armenia.

Output 4.2 Development and adoption of new standards for lighting quality, lighting design in buildings and construction, and lighting issues in public health. It is expected that the adoption of the IL phase-out or other major national policies will trigger the need for accompanying technical standards and/or construction codes for energy-efficient lighting. The UNDP/GEF project will support the development of all relevant standards, which will likely cover energy performance, mercury content, operating lifetime, and lighting quality, and will include not only performance criteria but also test procedures.

Output 4.3 Development and adoption of new rules for state agencies on procurement of energy-efficient lighting. Based on best practices in other countries, including European nations as well as Russia and Kazakhstan (where procurement is one focus area of analogous UNDP/GEF projects), the project in Armenia will elaborate and deliver recommended processes and criteria, including performance and life-cycle costs, for public agencies to use in bulk procurement of lighting products.

Summary of expected benefits

The project is expected to yield global environmental benefits of avoided GHG emissions from more efficient consumption of electricity in the lighting sector. Demonstration projects will directly yield approximately 10,000 tonnes of avoided CO₂ emissions, and a total of about 135,000 tonnes via replication in municipal lighting programmes. The greatest benefits would come from a phase-out of inefficient incandescent lighting currently in wide use in the residential sector. These benefits are expected to range between 500,000 and 1 million tonnes of avoided CO₂ emissions in the ten-year period starting with project inception. Table 3 summarizes these projections.

Table 3. Summary of Projected Global Environmental Benefits
(figures are rounded from data presented above)

Emissions reduction type and relevant output	Amount (tonnes of CO₂)	Time frame over which reductions are to be achieved
Direct <i>Demonstration projects</i>	10,000	Measures installed during project period; savings achieved over various measure lifetimes
Indirect bottom-up <i>Replication of pilot projects via municipal programs</i>	135,000	Programs adopted and launched during project period; savings achieved over various measure lifetimes
Indirect top-down <i>National cross-sectoral policy, including IL phase-out</i>	500,000 (moderate phase-out) to 1,000,000 (aggressive phase-out)	Policies to be developed and adopted during project period. Reductions calculated for 10 years from project inception. Further savings may reasonably be expected beyond 10 years, but are not shown here.

Coordination with related initiatives

The proposed project will operate in close collaboration with two other ongoing UNDP/GEF projects on energy efficiency in Armenia. The UNDP/GEF full-sized project “Improving Energy Efficiency of Municipal Heating and Hot Water Supply,” which will conclude around the time of the inception of the lighting project, has already been providing valuable connections with outreach partners, including apartment-owner associations and the Municipality of Yerevan. The UNDP/GEF full-sized project “Improving Energy Efficiency in Buildings” (IEEB) will also offer collaborative assistance with regard to building codes and demonstration projects in public buildings. Some objectives of the IEEB project are in line with those of the proposed project; thus, combination of efforts (e.g. integration of minimum lighting efficiency standards into building codes) will be mutually beneficial. Specifically, the UNDP-GEF “Improving Energy Efficiency in Buildings” project focuses on building envelope and will introduce new mandatory energy efficient building code that require a strict energy performance target (including for lighting). The proposed Green Urban Lighting project will complement these efforts by working on the codes entitled “Artificial and Natural Lighting” and also possible “On Design of Outdoor Lighting of Cities, Villages, and Rural Population Centers.” All three projects will be overseen by UNDP Climate Change Programme Coordinator and Head of UNDP Energy and Environment Unit of UNDP in Armenia.

During the project preparatory period, UNDP has met with staff of the Renewable Resources and Energy Efficiency Fund (R2E2 Fund) of Armenia. The sides have agreed to render mutual support between the new UNDP/GEF lighting project and R2E2’s role in managing the new GEF-supported

initiative of the World Bank, entitled simply the Armenia Energy Efficiency Project. This project will steer the World Bank funds as loans to municipalities and other public entities for energy-efficiency projects, with the R2E2 Fund also offering accompanying energy services. For eligible social facilities, the R2E2 Fund will enter into Energy Service Agreements. Under these agreements, the R2E2 Fund would provide financing, while the social and other public facilities would provide payments equal to baseline energy costs over the life of the agreement. With these payments, the R2E2 Fund will pay the reduced energy bills on the facility's behalf and reimburse itself via the difference for its own investment cost and service fee. The R2E2 Fund recommends but does not prescribe qualifying energy-efficiency measures, thus giving applicants broad flexibility in project design. R2E2 also supports the development of the energy services sector in Armenia by engaging and supporting contractors.

To date, the R2E2 Fund has not worked specifically on energy-efficient lighting, but in case programs with necessary financial justification can be developed, then it would be certainly suitable for municipalities, their contracted lighting companies, or ESCOs to apply. The UNDP/GEF project will provide assistance to these entities in preparing proposals to R2E2 and in coordinating technical support, monitoring, and evaluation.

The UNDP/GEF project will also work in conjunction with EBRD in the securing of financing for municipal lighting in Yerevan. There is a strong history of successful coordination of this type between EBRD and UNDP/GEF projects in Armenia, especially in the residential sector, where UNDP has provided instrumental assistance to EBRD in the implementation of a municipal water supply and sanitation project. UNDP is also leading the structuring of an EBRD investment to improve the transport links between Armenia and Georgia.

The project will also seek synergy and work closely with the GEF/UNEP en.lighten Initiative, as well as other relevant international bodies and programs, such as CLASP and EU Lighting Association. For example, quality standards, as well as required testing methodology and enforcement mechanisms to be introduced under Component 4 will be adopted based on international best practices and standards as developed by en-lighten and other international partners. At PPG stage, agreement was reached with en.lighten regarding collaboration and exchange: the Armenian project has already benefited from guidance and assistance provided by en-lighten for sectoral GHG emission estimates and, vice-versa, all knowledge products, case studies, and best practices from the Armenian project will be shared with global EE lighting community via en-lighten knowledge management platform. To ensure regular exchange, representatives of GEF/UNEP en-lighten team will be invited to join Project Board meetings, where details of collaboration can be agreed upon and included in the Annual Work Plan.

Collaboration with new EU member states, such as Czech and Slovak Republics, will be established (co-financed by respective Governments) to learn about these countries' practical experience with transposition of their technical regulation, norms and standards in line with EU requirements.

III. PROJECT RESULTS FRAMEWORK

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD:
4.1.5 Innovative policies and practices for environmentally sound, energy efficient technologies and cleaner production developed and implemented
Country Programme Outcome Indicators:
1. No. of laws and legal acts promoting energy efficiency adapted; 2. No. of initiatives promoting energy efficiency developed and implemented; 3. No. of environmental rating and labeling practices introduced.
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): Mainstreaming environment and energy
Applicable GEF Strategic Objective and Program: CCM-2
Applicable GEF Expected Outcomes: 2.1. Appropriate policy, legal and regulatory frameworks adopted and enforced. 2.2 Sustainable financing and delivery mechanisms established and operational
Applicable GEF Outcome Indicators: Policy adoption and mobilization of financing in support of EE lighting

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective To remove barriers to energy-efficient lighting in Armenia, by means of technical assessment, facilitation of financing, and development and implementation of municipal programs and national policy	Quantity of energy saved and GHG emissions avoided	40 GWh of electricity consumed for street lighting in 2011, accounting for about 16,000 tonnes of CO ₂ emissions 550 GWh consumed for residential lighting in 2011, accounting for about 220,000 tonnes of CO ₂ emissions	Direct energy savings of 1.4 GWh per year from demonstration projects (560 tonnes of CO ₂ emissions) Indirect energy savings of 20 GWh per year from replication of demonstration projects via municipal programs (8000 tonnes of CO ₂ emissions) Indirect energy savings of 125 GWh per year from implementation of national lighting policy (50,000 tonnes of CO ₂ emissions)	Direct energy savings and savings from municipal programs: meter readings and power company invoices Savings from national policy: calculations based on regulatory requirements, data from national agencies and suppliers on import and other market indicators	Achievement of these targets depends on adoption and timely implementation of municipal programs and national policies, which in turn require sufficient political will and financing.
Outcome 1 Municipal energy audits and technical capacity-building	Number of municipal energy audits conducted Number of specialists and agency representatives trained	Comprehensive energy audits are not part of normal practice for public lighting in Armenia No specialized training on EE lighting is offered in Armenia	At least 10 comprehensive audits of public lighting completed in Yerevan and other cities Training on EE lighting delivered to specialists and agency representatives in Yerevan and at least 10 other cities	Completed audit documentation Training materials, participant rosters, summaries of proceedings	

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
<p>Outcome 2 Demonstration projects <i>Pilot projects yield cost-effective energy savings, raising the confidence and capacity of investors and decision-makers about EE lighting</i></p>	<p>Efficiency and energy savings of installed EE lighting</p> <p>Share of LED in demo-projects</p>	<p>Various levels for existing types of lighting – baseline technologies include older 250W HPS lamps, 400W mercury-vapor lamps, incandescents and fluorescent tubes. (Baselines to be updated during the inception period.)</p>	<p>At least five demonstration projects completed, covering various technologies including LEDs, and various applications including both street lighting and buildings</p> <p>Direct energy savings of 1.4 GWh per year</p> <p>100% LED for new outdoor and indoor lighting</p> <p>5% LED for outdoor lighting retrofits</p>	<p>Field verification, metering, and other documentation</p>	<p>Fulfillment of the target will depend on planning, financing, and implementation according to strict timetables agreed upon by the project and its partners.</p>
<p>Outcome 3 Replication via municipal programs and associated financial instruments <i>Municipal lighting programs lead to widespread deployment of EE lighting and associated energy savings</i></p>	<p>Adoption and financing of municipal programs for EE public lighting</p> <p>Energy savings from these programs</p> <p>Financial commitments for energy-efficient municipal lighting</p>	<p>Municipal programs for EE public lighting are desired but not comprehensively designed, financed, or implemented</p>	<p>Municipality of Yerevan develops and adopts program for upgrades of municipal lighting, with secured financing</p> <p>Similar programs are adopted in at least five other cities of Armenia</p> <p>Savings of 20 GWh per year from municipal lighting programs</p> <p>US \$10 million for energy-efficient municipal lighting secured</p>	<p>Official documentation of adoption of programs and financing agreements.</p>	<p>Adoption of municipal programs requires sufficient funds from municipal budgets and/or public and private sources of financing</p>
<p>Outcome 4 National policies, codes, and standards on lighting <i>New national policies mandate significantly greater energy efficiency and ensure product quality for lighting, particularly in residential buildings</i></p>	<p>Adoption and entry into force of phase-out of conventional incandescent lighting</p> <p>Adoption and implementation of other needed policies to promote EE lighting in various areas, including codes, standards, and procurement rules</p>	<p>Conventional incandescent lighting is available without restrictions and constitutes 85 percent of residential lighting in Armenia</p>	<p>A national phase-out of conventional incandescent lighting is adopted and enters into force</p> <p>Lamps with at least 25 percent greater luminous efficacy replace conventional incandescents according to the timetables of the adopted phase-out</p> <p>Other adopted policies and standards support the phase-out</p>	<p>Official documentation of adopted legislation, standards, or other state policy and regulations.</p>	<p>Adoption of national policy requires sufficient political will and addressing of stakeholder concerns about lighting quality, cost to consumers, and mercury containment.</p>

IV. TOTAL BUDGET AND WORKPLAN

Project ID:	00074869	Award ID:	00087057
Award Title:	Armenia – Green Urban Lighting		
Business Unit:	ARM10		
Project Title:	Armenia – Green Urban Lighting		
PIMS no.	4669		
Implementing Partner (Executing Agency)	Ministry of Nature Protection of the Republic of Armenia		

GEF Outcome/Atlas Activity	Responsible Party	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 2013 (USD)	Amount Budget 2014 (USD)	Amount Budget 2015 (USD)	Amount Budget 2016 (USD)	Total (USD)	Budget notes
OUTCOME 1: Municipal energy audits and technical capacity-building	MNP	62000	GEF	71200	International Consultants	15,000	18,000	-	-	33,000	1
				71300	Local Consultants	8,000	14,000	12,000	8,000	42,000	2
				71400	Contractual Services-individuals	12,000	12,000	12,000	12,000	48,000	3
				71600	Travel	3,000	20,000	3,000	-	26,000	4
				72100	Contractual Services-companies	20,000	50,000	-	-	70,000	5
				72400	Communic & Audio Visual Equip	1,000	1,000	1,000	1,000	4,000	6
				72500	Supplies	1,000	1,000	-	-	2,000	
				72800	Information Technology Equipment	5,000	1,000	1,000	1,000	8,000	
				73100	Rental and Maintenance-Premises	1,000	1,000	1,000	1,000	4,000	
				74200	Audio Visual & Printing Prod cost	4,000	3,000	2,000		9,000	7
74500	Miscellaneous	500	500	500	500	2,000					
					TOTAL OUTCOME 1	70,500	121,500	32,500	23,500	248,000	
OUTCOME 2: Demonstration projects	MNP	62000	GEF	71300	Local Consultants	10,000	10,000	10,000	7,000	37,000	8
				71600	Travel	3,000	4,000	4,000	3,000	14,000	9
				72100	Contractual Services-companies	25,000	60,000	60,000	-	145,000	10
				72300	Materials & Goods	100,000	250,000	150,000	50,000	550,000	11
				74200	Audio Visual & Printing Prod cost	-	-	2,000	2,000	4,000	
					TOTAL OUTCOME 2	138,000	324,000	226,000	62,000	750,000	
OUTCOME 3: Municipal lighting programs and associated financial	MNP	62000	GEF	71200	International Consultants	-	15,000	10,000	-	25,000	12
				71300	Local Consultants		14,000	12,000	12,000	38,000	13
				71400	Contractual Services-individuals	12,000	12,000	12,000	12,000	48,000	14
				71600	Travel	-	5,000	5,000	5,000	15,000	15
				72100	Contractual Services-companies	-	40,000	30,000	10,000	80,000	16

mechanisms				72200	Equipment and Furniture	5,000	22,000	-	-	27,000	17
				72400	Communic & Audio Visual Equip	5,000	2,000	2,000	2,000	11,000	18
				72500	Supplies	2,000	2,000	2,000	2,000	8,000	
				72800	Information Technology Equipment	5,000	-	-	-	5,000	19
				73100	Rental and Maintenance-Premises	1,000	6,000	1,000	1,000	9,000	20
				73400	Rental and Maint of Other Equip	1,000	2,000	2,000	2,000	7,000	21
				74200	Audio Visual & Printing Prod cost	3,000	5,000	6,000	6,000	20,000	22
				74500	Miscellaneous	500	3,000	500	1,000	5,000	
					TOTAL OUTCOME 3	34,500	128,000	82,500	53,000	298,000	
OUTCOME 4: National policies, codes, and standards on lighting	MNP	62000	GEF	71200	International Consultants	-	14,000	10,000	-	24,000	23
				71300	Local Consultants	9,000	18,000	18,000	9,000	54,000	24
				71400	Contractual Services-individuals	12,000	12,000	12,000	12,000	48,000	25
				71600	Travel	-	3,000	3,000	1,000	7,000	
				72100	Contractual Services-companies	-	15,000	15,000	-	30,000	26
				72200	Equipment and Furniture	-	10,000	-	-	10,000	27
				72400	Communic & Audio Visual Equip	1,000	1,000	1,000	1,000	4,000	
				72800	Information Technology Equipment	4,000	1,000	1,000	1,000	7,000	28
				73100	Rental and Maintenance-Premises	-	1,000	1,000	1,000	3,000	
				74200	Audio Visual & Printing Prod cost	1,000	2,000	4,000	2,000	9,000	29
				74500	Miscellaneous	500	1,000	500	1,000	3,000	
				TOTAL OUTCOME 4	27,500	78,000	65,500	28,000	199,000		
Project management	MNP	04000	UNDP	71200	International Consultants	-	25,000	-	30,000	55,000	30
				71400	Contractual Services-individuals	10,000	10,000	10,000	10,000	40,000	31
				71600	Travel	1,000	1,000	-	1,000	3,000	
				72400	Communic & Audio Visual Equip	2,000	2,000	2,000	2,000	8,000	
				74200	Audio Visual & Printing Prod cost	2,000	2,000	2,000	2,000	8,000	
				74100	Prof services (Audit)	-	2,000	2,000	2,000	6,000	32
					UNDP	15,000	42,000	16,000	47,000	120,000	
	MNP	62000	GEF	71400	Contractual Services-individuals	24,000	24,000	24,000	24,000	96,000	33
				74599	Miscellaneous (Project Direct Costs)	2,500	2,500	2,500	1,500	9,000	34
					GEF	26,500	26,500	26,500	25,500	105,000	
				TOTAL OUTCOME 5	41,500	68,500	42,500	72,500	225,000		
				UNDP Total	15,000	42,000	16,000	47,000	120,000		
				GEF Total	297,000	678,000	433,000	192,000	1,600,000		
				TOTAL PROJECT	312,000	720,000	449,000	239,000	1,720,000		

Summary of Funds: ⁴

	Amount, USD Year 1	Amount, USD Year 2	Amount, USD Year 3	Amount, USD Year 4	Total, USD
GEF	297,000	678,000	433,000	192,000	1,600,000
UNDP	15,000	42,000	16,000	47,000	120,000
Government (cash and in-kind)	2,130,000	3,210,000	1,980,000	1,055,000	8,375,000
TOTAL	2,442,000	3,930,000	2,429,000	1,294,000	10,095,000

⁴ Summary table should include all financing of all kinds: GEF financing, cofinancing, cash, in-kind, etc...

Budget notes:**General Cost Factors:**

- Short-term national consultants (NC) are budgeted at US\$ 300 per week.
- International consultants (IC) are budgeted at US\$3000 per week.
- DSA's are budgeted at US\$ 185 per day.
- International flight tickets are budgeted at US\$ 1000 per round trip.
- Other expenses are based on UNDP standard costs. The project will look for cost-savings wherever possible using programmatic approach so far applied in Climate Change Programme, particularly connected with costs associated with office equipment purchase and maintenance, technical support connected with information technologies and logistics, as well as communication costs and vehicle sharing.

Outcome 1:

1. International short term consultants will be hired to guide the PMT and the national consultant throughout the planning and implementation of energy audit based on best available experience in the region and proved methodologies. The IC will plan and conduct training of the staff of municipal lighting companies on energy audit and evaluation of potential for reducing the energy consumption and optimization of O&M costs.
2. The local short term consultant will be hired to support the PM in planning and guiding the energy audit, training and study tour planning, providing local knowledge and perspective.
3. The Task leader/expert (time shared between Outcomes) will be hired to provide necessary management and technical backstopping of the expert team and professional service providers.
4. The travel costs include the DSA and international flights for International consultants, as well as for study tour for national professionals from municipality to be organized during the second year of the project.
5. These include sub-contract with local and international companies for organization of the energy audit of the urban lighting system in Yerevan, including data-gathering, analysis, and recommendations, as well as conducting on job training of the municipal lighting company staff on the applied energy audit methodology.
6. Internet connectivity, land phone charges postage and pouch costs.
7. Translation, printing and reproduction of technical reports and documentation.

Outcome 2:

8. Local consultant will be hired for evaluation of the compliance of demonstration projects with recommendation of audit (in cooperation with Activity 1.1.1) and monitoring of the implementation progress.
9. Travel costs will cover costs of national consultants.
10. The local companies will be hired for conducting design and implementation of energy efficiency lighting demonstration projects
11. Costs associated with purchase of the lighting fixtures, lamps and regulation devices to be implemented with the demonstration projects.

Outcome 3:

12. International short term consultants will be hired to guide the PMT in planning and development of municipal lighting upgrades, including technical, measures and implementation schedule of the city wide planning of public lighting, based on best available international practice.
13. Local consultants will facilitate the negotiations with municipalities, and data collection including municipal development planes and dissemination of the outcomes outreach strategy under guidance of International Consultant.
14. National expert on information technologies will be hired to ensure the modeling works, software application, web-site design and LAN troubleshooting and maintenance.

15. Travel costs will cover international travel associated costs of International consultant and in country travel of national consultants.
16. These include sub-contract with international company for development of the comprehensive city wide lighting system planning document for attracting financing for implementation. The local company will be hired for adoption of the similar schemes for other cities of Armenia considering local circumstances.
17. Purchase of the office furniture and vehicle for in-country field visits
18. Internet connectivity, land phone charges postage and pouch costs.
19. Includes purchase equipment for organization of the trainings
20. Costs associated with organization of meetings, trainings, workshops
21. Costs associated with repair of office equipment and vehicle
22. Translation of the reports, editorial and publication costs.

Outcome 4:

23. The International short term consultant will guide national consultants and PMT in main directions on revision of national legislation/regulation based on evaluation of the applicable best international practices and EU standards for efficiency, quality and mercury content of lighting products, as well as phasing-out incandescent lamps and disposal of mercury containing lighting products. IC will assist the PMT and national professionals in development of the technical specifications of the essential equipment for partner testing laboratories.
24. Local consultants will be involved in development of the recommendations for: i) phasing-out the incandescent lamps; ii) institutional scheme for handling spent and broken mercury containing lamps; iii) for capacity building of testing laboratories, certification and control bodies. Local consultants will ensure drafting the amendments to the building code and health standards promoting use of energy efficient lighting products, and rules for state procurement based on life cycle cost and minimum performance standards of lighting products.
25. Public relations and information assistant will be responsible for collection, compilation, and editing of outreach/information materials, technical reports, including training kits, fact sheets in close cooperation with national and international experts. The assistant will be responsible for regular update and drafting materials for project and regional web-sites, www.nature-ic.am; www.beeca.net
26. These will include services connected with development of the technical standards and documentation on advanced lighting products, testing, certification and compliance. On 3rd Year the contractor will be selected for development of rules for state procurement of the energy efficient lighting and training of public agencies.
27. Equipment includes testing equipment and essential laboratory equipment for lighting products testing.
28. Purchase of information technology supplies.
29. Translation, editing and printing costs of draft regulatory documents, promotional and advertising materials.

Project Management:

30. Mid-term and terminal independent evaluation of the project and International consultant for preparation of project Inception report.
31. Project manager (50% of wage)
32. Project financial audit
33. Project manager (50% of wage) and part time financial and administrative assistant
34. See Annex F for details and estimation of Project Direct Costs

V. MANAGEMENT ARRANGEMENTS

The project will be implemented by the Ministry of Nature Protection (MNP) following UNDP’s National Implementation Modality (NIM). As the national authorized body for UNFCCC implementation in Armenia, MNP has coordinated the climate change program of UNDP-GEF since 1997 and will be responsible for the overall management and supervision of the project to ensure synergy with other GHG mitigation policies and measures in country, such as the above-mentioned UNDP-GEF projects. MNP has capacity and knowledge to guide and oversee the conceptual part of the project implementation including professional guidance for achieving the climate change mitigation objectives and overseeing the GHG emissions reduction impacts with regard to mercury recycling, as well as overall support via the project’s Technical Advisory Committee and Project Board.

MNP has been the implementing agency for the full-sized UNDP/GEF projects on energy efficiency of district heating and the building sector, and has a proven track record in successful implementation and cooperation with different ministries and stakeholders.

The Municipality of Yerevan will act as the main beneficiary and implementing partner. The energy-efficient lighting programmes and implementation modalities will be developed in close cooperation with municipalities of other cities. The corresponding regulatory framework for promotion of energy efficient lighting systems will be developed in close cooperation with the Ministry of Energy and Natural Resources and Ministry of Urban Development of the Republic of Armenia. These and other stakeholders, including project beneficiaries, are listed in Table 4.

Table 4. Project Partners, Roles, and Areas of Collaboration⁵

Partner	Joint and complementary activities
Ministry of Nature Protection	<ul style="list-style-type: none">• Coordination and supervision of project implementation in accordance with UNDP and GEF procedures• Evaluation of GHG mitigation potential of the project (including demonstration projects) and its further replication• Development and adoption of regulations for environmentally safe collection and disposal of used lighting equipment
Municipality of Yerevan	<ul style="list-style-type: none">• Energy audit of selected areas for assessment of baseline situation and upgrade potential (partly in the framework of the technical assistance project to be supported by the Austrian Bank). Assessment of technical condition of the system, and optimization opportunities for identification of the energy efficiency measures with highest reduction potential.• Design, implementation and monitoring of demonstration projects on EE public lighting in Yerevan.• Design and implementation of municipal plans and financing applications for comprehensive lighting upgrades in city networks• Training of the staff of the Yerevan Illumination Company.

⁵ The project has assessed the potential for working with the national electric grid company, the joint stock company “Electric Networks of Armenia.” Because there are not yet any enforced legal mandates for energy-efficient lighting, and because the company’s profits remain directly tied to volume of electricity sales, it is unrealistic at present to plan for common interests and synergies with the grid company with regard to demand-side management.

Partner	Joint and complementary activities
Ministry of Energy and Natural Resources	<ul style="list-style-type: none"> • Technical analysis, justification, policy development and adoption of provisions for a phase-out of conventional incandescent lighting • Oversight of development of technical standards for lighting products, including harmonization with relevant EU standards • Development of procurement rules for EE lighting
Ministry of Urban Development	<ul style="list-style-type: none"> • Review and revision of the building code on artificial and natural lighting
National Institute for Standardization	<ul style="list-style-type: none"> • Development of technical standards for lighting products.
State Engineering University of Armenia	<ul style="list-style-type: none"> • Testing and certification of lighting products in accordance with technical standards • Education, training and awareness raising events.
Scientific Research Institute of Energy of Armenia	<ul style="list-style-type: none"> • Education, training and awareness raising events.

Outside direction and oversight will be provided by two separate but closely linked bodies.

The Project Board will consist of the UNDP Environment Governance Portfolio National Director; a representative of government and implementing partner, the Ministry of Nature Protection; a focal person nominated from the municipality of Yerevan as main project beneficiary and second implementing partner; and a senior representative of UNDP. This Project Board will provide consensus management decisions when guidance is required by the Project Manager. The Project Board will also have final authority on matters requiring official review and approval, including annual work plans, budgets, and key hires.

The Technical Advisory Committee will comprise representatives of various other interested public and private agencies. The Ministry of Energy and Natural Resources, Ministry of Urban Development, Ministry of Territorial Administration, Ministry of Economy, Ministry of Nature Protection, the R2E2 Fund, the Scientific Research Institute of Energy, National Institute for Standards of RA and the Yerevan State University of Architecture and Construction will be invited to nominate representatives to the Technical Advisory Committee. This group will meet annually, with periodic consultation as needed throughout the year. The Project Board will actively seek and take account of the input of the Technical Advisory Committee. Project Board meetings will be timed, where possible, to occur immediately after the annual meetings of the Technical Advisory Committee.

UNDP will act as the GEF Agency for this project. The project builds on UNDP’s strong experience in Armenia and Eastern Europe and CIS with promoting energy efficiency and environmental protection, and building capacity of governmental organizations and the general public. UNDP has conducted recent projects in Armenia in diverse subject areas, including energy efficiency in buildings; energy efficiency in municipal heating; development of national greenhouse inventory and preparation of the national communications to UNFCCC; support for democratic governance; and particularly advancing the decentralization and capacity building of local administrations and have several years of effective cooperation with Yerevan Municipality in the framework of “Beautiful Yerevan” Programme. Moreover, UNDP in Russia, Ukraine, and Kazakhstan has already begun implementation of highly analogous projects on energy-efficient lighting, with much potential for synergy and mutual support to be facilitated via the UNDP-GEF Regional Coordinating Unit located at Bratislava.

UNDP's Country Office in Armenia will be responsible for ensuring transparency, appropriate conduct and financial responsibility. This office will oversee annual financial audits, as well as the execution of independent Midterm and Terminal Evaluations. All financial transactions and agreements, including contracts with staff and consultants, will follow the rules and regulations of the United Nations. The UNDP Regional Coordinating Unit will provide regular programmatic and administrative oversight as well.

The day-to-day implementation of the project will be carried out through the well-established UNDP Climate Change Program Unit coordinated by and located at the MNP (office space, means of communication, and other utilities as part of the government in-kind contribution): see Figure 1 for a graphic representation of the intended project management structure.

A full time Task Leader (TL) technical expert will be brought in under the project to provide necessary management and technical backstopping to the Climate Change Program Coordinator. The Task Leader is fully responsible for the direct project execution and coordination of all project activities. He/she has a right to implement the planned activities in accordance with the AWP approved by the PSC. A project team will be established and recruited on a competitive basis for project implementation. The project team will be managed by the TL, who will be accountable to the Programme Coordinator and UNDP for planning, implementation quality, timeliness and effectiveness of the activities carried out and the proper use of funds. The recruitment of the TL will be carried out jointly by the National Executing Agency and UNDP according to the UNDP procedures. In order to successfully implement the project activities, it is preferable and advantageous to use the accumulated capacities, including personnel, experience and information, established, trained and strengthened during the preparatory phase (PPG). Such approach will ensure smooth start up and implementation of the project. The Task Leader will be supported by International Consultants as well as by local support staff in the overall project management, including logistic support, circulation of discussion papers and draft reports, raising public awareness on project activities, coordinating and monitoring the work of the consultants and providing other support needed. The services of an international consultant will be engaged during the project inception phase. Additional short-term national and international experts will be brought in for different technical aspects as needed.

The Project Management Team will be responsible for recruitment of International and National Consultants, including candidate search/selection, preparation of TORs, and supervision; project coordination, including organization of regular meetings with the national implementing agency; financial management and accountability, issuance of payments, training staff on financial disbursements and reporting, and ensuring completeness and timeliness of financial reporting; technical reporting including preparation of progress reports; monitoring and evaluation; organization of training/workshop activities; and other tasks.

Project support staff will provide services required for the project implementation or services required by the TL. Services include project reporting, filing of project information, logistics, and other support on financial matters, procurement or hiring procedures.

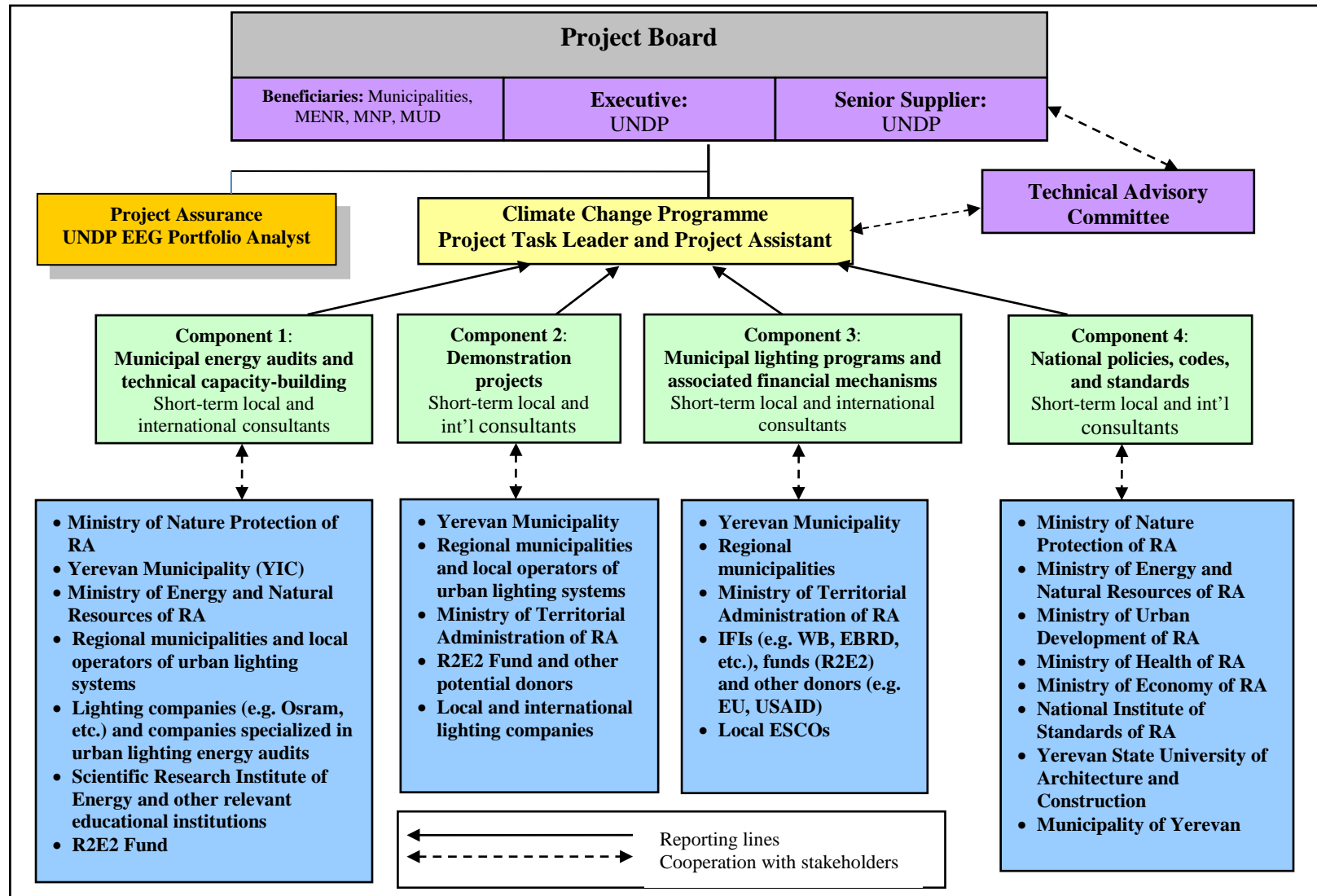
The four project components will be staffed by part-time teams of local experts and international experts, working closely together. Component 1 will be driven by experts and consultants with experience in urban lighting energy use, and energy efficient or green lighting technologies. Together they will collect and analyze data on urban lighting energy use, as well as monitoring the energy improvements and social and environmental impacts of energy efficient lighting. In addition, they will provide methodological assistance on public lighting energy audits in the capital and other major cities, and produce guidelines on green lighting applications for urban planners, architects, and municipal energy managers.

The team working on Component 2 (pilot urban green lighting projects) will include experts on street lighting technology, monitoring impacts and communication and dissemination of project results.

The team working on Component 3 (municipal lighting programs and associated financial mechanisms) will comprise experts with experience in energy efficiency financing, business investment strategies and project finance.

The team working on Component 4 (national policies, codes and standards on lighting) will be driven by experts and consultants with experience in policy, building codes, product standards and compliance mechanisms.

Figure 1. Project Implementation Structure



VI. MONITORING FRAMEWORK AND EVALUATION

The project will be monitored through the following M& E activities. The M& E budget is provided in the table below.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

- a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
- b) Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
- d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the [UNDP Evaluation Office Evaluation Resource Center \(ERC\)](#).

The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of

global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the [UNDP Evaluation Office Evaluation Resource Center \(ERC\)](#).

The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at <http://intra.undp.org/coa/branding.shtml>, and specific guidelines on UNDP logo use can be accessed at: <http://intra.undp.org/branding/useOfLogo.html>. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at <http://intra.undp.org/coa/branding.shtml>.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"), [http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08 Branding the GEF %20final_0.pdf](http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf) Amongst other things when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment, reflected in press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

Type of M&E activity	Responsible Parties	Budget US\$ (excluding project team and UNDP staff time)	Time frame
Inception Workshop (IW) and Report	<ul style="list-style-type: none"> ▪ Project Manager supported by an International Expert ▪ UNDP Armenia ▪ UNDP-GEF Regional Technical Advisor (RTA) 	5,000	Within first two-three months of project start up
Measurement of Means of Verification for Project Purpose Indicators: GHG emission monitoring (baseline and results) in-line with GEF/STAF methodology	<ul style="list-style-type: none"> ▪ UNDP-GEF RTA ▪ Project Manager ▪ GHG monitoring expert 	10,000	Start, mid and end of project
Measurement of Means of Verification for Project Progress and Performance (measured on an annual basis)	<ul style="list-style-type: none"> ▪ Oversight by Project UNDP-GEF RTA and Project Manager ▪ Project Team 	None	Annually prior to APR/PIR
APR/ PIR	<ul style="list-style-type: none"> ▪ Project Manager and Team ▪ UNDP Armenia ▪ UNDP-GEF RTA 	None	Annually
Project Board Meetings	<ul style="list-style-type: none"> ▪ Project Coordinator ▪ UNDP Armenia 	None	Following Project IW and subsequently at least once a year
Periodic status reports	<ul style="list-style-type: none"> ▪ Project Manager and team 	None	Quarterly
Mid-term External Evaluation	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP Armenia ▪ UNDP-GEF RTA ▪ External Consultants (i.e. evaluation team) 	20,000	At the mid-point of project implementation.
Final External Evaluation	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP Armenia ▪ UNDP-GEF RTA 	20,000	At least three months before the end of project implementation
Terminal Lessons Learnt Report	<ul style="list-style-type: none"> ▪ Project Manager ▪ UNDP Armenia ▪ National Experts 	None	At least one month before the end of the project
Audit	<ul style="list-style-type: none"> ▪ UNDP Armenia ▪ Project Manager and team 	6,000 (\$2,000 average per year, except for 1 st year)	Annually
Visits to field sites (UNDP staff travel costs to be charged to IA fees)	<ul style="list-style-type: none"> ▪ UNDP Armenia ▪ UNDP-GEF Regional Coordinating Unit (as appropriate) ▪ Government representatives 	For GEF supported projects, paid from IA fees and operational budget	Annually
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 61,000	

VII. LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article I of the Standard Basic Assistance Agreement (SBAA) between the Government of Armenia and the United Nations Development Programme (UNDP), signed by the parties on 8 March, 1995. The host country-implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government co-operating agency described in that Agreement.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the executing agency and its personnel and property, and of UNDP's property in the executing agency's custody, rests with the executing agency.

The executing agency shall:

- (i) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- (ii) assume all risks and liabilities related to the executing agency's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The UNDP Resident Representative is authorized to effect in writing the following types of revision to this Project Document, provided that he/she has verified the agreement thereto by GEF Unit and is assured that the other signatories to the Project Document have no objection to the proposed changes:

- a) Revision of, or addition to, any of the annexes to the Project Document;
- b) Revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of the inputs already agreed to or by cost increases due to inflation;
- c) Mandatory annual revisions which re-phase the delivery of agreed project inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility; and
- d) Inclusion of additional annexes and attachments only as set out here in this Project Document.

VIII. AUDIT CLAUSE

The Audit will be conducted in accordance with UNDP Financial Regulations and Rules and applicable audit policies on UNDP projects.

IX. ANNEXES

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Annex A. Risk Log



OFFLINE RISK LOG

(see Deliverable Description for the Risk Log regarding its purpose and use)

Project Title:	“Green Urban Lighting”	Award ID:	00067092	Date:	May-13
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#	Description	Date Identified	Type	Impact &	Countermeasures / Mngt response	Owner	Submitted, updated by	Last Update	Status
				Probability					
1	Financing for demonstration projects and/or municipal programs proves to be unavailable	Apr-13	financial	Fail to demonstrate financial and energy saving benefits from introduction of energy efficient technology in municipal lighting sector. P = 2 I = 4	Starting during or immediately after demonstration projects are confirmed during the Inception Period, the project will negotiate memoranda of understanding with responsible agencies and partners. Then, during the project design stage, specific sums for co-financing responsibility will be agreed upon and confirmed by contract. Municipality of Yerevan and UNDP have both confirmed their commitment to support demonstration projects. In addition, UNDP and the R2E2 Fund have agreed to try to provide mutual support where possible, which could prove very helpful in the orderly and timely securing of financing.	Yerevan Municipality Other target cities' Municipalities Stakeholders, e.g. USAID, WB, UNDP RBEC	EG Portfolio Analyst Project Team Leader	May-13	pending

2	Proposed policy changes are not adopted or not sufficiently enforced	Apr-13	political	<p>Energy efficiency is not legally mandatory enforced: low incentives for energy performance improvement; low replicability of energy efficiency lighting demonstration projects.</p> <p>P = 3 I = 3</p>	<p>All proposed policy changes are aligned with stated national priorities and objectives in the areas of climate change mitigation and energy efficiency. With specific regard to the phase-out of incandescents, the project is already anticipating proposing a more moderate alternative approach if stakeholder opposition to an aggressive phase-out is prohibitively strong.</p> <p>Involvement of the Ministry of Energy and Natural Resources and the Municipality of Yerevan as key national implementing partners will secure required political backstopping to the proposed policy changes at the national and municipal level. UNDP has a successful track record in Armenia with promoting policy reforms, such as in district heating sector, and will build on its past experience and lessons learnt.</p>	RA Government RA National Assembly	EG Portfolio Analyst Project Team Leader	May-13	pending
3	Inadequate project implementation and coordination with other initiatives	Apr-13	strategic	<p>Ineffective efforts in the fields due to lack of cooperation, overlap of functions.</p> <p>P = 2 I = 2</p>	<p>In particular, for design and implementation of demonstration projects, implementation time-frame and coordination with other partners and providers of co-financing is critical. UNDP Armenia has experience with implementing similarly complex projects for construction of pilot EE buildings; the same model and institutional arrangement for procurement will be adopted for green lighting projects.</p>	Project Team Stakeholders	EG Portfolio Analyst Project Team Leader	May-13	pending

Annex B. Expected responsibilities of Project Board and National Director

1. General Conditions

- 1.1. The Project Board is to be formed on the basis of the project document signed by the Ministry of Nature Protection of the Republic of Armenia (RA), the Municipality of Yerevan and the United Nations Development Programme (UNDP), for the project entitled “Green Urban Lighting” (hereinafter referred to as “the Project.”)
- 1.2. This document establishes the fundamental tasks, structure, organizational process, and meeting schedule of the Project Board, as well as the functions and rights of the Project Board and National Director (ND).
- 1.3. This document applies to the activity of all members of the Project Board.
- 1.4. The Project Board is a group providing management and oversight, coordination functions, and political support to the Project.
- 1.5. The Project Board operates on the basis of the Constitution of the Republic of Armenia, legislative acts of the Republic of Armenia, decrees and orders of the Government of the Republic of Armenia as well as this document.
- 1.6. The activity of the Project Board is based on the principles of free discussion and openness.

2. Fundamental Tasks of the Project Board

- 2.1. Oversight and coordination of the activities of the Project.
- 2.2. Creation of conditions for collaborative participation of local authorities with project staff and consultants, making possible the successful realization of project activity.
- 2.3. Review, assessment, and elaboration of recommendations, as well as consultative and expert delivery of suggestions on strategy, contents, volume, and timetables for concrete steps of the work of the Project.
- 2.4. Delivery of assistance in the realization of the work plans of the Project.
- 2.5. The Project Board is to be guided by this document with regard to its own activity.

3. Fundamental Functions of the Project Board

- 3.1. Overall direction of the realization of the project;
- 3.2. Definition of high-level directions of project;
- 3.3. Facilitation of collaboration with other complementary projects;
- 3.4. Facilitation of collaboration among government agencies, organizations, and other institutes for the successful realization of the project;
- 3.5. Provision of full access by the project to all documents and information in various government departments necessary for monitoring and realization of the project;
- 3.6. Delivery of methodological and practical assistance to the project on questions of realization of project activities;
- 3.7. Review and confirmation of Annual Work Plans, budget revisions, and staged financing;
- 3.8. Review and confirmation of annual reports on project activity;

- 3.9. Execution of the function of main coordinating body for promotion of the interests of the Project with regard to political, regulatory, legal, and financial support from the RK Government;
- 3.10. Continued effort to raise additional co-financing to support results and activities of the project after the conclusion of funding from the Global Environmental Facility.
- 3.11. Discussion and confirmation of rationale for establishment of project's Technical Advisory Committee and other working groups of the Project.

4. Composition of the Project Board

- 4.1. The Project Board includes representatives of the following organizations:
 - RA Ministry of Nature Protection (National Implementing Agency),
 - Yerevan Municipality(Main beneficiary and National Implementing Agency)
 - UNDP (country office in Armenia).
- 4.2. The general direction of the Project Board will be carried out by its Chairperson. The Chairperson is the National Director appointed by the RA Prime Minister for coordinating the Environmental Governance portfolio projects implemented by UNDP in Armenia.
- 4.3. For resolution of specific issues at Project Board meetings, various entities may be invited to attend, including representatives of scientific-technical institutes and academies, design companies, consultants, experts, and others.
- 4.4. The roster of the Project Board may be changed and/or supplemented by agreement of Project Board members, subject to approval by the Chairperson.

5. Role and Responsibilities of the National Director

- 5.1. The National Director (ND) bears the responsibility for coordination of project realization, in the side of the Government of RA.
- 5.2. The ND will direct the project over its entire duration, in order to provide for the realization of project action steps in accordance with the project document.
- 5.3. The ND may delegate all needed authority to the Project Manager, for the successful implementation of the project.
- 5.4. The ND provides for delivery of financial information to relevant authorized entities in accordance with operating principles for national activity.
- 5.5. The ND provides for coordination among project action steps and corresponding steps made in the framework of government programs and relevant incentives.
- 5.6. The ND presents various forms of support for the successful execution of the project and corresponding steps after completion of the project, including the long-term persistence of project results, as well as dissemination of lessons learned.
- 5.7. The ND confirms Annual Work Plans and project budgets.
- 5.8. The ND confirms financial and substantive reports on project realization.
- 5.9. The ND provides for collaboration with partners and coordination with departments of the National Implementing Agency.

6. Organization of activity and scheduling of meetings of the Project Board

- 6.1. The Project Board conducts its work at meetings convened at least twice annually, or more often as needed.
- 6.2. Decisions may be made by the Project Board with a quorum of two of its three members in attendance.
- 6.3. The Project Board makes decisions by votes at meetings. Project Board members attending meetings must devote every effort to achieving consensus.
- 6.4. Decisions of Project Board meetings are formulated as protocols.
- 6.5. Project staff will carry out the following activities in support of Project Board meetings:

Analysis of information provided by organizations, preparation of an agenda, and provision of necessary materials;

Advance submittal of the draft agenda and accompanying materials with a cover letter for the review and approval of the Chairperson or his or her appointed delegate;

Announcement of the time and location of the meeting and distribution of approved materials to the Project Board members no less than ten days before the meeting.

Annex C. Terms of Reference of Key Personnel

1. Project Task Leader

Under the direct supervision of the UNDP CO Head of Environment & Energy Unit, and in close cooperation with the Climate Change Programme Coordinator and National Project Coordinator (NPC), the Project Task Leader is responsible for the day-to-day management and implementation of the UNDP-GEF project, including all project administrative matters. All work of the Task Leader will be carried out in line with the Country Programme Action Plan and in full compliance with the UNDP Rules and Regulations.

Job content

- (i) Ensure efficient implementation and development of activities assigned under the project in accordance with approved Project Document;
- (ii) Lead, supervise, and monitor project implementation process,
- (iii) Act as Project asset management custodian and ensure maintenance and update of the project office inventory records in line with UNDP rules and regulations.
- (iv) Provide substantive support in the development of the project planning documents; monitor work plan implementation.
- (v) Provide substantive support in identifying and recruiting the competent staff and subcontractors, formulate their responsibilities as well as appraise their performance.
- (vi) Monitor and analyze the adequacy and content of the technical reports and project deliverables to achieve the project outcomes/outputs.
- (vii) Prepare reports on the operational status of the Project to the implementing, executing and funding agencies.
- (viii) Liaise with the Government, regional and local authorities, private sector, civil society organizations, and international partners to ensure participatory approach for achievement of project objectives.
- (ix) Provide technical backstopping and guidance to the national team of experts and subcontractors.
- (x) Coordinate the development of networking and information system activities relevant to the project implementation in the scope of the UNDP programme.
- (xi) Analyze the outputs, organize surveys and awareness rising campaign;
- (xii) Ensure organization of workshops and other meetings, prepare briefing notes, background papers and make presentations.
- (xiii) Ensure technical and organizational support of key institutes in the beginning of pilot implementation;
- (xiv) Ensure regular update regarding course of Project implementation on www.nature-ic.am web-site.
- (xv) Perform other duties as required.

Outputs

- Successful and timely Project implementation in accordance with objectives, schedule and planned budget.
- The quality of work of the Project Task Leader will be assessed by successful achievement of general objectives of the Project, in particular:
 - Preparation of annual Project reports, working plans and other relevant Project documents;
 - Documents on informative campaigns.

Remuneration

Remuneration is to be made on monthly basis according to the Contract.

Required qualifications

Education: Advanced University Degree in energy or relevant field, economics, finance, business administration and management.

Experience: Minimum of 5 years of related working experience in project implementation and management. The experience in international project management is an advantage. Demonstrated ability of cooperation with stakeholders: government officials, scientific institutions, NGOs, private sector and international financing institutions. Experience with UNDP-GEF project implementation procedures is highly desirable.

Languages: Excellent knowledge of Armenian and English, with exceptional writing skills. Ability to review, prepare and present training material and make oral presentations, both in Armenian and English.

Other skills: Strong interpersonal and communication skills, ability to take decisions. Good knowledge of computer software (MS Office, and task relevant specific software).

2. Administrative and Finance Assistant

The Administrative and Finance Assistant will work under the direct supervision of the National Project Coordinator and Project Task Leader and provide assistance to project implementation in the mobilization of inputs, the organization of training activities and financial management and reporting.

Job content

The Administrative and Finance Assistant will be responsible of the following duties:

- (i) Prepare all payment requests, financial record-keeping and preparation of financial reports required in line with NIM financial rules and procedures.
- (ii) Assistance to the recruitment and procurement processes, checking the conformity with UNDP and the Government rules and procedures.
- (iii) Assistance to the organization of in-country training activities, workshops and seminars, team meetings, ensuring logistical arrangements.
- (iv) Preparation of internal and external travel arrangements for project personnel.
- (v) Maintenance of equipment ledgers and other data base for the project.
- (vi) Routine translation/interpretation during projects meetings and drafting of meeting minutes and correspondence as required.
- (vii) Maintain project filing.
- (viii) Other duties which may be required.

Qualifications

Education: University degree, some training in business and/or administration desirable (finance or accounting).

Experience: At least five years administrative experience.

Skills: Good organizational skills, good computer skills, including spread-sheets and database.

Languages: Fluent in Armenian and English.

Local Consultants

3. Energy Audit Expert

Job content

- (i) Provide assistance in identification and recruitment of local service-companies (contractors) for implementation of urban lighting energy audits.
- (ii) Provide assistance in selection of urban lighting systems (parks, streets, neighborhoods, and public buildings) to be audited.
- (iii) Develop a plan/procedure for audit that will identify relevant activities, expected outputs and proposed deadlines and agree the document with involved municipalities and contractors.
- (iv) Elaborate detailed technical methodology for energy audit to be performed by the identified contractors.
- (v) Supervise the execution of audits and ensure timely submission of deliverables by the contractors.
- (vi) Develop a report summarizing and analyzing technical and financial results of the performed energy audits as well as providing appropriate recommendations for design and implementation of pilot projects.
- (vii) Based on the results achieved within the scope of energy audits develop a methodological guidance on public lighting energy audits for local municipalities.

Qualifications

- At least five years of working experience as a specialist in the field of energy audit;
- Academic qualification in the field of energy, engineering, architecture, or construction;
- Strong awareness of local and international best practice in the field of energy audit;
- Good communication, analytical and writing skills;
- Good knowledge of computer information technologies;
- Knowledge of English is advance.

4. Capacity Building and Training Specialist

Job content

- (i) Develop a technical training and capacity building programme on modern and EE lighting technologies and practices for lighting specialists from municipalities and lighting companies as well as for building designers in Armenia.
- (ii) Assist the project in organization and execution of the programme in cooperation with respective educational/scientific organizations (e.g. the Scientific Research Institute of Energy of Armenia).
- (iii) Assist the project in organization and execution of a study tour to GEF Public Lighting project in Central Europe and in development of a summary report, including follow-up plans.
- (iv) Based on the outcomes of the training programme identify needs in capacity building for municipal lighting specialist and develop recommendations to address the identified needs.
- (v) Develop guidelines on green lighting applications for urban planners, architects, and municipal energy managers.
- (vi) Develop outreach materials on EE lighting for the general public to be communicated with media coverage and other channels.

Qualifications

- At least ten years of experience of organization and execution of capacity building activities and trainings in the field of energy efficiency and /or efficient lighting;
- Academic qualification in the field of energy or engineering;
- Practical experience in organization of capacity building activities and trainings;
- Awareness of international best practice in the field of efficient lighting technologies;
- Good communication, analytical and writing skills;
- Knowledge of English is an advantage.

5. Energy Efficient Lighting Specialist, Responsible for Demonstration Projects

Job content

- (i) Participate in the process of selection of demonstration energy efficient lighting projects based on project criteria (e.g. cost-effectiveness, replicability, potential for financing and co-financing, etc.), results and recommendations of energy audit of urban lighting systems and proposals received from municipal governments and other relevant stakeholders.
- (ii) Develop implementation plans for each of the identified demonstration projects, including specific activities, timetables, expected outcomes and monitoring procedures.
- (iii) Provide assistance in identification and recruitment of contractors for implementation of demonstration projects.
- (iv) Assist the project team in negotiations with the municipalities, contractors and project partners (e.g. IFIs or ongoing projects) to ensure smooth and successful implementation of demonstration projects.
- (v) Ensure coordination of supervision of design, realization, operation and subsequent monitoring of demonstration projects.
- (vi) Develop written reports on technical and financial performance (results) of demonstration projects as well as lessons learned based on monitoring results after one year of operation.
- (viii) Produce a written report or reports on performance of demonstration projects based on monitoring up to the end of the project period as well as appropriate recommendations (justifications) for replication of the proposed EE lighting measures within the scopes of municipal EE programs.

Qualifications

- At least ten years of working experience in the field of EE and lighting;
- Academic qualification in the field of energy, engineering or construction;
- Good knowledge of building codes and other relevant norms and standards;
- Outstanding time-management and organizational skills;
- Good communication and writing skills;
- Good knowledge of computer;
- Knowledge of English is an advantage.

6. Expert on Municipal EE Lighting Programs and Finance

Job content

- (i) Assist the project team and the municipal government of Yerevan in development and implementation of a comprehensive program for upgrading of public lighting in the capital city

based on analyzes of technical and financial results of energy audits and demonstration projects. The plan shall include description of the proposed technical measures, timetables, budgets, and recovery and reinvestment of savings, as well as a plan for ongoing monitoring and maintenance, etc.

- (ii) Ensure ongoing monitoring of implementation of the public lighting upgrade program and evaluation of the upgrades including preparation of reports on energy savings, avoided emissions, and financial returns.
- (iii) Assist the project team in designing of a revolving-fund mechanism for recovery and reinvestment of funds saved from the implementation of the program.
- (iv) Based on the work performed for Yerevan, support the project team in development of analogous municipal programs in other urban areas of Armenia.
- (v) Support the project team and target municipalities in facilitation of linkages with international (e.g. EBRD, WB, IFC, etc.), national (state budget and funds) and local (municipal budgets) financing needed for implementation of the programs as well as provide necessary assistance and coordination for implementation of municipal programs (implementation of programs will be carried out by municipal agencies themselves) and subsequent monitoring.
- (vi) Develop a report summarizing the results and lessons learned from implementation of the municipal lighting-upgrade program in Yerevan, for both technical and non-technical audience (municipalities, energy-service providers, etc.).

Qualifications

- At least 5 years of working experience in the field of development and implementation of municipal development plans.
- Academic qualification in the field of energy and finance;
- Experience of working with international financial organizations;
- Outstanding time-management, communication and organizational skills;
- Good computer and information technology skills;
- Knowledge of English is an advantage.

6. Policy Specialist

Job content

- (i) Prepare a review and comparative analysis of energy consumption, life-cycle costs, and environmental effects of incandescent lighting and potential replacement technologies (including CFLs and LEDs), in Armenia.
- (ii) Develop technical and policy justifications and propose enforcement mechanism to support introduction of EE lighting technologies and facilitate phase-out of inefficient incandescent lighting in Armenia based on relevant international experience (laws, regulations and enforcement mechanisms).
- (iii) Based on the results of the above sub-tasks provide support to the project team and relevant stakeholders (e.g. ministries) in drafting and enforcement of appropriate legislation and enforcement mechanisms.
- (iv) Develop a review of international best practices with regard to handling of spent and broken mercury-containing lamps.
- (v) Based on the results of the review draft recommendations for adoption and implementation of national program aimed at safe handling (e.g. collection, storage, utilization, etc.) of spent and broken mercury-containing lamps in Armenia.

Qualifications

- At least 10 years of working experience in the field of energy policy;
- Academic qualification in the field of energy or engineering;
- Strong awareness of international regulation and best practice in the field of EE lighting;
- Strong knowledge of the relevant Armenian legislation and regulation;
- Time-management and organizational skills;
- Good communication and writing skills;
- Good knowledge of computer;
- Knowledge of English is an advantage.

7. Expert on Standards

Job content

- (i) Review international experience with technical standards and codes with regard to lighting products and develop appropriate recommendations on enhancements of relevant regulations in Armenia.
- (ii) Assist the project team in formation and coordination of a working group for the development of technical standards on advanced lighting products.
- (iii) Assist the project in enforcement of the developed standards and codes.
- (iv) Assist the project in facilitation of agreements and funding mechanisms by which local appropriately equipped institutions would provide testing and certification of lighting products in accordance with adopted technical standards.
- (v) Review health code limitations in other countries with regard to the use of LEDs for indoor lighting and develop recommendations for revision of existing health code requirements in order to expand allowed uses of LEDs (if needed).
- (vi) Review procurement rules in other countries with regard to energy-efficient lighting and elaborate recommendations on improvement of public procurement procedures in Armenia to favor EE lighting products.

Qualifications

- At least 10 years of working experience as a specialist in the field of standards and codes.
- Academic qualification in the field of energy and technical standards.
- Strong awareness of international experience in the field of EE lighting standards and codes.
- Good knowledge of application scope for LED based lighting technologies.
- Familiarity with of international and local procurement legislation and procedures.
- Time-management and organizational skills;
- Knowledge of English is an advantage.

8. GHG Emission Mitigation Expert

Job content

- (i) Assist the project team in calculation of GHG emission factor for power system and evaluation/monitoring of actual GHG emission reduction achieved during implementation of proposed pilot projects.
- (ii) Review and analyze existing system of collection, assessment and use of data on energy consumption in urban lighting sector and develop recommendations on institutional and technical

aspects for establishment of municipal energy consumption and GHG monitoring system in the sector. Develop a monitoring plan and methodology for continuous (annual) monitoring and evaluation of energy consumption, energy saving and GHG emission reduction in the sector of urban lighting.

Qualifications

- At least five years of working experience as a specialist in the field of GHG emission reduction and climate impacts;
- Academic qualification in environmental science, energy or economy with specialization in GHG emission related aspects;
- Practical experience in financial and economic analysis and GHG emission reduction and carbon trade issues;
- Good computer skills;
- Knowledge of English is an advantage.

International Consultants

9. Expert on Municipal Energy Audit

Job content

- (i) Provide recommendations and assist the project team in organization and implementation of urban lighting energy audits as well as in analysis of the achieved results.
- (ii) Provide expertise and assist in development of a methodological guidance on public lighting energy audits for local municipalities.
- (iii) Assist the project team in development of a comprehensive program for upgrading of public lighting in Yerevan;

Qualifications

- At least fifteen years of working experience as a specialist in the field of energy audit and lighting;
- Academic qualification in the field of energy, engineering or construction;
- Practical experience in organization and implementation of energy audits;
- Working experience in CIS countries in the respective area;
- Strong awareness of international best practice in the field of energy audit;
- Proficiency in English; preferably proficiency in written Russian.

10. EE Lighting Policy Specialist

Job content

- (i) Provide expertise regarding development of technical and policy justifications and proposed enforcement mechanism to support introduction of EE lighting technologies and facilitate phase-out of inefficient incandescent lighting in Armenia based on relevant international experience (laws, regulations and enforcement mechanisms).
- (ii) Provide support to the project team in drafting and enforcement of appropriate legislation and enforcement mechanisms.

- (iii) Based on the results of the review of international best practices with regard to handling of spent and broken mercury-containing lamps developed by local consultants draft recommendations for adoption and implementation of national program aimed at safe handling (e.g. collection, storage, utilization, etc.) of spent and broken mercury-containing lamps in Armenia.

Qualifications

- At least ten years of working experience as a specialist in the field of design and implementation of municipal energy and lighting programs;
- Academic qualification in the field of energy, engineering or finance;
- Practical experience of work with international financial institutions aimed at funding of municipal energy programs;
- Proficiency in English, excellent analytical and presentation skills;
- Excellent interpersonal and cross-cultural communication skills;
- Previous experience of working in CIS countries in the similar field will be an asset;
- Preferably proficiency in written Russian.

11. Expert on Municipal Planning

Job content

- (i) Assist the project team in planning and development of municipal upgrades including technical and implementation schedule of city-wide planning of public lighting based on best available international practice.
- (ii) Based on the results of the review of international best practices with regard to energy efficient lighting developed by local consultants provide recommendations on improvement of public procurement procedures in Armenia to favor EE lighting products.
- (iii) Provide recommendations on design and establishment of a revolving-fund mechanism for recovery and reinvestment of funds saved from the implementation of the program;
- (iv) Provide recommendations and practical advices regarding facilitation of linkages with international financing needed for implementation of the municipal lighting program.

Qualifications

- At least ten years of working experience as a specialist in the field of municipal planning;
- Academic qualification in the field of urban planning, economy;
- Good knowledge in municipal project funding schemes and mechanisms;
- Excellent analytical and presentation skills;
- Excellent interpersonal and cross-cultural communication skills;
- Previous experience of working in CIS countries in the similar field will be an asset;
- Proficiency in English, good knowledge of Russian is an asset.

Annex D. Co-financing Letters from Stakeholders



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ՀՀ, 0015, ք. Երևան, Արգիշտիի 1

№ *ՁԶ/4Ձ-13566 Կ*

ՁԶ 03 2013 թ.

To: Mr. Bradley Busetto
UNDP Resident Representative
UN Resident Coordinator

Dear Mr. Busetto,

I would like to express our full support and commitment to “Green Urban Lighting” project financed by GEF and executed jointly by the UNDP CO Armenia, the Ministry of Nature Protection of RA and Yerevan Municipality.

The Yerevan Municipality is continuously expanding and improving urban lighting system and the objective of the project is in line with the national policy on energy saving and energy efficiency. Hence, we do hope that the project will help us to optimize efficiency of the urban lighting system of Yerevan city based on best international practice.

The Municipality of Yerevan within the next 4 years is planning to allocate the budget of about 7 mln USD for lighting sector of Yerevan city. The mentioned budget excludes electricity costs and includes costs associated with operation, maintenance and improvement of the existing system of street and public lighting as well as funds allocated for installation of new lighting on streets, yards, parks, blind alleys and other sites.

I would also like to mention that Development and Investment Programs Department of the Municipality of Yerevan and the staff of the Yerevan Illumination Company CJSC are ready to provide organizational and technical assistance that may be required for successful implementation of the project, including materials, electrical network equipment and machinery. This support should be considered as an in-kind contribution of the Municipality of Yerevan.

We are looking forward to further productive and mutually beneficial cooperation.

Sincerely yours,

Kamo Areyan
Deputy Mayor



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ՍՊԻՏԱԿԻ ՔԱՂԱՔԱՊԵՏԱՐԱՆ

Հայաստանի Հանրապետություն, Լոռու մարզ, Սպիտակի քաղաքապետարան, Շահումյան 7, 1804,
Հեռ: (0-255) 2-25-00, Ֆաքս: (0-255) 2-25-97, էլ. փոստ: municipalityspitak@gmail.com

«02» 04 2013թ. N⁰ 034/-27-191

To: Mr. Bradley Busetto

UNDP Resident Representative

UN Resident Coordinator

Dear Mr. Busetto,

I am pleased to inform you that, within the framework of Spitak town development program, it is planned to implement modernization and extension of the urban lighting system (including street, external and in-door lighting) during 2013-2016.

The preliminary total budget of the aforementioned works implementation constitutes 12 mln AMD (about 30 thous. USD). To cover a part of that sum, we envisage receiving co-financing from different international financial institutions operating in the Republic of Armenia.

At the same time, please be informed, that the Spitak town street lighting system operational budget for 2013-2016 is about 9 mln AMD, which except for the operational and maintenance works should be also targeted to the modernization.

Taking into consideration that the main objective of the UNDP/GEF “Green Urban Lighting” Project is provision of support to enhancement of energy efficiency of Armenian cities lighting systems, the municipality of Spitak town is expressing its willingness to cooperate with the UNDP-GEF Project on the bases of cost-sharing principle for installation of the up-to-date energy efficient lighting system in the city.



G.Sahakyan
Mayor of Spitak town



1501, ք. Սևան, Նաիրյան փ. 164
հեռ. (0261) 2-43-23
Էլ. փոստ sevanhamaynq@mail.ru

1501, г. Севан, ул. Наирян 164
тел. (0261) 2-43-23
Эл. почта sevanhamaynq@mail.ru

04/03/2013թ.

N *ԲԻՍ 1/51*

Ms. Claire Medina
UNDP Deputy Resident Representative

Dear Ms. Medina,

I am pleased to inform you that the four-year development program of Sevan town urban community envisages construction of external lighting system in its newly built park as well as reconstruction and modernization of the adjacent street's external lighting system of about 900 m length.

The total budget for implementation of these works is about 200 million AMD (about 500 thousand USD). Besides, 10 million AMD (about 25 thousand USD) are allotted from the municipal budget for installation of new lighting systems in 2013.

Taking into account that the main objective of UNDP-GEF "Green Urban Lighting" project is to contribute to improving energy efficiency of urban lighting in Armenia, Sevan town municipality is committed to work with the UNDP-GEF project on co-financing basis to install an urban lighting system meeting most recent energy efficiency requirements in Sevan town.

Best regards,

R. Ghukasyan



ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԲՆԱԴԱՀՊԱՆՈՒԹՅԱՆ ՆՏԵՍԱՐԱՐՈՒԹՅՈՒՆ
 ՆԱԽԱՐԱՐ
 MINISTRY OF NATURE PROTECTION OF THE REPUBLIC OF ARMENIA
 MINISTER
 МИНИСТЕРСТВО ОХРАНЫ ПРИРОДЫ РЕСПУБЛИКИ АРМЕНИЯ
 МИНИСТР

0010, ք. Երևան, Հանրապետության հրապարակային 3-րդ տուն
 3 Government Bldg, Republic Sq, Yerevan, 0010, Armenia
 0010, Армения, г.Ереван, Дом правительства, здание N3
 Էլ.փոստ /E-mail/ էլ.փոստ: minister@mnp.am
 Web page: www.mnp.am
 ☎ (374 10) 52 10 99
 📠 (374 10) 54 08 57

№ 1/01/10692
 «13» 05 2013թ.

To: Mr. Bradley Busetto
 UN Resident Coordinator
 UNDP Resident Representative

Dear Mr. Busetto,

The Ministry of Nature Protection of the Republic of Armenia confirms its full support to the implementation of “Green Urban Lighting” PIMS: 4669 Project financed by GEF with UNDP as the executive agency.

The project aims at improving energy efficiency in urban lighting sector of Armenia with focus on modernization of the existing as well as construction of new urban (street) lighting systems with application of modern efficient lighting technologies and approaches. The project is fully in line with the strategic priority of the Government of the Republic of Armenia to ensure the overall energy safety and improve effectiveness of energy use in conformity with the commitments of Republic Armenia under UNFCCC.

Hereby, I would like to confirm the commitment of the Ministry of Natural Protection of the Republic of Armenia to provide 250,000 USD in-kind contributions as co-financing to the “Green Urban Lighting” full-sized project.

We look forward to our continuous and fruitful collaboration with UNDP.

Sincerely,

Aram Harutyunyan 
 Minister of Nature Protection of RA

000755





*Empowered lives.
Resilient nations.*

17 April 2013
L112/2013

Dear GEF Council Members and Secretariat,

Subject: Letter of co-financing for “Green Urban Lighting” PIMS 4669 Full-Sized Project

We are pleased to confirm the commitment of the United Nations Development Programme in Armenia to successful implementation of **“Green Urban Lighting” PIMS 4669 Full-Sized Project**. The amount of co-financing for implementation of the project allocated from UNDP Armenia TRAC resources is USD 120,000 (one hundred twenty thousand US dollars only) throughout the 4 year period of the project implementation.

UNDP CO is successfully cooperating with Yerevan Municipality in the framework of “Beautiful Yerevan” Project. The budget of the project is approved on annual basis and makes USD 0.95 million for the period of 2011-2013. There is mutual intention to continue the project and it can be considered as cash contribution of UNDP to the “Green Urban Lighting” Project.

Look forward to our cooperation on this important initiative.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'B. Busetto', is placed above the printed name.

Bradley Busetto
UN Resident Coordinator
UNDP Resident Representative

GEF Council Members and Secretariat

N^o 1059/02-02
«22» 04 2013թ.

Mr. Bradley Busetto
UN Resident Coordinator
UNDP Resident Representative

Dear Mr. Busetto,

Based on the common objectives of the energy saving loan program of "ARARATBANK" OJSC financed by the Green for Growth Fund and UNDP-GEF "Green Urdan Lighting" project, "ARARATBANK" expresses its willingness to cooperate with the UNDP-GEF project to mainstream and enhance efforts aimed at the energy efficiency and energy saving in Armenia.

We expect that this cooperation will encourage private sector involvement in energy efficiency improvement projects thus contributing to achievement of the stated common objectives.

Sincerely,



Ashot Osipyan



USAID
FROM THE AMERICAN PEOPLE

COUNTERPART
INTERNATIONAL
In partnership for
results that last.



Mr. Bradley Busetto
UNDP Resident Representative
UN Resident Coordinator

Yerevan, 20 March 2013

Dear Mr. Busetto,

It is my pleasure to inform you that Counterpart International Armenia, within the framework of its local governance support activities, provides Local Government Incentive Grants to communities of Armenia aimed at co-financing the installation of new street lighting systems.

In 2012 Counterpart International Armenia provided 95000 USD (approximately 38.000.000 AMD) towards the installation of new street lighting systems in 4 urban (Vanadzor, Sevan, Sisian and Maralik) and 10 rural (Kotayk, Nor-Geghi, Haykadzor, Ashotavan, Halidzor, Shinuhayr, Khndzoresk, Aygehovit, Gandzakar, Koti) communities. This work will be continued in 2013 as well.

The overall goal of the UNDP-GEF “Green Urban Lighting” project to facilitate improvement of urban lighting through introduction of energy efficient lighting technologies, capacity building activities and development of municipal lighting plans in cooperation with the local population is very much in line with Counterpart International Armenia objectives to improve local governance and support the social development of Armenian communities.

In this regard, I would like to confirm the readiness of Counterpart International Armenia to cooperate with the “Green Urban Lighting” project in the implementation of pilot activities aimed at installation of energy efficient street lighting systems in the urban communities of Armenia. We will decide on the scope of our co-financing based on concrete proposals to be made by “Green Urban Lighting” project.

I welcome the soonest start of the project and look forward to our fruitful co-operation.

Sincerely yours,

Carel Hofstra
Chief of Party
Counterpart International Armenia

Demirchyan 62 Street, Yerevan, Armenia 0002
Tel./Fax: +374-10-51 90 24, 51 90 27, 52 90 56 www.counterpart.am

Annex E. Calculation of Energy Saving and CO₂ Emission Reduction Potential for Pilot Projects

Description of pilot projects

Taking into consideration the indicative project budget and the scope of potential pilot projects set in the PIF as well as information obtained from the urban municipalities and preliminary estimations made by the project local experts, a group of pilot projects have been identified and prioritized based on cost-effective energy saving and GHG emission reduction potential as well as considerable potential for replication across the country for each option.

The proposed demonstration projects will lead to direct energy saving and associated reduction of GHG emissions through introduction of modern energy efficient lighting technologies (e.g. produced by Philips, Osram, GE) that will replace the existing (baseline) technologies (usually low-quality, low luminous efficacy lights produced in China). For all cases modernization of existing lighting systems through implementation of the pilots and their future replication leads to improvement of the quality of illumination in accordance with the acting standards and regulations.

The diversity of the identified pilots is aimed to ensure application of various available technologies (e.g. modern efficient HPS and LED based lights) and, thus, secure maximal penetration of energy efficiency lighting technologies in the sector which will help to achieve better direct and indirect energy saving and GHG emission reduction.

Similarly to the example of the analogous UNDP/GEF project in Kazakhstan (Promotion of Energy Efficient Lighting), modernization of lighting system implies replacement and maintenance of both bulbs and fixtures because installation of modern efficient bulbs into existing fixtures will considerably reduce total effect of modernization measures due to low quality and reliability of the currently used fixtures.

Moreover, in some cases, replacement of fixtures is a must because of application of completely different lighting technology (e.g. replacement of HPS lights with LED based lights). Accordingly, for all pilots (except for LED based street lighting for which 20 years is taken) an average technology lifetime of 15 years is taken as a conservative approach provided that average service time of modern fixtures is about 20 year and even more. The approach is especially conservative for LED based technologies because declared lifetime of such type of lights exceeds 30 years.

Final selection of concrete pilot streets and objects will be made by the project team within the first 2-3 months after the launch of the full-sized project based on appropriate selection criteria (with consideration of the results of calculations introduced below) and in close consultation with local municipalities.

For all pilot pilots it is assumed that the project's partners will provide co-financing in support of baseline activities, materials, and technology, while the UNDP/GEF project will provide investment support to cover the incremental cost of energy-efficient equipment, including lamps and fixtures.

The proposed pilot projects include the following:

1. *Street lighting retrofit.*

- A. 250-watt HPS fixtures and lamps replaced with 150W HPS
- B. 400-watt mercury-vapor fixtures and lamps replaced with 150W HPS
- C. 250-watt HPS fixtures and lamps replaced with LED fixtures and lamps.

2. **New street lighting:** 150W HPS fixtures and lamps (which otherwise would have been 250W HPS).
3. **Lighting retrofit in buildings:** Incandescent lamps and fluorescent tubes replaced with various LEDs, including screw-in bulbs and linear tubes.
4. **New outdoor lighting** (parks, public areas, etc.): LED fixtures and lamps (which otherwise would have been 150W HPS).

Pilot 1A: Replacement of 250W HPS with 150W HPS

Basic parameters and assumptions for replacement of 250W HPS with 150W HPS for Pilot 1A are summarized below.

Table E.1. Parameters of replacing 250W HPS with 150W HPS (Pilot 1A)

Parameters	Unit	Baseline scenario	Project scenario
Type of lights (fixtures)	type	ZHKU-250 (old)	Osram/Philips/GE
Type of bulbs	type	DNAT 250	HPS or LPS bulbs
Capacity of bulbs	W	250	150
Indicative luminous efficacy	Lm/W	-	100-140 ¹
Cost of bulb	USD	11	32
Cost of fixture	USD	74	173
Number of lights (bulb + fixture, retrofit)	psc.	2323	2323 ²
Total installed capacity	kW	580	348
Daily operation of the lighting system	hours	10	10
Annual electricity consumption	MWh/year	2117	1270
Annual electricity costs (average tariff of 0,064 USD/kWh)	USD/year	135488	81280
Annual GHG emissions (GEF is 0.4 kg/kWh)	tCO ₂ /year	847	508
Total energy consumption during technology lifetime	MWh	31755	19050
Total GHG emission during technology lifetime	tCO ₂	12705	7620
Actual average operational lifetime of light bulbs	hours	4500	21000
Number of replacements during the technology lifetime of 15 years	times	12	2.6
Replacement costs within technology lifetime (cost of bulb + installation)	1000 USD	306.6	193.3
Length of hypothetical street (2 fixtures per pole)	km	17	17 ³

Notes:

1. Data provided for Philips produced HPS street lights (Master SON-T and similar) www.philips.com
2. Number of lights is calculated in the following way $400,000\text{USD} / ((32 + 173) * 0.84)$ i.e. it is considered that budget allocated by the project will be spent to cover the incremental cost to purchase EE street lights. Coefficient 0.84 takes into consideration VAT exemption applicable for UNDP projects.
3. The acting regulation requires installation of 33 poles per 1 km of street. If such approach is taken (considering that there are 2 fixtures per pole), then the length of hypothetical pilot street is $2323 / 2 / 33 / 2 = 17$ km.

Based on the data from the Table E.1, a summary of baseline and GEF project scenario for hypothetical Pilot N1 is provided in Table E.2 below.

Table E.2. Projected Energy Savings and Avoided Emissions from Pilot 1A

Technology		Old fixtures and inefficient HPS DNAT 250 type bulbs	Modern fixtures and efficient HPS bulbs with better Lm/W parameters
Baseline scenario			
Project scenario			
Number of lights		2323	2323
Wattage per light, W		250	150
Hours of operation per year, Hours		3650	3650
Annual energy consumption, MWh/y		2117	1270
Annual energy saving, MWh/y		-	847
Technology life cycle, years		-	15
Life-cycle energy saving and avoided emissions of the pilot project		MWh	12705
		tCO ₂	5082

It is believed that implementation of the proposed pilot will demonstrate feasibility of modernization measures within the first two years of the project implementation. This along with institutional, regulation and other improvements and promotional measures to be developed and enforced by the project will facilitate direct replication of the proposed modernization activity not only in Yerevan but also in other urban communities of Armenia where DNAT 250 type street lights are in operation. Moreover, replication will cover both already existing street lighting systems and new systems to be installed in the nearest future.

Based on this assumption a conservative indicative estimation of expected replication effect of Pilot 1A is made.

Table E.3. Projected Replication of Pilot 1A

Location	Street lighting systems	Number of lights to be replaced	Share in the total number of street lights of that type	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO ₂
Yerevan	Existing systems	23230	45%	127050	50810
Other cities	Existing systems	2428	40%	13279	5310
Total		25658		140329	56120
Conservative Total (considering proportion of achieved saving – 0.9)				126296	50508

Pilot 1B: Replacement of 400W mercury-vapor lamps and fixtures with 150W HPS

This hypothetical pilot project envisages replacement of the existing inefficient 400W mercury-vapor street lights (bulb and fixture) with modern efficient 150W HPS lights with better luminous efficacy (lm/W) in one or a number of street lighting systems in regions of Armenia (outside of Yerevan). This measure will allow reducing energy consumption and associated GHG emission while securing the same or better illumination of streets.

Also, this pilot will allow avoiding utilization of mercury-containing bulbs, thus, reducing environmental and human health risks associated with their application and final disposal. The table below summarizes all basic parameters and assumptions made for this pilot project.

Table E.4. Parameters of Pilot 1B

Parameters	Unit	Baseline scenario	Project scenario
Type of lights (fixtures)	type	RKU-003-400	Osram/Philips/GE
Type of bulbs	type	Mercury-vapor	HPS or LPS bulbs
Capacity of bulbs	W	400	150
Indicative luminous efficacy	Lm/W	-	100-140
Cost of bulb	USD	10	32
Cost of fixture	USD	60	173
Number of lights (bulb + fixture)	psc.	581	581
Total installed capacity	kW	232	87
Daily operation of the lighting system	hours	7	7
Annual electricity consumption	MWh/year	593	222
Annual electricity costs (average tariff of 0,064 USD/kWh)	USD/year	37951	14208
Annual GHG emissions (GEF is 0.4 kg/kWh)	tCO ₂ /year	237	89
Total energy consumption during technology lifetime	MWh	8895	3330
Total GHG emission during technology lifetime	tCO ₂	3558	1332
Actual average operational life-time of light bulbs	hours	4500	21000
Number of replacement during the technology LT of 15 years	times	8.5	1.8
Replacement costs within TLT (cost of bulb + installation)	1000 USD	49.4	33.5
Length of hypothetical street (one fixture per pole)	km	9.7	9.7

Based on the data from the Table E.4 a summary of baseline and energy-efficient (project) scenario for hypothetical Pilot N2 is provided in the below table.

Table E.5. Projected Energy Savings and Avoided Emissions from Pilot 1B

Technology		Old fixtures and inefficient mercury-vapor 400W bulbs	Modern fixtures and efficient HPS bulbs with better Lm/W parameters
Baseline scenario			
Project scenario			
Number of lights		581	581
Wattage per light, W		400	150
Hours of operation per night, Hours		7	7
Annual energy consumption, MWh/y		593	222
Annual energy saving, MWh/y		-	371
Technology life cycle, years		-	15
Life-cycle energy saving and avoided emissions of the pilot project	MWh		5565
	tCO₂		2226

It is believed that implementation of the proposed pilot will demonstrate feasibility of modernization measures within the first two years of the project implementation. This along with institutional, regulation and other improvements and promotional measures to be developed and enforced by the

project will facilitate direct replication of the proposed modernization activity in Yerevan and in other urban communities of Armenia where mercury-vapor type street lights are in operation.

Based on this assumption a conservative indicative estimation of expected replication effect of Pilot 1B is made.

Table E.6. Replication of Pilot 1B

Location	Street lighting systems	Number of lights to be replaced	Share in the total number of street lights of that type	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO ₂
Yerevan	Existing systems of 400W MV lights	630	90%	6034	2413
	Existing systems of 250W MV lights	1800	90%	6898	2760
Other cities	Existing systems of 400W MV lights	1295	60%	12407	4963
	Existing systems of 250W MV lights	2240	60%	8585	3434
Total		5965		33924	13570
Conservative Total (considering proportion of achieved saving – 0.9)				30531	12213

Pilot 1C: Replacement of 250W HPS with LED street lights

This hypothetical pilot project envisages replacement of the existing inefficient 250W HPS lights (bulb and fixture) with modern efficient 110W LED based street lights with better luminous efficacy (lm/W) in one of the street lighting systems of Yerevan.

This measure will allow to test and prove more advanced technology which is yet in the technological improvement phase and national partners of the project have less information and confidence and prove the potential for reducing energy consumption and associated GHG emission while securing the same or better illumination of streets. The table below summarizes all basic parameters and assumptions made for this pilot project.

Table E.7. Parameters of Pilot 1C

Parameters	Unit	Baseline scenario	Project scenario
Type of lights (fixtures)	type	ZHKU-250 (old)	Osram/Philips/GE
Type of bulbs	type	DNAT 250	LED
Capacity of bulbs	W	250	110
Indicative luminous efficacy	Lm/W	-	100
Cost of bulb	USD	11	1100
Cost of fixture	USD	74	
Number of lights (bulb + fixture)	psc.	162	162
Total installed capacity	kW	40	18
Daily operation of the lighting system	hours	10	10
Annual electricity consumption	MWh/year	148	65
Annual electricity costs (average tariff of 0,064 USD/kWh)	USD/year	9408	4128
Annual GHG emissions (GEF is 0.4 kg/kWh)	tCO ₂ /year	59	26
Total energy consumption during technology lifetime	MWh	2957	1300
Total GHG emission during technology lifetime	tCO ₂	1183	520

Parameters	Unit	Baseline scenario	Project scenario
Actual average operational life-time of light bulbs	hours	4500	75000
Number of replacement during the technology LT of 20 years	times	16	N/A
Replacement costs within TLT (cost of bulb + installation)	1000 USD	28.5	N/A
Length of hypothetical street (1 LED per pole)	Km	1.6	1.6

Based on the data from the Table E.7 a summary of baseline and energy-efficient (project) scenario for hypothetical Pilot N3 is provided in the below table.

Table E.8. Projected Energy Savings and Avoided Emissions from Pilot 1C

Technology		Old fixtures and inefficient HPS DNAT 250 type bulbs	Modern LED based street lights with better Lm/W parameters
Baseline scenario			
Project scenario			
Number of lights		162	162
Wattage per light W		250	110
Hours of operation per night hours		10	10
Annual energy consumption MWh/y		148	65
Annual energy saving MWh/y		-	83
Technology life cycle years		-	20
Life-cycle energy saving and avoided emissions of the pilot project	MWh	-	1657
	tCO₂	-	663

It is believed that implementation of the proposed pilot will demonstrate feasibility of modernization measures within the first two years of the project implementation. This along with institutional, regulation and other improvements and promotional measures to be developed and enforced by the project will facilitate direct replication of the proposed modernization activity in Yerevan and in other urban communities of Armenia where HPS DNAT 250 type street lights are in operation (without consideration of 2323 pilot street lights mentioned in Table E.1 as well as existing and new 29481 street lights to be modified within the scope of replication of Pilot N1, see Table E.3).

It is also assumed that implementation of the proposed pilot will trigger replacement of existing inefficient HPS DNAT 150 type street lights (used for illumination of secondary streets, side streets, yards and parks) with LED based energy efficient lights of lower capacity (most likely 60W) and better Lm/W parameters. Replication will cover already existing and new street lighting systems to be installed in the nearest future. Due to still very high costs of LED based SL technologies relatively low replication rate is taken.

Based on this assumption a conservative indicative estimation of expected replication effect of Pilot 1C is made.

Table E.9. Replication of Pilot 1C

Location	Street lighting systems	Number of lights to be replaced	Share in the total number of street lights of that type	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO ₂
Yerevan (daily operation of SL-10 hours)	Existing systems of 250W HPS lights	2500	5%	25550	10220
	Existing systems of 150W HPS lights	2500	5%	16425	6570
	New systems of 250W HPS lights	485	8%	4957	1983
	New systems of 150W HPS lights	295	8%	1938	775
Other cities (daily operation of SL-7 hours)	Existing systems of 250W HPS lights	372	5%	3802	1521
	Existing systems of 150W HPS lights	372	5%	2444	978
	New systems of 250W HPS lights	500	10%	5110	2044
	New systems of 150W HPS lights	300	10%	1971	788
Total		7324		62197	24879
Conservative Total (considering proportion of achieved saving – 0.9)				55977	22391

Pilot 2: 150W HPS instead of 250W HPS on a new street

Pilot 2 has technical parameters highly similar to those of Pilot 1A, except that it involves installation of lighting in a previously unlit area, instead of retrofit. The proposed project will involve installation of 600 new fixtures and lamps, using 150W HPS instead of the conventional 250W HPS.

Table E.10. Projected Energy Savings and Avoided Emissions from Pilot 2

Technology		Old fixtures and inefficient HPS DNAT 250 type bulbs	Modern fixtures and efficient HPS bulbs with better Lm/W parameters
Baseline scenario			
Project scenario			
Number of lights		600	600
Wattage per light, W		250	150
Hours of operation per year, hours		3650	3650
Annual energy consumption, MWh/y		548	329
Annual energy saving, MWh/y		-	219
Technology life cycle, years		-	15
Life-cycle energy saving and avoided emissions of the pilot project	MWh		3285
	tCO₂		1314

Results of this demonstration will be used to provide financial justification and technical guidance for replication throughout Armenia.

Table E.11. Replication of Pilot 2

Location	Street lighting systems	Number of lights to be installed	Share in the total number of street lights of that type	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO ₂
Yerevan	New systems	1500	20%	8207	3282
Other cities	New systems	2323	46%	12705	5081
Total		29481		20912	8363
Conservative Total (considering proportion of achieved saving – 0.9)				18821	7528

Pilot 3: EE lighting in buildings

This hypothetical pilot proposes implementation of demonstration projects in a number of municipal buildings in Yerevan (e.g. hospitals, kindergartens, museums, etc.) aimed at replacement of the existing inefficient indoor lighting systems (incandescent “IL” and tube-type mercury-containing fluorescent “FL”) with modern efficient LED based indoor lighting systems. In addition, this pilot will allow avoiding utilization of mercury-containing bulbs, thus, reducing environmental and human health risks associated with their application and final disposal.

The table below summarizes all basic parameters and assumptions made for this pilot project.

Table E.12. Parameters of Pilot 3

Parameters	Unit	Baseline scenario	Project scenario
Type of lights	type 1	IL	LED
	type 2	FL (length: 1,2m)	LED Tube Shape
	type 3	FL (length: 0,6m)	LED Tube Shape
Capacity of type 1 light	W	60	12
Capacity of type 2 light	W	40	20
Capacity of type 3 light	W	20	10
Cost of type 1 light (including replacement)	USD	0.6	26
Cost of type 2 light (including replacement)	USD	1.7	72
Cost of type 3 light (including replacement)	USD	1.2	38
Number of type 1 light	psc.	343	343
Number of type 2 light	psc.	330	330
Number of type 3 light	psc.	705	705
Total installed capacity	kW	48	18
Daily operation of all lighting systems	hours	8	8
Annual electricity consumption	MWh/year	140	52
Annual electricity costs (average tariff of 0,074 USD/kWh)	USD/year	10360	3848
Annual GHG emissions (GEF is 0.4 kg/kWh)	tCO ₂ /year	56	21
Total energy consumption during technology lifetime	MWh	2100	780
Total GHG emission during technology lifetime	tCO ₂	840	312

Parameters	Unit	Baseline scenario	Project scenario
Actual average operational life-time of light bulbs	hours	1000	80000
Number of replacement during the technology LT of 15 years	times	44	N/A
Replacement costs within TLT (cost of bulb + installation)	1000 USD	71	N/A

Based on the data from the Table E.12 a summary of baseline and energy-efficient (project) scenario for hypothetical Pilot 3 is provided in the below table.

Table E.13. Projected Energy Savings and Avoided Emissions from Pilot 3

Technology Baseline scenario Project scenario	Old incandescent and tube-type mercury-containing fluorescent bulbs of various capacities	Modern LED based indoor lighting systems of various capacities
Number of lights	1378	1378
Wattage per light, W	20 - 60	20-Oct
Hours of operation per year, Hours	8	8
Annual energy consumption, MWh/y	140	52
Annual energy saving, MWh/y	-	88
Technology life cycle, years	-	15
Life-cycle energy saving and avoided emissions of the pilot project	MWh	1320
	tCO ₂	528

It is believed that implementation of the proposed pilot will demonstrate feasibility of modernization measures within the first two years of the project implementation. This along with institutional, regulation, awareness and other improvements and promotional measures to be developed and enforced by the project will facilitate direct replication of the proposed modernization activity in municipal buildings in Yerevan and other urban communities of Armenia where inefficient indoor lighting systems are in operation.

Due to the lack of information on the current status of indoor lighting systems in municipal buildings in Armenia it is assumed that the proposed modernization of indoor lighting system will be applied for 50 similar projects (set of municipal buildings) in Yerevan and 25 projects in the regions.

Based on these assumptions a conservative indicative estimation of expected replication effect of Pilot 3 is made.

Table E.14. Replication of Pilot 3

Location	Objects	Number of lights to be replaced per project	Number of projects	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO ₂
Yerevan and other cities	Municipal buildings	1378	75	99000	39600
Conservative Total (considering proportion of achieved saving – 0.9)				89100	35640

Pilot 4: LED illumination of outdoor spaces

This hypothetical pilot proposes implementation of demonstration projects involving new lighting at public sites in Yerevan (e.g. court yards, parking, playgrounds, parks, etc.) aimed at replacement of the existing inefficient outdoor lighting systems with modern efficient outdoor lighting technologies. Due to the lack of baseline information the proposed hypothetical pilot project envisages the use of 60W LED based modern lights in place of the prevailing technology, HPS DNAT 150 type lights. It is acknowledged that actual demonstration projects may differ from the proposed option; however, at this stage more accurate design of pilots in public sites is not possible.

The table below summarizes all basic parameters and assumptions made for this pilot project.

Table E.15. Parameters of Pilot 4

Parameters	Unit	Baseline scenario	Project scenario
Type of lights (fixtures)	Type	ZHKU-150 (old)	Osram/Philips/GE
Type of bulbs	Type	DNAT 150	LED
Capacity of bulbs	W	150	60
Indicative luminous efficacy	Lm/W	-	80
Cost of bulb	USD	11	550
Cost of fixture*	USD	62	
Number of lights (bulb + fixture)	psc.	108	108
Total installed capacity	kW	16	6.5
Daily operation of the lighting system	hours	10	10
Annual electricity consumption	MWh/year	59	24
Annual electricity costs (average tariff of 0,064 USD/kWh)	USD/year	3712	1536
Annual GHG emissions (GEF is 0.4 kg/kWh)	tCO ₂ /year	23	9.6
Total energy consumption during technology lifetime	MWh	870	360
Total GHG emission during technology lifetime	tCO ₂	348	135
Actual average operational life-time of light bulbs	hours	4500	60000
Number of replacement during the technology LT of 15 years	times	12	N/A
Replacement costs within TLT (cost of bulb + installation)	1000 USD	14	N/A

* Project partners will cover other baseline costs not shown here, including site preparation, utility poles, cables, etc.

Based on the data from the Table E.15 a summary of baseline and GEF project scenario for hypothetical Pilot 4 is provided in the below table.

Table E.16. Projected Energy Savings and Avoided Emissions from Pilot 4

Technology	Old fixtures and inefficient HPS DNAT	Modern LED based street lights with better Lm/W parameters
Baseline scenario	150 type bulbs	
Project scenario		
Number of lights	108	108
Wattage per light, W	150	60
Hours of operation per year, Hours	10	10
Annual energy consumption, MWh/y	59	24
Annual energy saving, MWh/y	-	35
Technology life cycle, Years	-	15
Life-cycle energy saving and avoided emissions of the pilot project	MWh	532
	tCO₂	213

It is believed that implementation of the proposed pilot will demonstrate feasibility of modernization measures within the first two years of the project implementation. This along with institutional, regulation and other improvements and promotional measures to be developed and enforced by the project will facilitate direct replication of the proposed modernization activity in public sites in Yerevan and other urban communities of Armenia where inefficient outdoor lighting systems are in operation.

Due to the lack of information on the current status of outdoor lighting systems in public sites (as well as variety of lighting systems depending of specificity of sites) in Armenia it is assumed that the proposed modernization of outdoor lighting system will be applied for 25 similar projects (set of public sites) in Yerevan and 10 projects in the regions.

Based on these assumptions a conservative indicative estimation of expected replication effect of Pilot 4 is made.

Table E.17. Projected Replication of Pilot 4

Location	Objects	Number of lights to be installed per project	Number of projects	Indirect energy saving and emission reduction via replication over TLT	
				MWh	tCO₂
Yerevan and other cities	Public sites	108	35	18375	7350
Conservative Total (considering proportion of achieved saving – 0.9)				16538	6615

Summary

As it is seen from the previous sections a set of the proposed pilot urban green lighting projects includes modernization of existing street, municipal building and public site lighting systems in the city of Yerevan and a number of urban communities of Armenia. In each particular case, an old inefficient lighting system will be replaced with a modern energy efficient technology that leads to energy saving and avoidance of associated GHG emissions. Along with assessment of life-cycle effect, estimation of effects from direct replication of the proposed measures is carried out.

It should be noted that due to the lack of information the proposed pilots do not consider effects from optimization measures such as installation of time relays and remote controlling systems, reduction of

number of fixtures, etc. Consideration of such measure will contribute to additional energy savings and GHG emission reduction.

Another important aspect to be mentioned is that the results presented in this report do not consider additional (i.e. additional to effects from replication of the proposed pilots due to promotional measures enforced by the project, new technical requirements for public procurement, ban for high wattage IC bulbs import) indirect energy savings and avoided emissions via top-down approach (effect from the first three components of the GUL project). Also, increase of electricity tariffs within the next 2-3 years (which is very likely due to expected rise of gas prices) has not been considered. Increase of the current tariffs will definitely improve economic feasibility of the proposed energy saving measures. This also proves that provided estimations are quite conservative.

In the table below overall effects from demonstration and replication projects are summarized.

Table E.18. Summary of Direct and Indirect Energy Savings and Avoided Emissions from All Pilot Projects

Pilots	Life-cycle energy savings and avoided emission of demonstration projects		Indirect energy savings and emissions reduction via replication	
	MWh	tCO ₂	MWh	tCO ₂
Pilot 1 - Street Lighting	19927	7971	212804	85111
Pilot 2 - Street Lighting	3285	1314	18821	7528
Pilot 3 - Municipal Buildings	1320	528	89100	35640
Pilot 4 - Public Sites	532	213	16538	6615
Total	25064	10026	337263	134894

In such a way total avoided CO₂ emissions achieved through implementation and replication of demonstration projects will be nearly 145,000 tonnes, yielding a figure of about US \$11 of GEF investment spent per ton of avoided emission.

Annex G. UNDP Environmental and Social Screening Template *[Refer to separate file for UNDP Environmental and Social Screening checklist]*

Annex H. Tracking Tool for Climate Change Mitigation Projects *(Refer to separate file for Tracking Tool for Climate Change Mitigation Projects)*

**Annex F. Standard Letter of Agreement between UNDP and the Government of Armenia
for the Provision of Support Services, “Green Urban Lighting” Project ID 00083013**

Excellency,

1. Reference is made to consultations between officials of the Government of *Armenia* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.
2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.
3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
 - (a) Identification and/or recruitment of project and programme personnel;
 - (b) Identification and facilitation of training activities;
 - (a) Procurement of goods and services;
4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.
5. The relevant provisions of the Standard Basic Assistance Agreement (SBAA) between the Authorities of the Government of Armenia and the United Nations Development Programme (UNDP), signed by the Parties on 8 March 1995 (the "SBAA") including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the project document.
6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.
7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

For the Government

Signed on behalf of UNDP

Aram Harutyunyan
Minister of Nature Protection
of the Republic of Armenia

Bradley Busetto
UNDP Resident Representative in Armenia

Date:.....

Date:.....

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between the Ministry of Nature Protection, the institution designated by the Government of Armenia and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project “Green Urban Lighting” Project ID 00083013
2. In accordance with the provisions of the letter of agreement signed and the project document, the UNDP country office shall provide support services for the Project as described below.
3. Support services to be provided:

Support services	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
Payment Process	Ongoing throughout implementation when applicable	As per the UPL- US\$ 23.59 for each	UNDP will directly charge the project upon provision of services, on a quarterly basis.
Vendor profile entry in ATLAS	Ongoing throughout implementation when applicable	As per the UPL- US\$ 12.17 for each	As above
Project personnel selection and/or recruitment process * Project Task Leader * Project Assistant	October-November 2013 December 2013	As per the UPL- US\$ 371.37	As above
Staff HR & Benefits Administration & Management (one time per staff including medical insurance enrolment, payroll setup and separation process)	Ongoing throughout implementation when applicable	As per the UPL- US\$ 128.77 for each	As above
Recurrent personnel management services: Staff Payroll & Banking Administration & Management (per staff per calendar year)	Ongoing throughout implementation when applicable	As per the UPL- US\$ 288.75 for each	As above
Consultant recruitment	Ongoing throughout implementation when applicable	As per the UPL- US\$ 145.21 for each	As above
Procurement of goods and services involving local CAP	October – December 2013	As per the UPL- US\$ 333.79 for each purchasing process	As above
Procurement of goods and services not involving local CAP	October – December 2013	As per the UPL- US\$ 133.07 for each purchasing process	As above
Issue/Renew IDs (UN LP, UN ID, etc.)	Ongoing throughout implementation when	As per the UPL- US\$ 23.86 for each	As above

	applicable		
F10 settlement	Ongoing throughout implementation when applicable	As per the UPL- US\$ 19.94 for each	As above
Visa request	Ongoing throughout implementation when applicable	US\$ 15.39 for each	As above
Hotel reservation	Ongoing throughout implementation when applicable	US\$ 8.44 for each	As above
Travel Ticket processing	Ongoing throughout implementation when applicable	US\$ 18.77 for each	As above

SIGNATURE PAGE

Country: Armenia

UNDAF Outcome (s)/Indicator (s): Environment and disaster risk reduction is integrated into national and local development frameworks

CPAP Outcome (s)/Indicator (s): Environmental performance Index

CPAP Output (s)/Indicator (s): 1. No. of laws and legal acts promoting energy efficiency adapted;
2. No. of initiatives promoting energy efficiency developed and implemented;
3. No. of environmental rating and labelling practices introduced.

Executing Entity/Implementing Partner: Ministry of Nature Protection of RA

Implementing Entity/Responsible Partners: Ministry of Nature Protection of RA

Programme Period:	CPD 2010-2015
Atlas Award ID:	00074869
Project ID:	00087057
PIMS #:	4669
Start date:	2013
End Date:	2017
Management Arrangements:	NIM
PAC Meeting Date:	2013

Total resources required:	10,095,000 USD
Total allocated resources:	10,095,000 USD
Cash resources:	
o GEF	1,600,000 USD
o UNDP	120,000 USD
o Local Administrations	7,055,000 USD
In-kind contributions:	
o UNDP in-kind	1,000,000 USD
o Government in-kind	320,000 USD

Agreed by (Government):

NAME	SIGNATURE	Date/Month/Year
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Agreed by (Executing Entity/Implementing Partner):

NAME	SIGNATURE	Date/Month/Year
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Agreed by (UNDP):

NAME	SIGNATURE	Date/Month/Year
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