INDEPENDENT EVALUATION DIVISION

Independent Terminal Evaluation

Promoting Ultra low-head Micro Hydropower Technology to Increase Access to Renewable Energy for Productive Uses in Rural India

SAP ID: 120182

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INDUSTRIAL DEVELOPMENT ORGANIZATION

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Abbreviations and acronyms

AHEC	Alternate Hydro Energy Centre
CFD	Computational Fluid Dynamics
DDG	Decentralized Distributed Generation
EoI	Expression of Interest
ET	Evaluation Team
EUR	Euro
GDP	Gross Domestic Product
GIS	Geographic Information System
GW	Giga Watt
HQ	Head Quarters
ICIMOD	International Centre for Integrated Mountain Development
IDB	Industrial Development Board
IEA	International Energy Agency
IITR	Indian Institute of Technology, Roorkee
IREDA	Indian Renewable Energy Development Agency Ltd.
IRI	Irrigation Research Institute
km	kilometre
kW	kilowatt
METI	Ministry of Economy Trade and Industry
MHP	Micro Hydro Power
MNRE	Ministry of New and Renewable Energy
MOFA	Ministry of Foreign Affairs
Mtoe	Million tons of oil equivalent
MW	Mega Watt
M&E	Monitoring and Evaluation
NPC	National Project Coordinator
NEDO	New Energy Development Organisation
NGO	Non-Governmental Organisation
O&M	Operation and Maintenance
PEU	Project Execution Unit
PM	Project Manager
ProDoc	Project Document
PSC	Project Steering Committee

RE	Renewable Energy
RWM	Roorkee Water Mill
R&D	Research and Development
SDG	Sustainable Development Goals
SHG	self-help groups
SHP	Small Hydro Power
SMEs	Small and Medium Enterprises
TE	Terminal Evaluation
TERI	The Energy and Resource Institute
ToR	Terms of Reference
UAE	
UEC	User Energy Committee
UCOST	Uttarakhand State Council for Science & Technology
ULH-MHP	Ultra-Low Head Micro Hydropower
UNDAF	UN Development Action Framework
UNIDO	United Nations Industrial Development Organisation
UREDA	Uttrakhand Renewable Energy Development Agency
US	United States
USD	United States Doller
WTO	World Trade Organisation

Glossary of evaluation-related terms

Term	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.

1 Executive Summary

1.1 Project background and evaluation objectives

The Government of India requested United Nations Industrial Development Organisation (UNIDO) to help in design and implementation of a pilot project on ultra-low head micro hydropower (ULH-MHP) technology with the aim to increase access to energy in rural India. In response to the request, UNIDO, with financial support from the Japanese Government, embarked on a project **"Promoting Ultra low-head Micro Hydropower Technology to Increase Access to Renewable Energy for Productive Uses in Rural India"** in Uttarakhand Sate in India.

The goal of the project is to increase the access of rural communities to renewable electricity in the State of Uttarakhand, India. The project is meant to demonstrate, deploy and transfer the ULH-MHP technology from Japan to the State of Uttarakhand. The project also seeks to create a favourable environment to deploy the ULH-MHP technology through the development of business models. The project intends to bring the ULH-MHP systems into operation and build the capacity for the mini grid operation/maintenance as well as local manufacturing of turbine units and spare parts.

The project consists of the following key activities:

1) Identification of business opportunities via technology transfer
2) Demonstration of mini-grid system for productive uses;
3) Capacity building with institutional networking; and
4) Awareness-raising and market/investment opportunities to mainstream the new technology.

The project concluded recently and a team of Evaluation Consultants was engaged to undertake a terminal evaluation of the project with a scope to evaluate the project performance against Relevance, Effectiveness, Efficiency, Sustainability and Impact. The objectives of the evaluation were to:

1. Answer the key Question of whether the project has achieved or is likely to achieve the project objective to increase the access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India for the promotion of new technology
2. Analyse the attainment of the project objectives
3. Draw lessons and provide recommendations

The Terminal Evaluation was conducted in line with the UNIDO Evaluation Policy and Guidelines. It was undertaken in a participatory manner in which key stakeholders were consulted throughout the evaluation process. The evaluation was guided by the key evaluation criteria mentioned earlier. A team of 3 evaluation

consultants was used, with one international consultant and two national consultants from India.

1.2 Key Findings and Conclusions

The Ultra-Low Head Micro Hydro project executed by UNIDO in the State of Uttarakhand is generally a good project that introduces a new technology and its application that is highly relevant in the circumstances and to the problems the project is trying to address. Renewable energy and micro hydro power in particular is highly relevant in Uttarakhand state and in India in general in solving problems with electricity access such as unavailability and unreliability of electricity in rural areas in order to generate electricity for productive uses without affecting the environment by use of fossil fuels.

The project was designed moderately well with a few aspects that were not considered at the design stage. One such aspect was the identification of local manufacturer to whom the technology would be transferred and the other was the issue of silt in water. Out of the two outcomes envisaged for the project, the outcome related to the creation of supporting environment has been achieved relatively well. The outcome of the demonstration of the ULH hydro technology has been achieved to a lesser extent due to some technical issues with the installation – these issues also caused the project timeline to be extended by several months. The duration of this project is somewhat short given that there was a component of technology transfer, installation and demonstration of a new technology which can give rise to initial technical issues.

Although the technology is very relevant given significant potential, and there is a strong enthusiasm in the community and other stakeholders about the technology but the long term uptake of the project is hindered by not being able to demonstrate the technology to the fullest extent possible.

The sustainability of project outcomes is on the whole good but the financial sustainability is questionable due to the uncertainty in the cost of the equipment and consequently whether the ULH hydro systems will be competitive when compared to grid electricity. Environmental, Social and Governance sustainability are all likely. Moreover, the ownership of the country is one of the strongest aspects of the project. Policies were introduced by the Central and State Governments to promote these kinds of technologies as a result of the outcome of this project suggesting that a project like this can contribute to reduce policy gaps, though more efforts may be required for sustainability.

Project was coordinated reasonably well and barring a few issues in the design stage, M&E of the project was satisfactory. The project also has considered gender aspect relatively well.

1.3 Key Recommendations

- For future projects that have a technology transfer component, it is recommended that UNIDO identifies, at the design stage of the project, the local manufacturers and technology service providers (such as Operation and Maintenance (O&M) companies) to whom the technology would be transferred in order to ensure minimum absorption capacity in the country.
- The duration of the project of this nature (technology transfer, installation and successful demonstration) should be longer and hence UNIDO and the donor agencies should keep that into account while designing the projects
- In order to keep the momentum and fully realise the outcome of successful demonstration to ensure uptake, it is recommended that additional activities are carried out including more pilot projects with locally manufactured equipment
- UNIDO should give more emphasis on preparing and following a more systematic Monitoring and Evaluation (M&E) process such as preparing M&E plans and explicitly allocating budgets for systematic monitoring processes.
- Additional policies, particularly by the State government, to promote ULH and other kinds of small hydropower systems will be beneficial to ensure sustainability of developmental efforts through such pilots targeted at Rural Development.

2 Evaluation Scope, Objectives, Approach and Methodology

2.1 Evaluation Scope

The scope this assignment is to evaluate the project performance against the following 5 criteria:

- Relevance
- Effectiveness
- Efficiency
- Sustainability
- Impact

In addition, the scope of the evaluation covers the whole duration of the project which is from January 2013 to June 2016.

2.2 Evaluation Objectives

2.2.1 Key Question

The key question of the terminal evaluation (TE) is whether the project has achieved or is likely to achieve the project objective, i.e., if the project has increased or is likely to increase the access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India for the promotion of new technology. The TE is expected to answer this question.

2.2.2 Analysis of the Attainment of the Project Objectives

The evaluation is required to assess the project performance against the five evaluation criteria: **relevance, effectiveness, efficiency, sustainability and impact**.

The evaluator is expected to provide an analysis of the attainment of the project objective(s) and the results. Through its assessments, the Evaluation Team (ET) is expected to enable the Government, counterparts, UNIDO and other stakeholders and donors to verify prospects for development impact and sustainability, project

objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators.

2.2.3 Draw Lessons and Provide Recommendations

The TE is expected to draw lessons and develop recommendations for UNIDO and the donor that may help in improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion.

2.3 Evaluation Approach and Methodology

The Terminal Evaluation was conducted in line with the UNIDO Evaluation Policy and Guidelines. It was undertaken in a participatory manner in which key stakeholders were consulted throughout the evaluation process. The evaluation was guided by the key evaluation criteria mentioned earlier.

For each of the outputs contemplated in the logical framework for the project, the Evaluation Team assessed if the corresponding programmed activities were carried out. This allowed the Evaluation Team to ascertain if the higher end objective of the project had been or could be met.

The evaluation team used a variety of methods to ensure an evaluation based on qualitative and quantitative information and on sources such as desk studies, literature review, individual interviews, focus group meetings, direct observation, presentations and feedback review.

The independent in-depth evaluation used the three main tools for the evaluation: Review of Documents, Interviews with Project Team and Stakeholders, and Observations in the field. The evaluation used a participatory approach integrating semi-structured interviews with stakeholders building on a desk review of project documents. The Evaluation Team used a variety of methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information in order to assess causality through quantitative means, but also to understand why results were achieved or not, and to triangulate information to ensure the higher reliability of the findings. All the three tools mentioned above were used to gather information about the project but also used to triangulate and verify the results – in the latter case, use of information directly obtained by the evaluators and obtained from independent sources were prioritised. Direct

observation in the field was also used for triangulation and verification. Discussions with direct beneficiaries and stakeholders were also an important source of information.

The interviews included PSC members, relevant staff of the PEU, focal points, government officials, institutional partners, technology & service providers, members & representatives from beneficiary enterprises, social groups & communities, UNIDO technical support staff in Vienna and in the field. The list of stakeholders consulted is provided in Annex.

A mission de-briefing was carried out at the end of field mission at the Uttarakhand Renewable Energy Development Authority (UREDA) Office in Dehradun. Additional de-briefings were carried out Delhi for other stakeholders and also in Vienna office. All the feedback obtained from these debriefs are used in the report.

An evaluation framework (evaluation matrix) was used to gather the information for the evaluation, which is shown below.

Table 1 Evaluation Matrix

Evaluation Criteria	**Lines of inquiries, verifiers, indicators**	**Primary Means of Verification** (method)	**Data Source and Location of Data Collection**
Project Design	Has the project been designed well including consultation with stakeholders in project planning and use of M&E	Document review, Interviews	UNIDO, Vienna and PEU, Field Mission
Project Relevance	Does the project fit the context of Uttarakhand specifically and India in General?	Document Review	UNIDO, Vienna and PEU
Effectiveness	Comparison of current product quality with baseline conditions	Interviews, observation	Field Missions, UNIDO, Vienna
Efficiency	Has the money spent been worth it?	Documents (progress reports), Observation, Interviews	Field Mission, UNIDO, Vienna, PEU
Sustainability	Will the benefits of the project continue even after the support from UNIDO is ended?	Documents, Observations, Interviews	Field Mission, UNIDO, Vienna, PEU
Monitoring and Evaluation	Has the project been designed and implemented based on the	Documents and Interviews	UNIDO, Vienna and PEU, Field Mission

	sound M&E principles?		
Monitoring of Long Term Changes	What project actions were undertaken and what has been the accomplishments towards establishing a long-term monitoring system were?	Documents and Interviews	UNIDO, Vienna and PEU, Field Mission
Assessment of Processes Affecting Achievement of Project Results	This aspect of the evaluation will deal with questions related to Country Ownership, Stakeholder Involvement and Financial Planning, among other aspects	Documents, Observation, Interviews	Field Mission, UNIDO, Vienna, PEU

The evaluation team have used ratings for each of the criteria for the project based on the findings of the analysis.

2.4 Evaluation Team

The Evaluation Team consisted of the following experts:

- Dr Drona Upadhyay, International Evaluation Consultant and Team Leader
- Mr Hemant Verma, National Evaluation Consultant
- Dr N P Singh, National Evaluation Consultant

3 Country and Project Background

3.1 Country context

India, a country in South Asia, is the 7th largest in the world by area. Bounded by the Indian Ocean on the south, the Arabian Sea on the south-west, and the Bay of Bengal on the south-east, it shares land borders with Pakistan to the west; China, Nepal, and Bhutan to the north-east; and Burma and Bangladesh to the east. In the Indian Ocean, India is in the vicinity of Sri Lanka and the Maldives. In addition, India's Andaman and Nicobar Islands share a maritime border with Thailand and Indonesia.

India is a federation composed of 29 states and 7 union territories. All states, as well as the union territories of Pondicherry and the National Capital Territory of Delhi, have elected legislatures and governments. The centre, through appointed administrators, directly rules the remaining five union territories.

3.2 Socioeconomic Overview

3.2.1 Social overview

With over 1.2 billion people, India is the 2nd largest country in the world by population and the most populous democracy in the world. Following table presents India's key social and demographic parameters.

Population	1,251,695,584 (July 2015 est.) ~17% of the world's population
Population Growth Rate	1.22 per cent (2015 est.)
Birth and Death Rates	19.55 births/1,000 population and 7.32 deaths/1,000 population (2015 est.)
Life Expectancy Rate	66.97 years for males and 69.42 years for females (2015 est.)
Urban Population	32.7% of total population (2015)
Sex Ratio	1.08 male(s)/female (2015 est.)

Nationality	Indian
Religions	According to the 2001 census, out of the total population of 1,028 million in India, Hindus constituted the majority with 80.5%, Muslims came second at 13.4%, followed by Christians, Sikhs, Buddhists, Jains, and others.
Literacy	According to the provisional results of the 2011 census, the literacy rate in India stands at 74.04 per cent, 82.14% for males and 65.46% for females.
Languages	There are 22 different languages that have been recognized by the Constitution of India, of which Hindi is an Official Language. Hindi 41%, Bengali 8.1%, Telugu 7.2%, Marathi 7%, Tamil 5.9%, Urdu 5%, Gujarati 4.5%, Kannada 3.7%, Malayalam 3.2%, Oriya 3.2%, Punjabi 2.8%, Assamese 1.3%, Maithili 1.2%, other 5.9% English enjoys the status of subsidiary official language but is the most important language for national, political, and commercial communication.

Despite the current economic progress, India suffers from a high level of poverty. In 2012, according to latest report by the Planning Commission of India (Tendulkar Committee) 21.9% of all people in India fell below the international poverty line of US$ 1.25 per day. Over the last decade, poverty has witnessed a consistent decline with the levels dropping from 37.2% in 2004-05 to 29.8% in 2009-10. The number of poor is now estimated at 250 million, of which 200 million reside in rural India.

3.2.2 Economic Profile

India's diverse economy encompasses traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of services. According to the International Monetary Fund (IMF) estimates, as of 2015, the Indian economy is nominally worth US$ 2.18 trillion; and stands as 7th largest economy in the world. As per Indian Economic Survey 2015-16, the Gross Domestic Product (GDP) Growth rate is 7.6% (2015-16), 7.2% (2014-15). Presently India is one of the world's fastest-growing economies.

GDP - composition, by sector of origin (2015 est.):

- Agriculture: 16.1%

- Industry: 29.5%
- Services: 54.4%

Major agricultural products include rice, wheat, oilseed, cotton, jute, tea, sugarcane, and potatoes. Major industries include textiles, telecommunications, chemicals, pharmaceuticals, biotechnology, food processing, steel, transport equipment, cement, mining, petroleum, machinery, and software.

Until 1991, all Indian governments followed protectionist policies that were influenced by socialist economics. Widespread state intervention and regulation largely walled the economy off from the outside world. In 1991, India liberalized its economy and followed market based economic reforms. Since then it has slowly moved towards a free-market system by emphasizing both foreign trade and direct investment inflows. India's recent economic model is largely capitalist. India has been a member of WTO since 1 January 1995. Table below shows a snapshot of India's external trade data.

Exports	USD 287.6 billion (2015 est.), USD 329.6 billion (2014 est.)
Exports: commodities	Petroleum products, precious stones, machinery, iron and steel, chemicals, vehicles, apparel
Exports: partners	UAE 10.4%, US 13.4%, Saudi Arabia 4.0 %, China 4.2%, Hong Kong 4.3% (2014 est.)
Imports	USD 432.3 billion (2015 est.), USD 472.8 billion (2014 est.)
Imports: commodities	Crude oil, precious stones, machinery, fertilizer, iron and steel, chemicals
Imports: partners	China 12.7%, UAE 5.9%, Saudi Arabia 7.1%, Switzerland 4.6%, US 4.6% (2014 est.)

Economic liberalization measures, including industrial deregulation, privatization of state-owned enterprises, reduced controls on foreign trade & investment began in the early 1990s, and served to accelerate the country's growth, which averaged below 7% per year from 1997 to 2011.

In recent years, India continues to move forward with market-oriented economic reforms that include increasingly liberal foreign investment and exchange regimes,

industrial decontrol, reductions in tariffs and other trade barriers, opening and modernization of the financial sector, significant adjustments in government monetary and fiscal policies, and more safeguards for intellectual property rights.

3.3 Energy Scenario in India

India is the world third-largest energy consumer with total primary energy demand close to 800 Mtoe (Million tons oil equivalent) in 2014. India has been responsible for almost 10% of the increase in global energy demand since 2000. Its energy demand in this period has almost doubled, pushing the country's share in global demand up to 5.7% in 2013 from 4.4% at the beginning of the century. Given its rapidly expanding population and emerging economy, India has one of the world's fastest growing energy markets. It is expected to be the second-largest contributor to the increase in global energy demand by 2035, accounting for 16% of the rise in global energy consumption. However, energy consumption per capita in India is still only around one-third of the global average and some 240 million people have no access to electricity.

The India's current energy generation capacity is largely dependent on fossil fuels viz. coal, crude oil and natural gas. India imports in net about 70% of domestic oil consumption. According to IEA India's oil imports are expected to increase by more than 4% per year between 2010 and 2035. Due to the continuous increase in total demand for electricity in India, the country is faces a shortage of electricity generation capacity. Having manufacturing at the heart of India's growth model also requires a large rise in the energy needed to fuel India's development.

3.4 Indian Renewable Energy Scenario

It has been realized that renewable energy has to play a major role in achieving energy security and sustainable economic growth. Over the years, renewable energy sector in India has emerged as a significant player in the grid connected power generation capacity. During last few years, renewable energy landscape in India has witnessed significant changes in the policy framework and introduction of various ambitious plans/missions to cater to country's exponentially growing energy demand.

According to the Ministry of New and Renewable Energy (MNRE), the gross installed capacity of grid interactive renewable power in the country stood about 33.8 GW as on Dec 2015. As on Dec 2015, Solar, Wind and Small Hydropower contribute about 13.6% of the total installed capacity of electricity in India. In the last 5 years,

Renewable energy has seen a growth of over 20%. Wind energy has highest share of 64% followed by Solar (13%), then bio power (12%) and small hydro power (11%). The government of India has up-scaled its target of renewable energy capacity to 175 GW by Year 2022, which includes 100 GW from Solar, 60 GW from Wind, 10 GW from Bio-Power and 5 GW from Small hydro-power.

Among various initiatives, in pursuance to the MNRE initiative, Reserve Bank of India has issued guidelines to all commercial banks in India to include renewable energy in categories of priority sector lending.

At National level, Indian Renewable Energy Development Agency Ltd. (IREDA), is a non-banking financial institution under the Ministry of New and Renewable Energy (MNRE) to promote and facilitate Renewable Energy. At state level also respective Renewable Development Agency serve as state government supported institutions to promote and facilitate renewable energy projects and programmes.

Also at National level, Alternate Hydro Energy Centre (AHEC), an academic centre of Indian Institute of Technology, Roorkee, was established in the year 1982 by Ministry of New and Renewable Energy (MNRE), Govt. of India to tap the huge renewable energy potential available in the country and to build up the capacity, which was almost non-existent at that time, in the area of power generation through the development of small hydro and other renewable energy sources to meet the growing demands of electricity in the country. AHEC has well equipped Hydro-mechanical, Electrical control system, Instrumentation, hydro turbine R&D, Solar Energy, Biomass and ecosystem, Computational Fluid Dynamics (CFD), Geographical Information Systems (GIS) and SHP simulator laboratories to carry out research and development in the area of small hydropower and other renewable energy & environmental management of rivers and lakes. AHEC is a stakeholder in the project being evaluated.

As state level institutions, in the state of Uttarakhand, UREDA has been set-up and encouraged to take a leading role in the development of the renewable energy sector in line with the guidance of Ministry of New and Renewable Energy (MNRE) and the conductive platform for the promotion of energy conservation. In Uttarakhand, operation and execution of various schemes based on non - conventional energy resources, as well as promotional measures for the renewable energy development, are handled by UREDA through local panchayat, volunteer organizations and district administration.

3.5 Sector-Specific Issues

3.5.1 Unavailability of Grid

India faces a challenge to ensure availability of reliable and modern form of energy for all its citizen. Almost 85% of rural households in India depend on solid fuel for their cooking needs and only 55% of all rural households have access to electricity. Many of the un-electrified villages are yet to be electrified by centralized power grid. More than 50% of the population has little or no commercial energy access for their living and livelihood. Others with access often have to cope with poor and erratic availability of electricity and other fuels. About 25% of total energy use is from combustible renewable sources and waste. This share includes traditional biomass sources such as firewood and dung, which are used by more than 800 million Indian households for cooking.

3.5.2 Unreliability of Electricity Supply

There are several areas in India with transmission grids though no electricity is provided. Even at present, 5-10 hours a day of power cuts can occur in some of the relatively large cities as well as industrial pockets in India. Due to frequent occurrence of blackouts and sudden power cuts, large section of energy consumers such as factories tend to install their own diesel based power generators. Some rural villages face the problem of electricity availability only in one day per month. The lack of electricity supply hampers to maintain or develop any income generation activities for regional value added.

3.5.3 Renewable Energy Solutions for Rural Electrification and Development

Due to diversified socio-economic and cultural situations in the country, rural electrification requires optimal solutions that are carefully selected based on the local conditions, targeting household category, region etc. Also the rural electrification requires integrated solutions such as decentralized distributed generation facilities together with local distribution network, development of infrastructure for agriculture, other economic activities or social services, financing etc. Also this requires continued support through appropriate institutional cooperation among various agencies of the State Governments, Central Government and participation of the community.

Although solar power system can be an alternative in the country, several other alternatives for reliable rural electrification can be considered using renewable energy based mini-grid system, when the energy costs become more competitive with diesel price in future.

The state of Uttarakhand in North India faces issues of limited connection in rural communities to central power grid and the lack of reliable electricity supply even where villages are connected to the power grid. Moreover, the state has been seeking alternative solutions based on decentralized renewable energy and mini grids. The current situation of access to electricity in the state hampers further development of rural industrialization, especially in the agro-industry sector as well as any improvement of the living standards in the rural communities.

3.5.4 Small Hydro Power (SHP) based RE Projects in India

In India, 24 states have in place policies towards private sector participation to setup Small Hydro Power (SHP) projects in their states. MNRE has taken a series of steps to promote development of SHP in a planned manner and improve reliability & quality of the projects. MNRE has special programme for setting up of micro hydel projects with the involvement of local organization such as water mills association, State Government, agencies, co-operative societies, NGO and individual entrepreneurs.

The total installed capacity of small hydro projects at the end of 11th plan was 3395 MW, which was achieved by adding an aggregate capacity of 1419 MW during 2007-2012. The 12th plan target for small/mini hydro is 250 MW per year. In cumulative terms 1048 small hydro power projects aggregating 4161.905MW have been setup in various parts of the country (Source: MNRE Annual Report 2015-16).

3.5.5 Small Hydro Programme in Uttarakhand

Uttarakhand, one of the mountain states of India has 11,588 km long irrigation canal system which are ideal for generation of hydro power based renewable energy using low head based falls. Uttarakhand has an estimated potential of 3500 MW hydro power from small, mini, and micro hydro technologies, out of which, only 170 MW has been achieved so far. The field of hydropower is currently one of the key industries in the State of Uttarakhand and a policy has been recently developed to progress in producing electricity from hydropower, especially with renewable technologies

The feasibility study with Indian experts has discovered an enormous untapped potential in the small and micro hydropower development in India. The development potential of small hydropower (up to 25 MW) accounts for more than 15 GW in the whole country. The study carried out in the State Uttarakhand has estimated that over 1.5 GW of electricity will be generated based on micro hydropower system by using, for example, existing water resources such as irrigation and service water canals. Such existing water infrastructures, however, require low head systems that can generate electricity with a hydraulic head of less than 3 m (Ultra Low Head Micro Hydro Power turbine system). The State Uttarakhand has an area of 53,566 km2 with about 10 million of population (2011).

The energy-development relationship has numerous social and political implications in Uttarakhand, where about 63.10% of the population lives in rural areas and most of them belong below the poverty line.

Geographical conditions of the state differ at a short distance. Most of the area is hilly and forest coverage is about 66%. Villages are in scattered manner and household coverage in a village is short. In this situation, either it is not possible to laid grid lines due to forest laws or due to high cost of coverage. Operation and maintenance is also an issue in this pattern. As a solution of this problem- Decentralized Distributed Generation (DDG) Micro & Mini Hydro Projects are suitable and best way to provide electricity facility to the forest fringe and scattered villages. Operation and maintenance of Standalone MHPs can be done in easy manner by local community after a formal training.

In the State of Uttarakhand, Uttarakhand Renewable Energy Development Agency (UREDA) is constructing MHPs for remote village electrification as well as for grid feeding. So far 44 MHPs of total capacity 4.29 MW have been commissioned and more than 300 Villages & Hamlets have been electrified through these projects. Earlier the projects were constructing on turn-key basis but from year 2005, Govt. of Uttarakhand has decided to construct MHPs for village electrification on community participation. For construction of MHPs, tripartite Agreements have been signed between UREDA, Alternate Hydro Energy Center (AHEC), IIT, Roorkee and Concern User Energy Committee (UEC). As per tripartite Agreement AHEC, IIT, Roorkee is providing technical specialized services for construction of MHPs, preparation of DPR etc. and UREDA is providing its services for monitoring, funding and guidance to UECs.

MHPs are being constructed with the financial support from Ministry of New and Renewable Energy (MNRE), Govt. of India. The financial support from MNRE is available as per the relevant guidelines of MNRE.

UREDA has commissioned large number of MHPs in the remote area of state where the National or state grid cannot be extended. 44 MHPs of total capacity 4.29 MW

has been installed in the remote villages of Uttarakhand till date and another 19 MHPs of total capacity 2.315 MW are under implementation.

3.6 Project Summary

3.6.1 Fact Sheet of the Project

Country	INDIA
Project Number:	120182
Project title:	Promoting ultra low-head micro hydropower technology to increase access to renewable energy for productive uses in rural India
Thematic Area Code:	Environment and Energy – EC33
Starting Date:	January 2013
Duration:	2 Years (24 months)
Project Site:	State of Uttarakhand, India
Government Co-ordinating agency:	Ministry of New and Renewable Energy (MNRE), Government of India
Counterpart:	District and State Government if Uttarakhand (Uttarakhand Renewable Energy Development Agency (UREDA)/ Uttarakhand Irrigation Department); SME's and local communities; Alternate Hydro Energy Centre, Indian Institute of Technology, Roorkee (AHEC-IITR)
Executing Agency/cooperating agency:	United Nations Industrial Development Organization (UNIDO)
Project Inputs (Euro):	Euro 1,000,000 from Government of Japan; Euro 60,000 from UNIDO

UNIDO inputs:	Euro 938,053
Support Cost:	Euro 121, 947
Counterpart Inputs	In-kind
Grand Total:	Euro 1,060,000

Project objectives and structure: The objective of this project is to increase access of rural communities to renewable energy for productive uses in the state of Uttarakhand, India.

The project is structured to implement along with four development stages of activities, viz:

1) Design
2) System Demonstration
3) Business Development, and
4) Strategy Development.

The project is targeted to design and demonstrate 3 pilot mini-grid systems for catalyzing productive activities based on 10kW ULH-MHP units, using existing infrastructure such as service water canals and irrigation canals.

The expected outputs of the project are as follows:

Output 1: ULH-MHP (Ultra Low Head Micro Hydro Power) system installed and operational

Output 2: Advisory support to create a favorable environment for ULH-MHP technology deployment

The expected outcomes of this project are:

Outcome 1: Technology of Ultra Low-Head Micro Hydro Power (ULH-MHP) successfully demonstrated and deployed

Outcome 2: Favorable environment created for ULH-MHP technology deployment

Donors and counterparts:

The financial support for this project is provided by the Government of Japan and UNIDO, with 'in-kind' contributions from the Government of India.

As counterparts for this project UNIDO collaborated with the Ministry of New & Renewable Energy (MNRE), Govt. of India, and 2 key agency in the State Government of Uttrakhand viz. Uttarakhand Renewable Energy Development Agency (UREDA) and Uttarakhand Irrigation Department.

Further, Project also engaged Alternate Hydro Energy Centre, Indian Institute of Technology, Roorkee (AHEC-IITR) as knowledge cum technical support counterpart. SMEs & Local communities are also engaged.

Project timings and duration:

	Scheduled	Actual
Project Start Date:	January 2013	January 2013
Project End Date:	January 2015	December 15, then extended to June 2016
Project Duration	24 Months	42 Months

Project cost and co-financing:

The total cost of this project is approximately Euro 1,060,000, which comprises an of Euro 1,000,000 from Government of Japan and remaining Euro 60,000 from UNIDO.

There is no direct co-financing to this project however the project counterparts have contributed their 'in-kind' inputs in terms of providing following:

a) Providing office space for the Project Execution Unit (PEU) at UREDA office in Dehradun,
b) Providing time-to time needful knowledge inputs and technical support from Alternate Hydro Energy Centre (AHEC), at Indian Institute of Technology (IIT) Roorkee, and
c) Providing access and usage of irrigation canals for 3 implementation sites by Irrigation Department of Uttarakhand.

3.6.2 Brief Description including History and Previous Cooperation

This project was developed in response to the interest expressed by the Government of India to help in designing and implementation of a pilot project on ultra-low head micro hydropower (ULH-MHP) technology with the aim to increase access to energy in rural India.

This ULH-MHP renewable energy technology was innovated a few years ago in Japan and is different from the conventional hydropower technologies, as it can generate electricity (around 10 kW or more) from low-head water flow (3 meters or below) in the small waterfalls of the existing water-supply and sewage systems, power station waterways, drainage from factories, agricultural waterways and stream channels, which have not been previously considered feasible for hydro power generation. This is an environmentally-friendly system that does not need large-scale engineering work and is easy in its maintenance.

The goal of the project is to increase the access of rural communities to renewable electricity in the State of Uttarakhand, India. The project is meant to demonstrate, deploy and transfer the ULH-MHP technology from Japan to the State of Uttarakhand. The project also seeks to create a favourable environment to deploy the ULH-MHP technology through the development of business models. The project intends to bring the ULH-MHP systems into operation and build the capacity for the mini grid operation/maintenance as well as local manufacturing of turbine units and spare parts.

The project consists of the following key activities:

5) Identification of business opportunities via technology transfer
6) Demonstration of mini-grid system for productive uses;
7) Capacity building with institutional networking; and
8) Awareness-raising and market/investment opportunities to mainstream the new technology.

This project aims to increase the number of people with access to sustainable renewable energy and to promote innovative renewable technologies with the prospect of delivering long-term growth and jobs for the benefit of local communities, in line with the Indian national strategy for developing the local institutional capacities.

The project is targeted to three main groups of beneficiaries in the State of Uttarakhand:

A. The existing energy and industry related associations in the local communities in the selected sites;
B. Local SMEs, technicians and communities in the selected sites;

C. Local university centre the Alternate Hydro Energy Centre, Indian Institute of Technology (AHEC-IITR)

As per the estimates Uttarakhand has about 8,200 Km of man-made water canals and 400 small falls suitable for utilizing such ULH-MHP turbine systems. This project aims to demonstrate the innovative ULH-MHP system generating power from man-made canals at 3 different locations in the state of Uttarakhand. Such installation will result in developing replicable business models based on ULH-MHP mini grid systems in the state of Uttarakhand. This in turn will showcase as an attractive solution for rural electrification, where access to main grid is not readily available.

3.6.3 Project implementation arrangements and implementation modalities

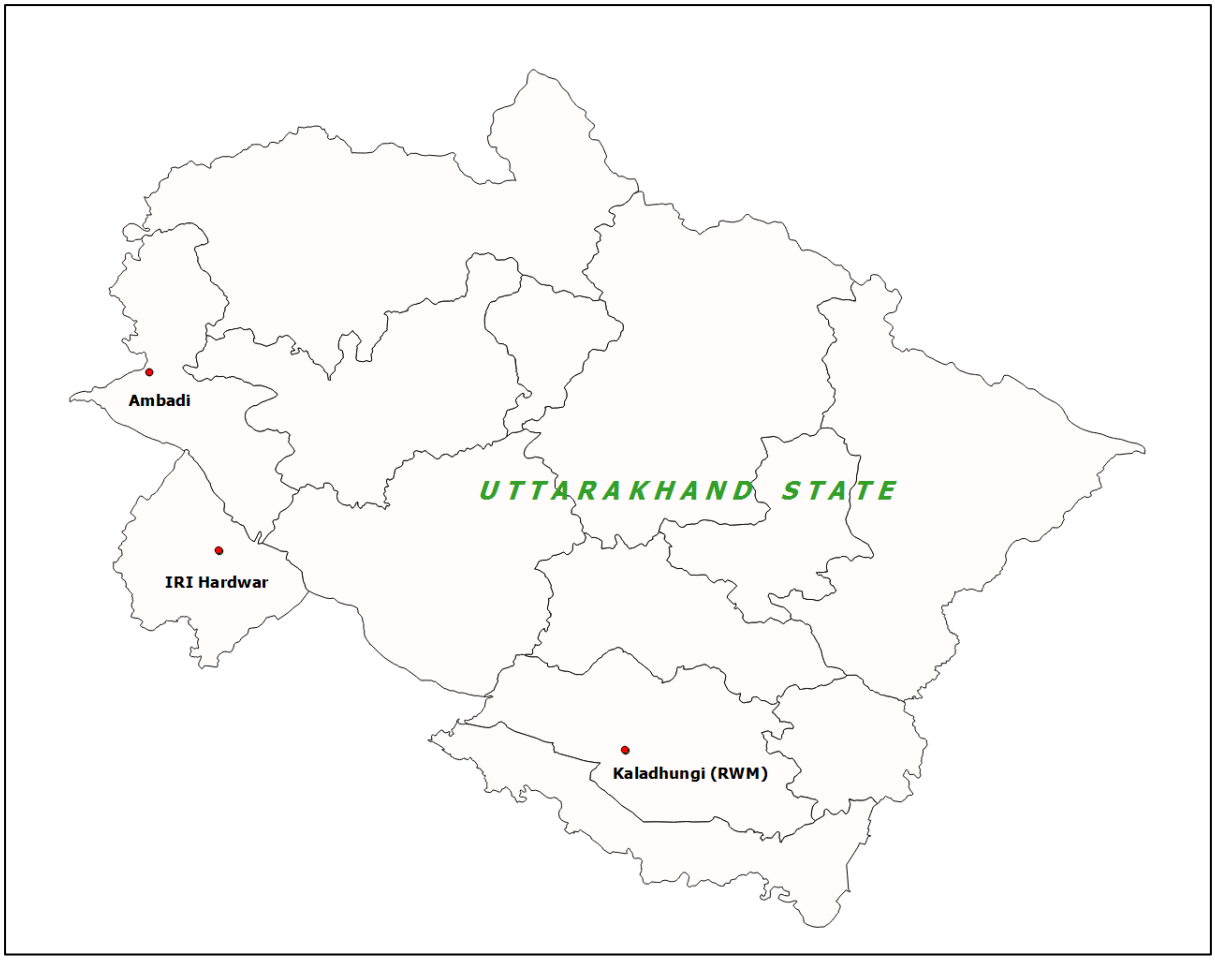
UNIDO is the implementation agency for the project and responsible towards the delivery of the planned outputs and achievement of the expected outcomes. The project is managed by UNIDO project manager at Vienna, having it directly executed by the Project Execution Unit (PEU) located at Dehradun, connected with the 3 project sites. The distance between PEU at Deharadun and 3 project sites across Uttarakhand are as follows:

a) Ambadi (40 Km)

b) IRI Haridwar (50 Km) and

c) Kaladhungi (RWM) (250 km). The approximate locations of the pilot projects are shown in Figure 1 below.

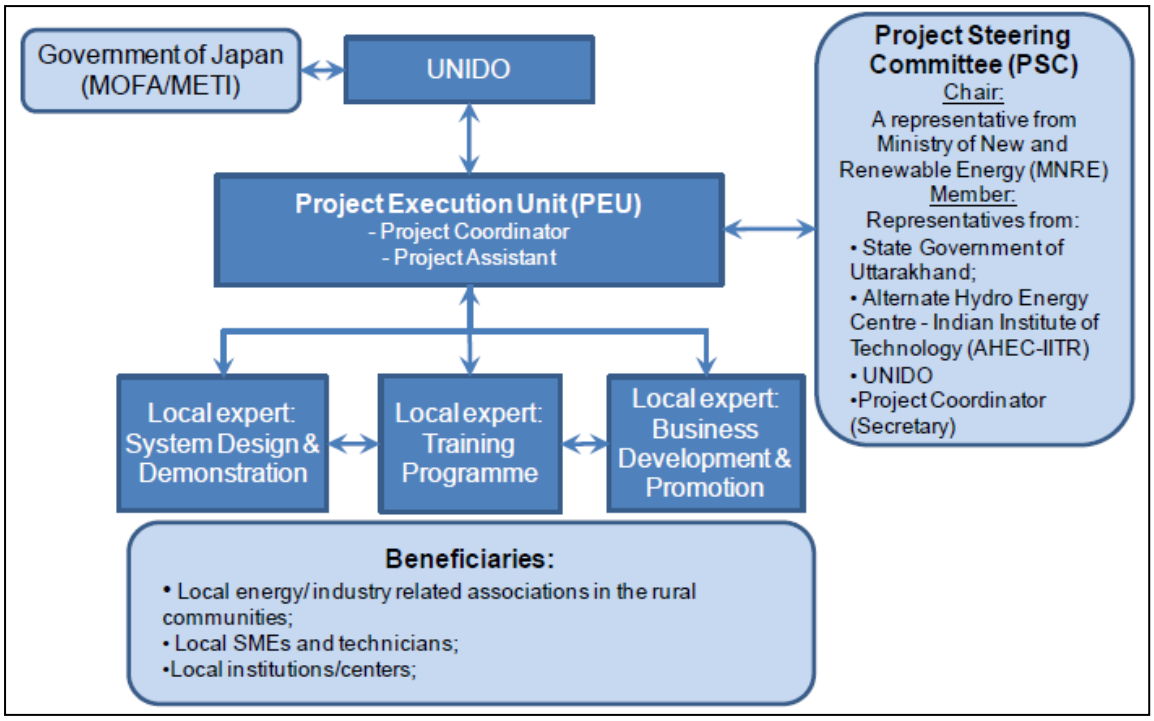
Figure 1 Location Map of Project Sites



A Project Manager (PM) from UNIDO headquarters is responsible for the general management and monitoring of the project, as well as reporting on the project performance to the donor agency. UNIDO is in charge of procuring international expertise, technologies, services etc needed to deliver the proposed output. UNIDO also manages, supervises and monitors the work of all project partners to ensure that deliverables are sustainably sound and consistent with the requirements of the project.

The PEU consists of a full time National Project Coordinator (NPC), along with a full time Micro Hydropower system expert, a full time MHP Business Development Expert, and a project assistant. The PEU also included a part time International consultant as ULH-MHP technology specialist. The project management structure is shown in Figure 2.

Figure 2 Project Management Structure



The PEU is responsible for the coordination of all the project activities. It has a responsibility to liaise and maintain mutual collaboration between UNIDO and project partners towards achieving one goal as a team. The NPC is responsible for the day-to-day management of the project, monitoring and evaluation of project activities as per the agreed project work plan, and reporting to the UNIDO PM. The NPC also continuously seeks and reports opportunities for private partner partnership through this project.

A Project Steering Committee (PSC) is established to periodically review and monitor project implementation progress, facilitate co-ordination between project partners, provide transparency and guidance, and ensure support and sustainability of the project results. Following are the PSC members for the project:

1. Director, Ministry of New and Renewable Energy (MNRE), Govt. of India, New Delhi.
2. Chief Project Officer, Uttarakhand Renewable Energy Development Agency (UREDA), Dehradun, Uttarakhand
3. Chief Scientific Officer, Alternate Hydro Energy Centre (AHEC)-Indian Institute of Technology (IIT) Roorkee
4. Additional Secretary, Irrigation Department, Govt. of Uttarakhand, Dehradun
5. Representative - Embassy of Japan, New Delhi
6. Chief Representative - NEDO (Japan) New Delhi

7. Representative - UNIDO Regional Office, New Delhi
8. Project Manager - UNIDO, Vienna
9. National Project Coordinator- UNIDO-PEU, Dehradun

The PSC is chaired by the representative of the Ministry of New and Renewable Energy (MNRE) and meets twice a year to review and discuss the project progress and expected results against its work plan, monitoring plan and logical framework.

Key institutions involved in the project are:

- Uttarakhand Renewable Energy Development Agency (UREDA)
- Alternate Hydro Energy Centre (AHEC)-Indian Institute of Technology (IIT) Roorkee.
- Irrigation Research Institute (IRI), Bahadrabad

Seabell International Co., Ltd., was identified as project partner for providing ULH-MHP technology and support the demonstration and technical training for ULH-MHP systems in India.

Project involved local SMEs and community leaders /groups at Ambadi and at Kaladhungi in identifying and promoting productive uses of the energy generated capacity building programmes and business plan development.

There were no major changes to project implementation.

3.6.4 Positioning of the UNIDO Project

In February 2012, UNIDO HQ received a request from the Ministry of Economy, Trade & Industry Japan (METI) through UNIDO ITPO Tokyo office to design a pilot project on ultra-low head micro hydropower (ULH-MHP) systems with the aim to increase access to energy in rural India. To follow up the request, UNIDO held consultations with the Government of India, the State Government of Uttarakhand and local partners to identify potential project sites in these rural areas. The Ministry of New and Renewable Energy (MNRE) and the State Government in India have shown strong interest and support to join in this collaborative initiative.

REASONS FOR UNIDO ASSISTANCE

This project contributes to UNIDO objective and institutional outcome with expected results indicated in the Programme and Budgets 2012-2013 IDB. 39/13/Rev.1 Page 67, “To promote access to clean energy for productive uses and industrial

applications by SMEs and other users" and "Public and private organisations promote clean and renewable energy sources on a sustainable basis, and facilitate development of clean and renewable energy markets".

Moreover, UNIDO is assisting in this project for the following reasons:

- UNIDO has proven expertise in developing technology transfer projects on the ground that have direct impact especially in piloting new technologies;
- UNIDO's integrated approach can advance the synergy within technical assistance that provides tangible solutions through system demonstration on the ground level with a linkage to policy levels effectively in catalysing greater development of specific technologies. UNIDO has hands-on experience in local technology adaptation and capacity development. In addition, the project emphasises on business model and market development to create sound investment environment for further up-scaling, which is in line with UNIDO's mandate.
- The proposed project is in line with other small-scale hydropower projects in the past and on-going in various countries including India. UNIDO will bring all experiences and lessons learned to this project;
- UNIDO has longstanding mutual collaboration with the Government of India and therefore, UNIDO can further ensure synergy and linkages in concrete technology transfer. UNIDO received a strong interest of the demonstration project by local counterparts such as state agencies /governments /districts in North India (Uttarakhand), the Ministry of New and Renewable Energy Government of India (MNRE), and local institutions such as the Alternate Hydro Energy Centre, Indian Institute of Technology (AHEC-IITR).

3.6.5 Counterpart Organizations

While Ministry of New and Renewable Energy (MNRE), Government of India is the national coordinating agency for the overall national-level project coordination, the following are the counterpart organizations:

a.) At state government level, Uttarakhand Renewable Energy Development Agency (UREDA) serves as the local implementing partner to promote ULH-MHP technology through mini grid demonstration.

b.) Alternate Hydro Energy Centre, Indian Institute of Technology (AHEC-IITR), located in Roorkee Uttarakhand, A local highly advanced institution, is key partner as well as beneficiary for local R&D, capacity building and training programme of innovative technology.

c.) Uttarakhand Irrigation Department, Deharahun provided local expertise and in-kind support for the selection of pilot sites.

District development councils at project sites provide support to local business promotion and job creation, including women involvement. The project also encouraged women participants at local community level.

4 Project Assessment

4.1 Design

In the context of this evaluation, the Design of the project is taken as the project description and plan as proposed in the ProDoc and early phase of the project itself (including early PSC and other meetings).

Generally, the design of the project was adequate to address the problems at hand. There was a strong stakeholder participation during the design phase. For example, the Ministry of New and Renewable Energy (MNRE) was part of the process of development of the project. The project was in fact developed in response to an interest expressed by the Government of India for a pilot project on ultra-low head micro hydropower (ULH-MHP) technology.

The Project has produced a logical framework (results framework) with clearly defined outcomes and outputs. Indicators of the attainment of the outcomes and outputs are provided and are generally sound. They are quantified reasonably well and sources of verification are provided.

Seabell company did not work with the identified company BOOM Systems Private Limited (BOOM) on technology transfer. Based on the conversations with Seabell representative, it appeared that instead of using BOOM, they have used various third party workshops and manufacturing shops to produce the individual parts of the turbine. One relevant aspect to this is that the ProDoc had not identified any Indian company to which the technology would be transferred.

Identification of local manufacturers for technology transfer at design stage would be beneficial to reduce the risk of not finding a right manufacturer to whom the technology could be transferred. Identification of local manufacturer at the outset would have provided an opportunity for them to actually manufacture and install the pilot sites.

The project was designed to implement ULH Hydro technology at three different locations/sites. The project of this nature involves various steps such as the initial site selection to handing over of the technological assets in demonstrably working order. In this context, it would have been appropriate, at the design stage itself, to provision for allocating full time project staff at these sites. A full time project staff for the remotely located project sites ensures not only needful monitoring, managing and controlling of activities at project site in line with its operational efficiency and effectiveness, but also addresses day to day issues and brings in active involvement of local community towards desired sustainability.

Certain issues of localisation such as presence of silt in water had not been considered in the project design, though it can be argued that it is part of the research and demonstration to identify such aspects. In addition, some assessment of techno-commercial viability of the technology could have been undertaken during the design phase.

Based on the evaluators' analysis, the Design of the project is **MODERATELY SATISFACTORY**.

4.2 Relevance

Rural areas in India including in the State of Uttarakhand, face issues such as limited availability and connection via central power grids and even if connected, the electricity supply can be unreliable. Given the abundance of hydropower resource in the state and also in other parts of India, small scale hydropower can be one of the most appropriate solutions to generate electricity at the local level. In this sense, any project that demonstrates and promotes small scale hydropower in such areas is relevant to the local needs.

The Government of India is fully committed to achieve increased share of renewable energy sources in its installed capacity and on-off-grid/decentralized solutions based on renewable energy application to increase rural electrification.

This project is also in line with the Strategic Priorities of Ministry of New and Renewable Energy (MNRE). The MNRE has developed a Strategic Plan for New and Renewable Energy Sector for the period of 2011-2017. This project is in line with some of the MNRE strategies such as:

- Development of entrepreneurship for rural electrification
- Identifying niche areas for application of renewable energy technologies and reducing consumption of diesel and evolving suitable mechanisms for off-grid deployments
- Demonstration projects for new technologies

This project is also in line with the objectives of UREDA (an important counterpart organisation), which is to exclusively to promote Renewable Energy Sources. Furthermore, the project aligns itself with the Renewable Energy Policy of the Government of Uttarakhand. According to the "POLICY FOR HARNESSING RENEWABLE ENERGY SOURCES IN UTTARAKHAND WITH PRIVATE SECTOR/COMMUNITY PARTICIPATION", the main objective of the Government of Uttarakhand is to create conditions conducive to Private Sector/Community

Participation in power projects based on RE Sources in the State. One of the outcomes of the project is to create favourable environment in ULH-MHP technology deployment in the state of Uttarakhand for the community based organisations, which clearly contributes to the Government of Uttarakhand objective as stated above.

The project is also aligned to the UNIDO thematic priorities, particularly:

- Poverty reduction through productive activities
- Environment and Energy

The project is also in alignment with and will contribute towards Sustainable Development Goals on Energy (SDG 7), which aims to “ensure access to affordable, reliable, sustainable and modern energy for all”.

The project is also consistent with the XII Plan of India with an objective of promoting access to energy and inclusive growth in the UN Development Action Framework (UNDAF) for India for 2013-2017.

Micro hydropower technologies are generally well understood and the technical implementation is in most of the cases well understood. However, there have been problems related to the management and other capacities to run such systems by communities. Many community-based micro hydro projects do not pay sufficient attention to such issues and only concentrate on technical aspects. This project is very relevant in this context as it tries to address such issues by helping to create an enabling environment surrounding the ULH hydro projects.

There have been no fundamental changes in the country and operational context and hence the project remains relevant.

Based on the above analysis, the Relevance of the project is **HIGHLY SATISFACTORY.**

4.3 Effectiveness

This section of the evaluation report on effectiveness assesses to what extent the results at various levels, including outcomes, as identified during the design of the project have been achieved.

A results framework (logical framework) was prepared at the project design stage in order to monitor progress of the project. The table below shows the major achievements of the project against the planned outcomes/outputs. The outcomes and outputs were verified using a variety of means including documents review, field visits, interviews conducted with stakeholders & beneficiaries and inputs from the members of the project team as far as practicable.

PLAN	ACHIEVEMENTS	REMARKS
IMPACT: Increased access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India	1) 1x farmer's development cooperative society jointly invested for processing machines connected to mini-grids. 2) 1x government office connected to the mini-grid 3) 1x community self-help group jointly invested for processing machines connected to mini-grids; 4) 1x system to be connected main grid for income generation;	1) 20% investment in Kaladhungi 2) IRI 3) 20 % investment in Ambadi 4) IRI
OUTCOME 1		
Technology of Ultra Low Head Micro Hydro Power (ULH-MHP) successfully demonstrated and deployed	1) 1x ULH system is successfully deployed and 70,080 kWh generated (INR 308,352, about USD4,800 of income) in 2013, system handed over; 2) 1x ULH system is successfully deployed, generated about 30,000 kWh (estimated values) at site-3, community used electricity for processing of spices and marketing local agricultural produce to market for livelihood	1) IRI, Hardwar 2) Kaladhungi
	1) 2x ULH installed system are operated and maintained by local operators, O & M training provided 2) Over 250 people visited the 1st demo site (IRI Bahaderabad) and 150 visitors to 2nd and 3rd demo sites (Ambadi & Roorkee Watermill); 3) At Kaladhungi, infrastructure developed, agricultural processing assets developed, community started processing agricultural produce and marketing since Aug 2015; 4) At Ambadi, infrastructure developed, processing assets procured, 1x system to be re-installed, community group trained on O &M and marketing of processed agricultural produce.	1) Kaladhungi and Ambadi
OUTPUT 1		

ULH-MHP (Ultra Low Head Micro Hydro Power) system installed and operational	1) 3x ULH-MHP systems installed with the designed capacity of 30 kW; 2) Over 72 local people are trained in various training programme (the female share ranging from 15% to 36% - details in gender assessment); 3) 13 operators and key personnel are trained (the female share was on average 19%);	1) IRI, Kaladhungi, Ambadi 2) Training on marketing for processed product, accounting, processing techniques, business development, how to use and market green energy / organic products.
OUTCOME 2		
Favourable environment created for ULH-MHP technology deployment	1. ULH-MHP technologies are included in the Policy Guidelines of the central government policy (Ministry of New and Renewable Energy (MNRE)). MNRE has made a provision of Central Financial Assistance of INR 125,000 (about USD 2000)/ kW for micro hydro projects and have now included ULH-MHP 2. State of Uttarakhand announced the Micro Hydro Policy on the Development of Micro & Mini Hydro Power Projects up to 2 MW 2015"; 3. Locally manufactured system installed and tested in the project sites and adaptation measures are on-going. Control panel fully manufactured locally. After-service can be made by local private sector. The generator and gear box are imported currently. 4. The technology provider invested for local manufacturing of the system and deployment with local partners; 5. The central and state governments have financed various enabling activities for ULH-MHP systems such as master plan survey (co-financed by MNRE), international conference and workshop; 6. Irrigation Department is actively involved. Project established and strengthened a cross-cutting cooperation on renewable energy application particularly canal-based system with state agencies for energy and irrigation;	
OUTPUT 2		

Advisory support to create a favourable environment for ULH- MHP technology deployment	1) Policy Guidelines of MNRE included ULH-MHP technologies; 2) State of Uttarakhand declared the Micro Hydro Policy on the Development of Micro & Mini Hydro Power Projects up to 2 MW 2015"; 3) Master Plan Survey for Low to Ultra Low head Micro Hydro-Underway; 4) ULH MHP presented at Renewable Energy Investment Summit inaugurated by the Prime Minister of India in 2015; 5) UNIDO Exhibited ULH-MHP technology in Uttarakhand State Council for Science & Technology (UCOST) Congress-2015 6) Hydro workshop by Arizona University, TERI and ICIMOD Nepal 2016; 7) UNIDO Supported International Conference on Sustainable Hydro Development- 2015; 8) 3x O&M trainings conducted; 9) 3x business models developed for each demonstration site: 1st site as Power Purchase Agreement (first time in the state) with main grid connection (on-grid mode), 2nd as green label for organic farming, 3rd as green products supply in eco-tourism sector. 10) 7x business trainings conducted (finance and book keeping training & marketing and branding);	

As shown in the table above, the project has delivered a number of results that lead ultimately to the achievement of the project objectives and impact. Apart from installation of the three pilot hydro sites, a large number of awareness raising activities have been carried out. The technology has been widely discussed and represented in various national and international forum and there is a real interest in all the stakeholder to consolidate the works of this UNIDO project and there appears to be a momentum about adopting this technology. However, given that some of the pilot sites suffered technical issues, the effectiveness of the project itself is slightly adversely affected given that one of the outcomes is the successful demonstration of the ULH technology. Even though it has been shown that the technology works and the output has been achieved, in at least one pilot site, successful demonstration has only partially been achieved affecting the effectiveness.

As mentioned elsewhere in this evaluation report, the original total project duration may have been shorter than that was required for successful demonstration of the ULH hydro technology. It is imperative that the momentum of interest and enthusiasm about this technology is consolidated and supported in order to successfully demonstrate the technology of ULH hydro for productive uses. Support from the technology provider and a greater level of technology transfer, with support from institutions will be necessary for consolidating the outputs and outcomes achieved as part of this project.

Based on the analysis above, the effectiveness of the project is **SATISFACTORY.**

4.4 Efficiency

One of the key aspects in measuring the efficiency of the project is the extent to which the project was cost effective and delivered with the least costly alternative. In this context, overall the project was undertaken with a good degree of efficiency though the project time period was extended twice. As the project was delayed, the activities were not in line with the original plans.

There was no direct co-finance arrangement for this project but some project counterparts pledged in-kind support, which was provided as planned. For example, UREDA pledged to provide office space for the PEU, which was provided as expected.

As also detailed in detailed Section 4.7.4 and shown in summary in table below, the actual expenditure on the project was very close to the budgeted amount – both on Japanese fund and UNIDO grant.

Donor	Budget	Expenditure
Japan	USD 1,173,682.00	USD 1,172,260.83
UNIDO	EUR 53,097.00	EUR 49,466.09

In view of the above, the Efficiency of the project is regarded as SATISFACTORY.

4.5 Sustainability of Project Outcomes

Sustainability is in the context of this evaluation is defined as the likelihood of continued benefits after the project ends.

The following four dimensions or aspects of risks to sustainability will be addressed with several questions for each of the aspects as shown below:

4.5.1 Financial Sustainability

Cost of the equipment has been identified by almost all the relevant stakeholders as key to sustainability and large scale replication. The cost of the technology will directly affect the cost effectiveness of the systems, and consequently the willingness or otherwise of the end users to invest in such systems in Uttarakhand or elsewhere in India. Since the original equipment comes from Japan, local manufacture is key to reducing the cost of the equipment and hence improve the cost effectiveness making it more likely to be financially viable. At the time of evaluation, it is not clear how the technology transfer is going to take place and how much cost reduction is possible.

The aspect of cost effectiveness or financial viability is closely linked with the cost of the electricity from the grid. In grid connected areas of Uttarakhand and other parts of India, an obvious comparison to make would be the cost of the electricity produced by the ULH hydro schemes versus the cost of electricity from the grid. However, cost of grid electricity alone cannot be the sole factor in deciding whether to use ULH hydro technology. This is particularly pertinent if the electricity from the grid is not reliable, making the grid electricity less attractive for productive uses.

Establishment and sustaining of repair and maintenance facilities at local level is important for long term sustainability of the project.

Based on the above analysis, the financial sustainability is **MODERATELY LIKELY.**

4.5.2 Socio-political Risks

The local community have shown a great deal of interest in this project. They have paid 20% of the cost of the processing equipment to be used with the ULH systems. The users have also organised themselves in groups and formalised them by registering as local cooperative organisations. This suggests that there is a low social risk to the project outcomes.

The Social sustainability is **LIKELY.**

4.5.3 Institutional Framework and Governance Risks

The government through the Ministry of New and Renewable Energy (MNRE) have shown a high level of interest in this type of hydropower projects, as it is in line with their strategy and are actively promoting small scale renewable energy technologies, including providing subsidies for such schemes.

Technology transfer & local manufacture are key to sustainability. The ProDoc has recognised this aspect of the project and the technology transfer has been identified as a risk, as follows:

"Mutual agreement between technology provider of ultra-low head micro hydropower technology to be transferred and local institutions cannot be established."

The mitigation proposed is to "*identify appropriate institutional partners for the technology transfer and clear understanding of role of parties at the beginning of cooperation."*

Even though a manufacturer was identified (BOOM), a longer term cooperation between the technology provider and the recipient does not appear to have materialised. It is unclear how Seabell company (now called JagSeabell) will be manufacturing the ULH hydro equipment through a partnership with a local manufacturing company in India. Seabell had identified a local manufacturer called Boom Systems Private Limited to manufacture the ULH hydro pilot equipment in India. However, this did not

materialise and Seabell manufactured the components in India using other unnamed manufacturing entities. The details of the terms and conditions of partnership of Seabell and these manufacturers are not available to the evaluators.

Interview with Irrigation department in Uttarakhand revealed that it is positive about the prospects and potential of the technology.

There have been policy changes in respect of the outcome of this project. For example, the MNRE have included this new ULH in the list of technologies that will be supported, including by providing subsidies (MNRE provides a subsidy of INR 125,000 /kW for other micro hydro projects). Similarly, UREDA have introduced a new micro hydro policy which encourages schemes like these by guaranteeing to buy the electricity from these schemes. A dedicated web page[1] was created within UREDA website. These are positive aspects of long term sustainability.

As mentioned elsewhere in this evaluation report, some of the ULH hydro demonstration units did not have an opportunity to run for a relatively longer period of time so that any issues could be identified, rectified and lessons could be learned. At the end of the UNIDO intervention, the hydro units were to be transferred to the local community groups. It is understood that arrangements are being put in place for such a hand over at all three ULH pilot hydro sites. Some additional trainings and after sales services were to be provided after the end of the UNIDO project.

Based on the above analysis, the sustainability related to institutional framework and governance is **LIKELY.**

4.5.4 Environmental Risks

In general, these small scale low head hydropower schemes or any type of small scale hydropower schemes do not present adverse impacts on the physical environment. However, the availability of water in the river may change due to various factors including short and long term change in rainfall. A reduced level of water in the rivers may mean that the availability of water for the hydropower scheme may be reduced affecting the performance.

Based on the above, the environmental sustainability is **LIKELY**.

[1] http://www.ureda.uk.gov.in/pages/display/167-ultra-low-head-micro---hydro-project-(unido)

4.6 Assessment of Monitoring and Evaluation Systems

The monitoring and evaluation (M&E) aspects of the project was assessed as follows.

4.6.1 M&E Design

The ProDoc states that Project monitoring, reporting and evaluation will be carried out in accordance with established UNIDO Technical Cooperation (TC) guidelines and procedures. The ProDoc also states that a detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the Project Execution Unit (PEU) and project partners at the start-up of the project of project implementation and then periodically updated. However, there does not appear to be a logical M&E plan formulated at the design stage of the project, though there are a number of methods and procedures underlined in the project that appear to have been used to monitor the project. There is no specific budget allocated for monitoring and evaluation.

Each staff from UNIDO involved in the project had job descriptions and monthly activity plan. The ProDoc provides a detailed activity plan on a monthly basis in the form of a Gantt Chart. There is logical framework for the project against which the project could be monitored.

Based on the analysis above, the M&E Design is **MODERATELY SATISFACTORY.**

4.6.2 M&E Plan Implementation

Even though there was no strict M&E plan in place and the M&E systems were not in strict alignment with UNIDO and other systems, there were various reporting mechanisms in place to monitor the project progress. Some of the key tools and documents used for the monitoring and evaluation of this project were:

- Annual Work Plans
- Quarterly Work Plans
- Regular Progress Reports
- Meeting minutes (PSC and other meetings)
- Staff Action Plans & Job Descriptions

- Logical Framework
- Phone calls and emails

In addition, the following activities were carried out for the monitoring of the project.

- Monthly reporting to UNIDO by NGO partners on various activities through reports, minutes, photographs, six monthly reports and annual reports
- Weekly to monthly community meetings recorded in registers, and important decisions shared with PEU
- Monthly visit by PEU team. Back-to-office reports (including the minutes of each meeting held during the visit) prepared after each visit
- Tracking the progress through meeting, field visits, teleconference and evaluating progress and re-working of plans
- Prepared minutes of each stakeholders meeting duly signed by all stakeholders involved
- Prepared minutes of each skype communication with manufacturer and also UNIDO HQ team
- Onsite monitoring at each of the ULH demonstration projects
- Email exchanges between PEU and HQ team and counterparts.
- PSC meetings and minutes

Even though there was no M&E plan in place, the methods and tools listed above meant that issues were identified and rectifying mechanism was put in place.

Based on above, the M&E Plan Implementation is deemed **SATISFACTORY.**

4.6.3 Budgeting and Funding for M&E Activities

There was no specific budget item allocated for M&E activities. However, there was a budget item “Other direct costs” of approximately 44 thousand Euros that included the Evaluation costs. In addition, there is an overhead of 13% of the total amounting to 122,000 Euros. There is no specific information available to the evaluation team that suggests that M&E activities were budgeted except the mention of a “reserved” fund for Monitoring & Evaluation plan which seems to be set aside for a specific task (SAP Database). In addition, page 17 of the ProDoc suggests that monitoring and assessment of the results will be provided from the UNIDO budget.

Based on the analysis above, the M&E Funding is **MODERATELY SATISFACTORY.**

4.7 Assessment of Processes Affecting Achievement of Project Results

Among other factors described elsewhere in this report, the evaluation has considered the following aspects affecting project implementation and attainment of project results.

4.7.1 Preparation and Readiness / Quality at Entry

Even though the objective/goal, outcomes and outputs of the project were clear, given that the project was to introduce a new technology, involving technology transfer and was supposed to demonstrate the use of ULH technology. In order for such a demonstration, it would be reasonable to expect the technology to be operating for a reasonably long period of time and hence the evaluators believe that the original length of the time allocated for the project was not long enough. Introduction of any new technology inherently carries uncertainties and hence any project should take into account the time needed to rectify initial problems before a smooth and regular operation can be achieved.

The project had identified the technology provider but not identified the recipient of the technology transfer. It can be argued that it is not always possible to do so in all the projects but identifying the recipient of the technology transfer at the design stage could reduce the risks.

UREDA and AHEC were identified as the two of the main counterparts in the project. UREDA is the key public sector agency established to promote Renewable Energy in the State of Uttarakhand, and was selected as the local implementing partner for the promotion of the ULH hydro through demonstration. UREDA had pledged to provide in-kind contribution through providing office space for the PEU, demonstration of mini grid systems, public awareness raising and regional policy promotion at the start of the project as described in the ProDoc. Selection of UREDA as the main counterpart is well justified as they have the resources and the mandate to promote renewable energy technologies in the State.

Similarly, AHEC were also selected as a counterpart in the project. A local advanced institution, Alternate Hydro Energy Centre, Indian Institute of Technology (AHEC-IITR), which is located in Roorkee, Uttarakhand, was a key partner/beneficiary for local R&D, capacity building and training programme of

innovative technology. The selection of AHEC is well justified as it is a premier institution in the country and has significant relevant experience in the sector.

4.7.2 Country Ownership / Drivenness

Country ownership has been one of the strong points of this project. As mentioned elsewhere in this report, the project concept is very much in line with the development priorities of the country (especially the alignment with the MNRE priorities). The project outcomes contribute to the national development priorities. For example, the key objectives of the Ministry of New and Renewable Energy are:

- To promote deployment of grid-interactive renewable power generation projects
- To promote renewable energy initiatives for:
    - meeting energy / lighting needs in rural areas
    - supplementing energy needs in urban areas
    - supplementing energy needs in industry and commercial establishments
- To promote research, design and development activities at premier national institutions and industries on different aspects of new and renewable energy technologies and help development of new products
- To encourage development of a Robust Manufacturing Industry in Renewable Energy Sector

The ULH hydro project is consistent and contributes to almost all of the key objectives of the MNRE, as shown above. MNRE were involved from the beginning of the project including the fact that the request for this project came from the ministry. MNRE also chaired the PSC and attended the meetings of the Project Steering Committee.

There was no direct financial commitment from the government to this project. However, there was in-kind support pledged for the project from UREDA (a State Government organisation) in terms of office space and other facilities and the use of the canals for the pilot sites was pledged by the Irrigation Department, a government body. All these in-kind supports were provided.

There have been policy changes in respect of the outcome of this project. For example, the MNRE have included this new ULH in the list of technologies that will be supported, including by providing subsidies (MNRE provides a subsidy of INR 125,000 /kW for other micro hydro projects). Similarly, UREDA have introduced a new micro hydro policy which encourages schemes like

these by guaranteeing to buy the electricity from these schemes. A dedicated web page[2] was created within UREDA website.

An additional example of the government interest and ownership in this project is that MNRE is interested to invest in Watermill Development Centre with UREDA (e.g. for training and testing related to hydropower / watermills). An Expression of Interest (EoI) in this regard has been published.

4.7.3 Stakeholder Involvement

There were a number of stakeholders involved in this project encompassing different sectors such as NGOs, local self-help groups (SHG), private sector, government agencies and educational establishments. Roles were defined or given during the implementation of the project for each of the stakeholders.

Since this project involved working with grassroots population, it was important to utilize existing relationships within the communities involved. The project used the local NGOs (such as Uttara Gharat in Kaladhungi and Institute for Development Support in Ambadi) already active in the area to mobilise the end users of the ULH project. This is regarded as positive aspect of the stakeholder engagement and using the skills, knowledge and experience of the stakeholders.

In addition, cooperative societies were formed in both Kaladhungi and Ambadi sites by way of which they party invested in processing machines (20% of the cost) demonstrating their involvement in this project.

Similarly, AHEC in Roorkee is one of the premier institutes in the country in hydropower research and education and their involvement has been beneficial to the project.

4.7.4 Financial Planning

There was no direct co-finance pledged in this project. Some in-kind contributions were pledged by counterparts and those generally materialized.

According to the budget figures available from UNIDO, the actual expenditures were close to the budget items as planned, as shown in the table below.

Expense Item	Budget	Actual
Donor Funding (USD)		

[2] http://www.ureda.uk.gov.in/pages/display/167-ultra-low-head-micro---hydro-project-(unido)

Capacity Building/Enabling Environment	924,327.55	923,195.40
Technology Demonstration	229,488.76	229,198.01
Evaluation	19,865.69	19,865.68
UNIDO Grant (EUR)		
Capacity Building/Enabling Environment	26,854.71	25,283.43
Technology Demonstration	26,242.29	24,182.66

4.7.5 UNIDO's Supervision and Backstopping

The project was implemented by the PEU formed by UNIDO and based in UREDA office in Dehradun. A National Project Coordinator (NPC) headed the PEU with various support staff involved at different times in the project, and the staff appointed had right skills and qualifications for the job. However, it was felt that that on some occasions (at various points in time during the execution of the project) fewer than necessary dedicated project staff to manage and monitor the implementation sites were available. The PEU staff prepared monthly plan that included the work to be done by that staff for the project including the timeline. The staff were provided with clear job descriptions and the progress were measured against then monthly plans and job description by preparing progress reports though irregular.

UNIDO Vienna office managed the project well through regular visits to the sites and through progress reports.

4.7.6 Delays and Project Outcomes and Sustainability

As mentioned elsewhere in the report, the project requested two extensions – one from the scheduled end month of January 2015 to December 2015, and the second extension to June 2016. Thus a project originally envisaged to run for two years eventually is ending after 3.5 years. The delays appear to be caused by technical issues, primarily due to the ULH Hydro equipment not being ready to operate properly. These technical issues were caused by a variety of reasons but they all seem to relate to the equipment not functioning as it should (such as vibrations in the machine).

It was not possible to run the hydro equipment for a longer period and hence the opportunity to gain experience on the running of the machines and related activities was limited and hence would affect sustainability.

4.7.7 Implementation Approach

The implementation approach is generally sound and is similar to other approaches applied by UNIDO and other agencies in aspects such as stakeholder participation and capacity building. The approach does promote local ownership by using approaches such as cash and in kind contribution from the community (the community contributed 20% of the end use processing equipment). The approach itself does not involve significant risks.

The project involved a significant amount of capacity building and awareness raising activities. The approach also is in line with the Paris Declaration of Aid Effectiveness and Accra Agenda for Action in aspects such as ownership, capacity building, delivering results and alignment.

4.8 Project Coordination and Management

Overall, the national management and overall coordination mechanisms were reasonably efficient and effective. A Project Steering Committee (PSC) consisting of stakeholders headed by the Ministry of New and Renewable Energy (nodal Ministry of the Government of India for all matters relating to new and renewable energy) was formed at the beginning and was overall in charge of the project. The ProDoc specifies that the PSC would meet twice a year review and discuss the project progress and expected results against its work plan, monitoring plan and logical framework. Details of the PSC meetings are available in the project documentation provided to the evaluators.

Table 2 shows the schedule of the PSC meetings held.

Table 2 PSC Meetings Held

Meeting	Date	Location
1st PSC Meeting	21 June 2013	New Delhi
2nd PSC Meeting	Dec 2013	New Delhi
3rd PSC Meeting	September 2014	New Delhi
4th PSC Meeting	September 2015	New Delhi
5th PSC Meeting	June 2016	New Delhi

It can be seen that the plan as described in the ProDoc for six monthly PSC meetings was not strictly followed.

The PSC meeting minutes were written after every meeting with actions to be undertaken. Detailed agendas were prepared before the meeting and a roll call and attendance were noted from the participants of the meetings.

A Project Execution Unit (PEU) was established under UNIDO to undertake day to day activities of the project. Roles and responsibilities, including in-kind contribution, of each of the partners viz. Ministry of New and Renewable Energy (MNRE), State Government of Uttarakhand, District development councils and Alternate Hydro Energy Centre were clearly defined in the project document.

UNIDO Project Manager based in Vienna provided regular support and was involved in monitoring of the project through the tools and methods described in Section 4.6.2.

4.9 Gender Mainstreaming

The evaluation is expected to consider to what extent socioeconomic benefits delivered by the project at the national and local levels included consideration of gender dimensions. There were two aspects of gender consideration in the ProDoc:

- Discussions with both male and female community leaders in order to ensure a balance and also to ensure that both men and women benefit from the project through the mutual knowledge sharing
- Gender balance of participants will be considered in various capacity building activities

During the implementation of the project, both men and women were involved in activities including in the membership of the self-help groups involved in productive end use activities and in various capacity building activities.

The project team (PEU) is formed of 2 male and 2 female staff as follows:

- 1x male National Project Coordinator
- 1x female Micro Hydropower System Expert
- 1x female Micro-Hydro Business Development Expert
- 1x male Administrative Associate

The gender balance of NGO/ facilitation core team is:

Ambadi Pilot site: 3 male

Kaladhungi Pilot Site: 2 female + 1 male

The gender balance in capacity building and other activities are summarized in the table below.

#	Particulars	Total	Female	Male	Female share
1	Total self-help group members in Ambadi (2nd site) who were trained and participated in community meetings	11	4	7	36%
2	Total self-help group members in Kaladhungi (3rd site) who were trained and participated in community meetings	12	4	8	33%
3	O&M Training by technology provider at Irrigation Research Institute Bahadrabad	13	2	11	15%
4	O&M Training by technology provider at local partner Factory	13	3	10	23%
5	Master plan survey orientation	23	6	17	26%
	Total	**72**	**19**	**53**	**26%**

5 Conclusions, Recommendations and Lessons Learned

5.1 Conclusions

The Ultra-Low Head Micro Hydro project executed by UNIDO in the State of Uttarakhand is generally a good project that introduces a new technology and its application that is highly relevant in the circumstances and to the problems the project is trying to address. Renewable energy and micro hydro power in particular is highly relevant in Uttarakhand state and in India in general in solving problems with electricity access such as unavailability and unreliability of electricity in rural areas in order to generate electricity for productive uses without affecting the environment by use of fossil fuels.

The project was designed moderately well with a few aspects that were not considered at the design stage such as identification of local manufacturers and technology providers to whom the technology would be transferred. Similarly, the issue of silt in the water used for the hydropower systems was not identified well. Out of the two outcomes envisaged for the project, the outcome related to the creation of supporting environment has been achieved relatively well. The outcome of the demonstration of the ULH hydro technology has been achieved to a lesser extent due to some technical issues with the installation – these issues also caused the project timeline to be extended by several months. The duration of this project is somewhat short given that there was a component of technology transfer, installation and demonstration of a new technology which can give rise to initial technical issues.

Although the technology is very relevant given significant potential, and there is a strong enthusiasm in the community and other stakeholders about the technology but the long term uptake of the project is hindered by not being able to demonstrate the technology to the fullest extent possible.

The sustainability of project outcomes is on the whole good but the financial sustainability is questionable due to the uncertainty in the cost of the equipment and consequently whether the ULH hydro systems will be competitive when compared to grid electricity. Environmental, Social and Governance sustainability are all likely. Moreover, the ownership of the country is one of the strongest aspects of the project.

Project was coordinated reasonably well and barring a few issues in the design stage, M&E of the project was satisfactory. Evaluators did not find an evidence of a systematic M&E tool for project management though the project progress was monitored reasonably well. The project also has considered gender aspect relatively well.

5.1.1 Evaluation Ratings

The project was evaluated for the performance against five criteria: Relevance, Effectiveness, Efficiency, Sustainability, Impact and were rated accordingly. The table below shows a summary of the evaluation and the related ratings.

1. Monitoring and Evaluation	**Rating**
M&E design	Moderately Satisfactory
M&E Plan Implementation	Satisfactory
Budgeting & Funding for M&E	Moderately Satisfactory
2. Assessment of Outcomes	**Rating**
Design	Moderately Satisfactory
Relevance	Highly Satisfactory
Effectiveness	Satisfactory
Efficiency	Satisfactory
3. Sustainability	**Rating**
Financial Sustainability	Moderately Likely
Socio-political Sustainability	Likely
Institutional framework and Governance Sustainability	Likely
Environmental Sustainability	Likely

5.2 Recommendations

The following recommendations are provided by the evaluation team.

- For future projects that have a technology transfer component, it is recommended that UNIDO identifies, at the design stage of the project, the local manufactures technology service providers (such as O&M companies) to whom the technology will be transferred.
- The duration of the project of this nature (technology transfer, installation and successful demonstration) should be longer and hence UNIDO and the donor agencies should keep that into account while designing the projects

- In order to keep the momentum and fully realise the outcome of successful demonstration to ensure uptake, it is recommended that additional activities are carried out including more pilot projects with locally manufactured equipment
- UNIDO should give more emphasis on preparing and following a more systematic M&E process such as preparing M&E plans and explicitly allocating budgets for M&E processes.

5.3 Lessons Learned

- Project Design should consider a provision of full time staffing in case of multi-location project
- Project Design should include Market Assessment, readiness and development initiatives if project has a technology transfer component
- M&E and periodic reporting (against Project Logframe and a formal M&E plan) should have greater emphasis during implementation

6 ANNEXES

6.1 Evaluation TOR

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE

Independent terminal evaluation of UNIDO project: Promoting ultra low-head micro hydropower technology to increase access to renewable energy for productive uses in rural India

UNIDO SAP ID: 120182

AUGUST 2015

CONTENTS

I. Project background and overview

1. Project factsheet

Project Title	**Promoting ultra low-head micro hydropower technology to increase access to renewable energy for productive uses in rural India**
UNIDO project No. (SAP ID)	120182
Thematic area code	Environment and Energy – EC33
Region	Asia and Pacific
Country	India
Implementing agency	UNIDO
Project executing partners	Ministry of New and Renewable Energy (MNRE), Government of India; Uttarakhand Renewable Energy Development Agency (UREDA) Government of Uttarakhand; Uttarakhand Irrigation Department, Government of Uttarakhand;
Project implementation start date	January 2013
Original expected implementation end date	January 2015
Revised expected implementation end date (if any)	December 2015
Actual implementation end date	December 2015
UNIDO inputs (EUR)	938,053
UNIDO's fee (13%) (EUR)	121,947
Co-financing	In-kind
Grand Total (EUR)	1,060,000
Planned terminal evaluation date	September – November 2015

Source: Project document

2. Project summary

The State of Uttarakhand, India faces issues of limited connection in rural communities to central power grid and the lack of reliable electricity supply even where villages are connected to the power grid. Moreover, the state has been seeking alternative solutions based on decentralised renewable energy and mini grids for various small and medium industrial enterprises. The current situation of access to electricity in the state hampers further development of rural industrialization, especially in the agro-industry sector as well as any improvement of the living standards in the rural communities.

The field of hydropower is currently one of the key areas for sustainable industrial development in the State of Uttarakhand and a policy has been recently developed to progress in producing electricity from micro level hydropower systems, especially with renewable and green technologies. The local institutions in the renewable energy field such as Alternate Hydro Energy Centre (AHEC) of Indian Institute of Technology (IIT) and Uttarakhand Renewable Energy Development Agency (UREDA) of Uttarakhand Government are located in the state and have expressed their interest in getting involved in the project in the area of the local capacity-building, research, facilitation and awareness-raising with the aim to promote innovative hydropower technology in the State.

The feasibility study with Indian experts has found an enormous untapped potential of small and micro hydropower development in India. The development potential of small hydropower (up to 25 MW) accounts for more than 15 GW in the whole country. The study carried out in the State Uttarakhand has estimated that over 1.5 GW of electricity can be generated based on micro hydropower system by using existing water resources of irrigation canals, drinking water supply channels and water released from sewerage systems outlets. Such existing water infrastructures, however, require low head systems that can generate electricity with a hydraulic head of less than 3 m (Ultra Low Head Micro Hydro Power turbine system, hereafter ULH-MHP system). The State Uttarakhand has an area of 53,566 km2 with about 10 millions of population (as of 2011). Although roughly 90% of households has access to electricity (as of
2011), frequent power cuts make power supply in the “electrified” villages unstable additionally the electricity requirement has not been focused for small scale industrial use through decentralized power generation options.

An inclusive project intervention that brings state-of-the-art technology and energy production connected to the rural industry sector such as agro industry and energy supply services, while ensuring the national capacity for local manufacturing and investment opportunities for replication in a business model framework, is thus needed to support successful new green technology deployment in India.

The project was developed in response to the interest expressed by the Government of India to help in design of a pilot project on ultra low-head micro hydropower (ULH-MHP) technology. This renewable energy technology has been the most up-to-date technique developed in this field, being innovated approximately four years ago, which remains available only in Japan.

Different from the conventional hydropower technologies, this hydropower system can generate electricity from low-head water flow in the small waterfalls of the existing water-supply and sewage, power station waterways, drainage from factories, agricultural waterways and stream channels, which have not been previously considered feasible for hydro power generation. This is an environmentally-friendly system that does not need large-scale engineering work and its maintenance does not require advanced technology - this makes it a very suitable way to generate electricity especially in the developing countries.

The goal of the project is to increase the access of rural communities to renewable electricity in the State of Uttarakhand, India. The project will demonstrate, deploy and transfer the ULH- MHP technology from Japan to the State of Uttarakhand. The project will also seek to create a favourable environment to deploy the ULH-MHP technology through the development of business models. The project will bring the ULH-MHP systems into operation and build the

capacity for the mini grid operation/maintenance as well as local manufacturing of turbine units and spare parts.

The project consists of the following key activities:

1) Identification of business opportunities via technology transfer;
2) Demonstration of mini-grid system for productive uses;
3) Capacity building with institutional networking; and
4) Awareness-raising and market/investment opportunities to mainstream the new technology;

This project is built on the strong commitment and leadership of the Government of India, in line with the national strategy and local institutional capacity for the technology transfer. Given the relevance of micro hydropower technology, it is foreseen that this intervention will guide a pathway to increase the number of people with access to sustainable energy and to promote innovative technologies with the prospect of delivering long-term green growth and jobs for the benefit of local communities.

Project implementation started in January 2013 and the initial project end date was in January 2015, which was revised to December 2015.

The project is funded by the Government of Japan and UNIDO grant amounting to EUR 1,060,000, including UNIDO's fee of EUR 121,947 (13%). Details on the budget are presented in Section 6.

An independent terminal evaluation for this project was foreseen in the project document as part of Monitoring & Evaluation plan, with the purpose of conducting a systematic and impartial assessment of the project in line with UNIDO policies. The terminal evaluation is planned to take place **during September- November 2015**.

3. Project objective

The goal of the project is to increase access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India.

The expected outputs of the project are as follows:

- Output 1: ULH-MHP (Ultra Low Head Micro Hydro Power) system installed and operational;
- Output 2: Advisory support to create a favourable environment for ULH-MHP technology deployment;

The project will be implemented along with four development stages of activities: 1) Design, 2) System Demonstration, 3) Business Development, and 4) Strategy Development. The project is targeted to design 3 pilot mini-grid systems for catalyzing productive activities based on 10kW ULH-MHP unit using existing infrastructure such as service water canals and irrigation canals.

4. Relevant project reports/documents

Progress Reports

Several progress reports are available to track the progress of project activities over the implementation period. They include progress reports on; the technology demonstration by technology provider and community development process by facilitating agencies.

Meeting minutes

Several meeting minutes are available to record significant processes of decision-making among project partners, which include minutes for Project Steering Committee meetings, beneficiaries, and governments.

Technical documents

Technical documents are available for the pilot project sites. They contain site-specific description such as technical design of the system, co-financing/commitment scheme, and socioeconomic information. Review reports will guide to understand the lessons-learned on the localization process of installed system and training activities for knowledge management. There are documents like 'Master Plan Survey Document', FAQ, O & M Manual, Feasibility survey format, agency selection documents, community training module, monitoring report by third party agency, etc.

Dissemination materials

Newsletter, brochure, webpage, community modules on awareness, do's & don't s on technology, presentations, news articles, conference /workshop papers and film can highlight the key achievement of the project activities.

Project Document: The original project design is relevant to provide the country context, address key needs and expected outcomes.

5. Project implementation arrangements

Implementation Agency: UNIDO holds the ultimate responsibility for the implementation of the project, the delivery of the planned outputs and the achievement of the expected outcomes.

Execution Agency: Uttarakhand Renewable Energy Development Agency (UREDA) Government of Uttarakhand (UREDA) is the nodal execution agency of the project.

Project Execution Unit (PEU): The project is managed and implemented by UNIDO and directly executed by the Project Execution Unit (PEU), which is established in the premise of Execution Agency - UREDA. The PEU consists of a full time National Project Coordinator (NPC) and a project assistant with a Micro Hydro system Expert and Business Development Expert. The PEU is responsible for the coordination of all the project activities as described in the proposal. It shall delegate responsibilities to liaise and maintain mutual collaboration between UNIDO and project partners towards achieving one goal as a team.

Project Steering Committee (PSC): PSC is established to periodically review and monitor project implementation progress, facilitate co-ordination between project partners, provide transparency and guidance, and ensure support and sustainability of the project results. The representative of the Ministry of New and Renewable Energy (MNRE) chairs the PSC meeting. PSC are composed of the representatives from key project partners:

- State Government of Uttarakhand such as Uttarakhand Renewable Energy Development Agency (UREDA) and Uttarakhand Irrigation Department;
- Alternate Hydro Energy Centre - Indian Institute of Technology (AHEC-IITR);
- Donor government (Government of Japan) and donor agency (NEDO);
- UNIDO;

Counterparts and beneficiaries contribute to the project such as labour, land, office space, funding opportunities for events and project activities, assets etc.

Ministry of New and Renewable Energy (MNRE):

Provision of national-wide expertise on renewable energy application for productive uses and co-financing support for the project;

State Government of Uttarakhand:

State government body such as Uttarakhand Renewable Energy Development Agency (UREDA) and Uttarakhand Irrigation Department will provide local expertise and support for the selection of pilot sites, demonstration of mini grid systems, authorization, provision of land and office, training activities at the site, public awareness raising, and regional policy promotion;

Community:

Provision of in-kind support for labour, productive assets, equipment etc for the demonstration of mini grid system for productive uses;

6. Budget information

The Government of Japan - Ministry of Foreign Affairs (MOFA) has released 1,000,000 Euro for the project implementation through UNIDO in cooperation with Ministry of Economy, Trade & Industry Japan (METI). UNIDO will also contribute 60,000 Euro (From UNIDO) to the project to secure the UNIDO mandate to develop business models based on mini grids for access to energy and productive activity. The estimated budget is presented below.

Budget Line	Item	Amount (EUR)		
		Output 1	Output 2	Total
11-01	International Consultants	24,000	24,000	**48,000**
15-00	Local Travel	12,000	12,000	**24,000**
16-00	Staff Travel	8,000	8,000	**16,000**
17-00	National Consultants	103,000	90,000	**193,000**
21-01	Contractual Services - installation and demonstration of low head microhydro power technology	410,000	0	**410,000**
30-00	Training programme for micro hydropower technology and mini grids	72,000	72,000	**144,000**
45-01	Equipments - productive assets	59,000	0	**59,000**
51-00	Other direct costs (incl. evaluation)	7,000	37,053	**44,053**
	Subtotal	695,000	243,053	**938,053**
	Overhead costs (13%)	90,350	31,597	**121,947**
	Total	785,350	274,650	**1,060,000**
	Grand Total			**1,060,000**

Source: Project document

UNIDO budget execution

As of July 2015, about 83% of fund has been obligated excluding reserved fund for Monitoring & Evaluation plan (SAP database, 14 July 2015).

II. Scope and purpose of the evaluation

The terminal evaluation (TE) will cover the whole duration of the project from its starting date in January 2013 to the estimated completion date in December 2015. It will assess project performance against the evaluation criteria: relevance, effectiveness, efficiency, sustainability and impact.

The evaluator should provide an analysis of the attainment of the project objective(s) and the results. Through its assessments, the ET should enable the Government, counterparts, UNIDO and other stakeholders and donors to verify prospects for development impact and sustainability, project objectives, delivery and completion of project outputs/activities, and outcomes/impacts based on indicators. The assessment includes re-examination of the relevance of the objectives and other elements of project design according to the project evaluation parameters defined in chapter VI.

The TE has an additional purpose of drawing lessons and developing recommendations for UNIDO and the donor that may help for improving the selection, enhancing the design and implementation of similar future projects and activities in the country and on a global scale upon project completion. The TE report should include examples of good practices for other projects in the focal area, country, or region.

The key question of the terminal evaluation is whether the project has achieved or is likely to achieve the project objective, i.e. if the project has increased or is likely to increase the access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India for the promotion of new technology.

III. Evaluation approach and methodology

The TE will be conducted in accordance with the UNIDO Evaluation Policy, and the UNIDO Guidelines for the Technical Cooperation Programmes and Projects. It will be carried out as an independent in-depth evaluation using a participatory approach whereby all key parties associated with the project are kept informed and regularly consulted throughout the evaluation. The evaluation team leader will liaise with the UNIDO Office for Independent Evaluation (ODG/EVA) on the conduct of the evaluation and methodological issues.

The evaluator will be required to use different methods to ensure that data gathering and analysis deliver evidence-based qualitative and quantitative information, based on diverse sources, as necessary: desk studies and literature review, statistical analysis, individual interviews, focus group meetings, surveys and direct observation. This approach will not only enable the evaluation to assess causality through quantitative means but also to provide reasons for why certain results were achieved or not and to triangulate information for higher reliability of findings. The specific mixed methodological approach will be described in the inception report.

The evaluator will develop interview guidelines. Field interviews can take place either in the form of focus-group discussions or one-to-one consultations.

The methodology will be based on the following:

1. A desk review of project documents, including, but not limited to:

   (a) The original project document, monitoring reports (such as progress and financial reports to UNIDO, output reports (case studies, action plans, sub-regional strategies, etc.), mission-reports, and relevant correspondence;

   (b) Notes from the meetings of committees involved in the project (e.g. approval and steering committees);.

   (c) Financial data generated for the projects and available from UNIDO's internal management systems;

   (d) Other project-related material produced by the project;

2. Since the project document contains a project results framework (included in annex of the TOR), the evaluator will assess performance against this framework. The validity of the theory of change will be re-examined through specific questions in the interviews and, possibly, through a survey of relevant parties involved in the project.

3. Counter-factual information: In those cases where baseline information for relevant indicators is not available, the evaluation team will aim at establishing a proxy-baseline through recall and secondary information.

4. Interviews at UNIDO HQ to project management and technical support staff, and – if necessary - staff associated with the project's financial administration and procurement.

5. A field mission to the project sites, which will include interviews to local governments, beneficiaries, local donor office/donor agency, UNIDO Field Office and the local project management members.

6. Other interviews, surveys or document reviews as deemed necessary by the evaluation team and/or UNIDO ODG/EVA.

7. The inception report will provide details on the methodology used by the evaluation team and include an evaluation matrix.

IV. Evaluation team composition

The evaluation team will be composed of one international evaluation consultant acting as a team leader and one or two national evaluation consultant(s).

Evaluation consultants will be contracted by UNIDO. The tasks of each team member are specified in the job descriptions attached to these terms of reference.

Members of the evaluation team must not have been directly involved in the design and/or implementation of the programme/projects.

The Project Manager at UNIDO and the Project Team in India will support the evaluation team.

V. Time schedule

The evaluation is scheduled to start in the period November - December 2015. The field mission is planned for end 2015 (tentatively).

After the field mission, the evaluation team leader will come to UNIDO HQ for debriefing and presentation of the preliminary findings of the Terminal Evaluation. The draft TE report will be submitted 4-6 weeks after the end of the mission.

VI. Project evaluation parameters

The evaluation team will rate the projects. The ***ratings for the parameters described in the following sub-chapters A to J will be presented in the form of a table*** with each of the categories rated separately and with **brief justifications for the rating** based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in annexes.

A. Project design

The evaluation will examine the extent to which:

- the project's design is adequate to address the problems at hand;
- a participatory project identification process was instrumental in selecting problem areas and national counterparts;
- the project has a clear thematically focused development objective, the attainment of which can be determined by a set of verifiable indicators;
- the project was formulated based on the logical framework (project results framework) approach;
- the project was formulated with the participation of national counterpart and/or target beneficiaries;
- relevant country representatives (from government, industries and civil society) have been appropriately involved and were participating in the identification of critical problem areas and the development of technical cooperation strategies;

B. Project relevance

The evaluation will examine the extent to which the project is relevant to the:

- National development and environmental priorities and strategies of the Government and the population, and regional and international agreements. See possible evaluation questions under "Country ownership/drivenness" below.
- Target groups: relevance of the project's objectives, outcomes and outputs to the different target groups of the interventions (e.g. companies, civil society, beneficiaries of capacity building and training, etc.).
- UNIDO's thematic priorities: Were they in line with UNIDO's mandate, objectives and outcomes defined in the Programme & Budget and core competencies?
- Does the project remain relevant taking into account the changing environment? Is there a need to reformulate the project design and the project results framework given changes in the country and operational context?

C. Effectiveness: Objectives and final results at the end of the project

- The evaluation will assess to what extent results at various levels, including outcomes, have been achieved. In detail, the following issues will be assessed: To what extent have the expected outputs, outcomes and long-term objectives been achieved or are likely to be achieved? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Are the project outcomes commensurate with the original or modified project objectives? If the original or modified expected results are merely outputs/inputs, the evaluators should assess if there were any real outcomes of the project and, if there were, determine whether these are commensurate with realistic expectations from the project.
- How do the stakeholders perceive the quality of outputs? Were the targeted beneficiary groups actually reached?
- What outputs and outcomes has the project achieved so far (both qualitative and quantitative results)? Has the project generated any results that could lead to changes of the assisted institutions? Have there been any unplanned effects?
- Identify actual and/or potential longer-term impacts or at least indicate the steps taken to assess these (see also below "monitoring of long term changes"). Wherever possible, evaluators should indicate how findings on impacts will be reported in future.
- Describe any catalytic or replication effects: the evaluation will describe any catalytic or replication effect both within and outside the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the project's catalytic role.

D. Efficiency

The extent to which:

- The project cost was effective? Was the project using the most cost-efficient options?
- Has the project produced results (outputs and outcomes) within the expected time frame? Was project implementation delayed, and, if it was, did that affect cost effectiveness or results? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that for similar projects. Are the project's activities in line with the schedule of activities as defined by the project team and annual work plans? Are the disbursements and project expenditures in line with budgets?
- Have the inputs from the donor, UNIDO and Government/counterpart been provided as planned, and were they adequate to meet the requirements? Was the quality of UNIDO inputs and services as planned and timely?
- Was there coordination with other UNIDO and other donors' projects, and did possible synergy effects happen?

E. Assessment of sustainability of project outcomes

Sustainability is understood as the likelihood of continued benefits after the project ends. Assessment of sustainability of outcomes will be given special attention but also technical, financial and organization sustainability will be reviewed. This assessment should explain how the risks to project outcomes will affect continuation of benefits after the project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

- **Financial risks**. Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once UNIDO assistance ends? (Such resources can be from multiple sources, such as the public and private sectors or income-generating activities; these can also include trends that indicate the likelihood that, in future, there will be adequate financial resources for sustaining project outcomes.) Was the project successful in identifying and leveraging co-financing?
- **Sociopolitical risks**. Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?
- **Institutional framework and governance risks.** Do the legal frameworks, policies, and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency and required technical know-how in place?
- **Environmental risks.** Are there any environmental risks that may jeopardize sustainability of project outcomes? Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits? The evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

F. Assessment of monitoring and evaluation (M&E) systems

- **M&E design.** Did the project have an M&E plan to monitor results and track progress towards achieving project objectives? The evaluation will assess whether the project met the minimum requirements for the application of the Project M&E plan (see annex 3).

- **M&E plan implementation.** The evaluation should verify that an M&E system was in place and facilitated timely tracking of progress toward project objectives by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete and accurate, with well-justified ratings; the information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure that data will continue to be collected and used after project closure. Was monitoring and self-evaluation carried out effectively, based on indicators for outputs, outcomes and impacts? Are there any annual work plans? Was any steering or advisory mechanism put in place? Did reporting and performance reviews take place regularly?
- **Budgeting and Funding for M&E activities.** In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for at the project planning stage and whether M&E was adequately funded and in a timely manner during implementation.

G. Monitoring of long-term changes

The M&E of long-term changes is often incorporated in UNIDO projects as a separate component and may include determination of environmental baselines; specification of indicators; and provisioning of equipment and capacity building for data gathering, analysis, and use. This section of the evaluation report will describe project actions and accomplishments towards establishing a long-term monitoring system. The evaluation will address the following questions:

a. Did the project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?
b. What were the accomplishments and shortcomings in establishment of this system?
c. Is the system sustainable—that is, is it embedded in a proper institutional structure and does it have financing? How likely is it that this system continues operating upon project completion?
d. Is the information generated by this system being used as originally intended?

H. Assessment of processes affecting achievement of project results

Among other factors, when relevant, the evaluation will consider a number of issues affecting project implementation and attainment of project results. The assessment of these issues can be integrated into the analyses of project design, relevance, effectiveness, efficiency, sustainability and management as the evaluators deem them appropriate (it is not necessary, however it is possible to have a separate chapter on these aspects in the evaluation report). The evaluation will consider, but need not be limited to, the following issues that may have affected project implementation and achievement of project results:

a. **Preparation and readiness / Quality at entry.** Were the project's objectives and components clear, practicable, and feasible within its time frame? Were counterpart resources (funding, staff, and facilities), and adequate project management arrangements in place at project entry? Were the capacities of executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project approval?

b. **Country ownership/drivenness.** Was the project concept in line with the sectoral and development priorities and plans of the country—or of participating countries, in the case of multi-country projects? Are project outcomes contributing to national development priorities and plans? Were relevant country representatives from government and civil society involved in the project? Did the recipient government maintain its financial commitment to the project? Has the government—or governments in the case of multi-country projects—approved policies or regulatory frameworks in line with the project's objectives?

c. **Stakeholder involvement.** Did the project involve the relevant stakeholders through information sharing and consultation? Did the project implement appropriate outreach and public awareness campaigns? Were the relevant vulnerable groups and powerful supporters and opponents of the processes properly involved? Which stakeholders were involved in the project (i.e. NGOs, private sector, other UN Agencies, etc.) and what were their immediate tasks? Did the project consult with and make use of the skills, experience, and knowledge of the appropriate government entities, nongovernmental organizations, community groups, private sector entities, local governments, and academic institutions in the design, implementation, and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process taken into account while taking decisions?

d. **Financial planning.** Did the project have appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? Specifically, the evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing.

e. **UNIDO's supervision and backstopping.** Did UNIDO staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNIDO staff provide quality support and advice to the project, approve modifications in time, and restructure the project when needed? Did UNIDO provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?

f. **Co-financing and project outcomes and sustainability.** If there was a difference in the level of expected co-financing and the co-financing actually realized, what were the reasons for the variance? Did the extent of materialization of co-financing affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?

g. **Delays and project outcomes and sustainability.** If there were delays in project implementation and completion, what were the reasons? Did the delays affect project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages?

h. **Implementation approach.** Is the implementation approach chosen different from other implementation approaches applied by UNIDO and other agencies? Does the approach comply with the principles of the Paris Declaration? Does the approach promote local ownership and capacity building? Does the approach involve significant risks?

The evaluation team will rate the project performance. The ratings will be given to four criteria: Project Results, Sustainability, Monitoring and Evaluation, and UNIDO related issues as specified in Annex 2. The ratings will be presented in a table with each of the categories rated separately and with brief justifications for the rating based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in the same annex.

I. Project coordination and management

The extent to which:

- The national management and overall coordination mechanisms have been efficient and effective? Did each partner have assigned roles and responsibilities from the beginning? Did each partner fulfil its role and responsibilities (e.g. providing strategic support, monitoring and reviewing performance, allocating funds, providing technical support, following up agreed/corrective actions)?

- The UNIDO HQ-based management, coordination, monitoring, quality control and technical inputs have been efficient, timely and effective (e.g. problems identified timely and accurately; quality support provided timely and effectively; right staffing levels, continuity, skill mix and frequency of field visits)?

J. Assessment of gender mainstreaming

The evaluation will consider, but need not be limited to, the following issues that may have affected gender mainstreaming in the project:

- To which extent were socioeconomic benefits delivered by the project at the national and local levels, including consideration of gender dimensions?

The checklist of gender mainstreaming for projects is listed in Annex.

VII. Reporting

Inception report

This Terms of Reference (ToR) provides some information on the evaluation methodology, but this should not be regarded as exhaustive. After reviewing the project documentation and initial interviews with the project manager, the International Evaluation Consultant will prepare, in collaboration with the national consultant, a short inception report that will operationalize the ToR relating to the evaluation questions and provide information on what type of and how the evidence will be collected (methodology). It will be discussed with and approved by the responsible UNIDO Evaluation Officer. The Inception Report will focus on the following elements: preliminary project theory model(s); elaboration of evaluation methodology including quantitative and qualitative approaches through an evaluation framework ("evaluation matrix"); division of work between the International Evaluation Consultant and National Consultant(s); mission plan, including places to be visited, people to be interviewed and possible surveys to be conducted and a debriefing and reporting timetable[1].

Evaluation report format and review procedures

The draft report will be delivered to UNIDO Office for Independent Evaluation–ODG/EVA (the suggested report outline is in Annex 1) and circulated to UNIDO staff and national stakeholders associated with the project for factual validation and comments. Any comments or responses, or feedback on any errors of fact to the draft report provided by the stakeholders will be sent to UNIDO ODG/EVA for collation and onward transmission to the project evaluation team who will be advised of any necessary revisions. On the basis of this feedback, and taking into consideration the comments received, the evaluation team will prepare the final version of the terminal evaluation report.

The evaluator will present its preliminary findings to the local stakeholders at the end of the field visit and take into account their feed-back in preparing the evaluation report. A presentation of preliminary findings will take place at UNIDO HQ after the field mission.

The TE report should be brief, to the point and easy to understand. It must explain the purpose of the evaluation, exactly what was evaluated, and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

[1] The evaluator will be provided with a Guide on how to prepare an evaluation inception report prepared by the UNIDO Office for Independent Evaluation.

Findings, conclusions and recommendations should be presented in a complete, logical and balanced manner. The evaluation report shall be written in English and follow the outline given in Annex 1.

Evaluation work plan

The "Evaluation Work Plan" includes the following main products:

1. Desk review, briefing by project manager and development of methodology: Following the receipt of all relevant documents, and consultation with the Project Manager about the documentation, including reaching an agreement on the methodology, the desk review could be completed.
2. Inception report: At the time of departure to the field mission, all the received material has been reviewed and consolidated into the Inception report.
3. Field mission: The principal responsibility for managing this evaluation lies with UNIDO. It will be responsible for liaising with the project team to set up the stakeholder interviews, arrange the field missions, coordinate with the Government. At the end of the field mission, there will be a presentation of preliminary findings to the key stakeholders in the country where the project was implemented.
4. Preliminary findings from the field mission: Following the field mission, the main findings, conclusions and recommendations would be prepared and presented in the field and at UNIDO Headquarters.
5. A draft terminal evaluation report will be forwarded electronically to the UNIDO Office for Independent Evaluation and circulated to main stakeholders.
6. Final terminal evaluation report will incorporate comments received.

Evaluation phases	Deliverables
Desk review	Development of methodology approach and evaluation tools
Briefing with UNIDO Office for Independent Evaluation, Project Managers and other key stakeholder at HQ	Interview notes, detailed evaluation schedule and list of stakeholders to interview during field mission
Data analysis	Inception Evaluation Report
Field mission Present preliminary findings and recommendations to key stakeholders in the field	Presentation of main findings to key stakeholders in the field.
Debriefing at UNIDO HQ	Present preliminary findings and recommendations to the stakeholders at UNIDO HQ Additional interviews and analysis
Analysis of the data collected	Draft Terminal Evaluation Report
Circulation of the draft report to UNIDO/relevant stakeholders and revision	Final Terminal Evaluation Report

VIII. Quality assurance

All UNIDO evaluations are subject to quality assessments by the UNIDO Office for Independent Evaluation. Quality assurance and control is exercised in different ways throughout the evaluation process (briefing of consultants on methodology and process of UNIDO's Office for Independent Evaluation, providing inputs regarding findings, lessons learned and recommendations from other UNIDO evaluations, review of inception report and evaluation report by the Office for Independent Evaluation). The quality of the evaluation report will be assessed and rated against the criteria set forth in the Checklist on evaluation report quality,

attached as annex 4. The applied evaluation quality assessment criteria are used as a tool to provide structured feedback. UNIDO's Office for Independent Evaluation should ensure that the evaluation report is useful for UNIDO in terms of organizational learning (recommendations and lessons learned) and is compliant with UNIDO's evaluation policy and these terms of reference. The draft and final evaluation report are reviewed by UNIDO Office for Independent Evaluation, which will submit the final report to the UNIDO Evaluation Office and circulate it within UNIDO together with a management response sheet.

Annex 1 - Outline of an in-depth project evaluation report

Executive summary

- Must provide a synopsis of the storyline which includes the main evaluation findings and recommendations
- Must present strengths and weaknesses of the project
- Must be self-explanatory and should be maximum 3-4 pages in length

I. Evaluation objectives, methodology and process

- Information on the evaluation: why, when, by whom, etc.
- Scope and objectives of the evaluation, main questions to be addressed
- Information sources and availability of information
- Methodological remarks, limitations encountered and validity of the findings

II. Country and project background

- Brief country context: an overview of the economy, the environment, institutional development, demographic and other data of relevance to the project
- Sector-specific issues of concern to the project[2] and important developments during the project implementation period
- Project summary:
  - Fact sheet of the project: including project objectives and structure, donors and counterparts, project timing and duration, project costs and co-financing
  - Brief description including history and previous cooperation
  - Project implementation arrangements and implementation modalities, institutions involved, major changes to project implementation
  - Positioning of the UNIDO project (other initiatives of government, other donors, private sector, etc.)
  - Counterpart organization(s)

III. Project assessment

This is the key chapter of the report and should address all evaluation criteria and questions outlined in the TOR (see section VI Project Evaluation Parameters). Assessment must be based on factual evidence collected and analyzed from different sources. The evaluators' assessment can be broken into the following sections:

A. Design
B. Relevance (Report on the relevance of project towards countries and beneficiaries)
C. Effectiveness (The extent to which the development intervention's objectives and deliverables were achieved, or are expected to be achieved, taking into account their relative importance)
D. Efficiency (Report on the overall cost-benefit of the project and partner countries' contribution to the achievement of project objectives)
E. Sustainability of project outcomes (Report on the risks and vulnerability of the project, considering the likely effects of sociopolitical and institutional changes in partner countries, and its impact on continuation of benefits after the project ends, specifically the financial, sociopolitical, institutional framework and governance, and environmental risks)
F. Assessment of monitoring and evaluation systems (Report on M&E design, M&E plan implementation, and budgeting and funding for M&E activities)
G. Monitoring of long-term changes
H. Assessment of processes affecting achievement of project results (Report on preparation and readiness / quality at entry, country ownership, stakeholder involvement, financial planning, UNIDO support, co-financing and project outcomes and sustainability, delays of project outcomes and sustainability, and implementation approach)

[2] Explicit and implicit assumptions in the logical framework of the project can provide insights into key-issues of concern (e.g. relevant legislation, enforcement capacities, government initiatives, etc.)

I. Project coordination and management (Report project management conditions and achievements, and partner countries commitment)
J. Gender mainstreaming

At the end of this chapter, an overall project achievement rating should be developed as required in Annex 2.

IV. Conclusions, recommendations and lessons learned

This chapter can be divided into three sections:

A. Conclusions

This section should include a storyline of the main evaluation conclusions related to the project's achievements and shortfalls. It is important to avoid providing a summary based on each and every evaluation criterion. The main conclusions should be cross-referenced to relevant sections of the evaluation report.

B. Recommendations

This section should be succinct and contain few key recommendations. They should:

- be based on evaluation findings
- be realistic and feasible within a project context
- indicate institution(s) responsible for implementation (addressed to a specific officer, group or entity who can act on it) and have a proposed timeline for implementation if possible
- be commensurate with the available capacities of project team and partners
- take resource requirements into account.

Recommendations should be structured by addressees:

- UNIDO
- Government and/or Counterpart Organizations
- Donor

C. Lessons learned

- Lessons learned must be of wider applicability beyond the evaluated project but must be based on findings and conclusions of the evaluation
- For each lesson, the context from which they are derived should be briefly stated

Annexes should include the evaluation TOR, list of interviewees, documents reviewed, a summary of project identification and financial data, including an updated table of expenditures to date, and other detailed quantitative information. Dissident views or management responses to the evaluation findings may later be appended in an annex.

Annex 2 - Overall ratings table

Criterion	Evaluator's summary comments	Evaluator's rating
Attainment of project objectives and results (overall rating), sub criteria (below)		
Design		
Effectiveness		
Relevance		
Efficiency		
Sustainability of Project outcomes (overall rating) Sub criteria (below)		
Financial risks		
Sociopolitical risks		
Institutional framework and governance risks		
Environmental risks		
Monitoring and Evaluation (overall rating) Sub criteria (below)		
M&E Design		
M&E Plan Implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
Project management		
UNIDO specific ratings		
Quality at entry / Preparation and readiness		
Implementation approach		
UNIDO Supervision and backstopping		
Overall rating		

RATING OF PROJECT OBJECTIVES AND RESULTS

- Highly satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Moderately unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.
- Highly unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results **may not be higher** than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

RATINGS ON SUSTAINABILITY

Sustainability will be understood as the probability of continued long-term outcomes and impacts. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits beyond project completion. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes.

Rating system for sustainability sub-criteria
On each of the dimensions of sustainability of the project outcomes will be rated as follows.

- Likely (L): There are no risks affecting this dimension of sustainability.
- Moderately likely (ML). There are moderate risks that affect this dimension of sustainability.
- Moderately unlikely (MU): There are significant risks that affect this dimension of sustainability.
- Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The project M&E system will be rated on **M&E Design**, **M&E Plan Implementation** and **Budgeting and funding for M&E activities** as follows:

- Highly satisfactory (HS): There were no shortcomings in the project M&E system.
- Satisfactory(S): There were minor shortcomings in the project M&E system.
- Moderately satisfactory (MS): There were moderate shortcomings in the project M&E system.
- Moderately unsatisfactory (MU): There were significant shortcomings in the project M&E system.
- Unsatisfactory (U): There were major shortcomings in the project M&E system.
- Highly unsatisfactory (HU): The Project had no M&E system.

M&E plan implementation will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on M&E plan implementation.

All other ratings will be on the six point scale:

HS	= Highly satisfactory	Excellent
S	= Satisfactory	Well above average
MS	= Moderately satisfactory	Average
MU	= Moderately unsatisfactory	Below average
U	= Unsatisfactory	Poor
HU	= Highly unsatisfactory	Very poor (appalling)

Annex 3 - Checklist on evaluation report quality

Independent terminal evaluation of UNIDO project:

PROJECT TITLE:

PROJECT NUMBER:

CHECKLIST ON EVALUATION REPORT QUALITY

Report Quality Criteria	UNIDO Office for Independent Evaluation Assessment notes	Rating
A. The terminal evaluation report presented an assessment of all relevant outcomes and achievement of project objectives in the context of the focal area program indicators if applicable.		
B. The terminal evaluation report was consistent, the evidence presented was complete and convincing, and the ratings were well substantiated.		
C. The terminal evaluation report presented a sound assessment of sustainability of outcomes.		
D. The lessons and recommendations listed in the terminal evaluation report are supported by the evidence presented and are relevant to the future projects.		
E. The terminal evaluation report included the actual project costs (totals, per activity, and per source) and actual co-financing used.		
F. The terminal evaluation report included an assessment of the quality of the M&E plan at entry, the operation of the M&E system used during implementation, and the extent M&E was sufficiently budgeted for during preparation and properly funded during implementation.		

Rating system for quality of evaluation reports
A number rating 1-6 is used for each criterion: Highly Satisfactory = 6, Satisfactory = 5, Moderately Satisfactory = 4, Moderately Unsatisfactory = 3, Unsatisfactory = 2, Highly Unsatisfactory = 1, and unable to assess = 0.

Annex 4 – Job descriptions

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	**International evaluation consultant (team leader)**
Main Duty Station and Location:	Home based
Mission/s to:	Missions to Vienna, Austria and India
Start of Contract (EOD):	1 September 2015
End of Contract (COB):	30 November 2015
Number of Working Days:	28 working days spread over 3 months

ORGANIZATIONAL CONTEXT

The Office for Independent Evaluation is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. The Office for Independent Evaluation is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

PROJECT CONTEXT

The overall objective of this micro-hydro project entitled - Promoting ultra-low-head micro hydropower mini grids to increase access to energy for productive uses in rural India, is to increase the access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India. The expected results are to install and make operational ultra low-head micro hydropower (ULH-MHP) mini-grid systems, which can generate electricity with a valid head of 1.0-3.0 m and the flow volume of 1.0-3.0 m3/s. The project takes places in collaboration with India and Japan and aims to create a favourable environment for future local technology deployment. During two years of project period, three main activities are targeted: 1) Demonstration of mini-grid systems for productive uses using ultra low-head micro hydropower technology; 2) Local capacity building of micro hydropower technology with institutional networking; and 3) Awareness raising and creating market and investment opportunities to mainstream the innovative energy solutions.

The project is managed and implemented by UNIDO and directly executed by the Project Execution Unit (PEU), which has been established in the project region - State Uttarakhand.

Detailed background information of the project can be found the Terms of Reference (TOR) for the terminal evaluation.

DUTIES AND RESPONSIBILITIES

MAIN DUTIES	Concrete/ measurable Outputs to be achieved	Working Days	Location
1. Review project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); determine key data to collect in the field and adjust the key data collection instrument of 3A accordingly; Assess the adequacy of legislative and regulatory framework relevant to the project's activities and analyse other background info.	• Adjust table of evaluation questions, depending on country specific context; • Draft list of stakeholders to interview during the field missions; • Brief assessment of the adequacy of the country's legislative and regulatory frameworks;	5 days	Home-based
2. Briefing with the project managers and other key stakeholders at UNIDO HQ; Preparation of the Inception Report;	• Detailed evaluation schedule with tentative mission agenda (incl. list of stakeholders to interview and site visits); mission planning; • Division of evaluation tasks with the National Consultant; • Inception report	2 days	Vienna, Austria
3. Conduct field mission to India in **October 2015**[3];	• Conduct meetings with relevant project stakeholders, beneficiaries, etc. for the collection of data and clarifications of 3 project sites located in Uttarakhand State, Dehradun region, and New Delhi region; • Agreement with the National Consultant on the structure and content of the evaluation report and the distribution of writing tasks; • Presentations of the evaluation's initial findings, draft conclusions and recommendations to stakeholders in the country at the end of the missions;	7 days (including domestic travel days)	India
4. Present overall findings and recommendations to the stakeholders at UNIDO HQ;	• After field mission(s): Presentation slides, feedback from stakeholders obtained and discussed;	1 days	Vienna, Austria
5. Prepare the evaluation report	• Draft evaluation report	8 days	Home-

[3] The exact mission schedule will be decided in agreement with the Consultant, UNIDO HQ, and the country counterparts. Two or all three missions may be carried out consecutively.

MAIN DUTIES	Concrete/ measurable Outputs to be achieved	Working Days	Location
according to TOR; Coordinate the inputs from the National Consultant and combine with her/his own inputs into the draft evaluation report			based
6. Finalize evaluation report, on basis of comments and suggestions received through evaluation manager	• Final evaluation report submitted to evaluation manager	5 days	Home-based
	Total	**28 days**	

MINIMUM ORGANISATIONAL REQUIREMENTS

Education: Advanced degree in environment, energy, engineering, development studies or related areas.

Technical and Functional Experience:

- A minimum of 10 year experience in environmental project;
- Knowledge about multilateral technical cooperation and the UN, international development;
- Knowledge of and experience in environmental projects management and/or evaluation (of development projects);
- Working experience in developing countries;
- Experience in rural energy and technology transfer desirable;
- Working experience in India an asset;
- Knowledge of UNIDO activities and experience in evaluation of UNIDO projects and an asset;

Languages:
Fluency in written, editing and spoken English is required.

Reporting and deliverables:
1) At the beginning of the assignment the Consultant will submit a concise Inception Report that will outline the general methodology and presents a concept Table of Contents;
2) The country assignment will have the following deliverables:
   · Presentation of initial findings of the mission;
   · Draft report;
   · Final report, comprising of executive summary, findings regarding design, implementation and results, conclusions and recommendations.
3) Debriefing at UNIDO HQ:
   · Presentation and discussion of findings;
   · Concise summary and comparative analysis of the main results of the evaluation report.

All reports and related documents must be in English and presented in electronic format.

Absence of conflict of interest:
According to UNIDO rules, the consultant must not have been involved in the design and/or implementation, supervision and coordination of and/or have benefited from the

programme/project (or theme) under evaluation. The consultant will be requested to sign a declaration that none of the above situations exists and that the consultants will not seek assignments with the manager/s in charge of the project before the completion of her/his contract.

REQUIRED COMPETENCIES

Core values:
1. Integrity
2. Professionalism
3. Respect for diversity

Core competencies:
1. Results orientation and accountability
2. Planning and organizing
3. Communication and trust
4. Team orientation
5. Client orientation
6. Organizational development and innovation

Managerial competencies (as applicable):
1. Strategy and direction
2. Managing people and performance
3. Judgement and decision making
4. Conflict resolution

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE FOR PERSONNEL UNDER INDIVIDUAL SERVICE AGREEMENT (ISA)

Title:	**National evaluation consultant**
Main Duty Station and Location:	Home based
Mission/s to:	Travel to potential sites within India
Start of Contract (EOD):	1 September 2015
End of Contract (COB):	30 November 2015
Number of Working Days:	25 working days spread over 3 months

ORGANIZATIONAL CONTEXT

The Office for Independent Evaluation is responsible for the independent evaluation function of UNIDO. It supports learning, continuous improvement and accountability, and provides factual information about result and practices that feed into the programmatic and strategic decision-making processes. Evaluation is an assessment, as systematic and impartial as possible, of a programme, a project or a theme. Independent evaluations provide evidence-based information that is credible, reliable and useful, enabling the timely incorporation of findings, recommendations and lessons learned into the decision-making processes at organization-wide, programme and project level. The Office for Independent Evaluation is guided by the UNIDO Evaluation Policy, which is aligned to the norms and standards for evaluation in the UN system.

PROJECT CONTEXT

The national evaluation consultant will evaluate the project according to the terms of reference under the leadership of the team leader (International evaluation consultant). S/he will perform the following tasks:

DUTIES AND RESPONSIBILITIES

MAIN DUTIES	Concrete/ measurable Outputs to be achieved	Working days	Location
1. Review and analyze project documentation and relevant country background information (national policies and strategies, UN strategies and general economic data); in cooperation with the Team Leader: determine key data to collect in the field and prepare key instruments in both English and local language (questionnaires, logic models) to collect these data through interviews and/or surveys	• List of detailed evaluation questions to be clarified; questionnaires/interview guide; logic models; list of key data to collect, draft list of stakeholders to interview during the field missions; • Drafting and presentation of brief assessment of the adequacy of the country's legislative and regulatory framework in the context of the project;	5 days	Home-based

	MAIN DUTIES	Concrete/ measurable Outputs to be achieved	Working days	Location
	during and prior to the field missions; Coordinate and lead interviews/ surveys in local language and assist the Team Leader with translation where necessary; Analyze and assess the adequacy of legislative and regulatory framework in India, specifically in the context of the project's objectives and targets; provide analysis and advice to the Team Leader on existing and appropriate policies for India for input to the terminal evaluation.			
2.	Review all project outputs/ publications/feedback; Briefing with the evaluation team leader, UNIDO project managers and other key stakeholders; Coordinate the evaluation mission agenda, ensuring and setting up the required meetings with project partners and government counterparts, and organize and lead site visits, in close cooperation with the Project Management Unit; Assist and provide detailed analysis and inputs to the Team Leader in the Preparation of the Inception Report;	• Interview notes, detailed evaluation schedule and • list of stakeholders to interview during the field missions; • Division of evaluation tasks with the Team Leader; • Inception Report;	5 days	Home-based (telephone interviews)
3.	Coordinate and conduct the field mission (New Delhi region, Dehradun region, and 3 project sites located in Uttarakhand State) with the Team Leader in cooperation with the Project Management Unit, where required; Consult with the Team Leader on the structure and content of the evaluation report and	• Presentations of the evaluation's initial findings, draft conclusions and recommendations to stakeholders in the country at the end of the mission; • Agreement with the Team Leader on the structure and content of the evaluation report and the distribution of writing tasks;	7 days (including domestic travel days)	India

MAIN DUTIES	Concrete/ measurable Outputs to be achieved	Working days	Location
the distribution of writing tasks;			
4. Prepare inputs and analysis to the evaluation report according to TOR and as agreed with the Team Leader;	• Draft evaluation report prepared;	6 days	Vienna, Austria
5. Revise the draft project evaluation reports based on comments from all stakeholders and edit the language and form of the final version according to UNIDO standards;	• Final evaluation report prepared	2 days	Home-based
	Total	**25 days**	

MINIMUM ORGANISATIONAL REQUIREMENTS

Education: Advanced university degree in environment, energy, engineering, development studies or related areas.

Technical and functional experience:

- A minimum of 10 years practical experience in the field of environment, energy, and technology transfer including evaluation experience at the international level involving technical cooperation in developing countries.;
- Exposure to the needs, conditions and problems in developing countries;
- Familiarity with the institutional context of the project in the Ministry and State Government is desirable.

Languages:
Fluency in written, editing and spoken English and local language (Hindi) is required.

Absence of conflict of interest:
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3. Judgement and decision making
4. Conflict resolution

Annex 5 – Project results framework

RESULTS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS & RISKS
EXPECTED IMPACT			
Increased access of rural communities to renewable energy for productive uses in the State of Uttarakhand, India	• # of enterprises and households connected to mini grids;	• Periodical statistical data collected by the state government	
OUTCOME 1			
Technology of Ultra Low Head Micro Hydro Power (ULH-MHP) successfully demonstrated and deployed	• kWh of renewable energy generated from ULH-MHP; • Key stakeholders (e.g. local operators of ULH-MHP) report that they are able to operate and maintain the systems by themselves; • Local stakeholders' willingness to apply the technology (yes/no);	• Technical surveys during the project implementation; • Feedback from key local stakeholders; • Project progress report;	• The system is installed successfully and ready for demonstration at the site
OUTPUT 1			
ULH-MHP (Ultra Low Head Micro Hydro Power) system installed and operational	• 3 ULH-MHP systems with the capacity of 30 kW installed and functional; • # of local people trained to operate and maintain the systems (gender-disaggregated);	• Project progress report	• The system designed properly suitable for local condition; • Installation completed on scheduled timeline;
OUTCOME 2			
Favourable environment created for ULH-MHP technology deployment	• Extent to which RE policy and regulation recommendations are adopted (rating of 0 to 4); • Extent to which the local capacity to produce ULH-MHP turbine units and spare parts, to develop R&D for ULH-MHP, to deploy ULH-MHP technology are enhanced (rating of 0 to 4); • Increased investment into ULH-MHP systems; •	• Project progress report; • Key stakeholders survey, observations of experts; feedback from key stakeholders	• The demonstrated system is in function for electricity supply; • Local skills for maintenance and manufacturing built through training activities;

OUTPUT 2			
Advisory support to create a favourable environment for ULH-MHP technology deployment	• Availability of a review of policy, legal and regulatory framework for development of/ investment in renewable energy; • Availability of a RE policy paper with policy and regulation recommendations; • Business models developed for operating ULH-MHP system; • # of training courses on operation, local manufacturing and R&D of ULH-MHP with AHEC-IITR; • # of workshops for business partnership development;	• Project progress report	• The demonstrated system is in function for electricity supply; • Mutual agreement between technology provider and local institutions is established;

Annex 6 – Gender mainstreaming checklist for UNIDO energy-related project[4]

	Question	Yes	No	Partially
ANALYSIS/ JUSTIFICATION	1. Does the project explicitly address a gender issue or issues? If so, please describe how and if not, please provide an explanation.			
	2. Does the background/context analysis of the project examine: *(a)* the different situations of women and men *(b)* the impacts the project will have on different groups			
DATA AND STATISTICS	3. Will the project collect and use sex disaggregated data and qualitative information to analyse and track gender issues?			
RESULTS FRAMEWORK	4. Are outcomes, outputs and activities designed to meet the different needs and priorities of women and men?			
	5. Does the results framework include gender responsive indicators, targets and a baseline to monitor gender equality results?			
BUDGET	6. Have adequate financial resources been allocated for the proposed gender activities (vis-à-vis per cent of total budget)?			
STAKEHOLDERS AND PARTICIPATION	7. Are women/gender focused groups, associations or gender units in partner organizations consulted/included in the project?			
	8. Does the project ensure that both women and men can provide inputs, access and participate in project activities (target at least 40 per cent of whichever sex is underrepresented)?			
GENDER CAPACITIES	9. Has a gender expert been recruited or do the project staff have gender knowledge and have gender related tasks incorporated in their job descriptions?			
	10. Will all project staff be sensitized to gender (e.g. staff will complete a basic online course ; staff will complete a basic online course; I Know Gender Course on UN Women's eLearning Campus https://trainingcentre.unwomen.org)?			
IMPLEMENTATION ARRANGEMENTS	11. Is there gender balanced recruitment of project personnel and gender balanced representation in project committees?			
MONITORING AND EVALUATION	12. Will the monitoring and evaluation of the project cover gender issues and monitor behavioural changes towards greater gender equality?			

[4] See Guide On Gender Mainstreaming Energy And Climate Change Projects (UNIDO, 2014) http://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Women_and_Youth/Guide_o n_Gender_Mainstreaming_ECC.pdf

6.2 List of Consultees

Ms. Ayumi Fujino, Regional Director and Country Head – UNIDO India

Mr. KN Vajpai, National Project Co-ordinator, UNIDO Project on Micro Hydro Technology

Dr. BK Bhatt, Director - MNRE

HR Khan, MNRE

Dr. AM Siddiqui, New Energy and Industrial Technology Development Organisation (NEDO), New Delhi

Mr. Dheeraj Kumar, New Energy and Industrial Technology Development Organisation (NEDO), New Delhi

Ms. Noriko Oshima, First Secretary (Economic Division), Embassy of Japan

Mr. Vimel Langer, Diretor, Jag Seaball India

Mr. Aaan Singh Gaira, Chairman, Roorkee Gharat SHG, Kaladhungi

Mr. Raj Kumar Pandey, member Roorkee Gharat SHG, Kaladhungi

Mr. Naveen Pandey

Ms. Leela Joshi, Head, Uttara Gharat (facilitating NGO)

Mr. Ajay Verma, Director IRI

Mr. Sanjeev Kumar Srivastava

Mr. Naeem /Mr. Hukum Singh - Technicians

Mr. Subhas Kumar, Chairman, Yamuna Ghati Krishak Vikas Swayat Sahkarita,

Mr. Kishor, member, Yamuna Ghati Krishak Vikas Swayat Sahkarita,

Mr. Ajay Dogra, Technician

Mr. Bharat Patwal, Head, IDS (facilitating NGO)

Mr. Kishan Nath, Additional Secretary, Irrigation Department

Mr. Ajay Verma, Chief Engineer

Mr. LD Sharma, In-charge – SHP, UREDA

Dr. Arun Kumar (CSO) AHEC-IIT Roorkee

Dr M P Singh, AHEC, IIT Roorrkee

6.3 India Evaluation Mission Itinerary

Independent Terminal Evaluation of UNIDO Project [UNIDO SAP ID 120182] **Promoting Ultra Low –Head Micro Hydropower Technology to increase access to renewable energy for productive uses in rural India** 31st March – 8th April 2016, Delhi, and Uttrakhand, India		
Day **Date** Venue	**1st Half of the day** Officials and Organisation to meet	**2nd Half of the day** Officials and Organisation to meet
Thursday **31 March** **UNIDO New Delhi** **MNRE New Delhi,** **NEDO New Delhi office**	**1000 – 1130 Hrs:** Ms. Ayumi Fujino, Regional Director and Country Head – UNIDO India (a.fujino@unido.org) Mr. KN Vajpai, National Project Co-ordinator, UNIDO Project on Micro Hydro Technology (k.vajpai@unido.org) **1200 - 1330 Hrs:** Dr. BK Bhatt, Director - MNRE and his team (bkbhatt@nic.in)	**1430 - 1730 Hrs:** Dr. AM Siddiqui & Mr. Dheeraj Kumar, - Representatives from New Energy and Industrial Technology Development Organisation (NEDO), New Delhi Ms. Noriko Oshima, First Secretary (Economic Division), Embassy of Japan (noriko.oshima@mofa.go.jp)
Friday **1 April** **UNIDO, New Delhi**	**1030 -1330 Hrs:** Discussion of ET members with Mr. KN Vajpai, NPC	**1400 - 1730 Hrs:** Mr. Vimel Langer, Diretor, Jag Seaball India (langer@seabell-i.com) +919810157191

Sunday **3 April** **New Delhi**	**1100 Hrs:** Leave by Taxi for Haldwani	**1700 hrs**: Arrival at Haldwani and Hotel check in
Monday **4 April** **Project Site at Kaladhungi, Nanital**	**0900 Hrs:** Travel to Project site at Kaladhungi **1000- 1330 Hrs**: Site visit and interaction with Beneficiary Representatives at Project site, NGOs, Community, SMEs, Association Roorkee Gharat SHG, Kaladhungi, Ward No. 2, Kaladhungi, Nainital, Uttarakhand, INDIA 263140, 1.) Mr. Aaan Singh Gaira, Chairman, Mob: +919411634979, 2.) Mr. Raj Kumar Pandey, member +919411634979, 3.) Mr. Naveen Pandey Mob: +919720563197, 4.) Ms. Leela Joshi, Head facilitating NGO, Uttara Gharat Mob: +918171664370 leela.devi.joshi@gmail.com	**1500 Hrs**: Hotel check out and Travel to Haridwar **2000 hrs:** Arrival at Haridwar and Hotel check in

Tuesday **5 April** **Irrigation Research Institute (IRI), Project Site at Bahaderabad, Haridwar.**	**1000 Hrs:** Travel to Project site at IRI, Bahderabad, Haridwar **1100-1400 Hrs:** Site visit and interaction with Beneficiary Representatives at Project site 1. Mr. Ajay Verma, Director IRI ajayirri@gmail.com, 2. Mr. Sanjeev Kumar Srivastava Executive Engineer, sksrivastavaid@gmail.com, 3. Mr. Naeem /Mr. Hukum Singh - Technicians	**1600 Hrs:** Hotel check out and Travel to Dehradun **2100 Hrs:** Arrival at Dehradun and Hotel Check in
Wednesday **6 April** **Project Site at Ambadi, Dehradun** **Irrigation Dept. Dehradun,**	**0900 Hrs:** Travel to Project site at Ambadi, Vikas Nagar (Dehradun) **1030- 1330 hrs:** Site visit and interaction with Beneficiary Representatives at Project site, NGOs, Community, SMEs, Association 1.) Mr. Subhas Kumar, Chairman, Yamuna Ghati Krishak Vikas Swayat Sahkarita, Village & Post Office Ambadi, Vikasnagar, Dehradun, Uttarakhand INDIA	**1400 -1600 Hrs:** Meeting with Uttarakhand Irrigation Dept. Mr. Kishan Nath, Additional Secretary Irrigation, Department kishan.nath56@gmail.com Mr. Ajay Verma, Chief Engineer ajayirri@gmail.com

	248 198 Mob: +919411512238, 2.)Mr. Kishor, member, Mob: +917830422177, 3.) Mr. Ajay Dogra, Technician Mob +919410575128, 4.) Mr. Bharat Patwal, Head facilitating NGO, IDS Mob: +917500279072 bharatpatwal@gmail.com **1330 Hrs:** Travel back to Dehradun	
Thursday **7 April** **UREDA, Dehradun** **AHEC-IIT Roorkee**	**1000 Hrs:** Meeting with Mr. LD Sharma, Incharge – SHP, UREDA Evaluation Mission preliminary Debriefing at UREDA, and Feedback gathering **1230 Hrs:** Travel to IIT Roorkee	**1400 -1600 Hrs** Meeting with Dr. Arun Kumar (CSO) AHEC-IIT Roorkee, and his team (aheciitr.ak@gmail.com) **1330 Hrs:** Hotel check out and Travel to New Delhi **2030 Hrs:** Arrival at New Delhi and Hotel Check in
Friday **8 April**	**1100 - 1230 Hrs:** Evaluation Mission Debriefing to UNIDO India team and Project partners	Mission Close

UNIDO, N Delhi		

6.4 Key Documents Reviewed

- Original Project Document (ProDoc)
- Steering Committee Meeting Minutes
- Training Reports
- Presentations
- Annual Reports by PEU
- Ambadi, Kaladhungi and IRI technical Reports
- Various TORs for Technicians
- TORs for Civil Works
- Project Newsletters
- Project Site Briefs
- Installation Reports
- Baseline Analysis Reports
- Brochure on market potential analysis
- Gender Success story
- Watermill Masterplan
- Various Monitoring Reports from Demonstration Projects